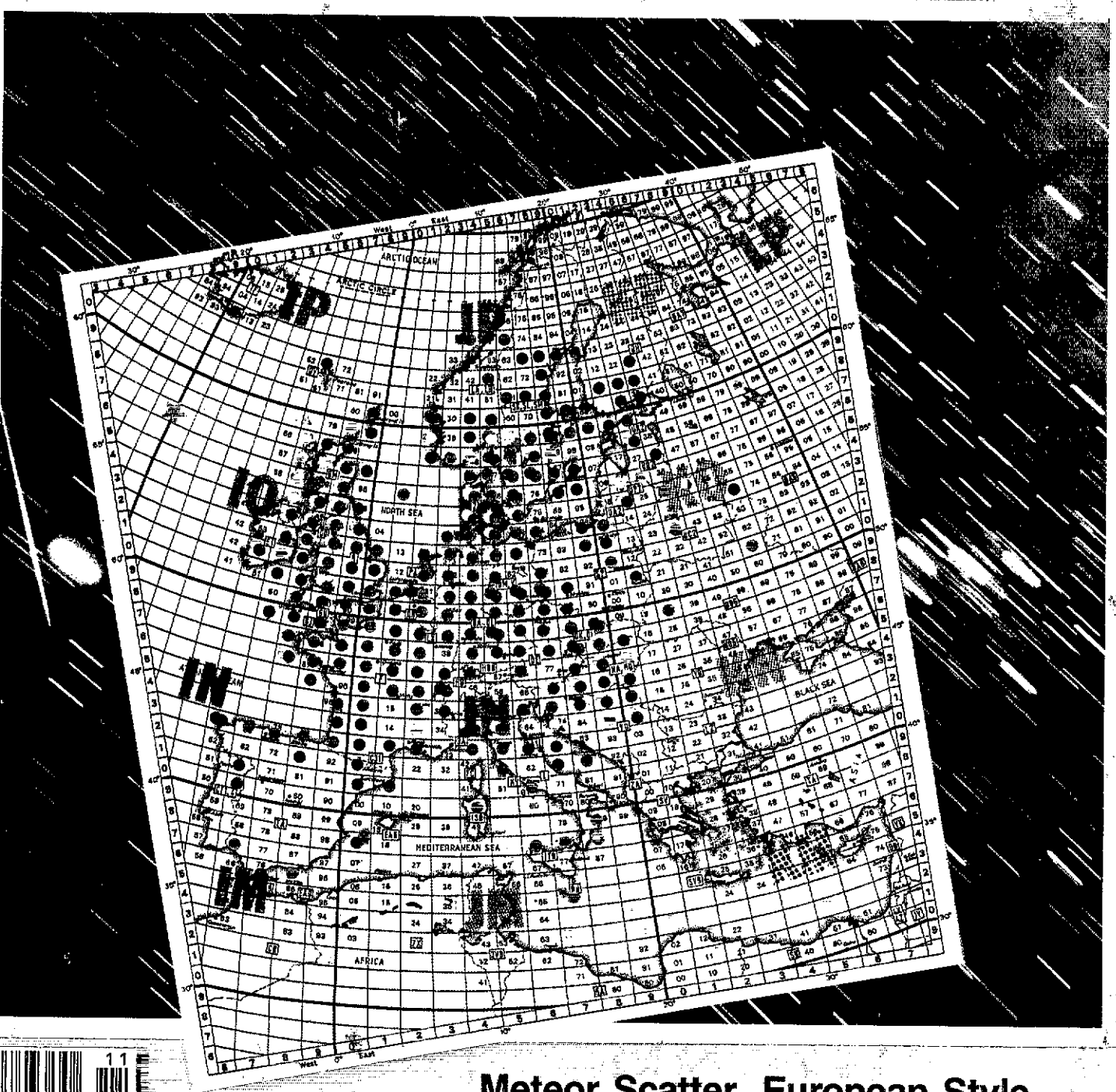
QST

November 1986 $3.00

devoted entirely to Amateur Radio



Meteor Scatter, European Style

843655 9 11

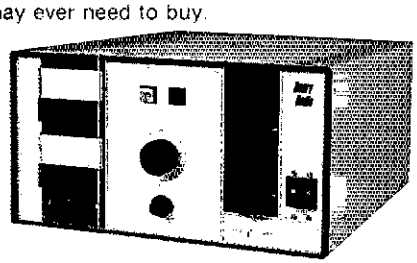
Henry has the amplifier you want!

Take your choice. The world famous 2K Desk Classic, 2K Console Classic and 3K Console Classic HF amplifiers speak for themselves. Now to complete your range of choice, the superb new 3002-A and 2002-A for 146 MHz and the 3004-A and 2004-A for 440 MHz.

Now a veritable cornucopia of superb amplifiers. Just make your choice!

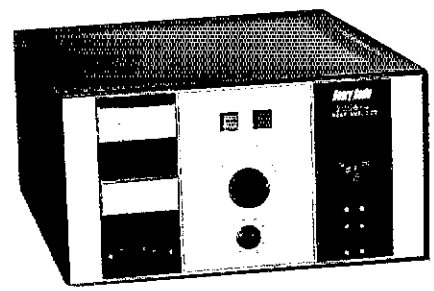
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse", built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through 15 meters (export models include 10 meter).

2K Classic "X"... We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable... the last amplifier you may ever need to buy.



2KD Classic...a desk model designed to operate at 2000 watts effortlessly, using two Eimac 3-500Z glass envelope triodes, a Pi-L plate circuit and a rotary silver plated tank coil. We challenge you to find a better desk model for even a thousand dollars more.

3K Classic MkII...uses the superb Eimac 3CX1200A7 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.



2002-A...a bright new rework of our popular 2002 2 meter amplifier. Uses the new Eimac 3CX800A7. The RF chassis uses a ¼ wave length strip line design for extremely reliable approach. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output.

2004-A The 400 MHz version of 2002-A. Write for full specifications.

3002-A A superb new 2 meter full power amplifier using the 8877 for 1500 watts output. You can't buy a better VHF amplifier.

3004-A Identical to the 3002-A except re-designed for UHF 1000 watts output...430-450 MHz.

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 or Mary Silva for full information.

We stock these plus many other fine names:
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

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KENWOOD

...pacesetter in Amateur radio

Here Now! TM-3530A 220 MHz

Power-Full...70 Watts!

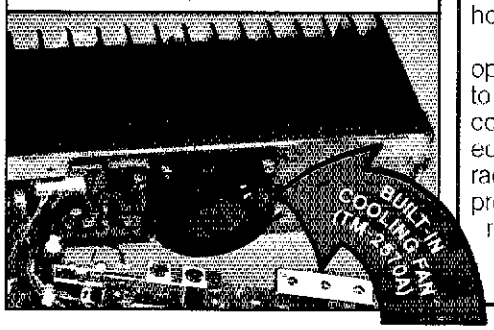
TM-2570A/2550A/2530A/3530A

Sophisticated FM transceivers

Kenwood sets the pace again! The all-new "25-Series" brings the industry's *first* compact 70-watt 2-meter FM mobile transceiver. There is even an *auto dialer* which stores 15 telephone numbers! There are four versions to choose from: The TM-2570A 70-watt, TM- 2550A 45-watt, TM-2530A 25-watt and the TM-3530A 220 MHz, 25-watt.

- **First** 70-watt FM mobile (TM-2570A)
- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit phone numbers)
- Direct keyboard entry of frequency
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- 23 channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz** (optional)
- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- Frequency lock switch
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector—relieves stress on microphone cord
- High performance GaAs FET front end receiver
- HI/LOW Power switch (adjustable LOW power)
- TM-3530A covers 220-225 MHz
- Digital Channel Link (optional)

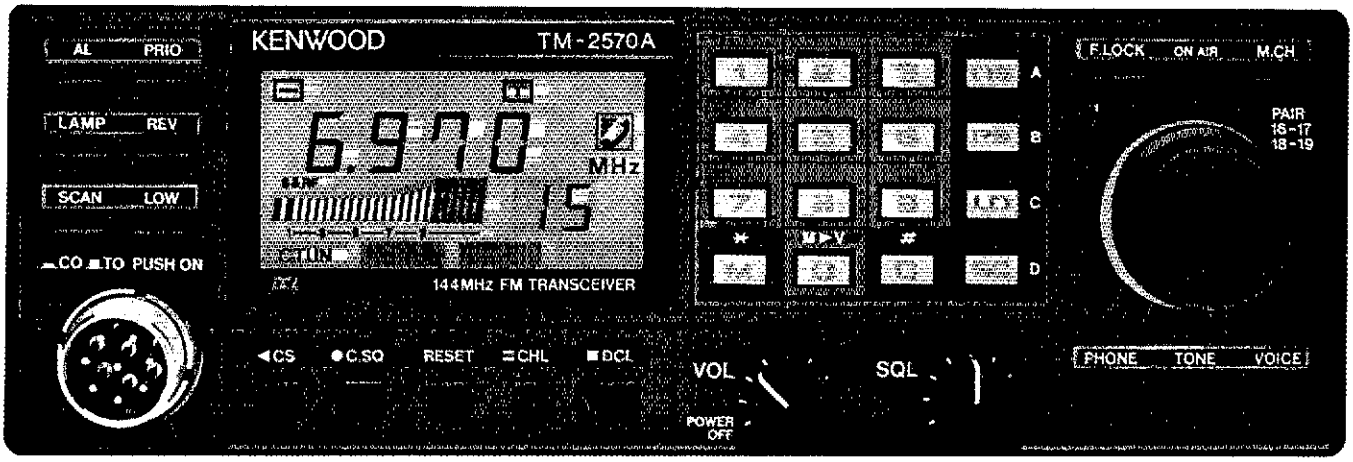
Large heatsink with built-in cooling fan (TM-2570A)



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 Trio-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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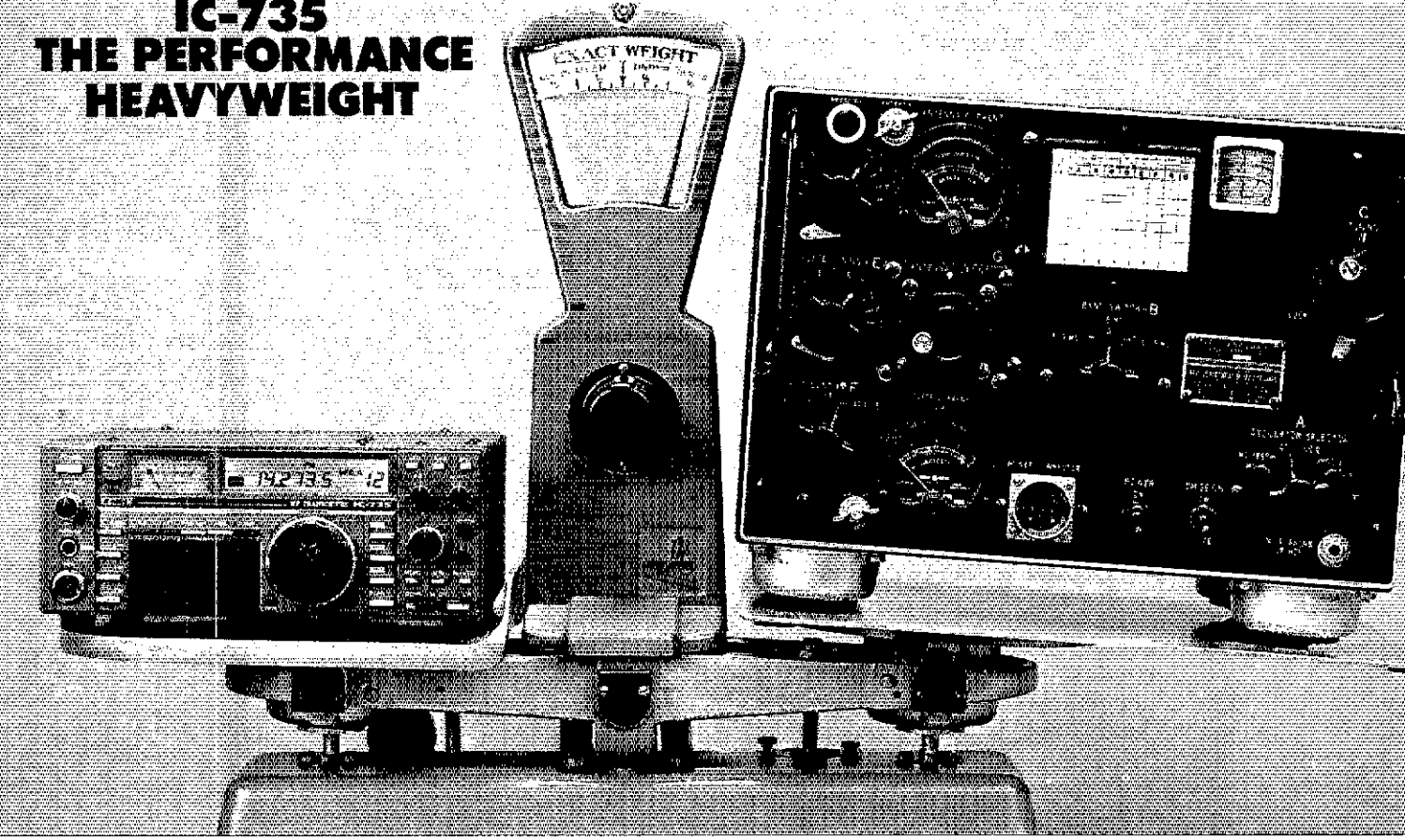
IC-735
THE PERFORMANCE HEAVYWEIGHT



BUY YOUR HF FOR PERFORMANCE, NOT BY THE POUND

- **All HF Band Transceiver/**
- **General Coverage Receiver**
- **HM-12 Scanning Mic Included**
- **12 Memories/Frequency and Mode**
- **105dB Dynamic Range**
- **All Modes Built-In USB, LSB, AM, FM, CW**

The IC-735 is a heavyweight when you compare features and performance. Other transceivers may weigh more than the advanced IC-735 compact HF transceiver, but inch-for-inch and pound-for-pound, the IC-735 outweighs them all.

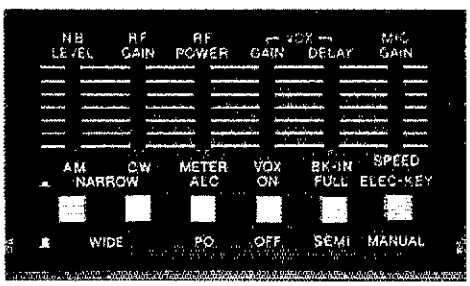
Ultra Compact. Measures only 3.7 inches high by 9.5 inches wide by 9 inches deep and weighs only 11.1 pounds. Without question, the IC-735 is the best HF transceiver for mobile, marine or base station amateur operation.

All Amateur Band Coverage. It's a high performer on all the ham bands, plus it includes general coverage reception from 100kHz to 30MHz. May be easily modified for MARS operation.

12 Memories. Frequency and MODE may be easily stored and retrieved in the 12 tunable memories.

Exceptional Receiver. To enhance receiver performance, the IC-735 has a built-in receiver attenuator, preamp, and noise blanker. PLUS it has a 105dB dynamic range and a technologically advanced low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel. Controls which require infrequent adjustment are placed behind a unique hatch cover on the front panel of the radio. The hatch cover is designed to protect seldom used controls from being accidentally knocked off line, but also provides easy access. The large LCD readout and 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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First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 **Customer Service Hotline (206) 454-7619**
3150 Premier Drive, Suite 126, Irving, TX 75063
ICOM CANADA, A Divison of ICOM America, Inc., 3071 - #5 Road, Unit 9, Richmond, B.C. V6X 2T4 Canada

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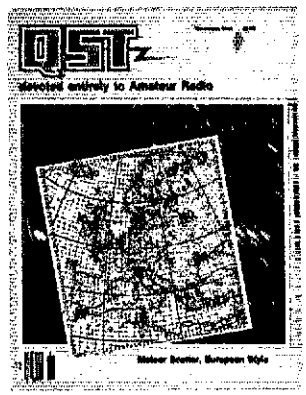
OUR COVER

Our cover map depicts G8VR's Amateur Radio contacts using VHF/UHF forms of communication. A red dot represents 2-meter meteor scatter QSOs; blue, green and yellow dots represent tropo, E_s and aurora contacts, respectively. How does the author successfully make these contacts? See page 35.
(Meteor photo by Dennis Milon)



CONTENTS

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

Or This Inexpensive
It Really Shouldn't Be This Easy

Remember just a few years ago, how it took a roomful of equipment just to work RTTY. And if you wanted more than one mode it took a dedicated computer system costing thousands of dollars. The new AEA Pakratts are proving it doesn't take lots of equipment or money to enjoy working all bands in five different modes.

First, A Good Idea

The idea behind the Pakratt is very simple. One controller that does Morse, Baudot, ASCII, AMTOR, and Packet, and works both HF and VHF bands. Of course the decoding, protocol, and signal processing software must be included in the unit, and connection to the computer and transceiver have to be easy. The unit also has to be small and require only 12 volts, so it will work both in the shack and on the road.

Second, Computer Compatible

It doesn't matter what kind of computer you have, we have a Pakratt for you. The PK-64 works with the popular Commodore 64 or 128, and the PK-232 works with any other computer or terminal that has an RS-232 serial port. The PK-64 doesn't require any additional programs. Simply connect to the computer and transceiver and you're on the air. The PK-232 needs a terminal or modem program for your computer. The one you're using with your telephone modem will work just fine.

PAKRATT™ Model PK-64

PAKRATT™ Model PK-232

Third, Performance and Features

The real measure of any data controller is what kind of on-air performance it gives. While the PK-64 and PK-232 use different types of modems, both give excellent performance on VHF. The optional HF modem of the PK-64 uses independent four-pole Chebyshev filters for both Mark and Space tones, and A.M. detection. The HF option can be factory or field installed.

The PK-232 uses an eight-pole bandpass filter followed by a limiter discriminator with automatic threshold correction. The internal modem automatically selects the filter parameters, CW Fc = 800 Hz, BW = 200 Hz; HF Fc = 2210 Hz, BW = 450 Hz; VHF Fc = 1700 Hz, BW = 2600 Hz.

The PK-64 uses on screen indicators to show status, mode, and DCD (Data Carrier Detect) while the PK-232 uses front panel indicators. Both units use discriminator style tuning for HF operation. And that's just the tip of the iceberg. Features like multiple connects on packet, hardware HDLC, CW speed tracking, and other standard AEA software features are included in both the PK-64 and PK-232.

Fourth, AEA Quality and Price

Not many manufacturers like to discuss quality and price at the same time. AEA thinks you want high quality and low price in any product you buy, so that's what you get with the Pakratts. Ask any friend who owns AEA gear about our quality. The people who buy our products are our best salespeople. As for price, the PK-64 costs $219.95, or $319.95 with the HF option. The PK-64A, an enhanced software unit with a longer flexible computer cable, costs $269.95 or $369.95 with the HF option. The PK-232 costs $319.95 with the HF modem included. All prices are Amateur Net and available from your favorite amateur radio dealer. For more information contact your local dealer or AEA.

Prices and specifications subject to change without notice or obligation.

AEA Advanced Electronic Applications, Inc.
P.O. Box C-2160, Lynnwood, WA 98036-0918
206-775-7373 Telex 6972496 AEA INTL UW

ANT FACTS

ELECTRICAL HAZARDS

You should consider the location of powerlines when selecting an antenna site. In addition to being very dangerous, powerlines are a source of noise and could interfere with your antenna's performance.

Maintain as much separation possible between your antenna installation and powerlines. During installation insure that the antenna and its support cannot come in contact with electric cables.

Safety is always important. You should be particularly aware of safety during the planning and installation of antennas

KENWOOD

...pacesetter in Amateur radio

NEW! Computer-Interface!

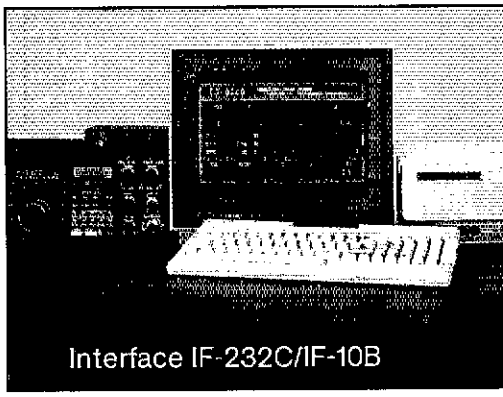
"DX-cellence!"

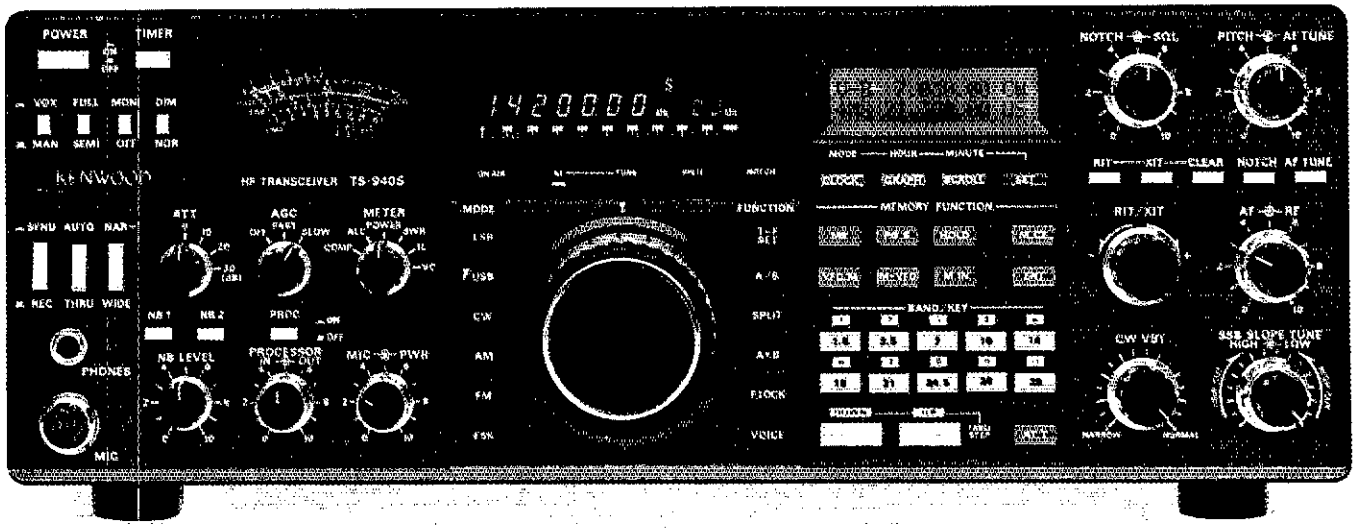
TS-940S

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.





Complete service manuals are available for all Trio-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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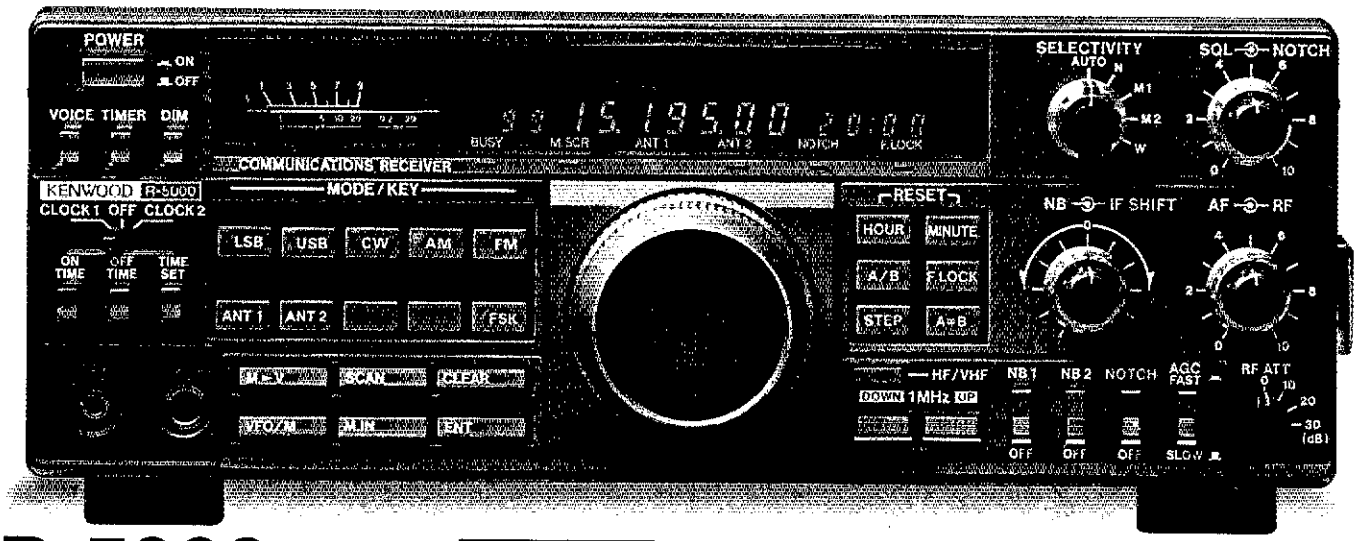
NEW

Hear it All!

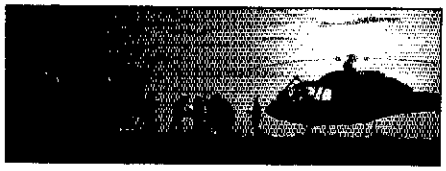


R-5000

High performance receiver

***THE* high performance receiver is here from the leader in communications technology—the Kenwood R-5000. This all-band, all mode receiver has superior interference reduction circuits, and has been designed with the highest performance standards in mind. Listen to foreign music, news, and commentary. Tune in local police, fire, aircraft, weather, and other public service channels with the VC-20 VHF converter. All this excitement and more is yours with a Kenwood R-5000 receiver!**

- **Covers 100 kHz-30 MHz in 30 bands, with additional coverage from 108-174 MHz (with VC-20 converter installed).**
- **Superior dynamic range.** Exclusive Kenwood DynaMix™ system ensures an honest 102 dB dynamic range. (14 MHz, 500 Hz bandwidth, 50 kHz spacing.)



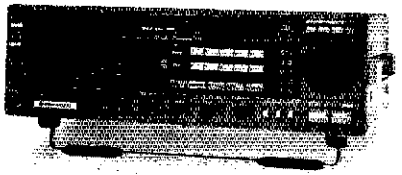
- **100 memory channels.** Store mode, frequency, antenna selection.
- **Voice synthesizer option.**
- **Computer control option.**
- **Extremely stable, dual digital VFOs.** Accurate to ±10 ppm over a wide temperature range.
- **Kenwood's superb interference reduction.** Optional filters further enhance selectivity. Dual noise blankers built-in.
- **Direct keyboard frequency entry.**
- **Versatile programmable scanning, with center-stop tuning.**
- **Choice of either high or low impedance antenna connections.**
- **Kenwood non-volatile operating system.** Lithium battery backs up memories; all functions remain intact even after lithium cell expires.
- **Power supply built-in.** Optional DCK-2 allows DC operation.
- **Selectable AGC, RF attenuator, record and headphone jacks, dual 24-hour clocks with timer, muting terminals, 120/220/240 VAC operation.**

Optional Accessories:

• VC-20 VHF converter for 108-174 MHz operation • YK-88A 1.6 kHz AM filter • YK-88S 2.4 kHz SSB filter • YK-88SN 1.8 kHz narrow SSB filter • YK-88C 500 Hz CW filter • YK-88CN 270 Hz narrow filter • DCK-2 DC power cable • HS-5, HS-6, HS-7 headphones • MB-430 mobile bracket • SP-430 external speaker • VS-1 voice synthesizer • IF-232C/IC-10 computer interface.

More information on the R-5000 and R-2000 is available from Authorized Kenwood Dealers.

R-2000 150 kHz-30 MHz in 30 bands • All modes • Digital VFOs tune in 50 Hz, 500 Hz, or 5 kHz steps • 10 memory channels • Programmable scanning • Dual 24-hour digital clocks, with timer • 3 built-in IF filters (CW filter optional) • All mode squelch, noise blanker, RF attenuator, AGC switch, S meter • 100/120/220/240 VAC operation • Record, phone jacks • Muting terminals • VC-10 optional VHF converter (108-174 MHz)



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

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Section Managers of the ARRL

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 73 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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Alberta — Bill Gillespie, VE6ABC, 10129 90th St, Edmonton T5H 1R5
British Columbia — H. E. Savage, VE7FB, 4553 West 12th Ave, Vancouver V6R 2R4 (604-224-5226)
Manitoba — Jack Adams, VE4AJE, 227 Davidson Ave E, Dauphin R7N 2Z4 (204-638-9270)
Maritime-Nfld — Donald R. Welling, VE1WF, 36 Sherwood Dr, St. John, NB E2J 3H6 (506-696-2913)
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 JØH 1YØ (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd, Regina S4S 5B1 (306-586-4963)

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Eastern Pennsylvania — Kay C. Craigie, KC3LM, 128 Berkeley Rd, Devon 19333 (215-688-5045)
Maryland-DC — John A. Barolet, KJ3E, 108 Elliott Ct, California, MD 20619 (301-862-3201)
Southern New Jersey — Richard Baier, WA2HEB, 1226 Audubon Dr, Toms River 08753 (201-270-9292)
Western New York — William Thompson, W2MTA, RD 1—Rock Rd, Newark Valley 13811 (607-642-8930)
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Indiana — Ronald J. Koczor, K9TUS, 2512 Glenwood Ave, Fort Wayne 46805 (219-483-1365)
Wisconsin — Richard R. Regent, K9GDF, 5003 South 26th St, Milwaukee 53221 (414-282-0312)

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North Dakota — Lois Jorgensen, WAØRWM, Box 55, Abercrombie 58001
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Louisiana — John M. Wondergem, K5KR, 600 Smith Dr, Metairie 70005 (504-837-1485)
Mississippi — Paul Kemp, KW5T, 3581 Beaumont Dr, Pearl 39208 (601-939-7612)
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Rhode Island — John Vota, WB1FDY, 41 Brookside Ave, Centerdale 02911 (401-231-1934)
Vermont — Frank I. Suitor, W1CTM, 727 North Ave, Burlington 05401 (802-863-5907)
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Montana — L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
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Pacific — Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-935-8893)
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Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

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Southern Texas — Arthur R. Ross, W5KR, 132 Sally La, Brownsville 78521 (512-831-4458)

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 . . ."

Let's Put Out the Welcome Mat!

If the FCC staff is able to keep its Novice Enhancement work on schedule, we may be kicking off the New Year in fine style with a substantial sweetening of Novice operating privileges. An announcement of the Commission's decision on Novice Enhancement could come as early as December.

What's the decision likely to be? There's no way of knowing for certain. But, given the overwhelming support for the basic concept that was expressed in hundreds of comments filed with the Commission, any dramatic shift in course at this point would come as a great surprise. It seems a virtual certainty that Novices will emerge with some phone and data communication privileges in one or more of the less-congested bands.

What's going to happen as a result? That depends; and it depends largely on the non-Novices among us.

Assuming that present Novices immediately gain the new privileges, and we're able to get the word out to them, there should be a resurgence of interest among Novices who may not have been on the air in years—if ever. At one time they thought enough of Amateur Radio to take the code and written exams, so they're good prospects for reactivation. But they'll need help. At first, equipment will be in short supply. For most, phone and keyboard operation will be a new experience. In some areas there may not be very much existing activity in the bands that will be newly opened to Novices, so they may have no one to talk to.

Nearly everyone agrees that creating a Novice ghetto is a bad idea. We want Novices to be in the mainstream of Amateur Radio activity, not shunted off to develop a culture of their own. We want Novices eventually to upgrade, to gain the personal satisfaction that comes from greater knowledge and achievement. Above all, we want Novices to feel welcome—to feel recognized as potential contributors to the record of service and accomplishment that makes us all so proud to be radio amateurs.

None of this will happen unless we *make* it happen. Here, for starters, are a few things we should do—either as individuals or through our local clubs—as soon as the FCC Report and Order on Novice Enhancement comes out:

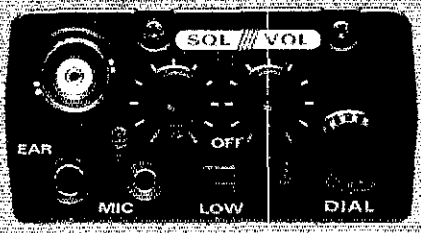
- Get the news out to the local ham community. Pass it along to anyone you know who's ever expressed an interest in Amateur Radio, including inactive Novices.
- Give the story to the local news media, along with a local angle: a quote from a local official expressing pleasure that hams will now be of even greater value to the community, a message of welcome to prospective amateurs from a club officer, news about licensing classes and examination sessions, a phone number to call with questions about Amateur Radio, and so on.
- Have the club secretary go over old lists of club members and Novice licensing class graduates, looking for those whose interest might be revived.
- Make sure there's a local net scheduled for a Novice phone band on a regular basis, and encourage everyone—not just Novices—to check in. (If phone privileges are provided in more than one band, you may have to decide which band is best for your area.)
- Spend as much time as you can looking for Novices on the air, and answering their questions. (Now we'll actually be able to *talk* to Novices *on the air*. On phone, it should be easier to express even one's own love of CW than with Morse at five words per minute!)
- If Novices are allowed to use repeaters, make sure there's one available in your area. (A good club project!)
- Talk upgrading, keeping in mind that carrots are better motivators than sticks. Even with the new privileges there will still be plenty of reasons for Novices to want to upgrade at their own pace.

Welcoming and helping newcomers to Amateur Radio has always been one of our most important and satisfying responsibilities as hams. Along with making the Novice license more attractive to prospective hams, Novice Enhancement should make that socialization process a whole lot easier. —*David Sumner, K1ZZ*

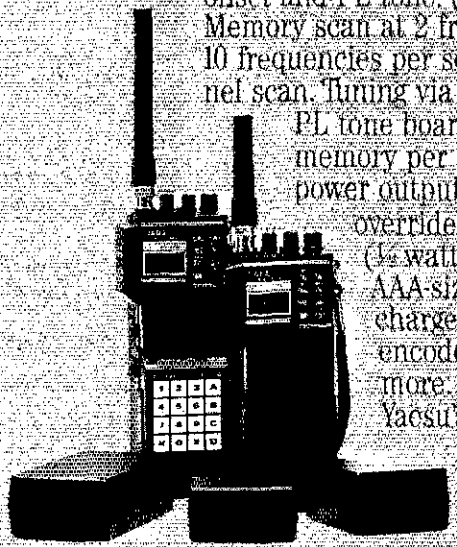
Finally, an HT that's built to take the realities of life.

Let's face it. It's easy to bump, drop, or get rain on an HT. ■ But if your HT is Yaesu's mini 2-meter FT-23R or 440-MHz FT-73R, such mishaps are a lot less worrisome. ■ They're built to last, with rugged aluminum-alloy cases that prove themselves reliable in a one meter drop test onto solid concrete. Plus, their moisture-resistant seals really help keep the rain out.

Built for the realities of operating. Despite their miniature size, both radios have all the operating capabilities of larger microprocessor-controlled HTs. Yet operating them couldn't be easier. Consider: ■ You get a 10-volt, 2-watt battery pack. (Optionally, a 12-volt, 5-watt pack, or a 10-volt miniature 2-watt pack.) 10 memories that store frequency, offset and PL tone. (7 memories can store odd splits.) Memory scan at 2 frequencies per second. Band scan at 10 frequencies per second. Tx offset storage. Priority channel scan. Tuning via tuning knob, or up/down buttons.



Radios above shown actual size.



PL tone board (optional). PL display. External PL selection. Independent PL memory per channel. PL encode *and* decode. Expanded Rx coverage. LCD power output and "S" meter display. Battery saver circuit. Push-button squelch override. Eight-key control pad. Keypad lock. High/low power switch (½ watt on low power.) ■ Options available: Dry cell battery case for 6 AAA-size cells. Dry cell battery case for 6 AA-size cells. DC car adapter/charger. Programmable CTCSS (PL tone) encoder/decoder. DTMF keypad encoder. Mobile hanger bracket. External speaker/microphone. And much more. ■ So get the intelligent mini HT that's built for life's realities. Yaesu's 2-meter FT-23R, or 440-MHz FT-73R.

YAESU

Our 30th Anniversary.

Yaesu USA 17210 Edwards Road, Cerritos, CA 90701 (213) 404-2700. Customer Service: (213) 404-4884. Parts: (213) 404-4847
Yaesu Cincinnati Service Center 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100.

UP FRONT in QST

Ham Radio Comics: Archie and his friends are full of adventure again—this time on the amateur airwaves, as they deal with a flash flood, a robbery and a ham radio imposter. Developed as a joint educational project by the Amateur Radio business community and the ARRL, the 32-page comic book is jam-packed with fun things for young people between the ages of 9 and 15 to do and read, and an application form to join the Archie Radio Club. Copies are available free of charge to teachers upon request from the ARRL Club Services Department. Help spread the word by contacting a school near you today.

ARRL/AMSAT Discuss Ham Space Station

One of the loftier topics discussed at the 1986 ARRL National Convention was the possibility of including an Amateur Radio facility aboard the NASA Space Station, slated for launch in 1995. A working group made up of representatives from the ARRL and AMSAT was organized to draft a long-range plan, which could lead to a formal proposal being made to NASA in 1987. See this month's Happenings for details.

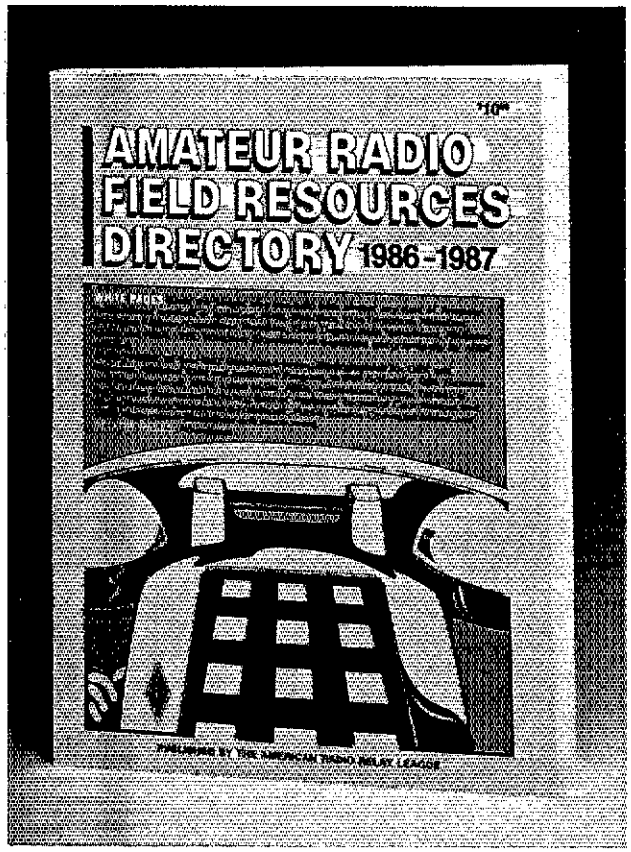
Entertainer/Ham Featured on TV PSAs

Television viewers will have an opportunity to see another side of Country and Western entertainer Ronnie Milsap—his ham radio side. The 1985 Grammy Award-winning singer, whose call is WB4KCG, has completed four new television public-service announcements promoting Amateur Radio. The PSAs—one 20-second, two 30-second and one 60-second spot—are available on NTSC 3/4-inch U-Matic and 1-inch type C broadcast videotape. They were co-produced by Bill Pasternak, WA6ITF, and Frosty Oden, N6ENV. If you can get one of these PSAs aired at a television station near you, contact ARRL Librarian Karl Townsend for a copy.

FCC: Special Call-Sign Program Could Work

Some FCC officials believe that a special call-sign assignment program could work in the Amateur Service, but would have to be handled by the private sector, not the FCC, at a cost to hams. That was a popular topic of discussion at the FCC Forum at the 1986 National Convention. See this month's Happenings for details.

Radio Camp: During summer camp this year, these kids and others spent some of their time indoors, but they didn't mind at all. Thanks to Terry Falknor, N8EEO, Dayton YMCA officials were sold easily on the idea of including ham radio at Camp Kern, a coed camp in southwestern Ohio. With help from the Dayton Amateur Radio Association and the ham radio industry, Terry was able to find a counselor—John McCoy, NS8A—and the equipment needed to set up a station at the camp. During the course of the summer, about 50 kids attended code and theory classes, with 20 going home with a Novice ticket. Camp personnel were very impressed by the kids' reaction to ham radio, says Terry, and plan to ask for an expanded progam next year.



The ARRL Phone Book: Have an Amateur Radio-related question, but don't know where to find the answer? Just ask FReD—the *Field Resources Directory*, that is. In it you'll find a wealth of information to help you contact a League official, solve an RFI problem, find an exam site, answer a technical question, and much more. See page 144, this issue, for information on how to order your copy.

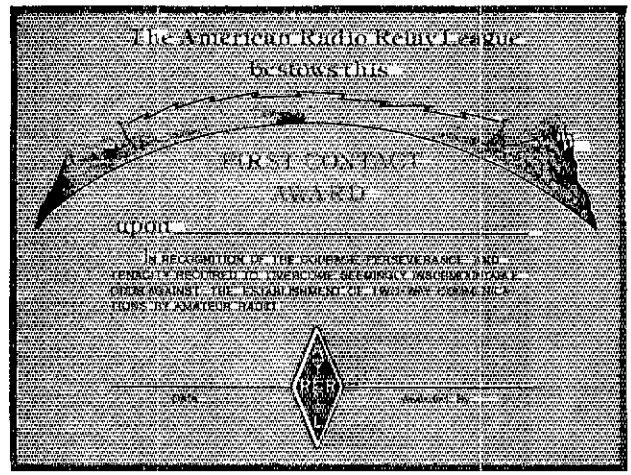
Have an Elmer Story to Tell?

Most everyone who's made it through the Novice test and through that first QSO has had a special someone—an Elmer—who has been a teacher, cheerleader and friend through it all. If you have an interesting story to tell about your Elmer, we're interested in seeing it, and may publish it in a future issue of *QST*. Send your Elmer story to ARRL, Attention: Elmer, 225 Main St, Newington, CT 06111.

Space Symposium to be Held This Month

If you're interested in what's happening in amateur satellites, AMSAT's Fourth Annual Space Symposium and Annual Meeting is the place to be on November 7-9. The symposium is being held at the Dallas/Fort Worth Airport Hilton Hotel, and will include experts from around the world who will address the latest in OSCAR news, including Fuji-OSCAR 12, the newest member of the satellite family, Phase 3C and the new Phase 4 Program. The featured speaker will be Dr Martin Davidoff, K2UBC, satellite expert and author of the popular *Satellite Experimenter's Handbook*. Registration information is available from AMSAT HQ, tel 301-589-6062.

"Best in the West": From the start, the 1986 ARRL National Convention was earmarked for success. About 6000 hams attended the event, held in San Diego September 5-7, which has been described by ARRL Executive Vice President Dave Sumner, K1ZZ, as "possibly the finest ever held in the western US." Shown are Roy Neal, K6DUE (cutting the ribbon), and Convention General Chairman Walter Hicks, W6UZL, during opening ceremonies. See this month's Happenings for a full report.



Remember Yours? Getting a Novice license is a worthy achievement indeed, but making that first on-the-air contact is, well, quite another feat in itself. Why not commemorate your first QSO with this certificate from the ARRL. You can get one by asking your Elmer, instructor or the ham first contacted to request a certificate from the ARRL Club Services Department. Elmers and instructors may obtain small quantities of the certificate from HQ. By the way, this month's lead article features the recollections of several amateurs who fretted and sometimes fumbled but ultimately braved their way through that first QSO. Don't miss it!

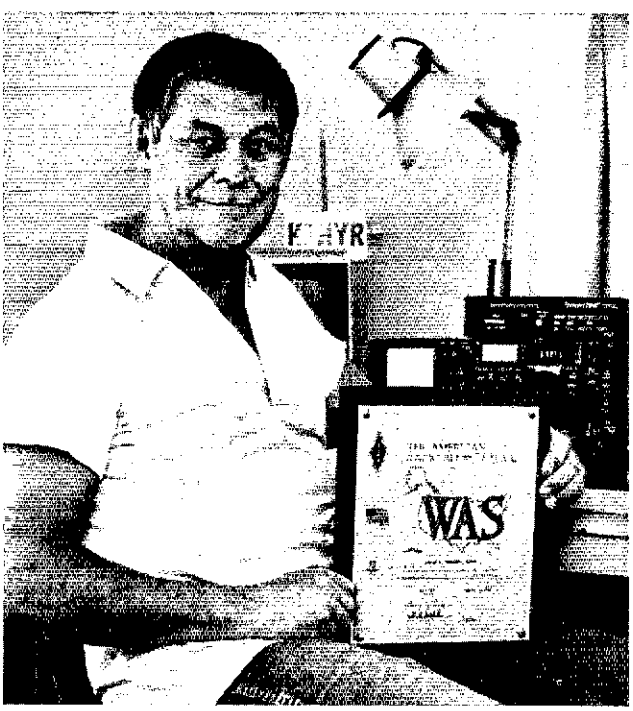
Can Do: Ron Small, WB2OOB (left), and Randy Maurer, WA3HLP, brought a little something special into the lives of a few children. They did it while spending a week this past summer in the woods of central Pennsylvania at Camp Can Do, a resident camp sponsored by the Childhood Cancer Committee of the Pennsylvania Division of the American Cancer Society. There, the two hams set up a station so the kids could experience the thrill of talking to hams in parts of the US and the world they may never get to see. Josh Styer, of East Greenville, Pennsylvania (shown here), got to talk with a ham in Boston during his chance at the radio.

Trivia Quiz

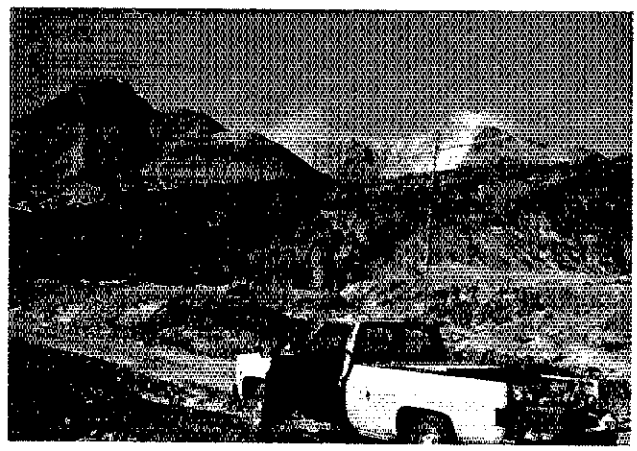
Time to put your thinking caps on again. Everyone knows that Hiram Percy Maxim, W1AW, was ARRL's founding President. But who was the League's founding Secretary? And who was the first full-time paid manager? Answers will appear next month in this column.

Visiting Mexico?

Although there is no reciprocal-licensing/operating agreement between the United States and Mexico, it is possible for US amateurs to obtain permission to operate south of the border. For more information on applying for permission and some tips on operating there, contact the ARRL Information Services desk.



From WARC to WAS: Don Marchesi, K7HYR, of Seattle, Washington, is the first to qualify for the first Worked All States endorsed for 12 meters (24 MHz). To accomplish this feat, Don used a home-brewed 4-element monoband beam on a 24-foot boom, which he built shortly after the 12-meter "WARC band" became available for amateur use on June 22, 1985. Congratulations, Don!



Mount St Helens' Hams: Every since its violent eruption a few years ago, hams have played an important role in the continuing scientific research of the Mount St Helens volcano in Tacoma, Washington. In order to enter the restricted areas, scientists must be able to establish and maintain a commmunications link with the US Forest Service, and that's where radio amateurs come into the picture. In September, for example, area hams accompanied geologists from the Institute for Creation Research through the rough terrain for several days and kept them in touch with US Forest Service officials. Getting out of the "hole" was accomplished through a local repeater with this 8-element beam antenna mounted on a 10-foot mast on a pickup truck. *(photo courtesy N7CFA)*

Insure—to be Sure

Replacing stolen or damaged amateur equipment can be costly—if you're not prepared for the worst. That's where the ARRL Equipment Insurance Program comes in. For a few dollars, ARRL members can get the utmost in "all risk" equipment protection. See this month's Happenings for details.

League Lines

FCC Dismisses Stoner Petition But May Create New Threat To 902-MHz Band: The FCC has dismissed a petition for rule making filed by Donald Stoner, W6TNS, which sought to create a new public digital radio service in the 52- to 54-MHz portion of the 6-meter amateur band. However, in doing so they may have created a new threat to the 902-MHz band. The Commission in its denial noted that the entire 6-meter band is allocated to the Amateur Radio Service, and ITU regulations do not provide the United States with any additional or alternative allocation that would permit a different type of service. The Commission also said that the reallocation of the 6-meter band to a new service would significantly and adversely affect existing amateur operations.

However, the Commission concluded that their actions dismissing the Stoner petition "should not discourage alternative proposals to establish a new computer hobbyist radio service" and that "computer hobbyists should continue to assess various spectrum alternatives ***such as portions of the 902- to 928-MHz frequency band, for this type of proposal.***" The ARRL believes that a good radio service for computer hobbyists already exists—it's called ***Amateur Radio,*** and any new service is unnecessary. It is unknown at this time why the Commission suggests the 902-928-MHz band in its conclusion.

Novice Enhancement Update: We understand that Novice Enhancement has been placed on the "fast track" within the FCC. The work schedule for the Special Services Division calls for completion by mid-November, at which time the draft Report and Order would be forwarded to the Chief, Private Radio Bureau, and then to the Commissioners for consideration. Thus, if everything goes as planned, it would appear that there's a reasonable possibility for Novice Enhancement to be in Amateur Radio's Christmas stocking.

Of course, there's no way of knowing in advance exactly what will be in the final rules. However, given the positive tenor of the comments filed, it seems reasonable to assume that something generally similar to what has been proposed will emerge.

1985 Hiram Percy Maxim Award Winner NK8Q: Mark J. Schreiner, NK8Q, is the recipient of the 1985 Hiram Percy Maxim Memorial Award. This award is given annually to the licensed amateur under the age of 21 for their accomplishments and contributions to Amateur Radio. Nominations are made by ARRL Section Managers, and the winner receives a $1000 award and plaque.

Mark is 20 years old and has been licensed for nearly five years. He is active in various traffic nets, including being an NCS for MID-CARS and the Michigan traffic net, and is Vice President of the Saginaw Valley Amateur Radio Association.

Mark's most notable achievement has been the direction of volunteers in service to a community event known as "The Friendship Games." The event occurs each August and involves the exchange of thousands of pieces of information needed to coordinate the activities of approximately 600 youngsters and 2000 adults who travel between Sault Ste Marie, Ontario, and Saginaw, Michigan.

Mark has been an integral part of this function and has taken on sole responsibility for its fruition for the past two years.

In the 6th call area, the FCC is about to run out of 2×1 Extra Class call signs. When the 2×1 calls are exhausted the Commission will begin issuing 2×2 calls beginning with the prefix AA6, such as AA6AB. A few AA6 2×2 calls were issued to Extra Class licensees in the late 1970s, but none have been issued since then. AA4 2×2 call signs have been issued to 4th call area Extra Class licensees for the past 2 years, as well as a few during the late 1970s.

There is an immediate opening for a full-time staff position of Deputy Circulation Manager at ARRL HQ. The Circulation Department is responsible for memberships, subscriptions and publication sales. Marketing and supervisory background required. An Amateur Radio license and recent radio retail store experience especially desirable. Salary range $18,226-25,506 depending on qualifications. Contact Publications Manager Paul Rinaldo, W4RI.

The Senate Judiciary Committee on September 19 gave unanimous approval to S.2575, the Electronic Communications Privacy Act. Consideration of the bill took less than a minute.

Senator Paul Simon (D-IL) introduced two amendments to the bill on behalf of the Association of North American Radio Clubs (ANARC). One reduces the penalty for a first intentional interception of public land mobile radio services (including cellular, older carphones and paging) to a fine of $500, eliminating the six-month jail term. The other eliminates criminal penalties for intentional interception of broadcast remote pick-up stations, but permits the federal government to seek court injunctions against interceptors, accompanied by a $500 civil fine. The Simon amendments, offered as compromises with those wanting stiffer penalties, were accepted and incorporated in the bill.

Just at press time ARRL HQ was informed that S.2575 was attached to the Senate Drug Act bill and passed by the Senate. Since a similar House Drug Act bill was passed without the Privacy Act bill, the bill now goes to a joint House-Senate conference committee. It is unknown at this time if the house conferees will object to the Privacy Act being attached to the bill or go along with the Senate. Since Congress is now in a rush to adjourn, any objection to the attachment of the Privacy Act bill would probably kill the bill in Congress this year.

Canada-Japan Reciprocity: Canada has signed a reciprocal licensing/operating agreement with Japan, effective November 16, 1986.

This is the third country that the Japanese government has entered into such an agreement with, the other two being the United States and the Federal Republic of Germany. Full information for US or Canadian amateurs to operate in Japan is available either from the ARRL or CRRL Headquarters or from the JARL Secretariat, 1-14-2 Sugamo, Toshima, Tokyo 170, Japan.

Amateurs operating in Japan under a reciprocal licensing/operating agreement sign 7J calls, such as 7J1AAA in Tokyo, 7J1ACH on Minami Tori-shima, 7J3AAA in Osaka, and 7J8AAA in Sapporo.

On the Air—At Last!

If you haven't worked up enough nerve to make that first contact, maybe these hams' experiences will give you the confidence you need.

By Paula McKnight, N1DNB
Editorial Assistant, ARRL

Hands shaking, pulse racing, your mind frantically running in circles like a hyperactive hamster in an exercise wheel. Is this describing a groom waiting for his bride to reach the altar? A baseball player at bat in the bottom of the ninth inning with a 3 and 2 count and the bases loaded? These symptoms belong to a common ailment called Novice Nervousness. It may be acute and uncomfortable, but I am happy to report that it is only temporary, never fatal.

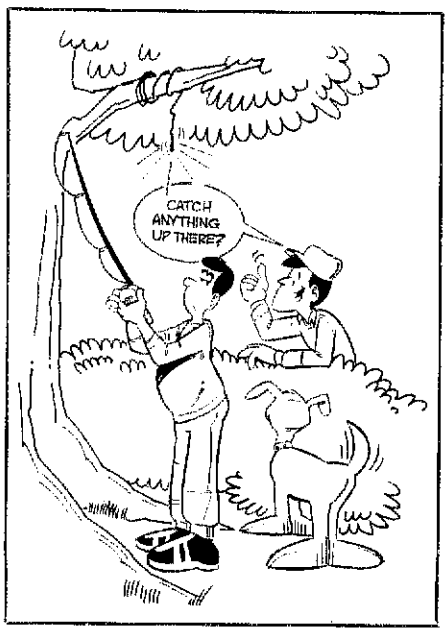
From the personal accounts in this article, it is safe to say that first-contact experiences are as varied as the operators themselves. Like snowflakes, no two are identical. However, there's a common thread throughout the narratives—everyone was apprehensive to some degree. Questions crowded their minds: Will the person at the other end go too fast? Can I be understood? (Shaky fists do produce odd-sounding CW.) What if I forget the code halfway through the QSO? How do I spell my name? This is supposed to be fun? Here are some first-hand accounts confirming that you, too, can survive Your First Contact.

"Catching Anything up There?"

It had been three weeks since I had passed my Novice test. Fully expecting another three-week wait for my license, I decided to get my antenna erected. Arriving home loaded down with 300 feet of wire, 100 feet of ladder line and some assorted insulators, I was astonished to find my ticket in my mailbox. A leisurely project was transformed instantly into a race against time.

As I stood beneath a towering oak in the backyard, futilely casting a lead sinker to a limb 40 feet up, my neighbor smirked, "Catching anything up there?" On the 46th try I got the monofilament line over the top. It was nearly dark. It was still dark the next morning as I sat waiting for the sun to come up so I could continue. By 2 PM, 265 feet of wire was up. The question of whether it would resonate on any known amateur frequency wasn't important. The transceiver was well warmed up. I plugged the keyer into its jack and started tuning up carefully, following the steps listed in the manual. Finally, I got the SWR below 2:1. The band sounded like a war had erupted. Every ham west of the Rockies must have decided to get on 40 and work the Novice band. Only later did I learn that it was a contest weekend.

Finally, after 30 minutes of searching, I found a quiet spot and started sending very slowly: CQ DE KB4LSE. My hand was shaking so hard I had to grip my right wrist with my left hand. And then, the matchless moment: KB4LSE DE KB4LOY K. To be truthful it wasn't much of a QSO. The QRM was just incredible, and I didn't have a chance to tell my first contact he was just that. In between a word, a contester found what he thought was an empty spot, and that was that. My advice to any Novice is simple: Don't try to make your first contact on a contest afternoon!—*Hugh Rushing, KB4LSE*



Fight or Flight

My Elmer insisted that my first contact be someone who answered my CQ, so I suppressed all urges to respond to a multitude of strong signals with slow, "clean" fists. CQ CQ DE KA9JFR K. At 3 watts, the effect was similar to a code-practice oscillator; I called again.

KA9JFR DE K1KO—GA OM (huh?) CONDX VY POOR—COULD NOT COPY U SOLID—GESS I SHOULD NOT HV ANSWERED UR CQ (oh no, please!)—UR SIG 459 HR IN EAST ORLEANS MASS—NAME TIM—LETS TRY AGN PSE (bless you, Tim) DE K1KO KN.

I cannot quite remember what happened next, but I may have used both hands on the straight key. Sweaty palms and rapid heartbeats were certainly part of it, but what I experienced was as close as any human can come to a true wild animal's fight-or-flight encounter.

R KA9JFR DE K1KO—SOLID COPY THAT TIME—OK UR RIG—GOOD SIGNAL ALEX—U HANDLE CW LIKE A VETERAN—U MUST HV HAD SOME PREVIOUS EXPERIENCE ALEX—AM OK IN CALLBOOK—MNE TNX REAL NICE QSO HPE CU AGN—LOTS LUCK ES VY 73 ALEX—KA9JFR DE K1KO GA.

I filled out a QSL card and drove right

to the post office. I may have even left the radio on. I was glowing!—*Alex Vrenios, KX9I*

What Do I Do Now?

I decided to send out a CQ. Listening for a clear frequency, I moved the dial back and forth. Finding a quiet frequency, I sent out my call. No response. Again, I tried. KA5DAV DE KA5BNM K. Oh, no! What do I do now? The months of listening and studying were immediately forgotten. Beads of water popped out on my forehead, and my palms became wet and clammy. I stared into my radio dial as if expecting a voice to tell me what to do next. Through my headphones came another loud sound that brought me back to reality. KA5DAV DE KA5BNM K.

My hand reached for the straight key. I started trying to pound out my signal. My shaky fist could be recognized as a beginner's by anyone. It was surprising the station I was working could make head or tails of my transmission.

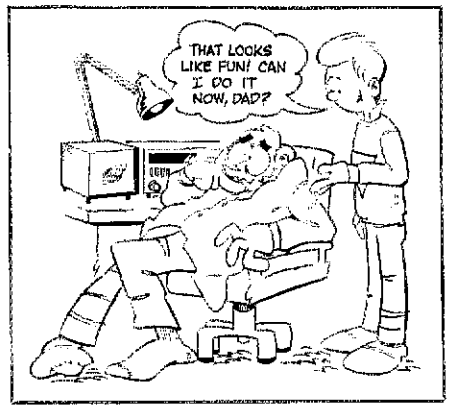
The station seemed to send faster and faster (in reality, he probably sent slower). I was afraid I couldn't copy him, even though his signal was strong. I sent my name and QTH, gave his RST and told him the QRM was so bad that I couldn't copy him. I then signed off and turned off the switch. I filled out my log, threw down the headphones and headed out the door. My family was at my grandmother's house, about three blocks away. I ran that three blocks in record time! I just had to tell them about my first ham contact.

Would I do it all over again? Would I go through the hard work, the sweat and tears? You bet I would!—*Carl Hickman, KA5DAV*

Total Darkness Descended

I didn't feel nervous or worried but was quite excited. My son and I calmly sat down in front of our Yaesu FT-101 and, after finding an open spot, began to QRL and CQ. To be honest, thoughts were running through my mind, like, "Is the transmitter really putting something out?" "Have I pushed all the right buttons?" and "Could there really be a ham out there listening at this moment?" After my third attempt, someone was sending code. My first thought was "Oh, great, I've jumped into the middle of a conversation." Feeling somewhat embarrassed I began to copy for practice and maybe to talk to them when they finished. All of a sudden it dawned on me I was copying my call sign! Then I heard KN, reached for the paddles and total darkness descended. With a sudden fear (my hand started shaking, which never happens to me), I froze, my hand one inch from the paddles as I desperately tried to remember my call sign, my name—anything—maybe even a few letters of code.

Finally, after what seemed about two or three hours, I had one of those brainstorms



born of desperation and sent back our call signs. Evidently, KA7MVO wanted to do more than just exchange call signs and began talking to me. All that time spent copying code off the radio and sending all those messages to imaginary distant parts of the world as I sat and practiced were lost forever. I don't think anyone could have sent slow enough for me to copy at that moment. Then it was my turn, and there I sat tongue-tied (key-tied?). Since he obviously didn't want to hear more call signs, I opted for something far more ingenious. HI I sent. However, this seemed a little short and maybe I should send something more, so I continued.

UR MY FIRST CONTACT AND I AM SCARED KN. His reply was RELAX ITS JUST ME WE CAN GO AS SLOW AS YOU WANT. Thank heavens for the patience of Jack, KA7MVO, and 15 minutes later I finished my QSO. After the last 73, I collapsed back into the chair a nervous wreck. My son, KA7VIO, said, "That looks like fun. Can I do it now, Dad?"—*Ron Wilcox, KA7VIN*

First Flight of the Wise Old Duck

As I had wished, my initial contact was with Bill, W9NTP, my good friend and mentor. My first QSO took place on March 25, 1936, shortly after the license arrived. Although I had no transmitter, I was able to make do with what I did have—a two-tube regenerative receiver.

W9NTP's schedule was fairly regular and, fortunately, he showed up as expected. With the antenna lead in my fingers, I keyed the receiver by touching the lead to the receiver's antenna terminal. My first call was successful. The QSO lasted roughly 15 minutes. Considering that my keying method would keep speed to a minimum, and the excitement of a first contact, probably not much more transpired than my identifying myself, but W9WOD was on the air.—*J. W. Dreher, W2TKG*

Hooked on Code

After getting my General, never having been a Novice, I eagerly ordered my first rig and mic and proceeded to set up the antenna and coax. Weeks later, the rig arrived in fine shape, but no microphone was included. It was backordered. So there I sat with a new rig and antenna and only a straight key that I practiced with.

I swore I'd never use CW, but I did need to check the rig and antenna. I found a clear spot on 15 meters and shakily tapped out CQ. Immediately, to my surprise, WB3AWM/4 in Florida came back to me! What now? Can I copy him? Can he copy my poor fist? I felt everyone was listening to us, but proceeded and completed my first QSO! A week or two later the mic arrived, but by now I was hooked on CW! —*Fred Wolf, N3CSL*

We Did It!

I had been, not too patiently, waiting several weeks for my license, and now I could finally get on the air. My Elmer, Doug, K2QWQ, tuned up the rig, and I called CQ in my best slow fist. Someone was there! It was my call sign on the air for the first time. I began to sweat, my pulse rate doubled and my heart felt like a pile driver in my chest. As I started copying, Doug copied along with me in case I missed something important. When it was my turn to answer, I didn't know what to say. He wrote a quick format down, and I filled it in. The contact was short and very sweaty.

As I signed off, I looked at him and smiled in disbelief. After nearly a year of hard work and studying "we" had just made our first contact. Without Doug's patience and encouragement, I wouldn't be KA2YKN today. It was wonderful sharing those few moments with the one person who most understood what it meant to me. I could tell by the ear-to-ear smile on his face that he was proud and happy to have shared my first contact with me, too.—*Jean Priestley, KA2YKN*

At the Helm

I had just turned 16 when my Novice ticket arrived. I was able to enlist the aid of my examiner and another member of the radio club of which I was a member. The deal was that they were only coming over to show me the transmitter tune-up procedure. However, after I had the hang of it, one of them said, "Well, let's go for a contact." I said, "Sure, you guys go right ahead." They quickly said, "Wait a minute. You're the operator in charge here!"

In a hopefully convincing imitation of courage, I sat down at the "helm" and tuned up. It only took two CQ routines to hear what at this point I really wished I didn't—someone answering. Suddenly I froze at the key. I lost all knowledge of Morse code, Q signals, procedures and everything else associated with what I was doing. I became totally reliant upon the instructions of my assistants. During the entire course of the contact I was no more than a computer executing "print" commands.

Of course, in the days that followed, my courage grew and making a contact or two became a regular after school and weekend activity. I will never forget that "first time out." I just wish that I had been more a part of it!—*Frank Monaco, WD4FTH*

I Couldn't Believe It!

I had a big problem at first. The SWR meter showed full reflect, and no apparent signal was being radiated. I was up and down the roof trimming the antenna trying to get the SWR to come down, but no luck. I spent two days trying to make it work. Here I was with my new ticket and couldn't get a signal out. My XYL had labelled my call "VE3 Not Yet Transmitting," which suited the situation for sure.

Out of sheer desperation at this point, I took that bare copper receiving wire and jammed the end through the center of a PL-259 plug and plugged it in the old Viking. I then just taped a ground wire to the outside of the plug. I hit the key and to my utter amazement, the SWR was down to about 3:1! I then put the useless dipole through the receiver, and it was okay for a receiver. I sat there about five minutes building up my courage and then tapped out a CQ. Immediately, I heard my call coming back. I couldn't believe it! It was KA3JEI in Pennsylvania. It took me a few transmissions to get his call right, but he was patient enough to get me through the QSO. I'm so happy now that I'm in the position to help any new hams get on the air.—*Steve Seymour, VE3NYT*

The Greatest Hobby on Earth

It was a dark and stormy night—no fooling! Drizzle-shrouded sunlight faded into night as I picked up my first rig, while forgetting to buy a key or an antenna. Come midnight, from my as-yet-unused basement shack, I could hear even more rain battering the roof. I looked longingly at my transceiver, now sporting a key improvised from a Radio Shack toy buzzer.

Seeing my consternation, my ever-patient XYL volunteered to help me string some 16-gauge electrical wire I found in the tool closet into what might be called a random-length antenna. She held a dim flashlight as I groped around the wet, glassy trunk of a maple tree at the far edge of our backyard. I promptly stumbled over an exposed root, landing squarely in a foot of mud. Nonetheless, I managed to tie an egg insulator to a lower branch and created a more or less operational antenna.

I gave the equipment a cursory tune-up and put out a somewhat mismatched CQ, trembling with excitement and soggy chills. Miracle of miracles, my prayers and CQ were answered when KA4BNH responded. I was a ham radio operator! Suddenly, all the lack of sleep, the wetness and the mud was worth it. By Christmas, I had worked and confirmed all 50 states plus scores of foreign countries. I enjoy the greatest hobby on earth more each day.—*Roy Johnson, KJ9H*

The Theraputic Value of Ham Radio

[You never know what impact that one contact may have on someone else. Bill Taylor, KD4IL, shares this letter.—Ed.]

"I want to thank you for the nice QSO yesterday morning. It was my first one upon getting my license, and I was as shaky as a June bride. I am a retired Eastern Air Lines captain. About three years after I retired, I suffered a severe stroke. After returning home, it was bad to be confined to bed and then to a wheelchair (which I still have to use). You can take so much of TV and reading—so I thought about radio. I built a Heathkit HW-16 with the VFO to go with it. It was tough with the limited use I now have back of my left arm and hand. What I am driving at is this has been great therapy for me, and more stroke victims should take up Amateur Radio. Sorry to bend your ear for so long, but your QSO did me so much good, both psychologically and physically that I just had to write you to thank you. They all told me that I would find nice people in Amateur Radio. You gave me a good start into ham radio, and I'll never forget it. Sincerely, Frank Baque, Jr." [Mr. Baque is now a Silent Key.— Ed.]

Part of the Magic

While at the cottage, I got on the air for the first time after getting my ticket. I picked up an Extra in New Jersey and flopped and floundered through an agonizing QSO. What an ordeal! Afterwards, I asked myself why I had worked and studied so hard all last winter for such a demanding, crazy and nerve-racking hobby as this. Amateurs really are kooks, and I even had a certificate to prove I was one of them. The rig that had intrigued me so much the previous summer was now an intimidating electronic monster; so believe me, I didn't go within six feet of it for another two days.

I eventually psyched myself up to attempt my second QSO. This time, I hung onto the key with a piece of rubber glove. That way it couldn't get away from my sweaty hand! Well, because of an organized plan of attack, things went much better this time. I had prepared a cue card which looked something like this: UR RST _____, NAME IS MARIE, QTH IS _____ etc, and I kept this in front of me for weeks.

That second contact was not particularly noteworthy, but it was exciting because I was still in the stage of disbelief that anyone could actually make sense out of my dits and dahs. I wonder if this feeling ever completely disappears? I hope not because for me, at least, that is part of the magic. I still roam the Novice bands, however, and love to answer a slow CQ, just hoping it might be someone's first time on the air and that I might be able to return some of the gracious treatment accorded me.—*Marie Bedal, VE3LUL (condensed from an article in* The Canadian Amateur)

Worked All Wichita

The log entries began with eight attempts to have anyone respond to my CQ and five notations of attempts to respond to CQ from stations around the country. The comments column told the result in terse terms—neg contact.

On October 30, the log indicated a CQ from WNØPYP. This time the response was to WNØQAC. That was me! After three days of trying, it was my first contact as an amateur. The good news was that it was a first; the bad news was that my signal report was 349. Such a report might not be too bad if the station were 3000 miles away, but she was three blocks away, across the campus of Wichita State University. Over the next 13 days, I managed to make a total of three additional contacts—all within the city limits of Wichita.

I was 25 years old then. My choice was to start as a Novice—one of the best decisions I have made. Novice operators are the most enthusiastic folks in the world. For the individual who would learn the full meaning of Amateur Radio—become a Novice. Build your equipment, and live an excitement that is rare in life.—*Tom Evans, WA6WTA*

How About You?

If you haven't made that first contact, I hope these testimonies will encourage and amuse you. Finding out that you're not the only one who feels scared should help you clear the first hurdle—turning on the rig. Discovering that 99- 99/100% of hams are patient and understanding will hurl you over the second obstacle—putting your fist to the key. Then, take several deep breaths (don't forget to exhale!), call CQ and prepare for a dizzying 15 or so minutes. . . Congratulations! We knew you could do it.

Ray Tracing and VHF/UHF Radio Propagation

It is no news to amateurs that radio propagation at VHF/UHF is usually limited to line-of-sight paths. Here's why that is not always true, and how to calculate propagation paths.

By Jack Priedigkeit, W6ZGN
441 Sherwood Way
Menlo Park, CA 94025

Do you know why the path of radio propagation at VHF/UHF is usually limited to near line of sight? This is caused by the long-term average refractive bending of the wave. However, under some meteorological conditions, refractive bending can result in anomalous propagation well beyond the average radio horizon. This article uses ray tracing to illustrate the effects of the refractive index on the spatial distribution of energy radiated by an antenna. The formation of ducts, radio holes and antiholes is discussed.

Ray-tracing techniques were first used to solve problems in optics. About 30 years ago, this technique was applied to radio propagation, both HF and VHF/UHF, and to the design of microwave antennas. State-of-the-art analog and, later, digital computers were used.[1,2]

The ray paths shown in this article were calculated with a personal computer and plotted with a reasonably priced digital X-Y plotter. Since each ray path was calculated and plotted independent of the adjacent rays, only general conclusions can be made in the regions where the rays merge or cross. Nevertheless, this simple program nicely illustrates the spatial distribution of energy about the antenna and the modes of propagation.

[1]Notes appear on p 21.

Refractive Index and Refractivity Profiles

Absolute refractive index is the ratio of the velocity of propagation in a vacuum to the velocity of propagation in some other medium, in this case air. Refractive index is the square root of the dielectric constant, and it determines velocity just as the square root of the dielectric constant in an RF transmission line determines the velocity factor.

For most purposes, it is sufficient to assume the dielectric constant and

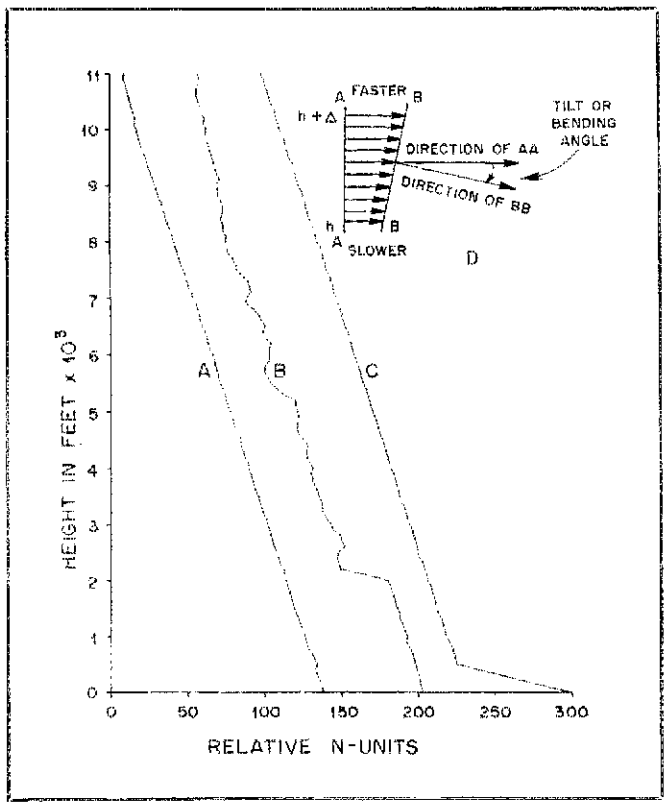


Fig 1—Refractivity profiles. See text.

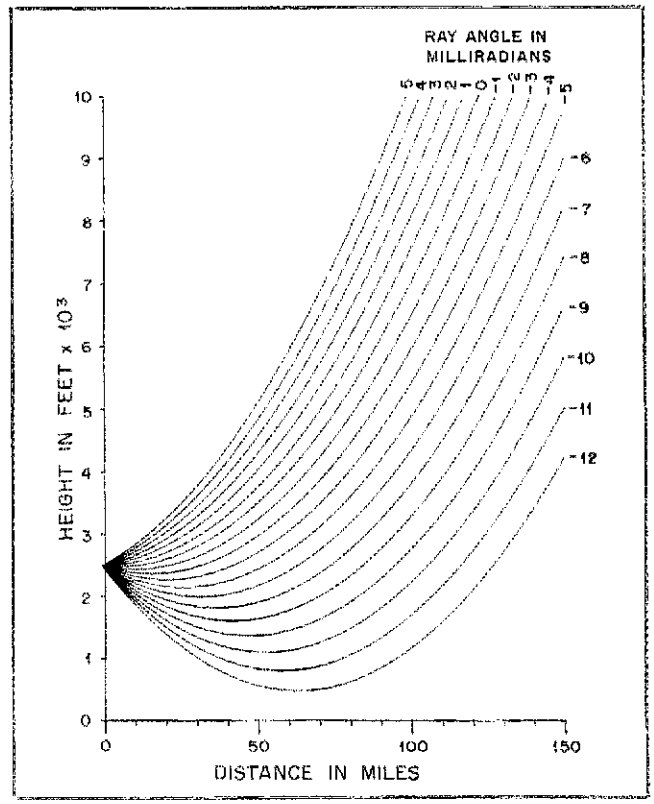


Fig 2—Ray paths for 4/3 earth and a linear refractivity profile.

refractive index for air to be 1. However, the refractive index for air is typically 1.000300 at sea level for average pressure, temperature and humidity. For the convenience of not having to use seven-digit decimal numbers, this refractive index value is defined as a refractivity of 300 N-units.[3,4]

The refractivity of air decreases with height to asymptotically approach zero N-units at great heights. The long-term average decrease in refractivity with height is nearly linear below 10,000 feet, with a slope (or gradient) of −12 N-units per 1000 feet. Thus, a radio signal at height h + △ travels just a little faster than the same signal at the lower height h. The effect is to tilt the radio wavefront downward, ever so slightly (see D of Fig 1). The wavefront tilt, or path bending, for this average refractivity gradient is equivalent to a 4/3 earth radius and results in the familiar expression for the distance to the radio horizon:

$$D = \sqrt{2h}$$

where

D is the distance to the radio horizon in miles

h is the antenna height in feet

Curve A of Fig 1 is a simulated refractivity height profile with a constant gradient of −12 N-units per 1000 feet. The horizontal axis of the figure is in relative N-units, as it is the *gradient* that is important, rather that the actual value of refractivity at any height.

Prevailing meteorological conditions can cause the refractivity profile to depart from the long-term average and can cause a varying degree of path bending as the radio signal propagates. The degree of path bending depends on the gradient, or slope, of the refractivity profile at the path height.

Curve B of Fig 1 is a measured refractivity profile for a particular location and time. This profile was measured with an aircraft instrumented to record refractive index as a function of altitude. It is evident that the average gradient of this profile is like that of Curve A. However, there is a break, or discontinuity, in refractivity near 2000 feet. This is typical of the West Coast and occurs at the interface between a dense fog layer below 2000 feet and clear bright sunshine above the fog. The humidity within the fog layer is 100 percent, and the temperature is 10 or more degrees below that of the dry air above the fog. Within about a 500-ft region, just above the fog layer, there is both a temperature inversion and a rapid drop in humidity. This results in a refractivity gradient of −160 N-units per 1000 feet. This is more than 13 times the average downward bending rate, and, depending on the height of the antenna, can result in elevated ducting.[5-7]

The refractivity profile shown in Fig 1 by Curve C is simulated, and is typical of regions where hot dry air flows offshore over relatively cool water. Large temperature and humidity changes occur at low heights and can result in refractivity gradients on the order of −300 N-units, or more, per 1000 feet. As will be shown later, this condition produces a low level or surface duct. The Arabian Sea region is usually cited as the geographical area where this regularly occurs. However, it occasionally occurs on both the East and West Coasts, and in some lake areas of the US.[8,9]

Ray Plots with the 4/3-Earth Refractivity Profile

The accumulated effect of refractivity on a propagation path extending many miles can best be illustrated by the use of ray tracing. The plot of a family of rays emerging from an antenna can provide considerable insight as to the spatial distribution of the energy radiated by the antenna.

Fig 2 is a plot of the rays emerging from an antenna at a height of 2500 feet. A linear refractivity profile with a gradient of −12 N-units per 1000 feet, Curve A of Fig 1, was used to compute the ray paths. The take-off angle, in milliradians relative to the horizon at the antenna, is shown on each ray. [A milliradian is 1/1000 of a radian, or 0.0573 degree.—Ed.] The angles of interest are within 12 milliradians—less than one degree—of the horizon. Thus, in most cases, the vertical directivity of the antenna need not be considered.

The ray paths are uniformly distributed in space and do not merge or cross with this linear refractivity profile. The rays,

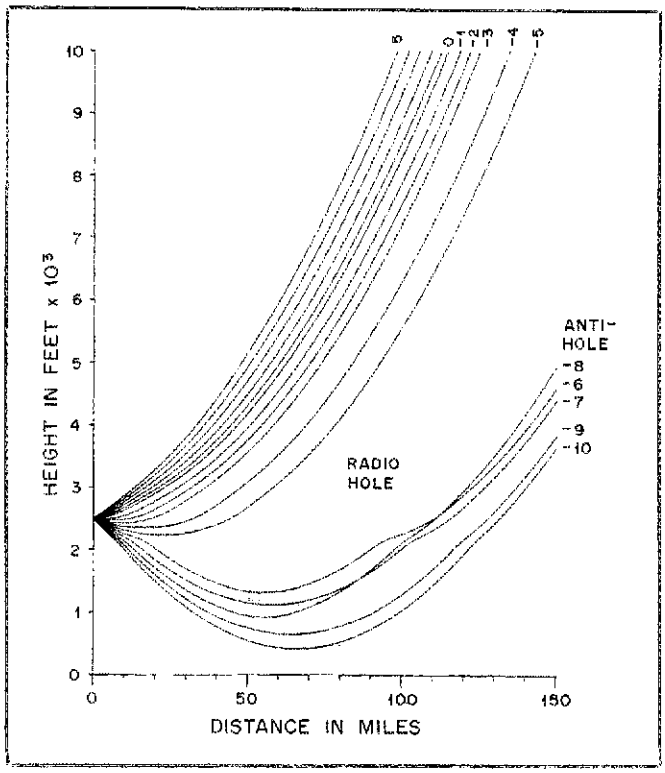


Fig 3—Ray plots for the refractivity profile of Curve B, Fig 1. The antenna height is 2500 ft.

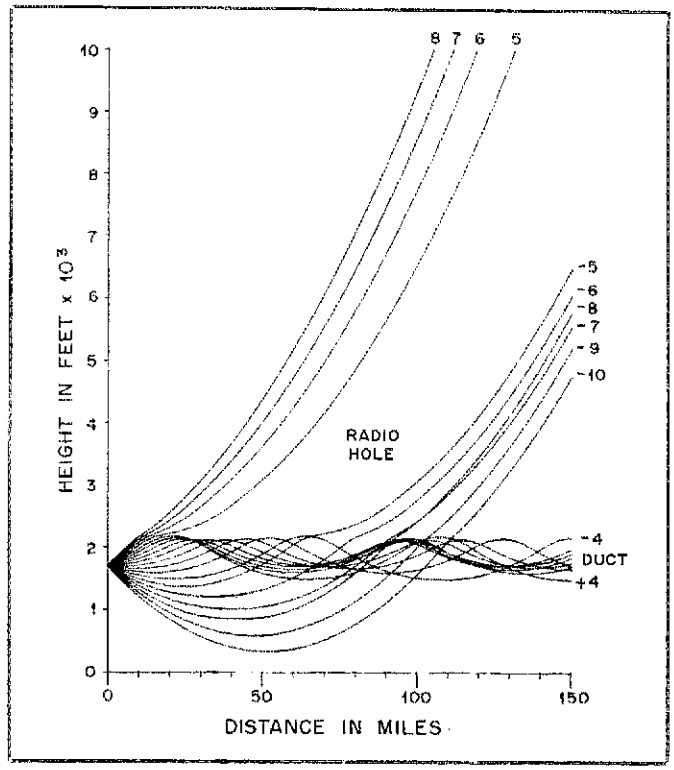


Fig 4—Ray plots for the refractivity profile of Curve B, Fig 1. The antenna height is 1700 ft.

particularly those near the horizon, appear to be sharply bent upward. This appearance is caused by the curved earth surface being plotted in a linear X-Y coordinate system. The ray-path height above the earth is correct. However, the ray angles are not in true scale, as the X-axis is graduated in miles and the Y-axis in feet.

Ray Plots with Antenna Above −160 N-Unit Gradient

Fig 3 shows the calculated ray paths for an antenna at a height of 2500 feet, using the Curve B refractivity profile of Fig 1. In this case, the antenna is just above the fog interface. Rays leaving the antenna with an angle between +5 and −5 milliradians are not affected. However, rays between −5 and −6 milliradians are bent downward at more than the normal rate as they enter the region of high refractivity at an angle near grazing. Rays at negative angles greater than −6 milliradians are able to penetrate the high refractivity region and tend to follow normal ray paths.

Fig 3 clearly illustrates a radio hole, where one can expect the signal strength to be lower than for average propagation conditions. This figure also illustrates an anti-hole where, because of the concentration of ray paths, one can expect the signal strength to be higher than for average propagation conditions.

For example, an aircraft flying at an altitude of 2500 feet should expect normal communication with a ground station beyond 125 miles, poor or even no communication between 125 and 75 miles, and good communication at less than 75 miles. Similarly, if the antenna were that of a radar set, targets may not be seen between 75 and 125 miles, although they could be detected at shorter and longer ranges.

Ray Plots with Antenna Below −160 N-Unit Gradient

Fig 4 is a ray plot using the Curve B refractivity profile of Fig 1. In this case the antenna height is 1700 feet, or just below the fog interface. Rays leaving the antenna with positive elevation angles immediately enter the region of high refractivity and are bent sharply downward into the region of average refractivity. From here they bend upward relative to the curvature of the earth. The rays at angles between −4 and +4 milliradians move in and out of the high refractivity region to form a duct between 1700 and 2000 feet. As this duct is parallel to the surface of the earth, there is no radio horizon for these rays, and they will continue to propagate at this height as long as the meteorological conditions persist. This is a possible propagation mode for the transpacific VHF/UHF contacts that are reported.

Ray Plots for Antenna Within Low-Level −160 N-Unit Gradient

Fig 5 is a ray plot for an antenna at a height of 100 feet using the profile of Curve C, Fig 1. The vertical scale for this figure is magnified five times for more detail. Rays leaving the antenna at angles less than 10 milliradians are trapped in a waveguide-like mode. These rays are refracted downward by the high refractivity gradient, and are reflected upward when they strike the earth. The angle of reflection at the earth is equal to the angle of incidence. However, the refraction at the upper boundary of the waveguide is a gradual turn-around of the ray path because of bending. For clarity, only a few of the ray paths below 5 milliradians have been plotted.

From Fig 5, it is clearly evident that most of the energy radiated from the antenna is trapped in this low-level surface duct. This duct, like the high-level duct previously described, has no radio horizon. Thus, trapped radio signals will propagate to distances determined by the meteorological conditions. Generally, favorable meteorological conditions for low-level ducting do not extend to great distances from the shoreline. However, there are many reports of shipborne radars detecting surface ships at distances of several hundred miles beyond the horizon.

Frequency Considerations

Refractive index is independent of frequency below 15 GHz. However, ducting is similar to propagation in a waveguide and is frequency dependent. The thickness of the high-refractivity region must be sufficient to allow the ray path to be reversed before the ray penetrates the region. Also, the wavelength must not be so large that there is an appreciable change in refractivity in a distance of one wavelength. These considerations, together with field experience, have resulted in the following expression for the lowest frequency that is likely to be trapped in a duct:

$$f = \frac{7.13 \times 10^6}{T^{1.5}\sqrt{DN/DH - 48}} \text{ MHz}$$

where

T is the thickness of the high refractivity layer in feet

DN/DH is the gradient of the refractivity in N-units per 1000 feet

For example, with a DN/DH of −160 and a thickness, T, of 300 feet (Fig 1, Curve B), the minimum frequency for ducting would be 130 MHz. Thus, signals at 144 MHz and above would most likely be trapped by this duct.

Because the gradient, thickness and extent of the high-refractivity region all depend on the local meteorology, the duct dimensions may not be precisely defined. Hence, the calculated frequency should be regarded as an estimate.

The Ray-Trace Program

Ray tracing for VHF/UHF propagation is based on Snell's Law for geometric optics in spherically stratified refractive layers. Numerical integration is used to solve the second-order differential equation that defines the ray path in this medium. Table 1 is a listing of the BASIC computer program used.

Data for the Curve B refractivity height profile of Fig 1 appears in lines 370-430. This is the value for N at 100-foot height intervals and can be replaced with data for other refractive profiles if desired.

The initial ray angle and antenna height are entered by the operator, lines 290-300. The refractivity gradient is calculated for the initial height, line 40. Using this initial data, the height of the ray is calculated after

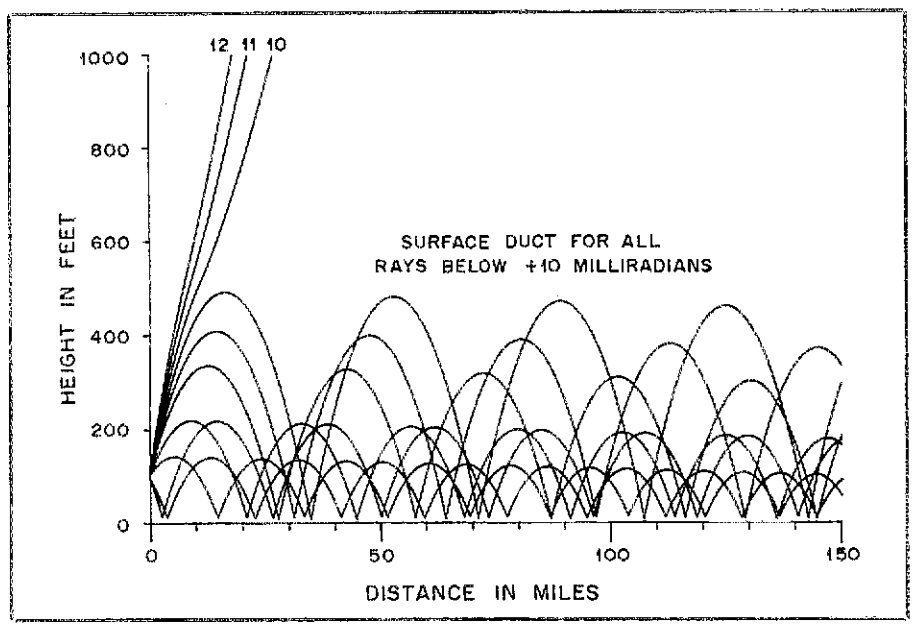


Fig 5—Ray plots for the refractivity profile of Curve C, Fig 1. The antenna height is 100 ft.

Table 1
BASIC Program for Ray Plots

```
1Ø DEFINT X,Y
2Ø DIM NØ(11Ø)
3Ø GOTO 26Ø
4Ø NSØ=NØ(H1ØØ+1)-NØ(H1ØØ)
5Ø NSØ=NSØ*1Ø
6Ø RETURN
7Ø SUMØ=Ø: SUM1=Ø: SUM2=Ø
8Ø FOR I=Ø TO 75Ø
9Ø H1ØØ=INT(HSL*.Ø1)
1ØØ GOSUB 4Ø
11Ø IF HSL<1ØØ GOTO 12Ø ELSE GOTO 14Ø
12Ø TAØ=-SUMØ-TAØ
13Ø SUMØ=Ø: SUM1=Ø: SUM2=Ø: HØ=HSL
14Ø SUMØ=SUMØ+1.Ø56E-Ø6*NSØ+.ØØØØ5Ø5
15Ø SUM1=SUM1+1Ø56*SUMØ
16Ø SUM2=SUM2+1Ø56*TAØ
17Ø HSL=HØ+SUM1+SUM2
18Ø XØ=2ØØ+HSL/5
19Ø YØ=17ØØ-2*I
2ØØ IF I>Ø GOTO 22Ø
21Ø LPRINT "MA";XØ;",";YØ;";"
22Ø LPRINT "DA";XØ;",";YØ;";"
23Ø NEXT I
24Ø LPRINT "PU;"
25Ø GOTO 35Ø
26Ø FOR I=Ø TO 11Ø
27Ø READ NØ(I)
28Ø NEXT I
29Ø INPUT "Initial angle in milliradians "; AØ
3ØØ INPUT "Initial height in feet "; HØ
31Ø AØ=AØ*.ØØ1
32Ø TAØ=TAN(AØ)
33Ø HSL=HØ
34Ø GOTO 7Ø
35Ø INPUT "RETURN TO CONTINUE "; Z$
36Ø GOTO 29Ø
37Ø DATA 183,182,181,18Ø,179,178,177,176,174,172,173,171,17Ø,168,166
38Ø DATA 165,164,163,162,16Ø,146,129,128,127,128,132,13Ø,129,124,123
39Ø DATA 12Ø,118,117,117,115,114,112,111,11Ø,111,1Ø9,1Ø7,1Ø7,1Ø8,1Ø5
4ØØ DATA 1Ø2,1Ø1,1Ø1,1Ø2,1Ø1,1ØØ,1ØØ,92,88,84,82,8Ø,8Ø,83,83,83,84,8Ø
41Ø DATA 79,8Ø,78,76,73,68,68,71,7Ø,69,65,62,61,59,56,56,55,55,53,53
42Ø DATA 52,53,53,52,5Ø,5Ø,49,51,49,48,47,46,45,44,43,42,42,41,41,39
43Ø DATA 38,37,36,36,37,38,37,36,35
44Ø END
```

the ray has propagated 0.2 mile, 1056 feet. This new height and distance are sent to the X-Y plotter, lines 180-220. This new height is used to calculate a new refractivity gradient, line 40 again, and the ray height is again calculated after it has propagated 1056 feet. This process is repeated 750 times as the ray propagates from the antenna to a distance of 150 miles. Lines 130-170 perform the double integration necessary to solve the second-order differential equation that defines the ray path.

The ray is considered as being reflected by the earth when the path height is less than 100 feet. At this time, the initial ray angle and ray height are reset to the reflection angle and the height of the reflection point. The integrators are also reset to zero, as this is considered to be the start of a new ray path with new initial conditions, lines 110-130.

The program pauses at line 350 to allow the operator to change paper or pens in the X-Y plotter, or to decide which ray to plot next. It take about two minutes to plot each ray path. Since the commands needed to draw and label the X-Y axis depend on the type of digital plotter used, these statements have not been included in this program listing.

Summary and Comments

VHF/UHF radio propagation is not always limited to line-of-sight paths. Discontinuities in the refractivity profile of the troposphere can result in ducting, and in radio holes and anti-holes. The occurrence of these propagation anomalies depends on the gradient and geographical extent of the refractivity profile, and, most important, on the height of the antenna relative to the refractivity discontinuity.

Finally, radio rays do not exist physically. However, the concepts of rays, ray paths and ray-tracing are very useful tools to better understand the role of meteorology in tropospheric radio propagation.

Notes

[1]M. S. Wong, "Refraction Anomalies in Airborne Propagation," *Proceedings of the IRE 46*, No. 9, pp 1628-1639, Sep 1958.
[2]S. Silver, *Microwave Antenna Theory and Design* (New York: McGraw-Hill, 1949).
[3]Richard Miller, "VHF Propagation and Meteorology," *QST*, Mar 1984.
[4]Jack Priedigkeit, "A Simple Computer Model for VHF/UHF Propagation," *QST*, July 1983, pp 32-33.
[5]B. R. Bean and E. J. Dutton, *Radio Meteorology*, NBS Monograph 92, March 1966.
[6]C. M. Crain, "Apparatus for Recording Fluctuations in Refractive Index of the Atmosphere," *Review of Scientific Instruments 21* No. 5, pp 456-457, May 1950.
[7]C. M. Crain, "Survey of Airborne Microwave Refractometer Measurements," *Proceedings of the IRE 43*, No. 10, pp 1405-1411, Oct 1955.
[8]H. R. Reed and C. M. Russell, *Ultra High Frequency Propagation* (Boston: Boston Technical Publishers, 1964).
[9]D. E. Keer, *Propagation of Short Radio Waves* (Boston: Boston Technical Publishers, 1964).

Jack Priedigkeit received his BSEE degree from the University of California in 1942. He was licensed as a radio amateur in 1947 and received his First Class Radiotelephone license in 1940. He is a long-time member of the ARRL. A registered electrical engineer in the state of California and a Senior Member of the IEEE, he retired in 1980 after working in his field for more than 40 years. He holds several patents related to research and development in the areas of instrumentation, antennas, propagation, avionics, communication and navigation systems, and position location. While on duty with the US Air Force (1950-1953), Captain Priedigkeit actively participated in airborne measurements of refractive index profiles and radio-signal field strength. QST

Strays

I would like to get in touch with ...

☐ anyone with information on plate circuit coils for a Central Electronics 600 L amplifier. Bill Fishback, W1JE, 6 Locust Grove Rd, Harwich, MA 02645.

☐ anyone with a manual/schematic for an EICO Model 460 oscilloscope. Joseph Karr, N9FAU, 3800 Cheyenne Ct, Racine, WI 53404.

☐ anyone with information on the Model 5600A DSI frequency counter. Russ Smith, W6ONK, PO Box 141, Brownsville, OR 97327-0141.

☐ anyone with a service manual for an NC-173. Lisle Hines, K2QLA, 11 Meadow Dr, Homer, NH 13077.

☐ anyone with a manual for an EICO Model 460 oscilloscope. Bob Ferrey, Jr, N3DOK, 9821 Presidential Dr, Allison Park, PA

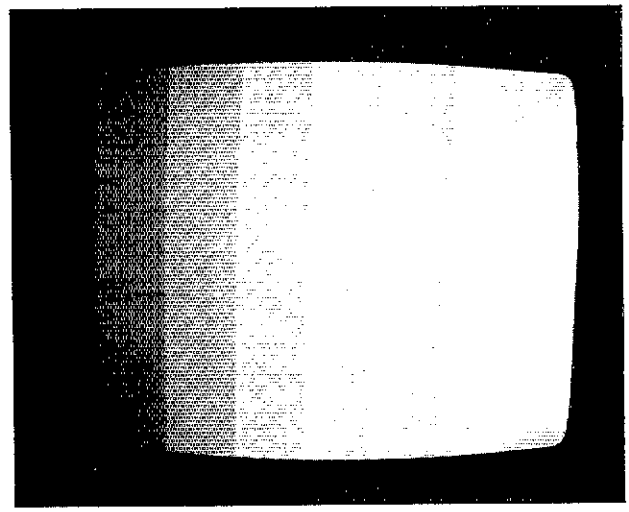
☐ anyone using an Ameco TX-62 and VFO 631 on 2-m FM. Tony Bodo, WA9YOZ, 4623 East 25th Ave, Lake Station, IN 46405.

☐ anyone with post-1922 information on Harold Bride, wireless operator on the *Titanic*. David Norris, N8HKV, 4463 Sunnymead Ave, Burton, MI 48519.

☐ anyone who has an Atoz Electric Novelty Co semiautomatic key, manufactured before 1930. Frank McDonough, W3PMV, 133 E Campbell St, Blairsville, PA 15717.

☐ anyone who has operated in the Philippines with a reciprocal license. Shelby Haukos, KBØJW, 1239 N Baird Ave, Fergus Falls, MN 56537.

WeatherFAX Gray-Scale Generator



One FAX satellite picture is worth a thousand words—but only if your FAX system does a good job resolving different shades of gray. This handy test generator gives you the straight black and white—and everything in between.

By George T. Isleib, W3CPR
RD 1, Box 272
Lehighton, PA 18235

WeatherFAX or WEFAX—you've heard of it before in *QST*, as recently as last March.[1] It's a system of transmitting *facsimiles*—hard copies—of satellite pictures and weather maps via radio. One FAX transmission method (that used on HF, as discussed in the Sueker article) uses frequency variation of an audio subcarrier to control brightness along each line of a FAX frame. WeatherFAX satellites transmit FAX on VHF-FM using an *AM* subcarrier: Line brightness is controlled by amplitude-modulating a 2400-Hz audio signal. You can find more about FAX techniques in *The ARRL Handbook for the Radio Amateur*.[2]

During the past five years, I've had the pleasure of observing the Automatic Picture Transmission (APT) imagery from both the US and Soviet polar-orbiting spacecraft. After quite a bit of tinkering, however, I realized I needed a piece of test equipment I couldn't buy ready-made—a WeatherFAX gray-scale generator. This article is intended for the amateur who, for the most part, is now in a position to receive the geostationary or polar-orbiting spacecraft and reproduce the APT imagery using an electromechanical or a digitally processed system. I'll spare you the details of processing the imagery, as a previous article by Grant Zehr, WA9TFB, covered the operational systems quite well.[3]

Why a Gray-Scale Generator?

A good FAX receiving setup must be able to resolve many degrees of grayness—everything from black to white. Without some sort of gray-scale standard, system alignment is hit-or-miss. To my knowledge, there are very few devices available that actually generate the gray scale necessary to determine whether an AM-subcarrier WeatherFAX system is really up to snuff. I have used both electromechanical and digital-storage FAX systems. Only the digital-storage units have the capability of generating gray scales, but their "post-injected" generators bypass system input circuitry, affording no indication that the audio input level is correct to produce all shades of gray. This left me in a position of either guessing where the levels are to be set, or trying to set up the input level on the eight shades of gray transmitted by the NOAA or Meteor-series polar-orbiting satellites.

My Solution

Since it is difficult to obtain a commercial gray-scale generator, I decided to design a circuit to bridge this gap. Certain criteria had to be met in order to make the generator as simple as possible. First, the generator circuit had to use readily obtainable parts and require no shielding or special construction. From an operational standpoint, the generator had to be easy to use and calibrate. Technically, it had to be crystal-controlled for long-term stability and include all FAX transmission speeds and levels of gray. This may sound like a complex goal, but the circuit I came up with is simple and straightforward in its design. A small knowledge of basic digital logic is all that's necessary to understand its operation. First, however, here's a brief overview of the job a gray-scale generator performs.

Generating a Standard Gray Scale

Once the WeatherFAX gray-scale generator is turned on and running, what does it *do?* See the title photo. The output of the gray-scale generator is a series of repetitive pulses (Fig 1). Each pulse draws one line of a FAX image, moving in linear steps from minimum to maximum brightness at precise intervals. Pulse by pulse, the WeatherFAX gray-scale generator draws a test pattern on the FAX drum or screen.

Before we get carried away with the circuit behind the test pattern, let's look at certain parameters that should be met by a system such as this. For starters, two scanning-line frequencies are involved in satellite FAX work—120 and 240 lines per minute—so our gray-scale generator must allow a choice between them.

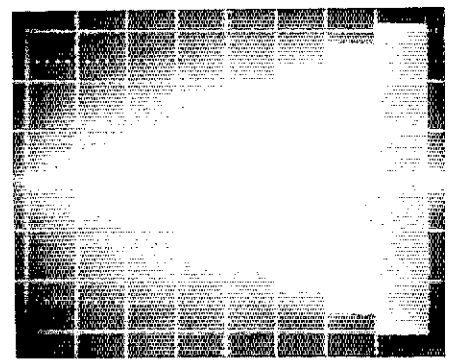


Fig 1—The gray-scale generator does *this*—see the text for how! Each of these pulses draws *one line* of the gray-scale test pattern shown in the title photo, and depending on how you set it, the generator produces 120 or 240 lines per minute.

[1]Notes appear on page 29.

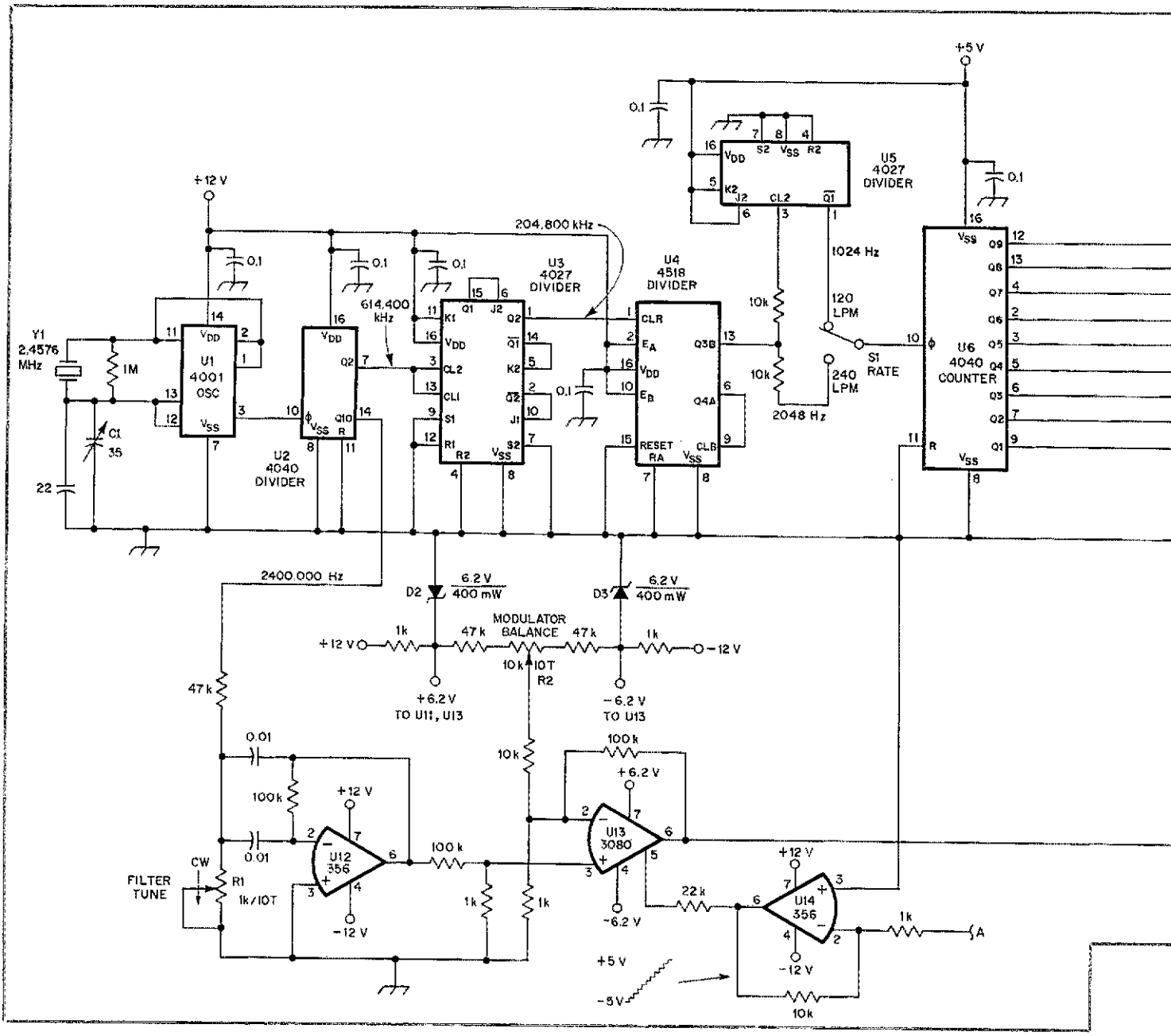


Fig 2—Schematic diagram of the gray-scale generator. Fixed-value capacitors are ceramic. Fixed-value resistors are ¼-W carbon film; trimmer potentiometers R1 through R5 are ten-turn linear taper units. Component designators not called out in the parts list are text referents.

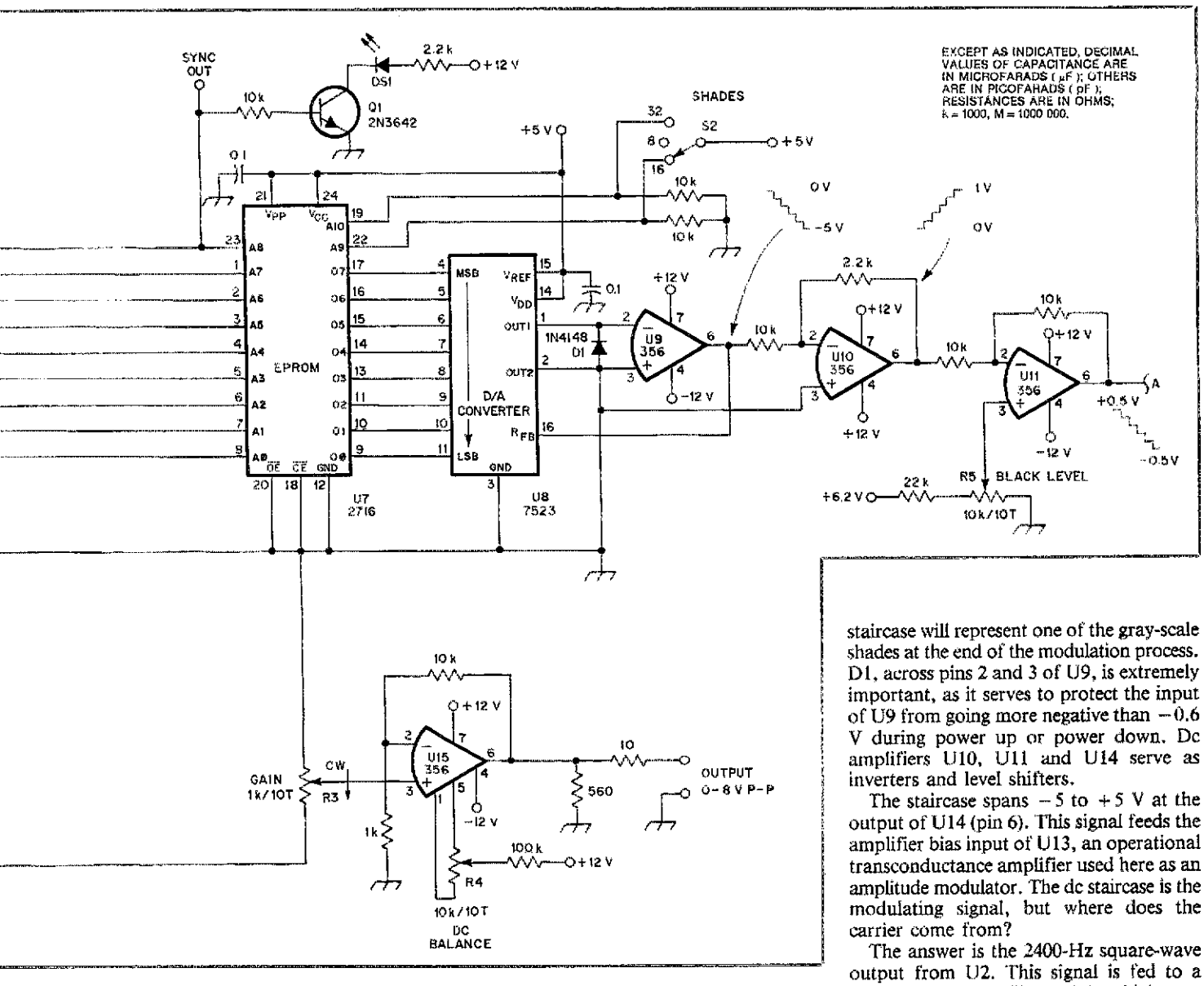
C1—7-35-pF trimmer.
D1—1N4148 switching diode.
D2, D3—6.2-V, 400-mW Zener diode.
DS1—Red LED.
S1—SPDT toggle.
S2—SPDT center-off toggle.
U1—4001 buffered quad 2-input NOR gate.
U2, U6—4040 12-stage ripple-carry binary counter.
U3, U5—4027 dual J-K flip-flop.
U4—4518 dual synchronous up-counter.
U7—2716 2048 × 8 EPROM (available pre-programmed from the author; see text).
U8—AD7523 8-bit multiplying D/A converter.
U9, U10, U11, U12, U14, U15—LF356N JFET-input op amp.
U13—3080 operational transconductance amplifier.
Y1—2.4576-MHz crystal.

For practical calibration purposes, scales of 8, 16 and 32 shades of gray will more than suffice, as anything beyond 32 shades of gray is stretching the limit of what the human eye may differentiate. (Even though an eight-shade scale doesn't offer quite enough resolution for adequate system alignment, it's a good range with which to begin calibration, as you'll see later.) Because APT subcarrier modulation varies linearly from a few percent at black to near 100% for white, our gray-scale generator must do the same.

The US satellites' 2400-Hz subcarriers are synchronized to a cesium standard, so they have no trouble with frequency stability! The subcarrier in our gray-scale generator must be adjustable to, and stay put on, 2400 Hz—within 0.01 Hz—or we'll end up with a skewed picture (slanted one way or the other, instead of being straight up and down). (By the way, the Soviet satellites use a subcarrier of approximately 2500 Hz, but this doesn't cause a problem during APT reception if you use a phase-locked receiver.) These are the "numbers" the gray-scale generator must provide to do its job. Here's how that job is done.

The Circuit

See Fig 2. U1 operates as a CMOS crystal oscillator at 2.457600 MHz. U2, a counter, divides this signal by four (614,400 kHz,



available at pin 7) and by 1024 (2400.000 Hz, pin 14). The 2400-Hz signal serves as the video subcarrier; this will be modulated elsewhere in the circuit to give us a gray scale. The 614.400-kHz signal from U2 is divided by three in U3 to 204.800 kHz. U4 further divides this signal by 100 to produce 2048.000 Hz.

The precise duration and modulation level of each gray-scale step is derived from this 2048-Hz clock signal by U5, U6, U7 and U8. Why 2048 Hz? Remember that the gray-scale generator must be able to generate its FAX signal at either 120 or 240 lines/min. U7, a 2716 EPROM, contains the data necessary to generate the staircase essential to the gray-scale modulation process. Whatever the EPROM "knows" must be extracted once per scanned line of FAX gray-scale video. At the 240 lines/min rate, then, the EPROM contents must be accessed four times per second. Since the EPROM is addressed in 512-byte increments, operation at the 240 lines/min (4 lines/sec) rate requires a clock frequency of 512 × 4, or 2048 Hz. Likewise, operation at 120 lines/min (2 lines/sec) requires that the clock frequency be 1024 Hz (512 × 2). U5, a flip-flop, performs this division. S1 selects either the 1024- or 2048-Hz clock signal, and counter U6 addresses U7 accordingly.

Q1, DS1 and the SYNC OUT terminal aid in testing and calibrating the gray-scale generator. Output from U6 turns on Q1, flashing DS1 at the lines/min rate selected by S1. A trigger signal to help you use your oscilloscope to observe waveforms at various points in the gray-scale generator is available at SYNC OUT—more on the use of this signal later on.

D/A converter U8 produces a voltage output proportional to binary data from U7. In this case, a zero output from U7 corresponds to an address of 00 hex. Full output, represented by FF hex, is 5 V. (Because U8's V_{ref} pin is tied to 5 V, its output voltage cannot exceed this value.)

The output of dc amplifier U9 is a staircase spanning 0 to −5 V. Each step on this staircase will represent one of the gray-scale shades at the end of the modulation process. D1, across pins 2 and 3 of U9, is extremely important, as it serves to protect the input of U9 from going more negative than −0.6 V during power up or power down. Dc amplifiers U10, U11 and U14 serve as inverters and level shifters.

The staircase spans −5 to +5 V at the output of U14 (pin 6). This signal feeds the amplifier bias input of U13, an operational transconductance amplifier used here as an amplitude modulator. The dc staircase is the modulating signal, but where does the carrier come from?

The answer is the 2400-Hz square-wave output from U2. This signal is fed to a peaked band-pass filter, U12, which converts the square wave into the sine wave necessary at U13. Since U13's output is directly proportional to its amplifier bias current, it serves well as an amplitude modulator. This current is supplied by the dc staircase applied to pin 5. As a result, U13 produces a 2400.000-Hz sine wave modulated by an 8, 16 or 32-step scale.

The modulator output is fed to dc amplifier U15 through potentiometer R3 (GAIN), allowing output control from zero to 8 volts P-P. Output impedance of this stage is approximately 600 ohms, unbalanced.

Construction

Construction of this circuit is not critical, and only dc wiring procedures need be followed. One note of caution, however: Make sure that the 5- and 12-V_{CC} lines go to the correct IC pins, especially the 5-V connections to U5, U6, U7 and U8. If 12 V dc is applied to U6 or U7, the EPROM, U7, will probably be destroyed. I recommend using IC sockets for this project. This way, replacement of faulty chips is easy, and proper wiring of the V_{CC} connections may

be confirmed *before* a mistake causes catastrophic results. I breadboarded my prototype and didn't attempt to put it into a cabinet; the choice of an enclosure for your version is up to you. Later, I developed a PC board to make circuit duplication easy (see Fig 3). I will be happy to supply a programmed EPROM, PC board and parts overlay to builders for $22 postpaid—you add the other parts, cabinet and power supply.

Calibration

Energize your gray-scale generator with a regulated power supply capable of supplying ±12 V at 35 mA and ±5 volts at 60 mA. The current drawn by your version may differ from these figures somewhat, but it should certainly be within 10% of these values. You'll also need a dc voltmeter capable of measuring at least 12 V, a frequency counter capable of handling input signals of up to 8 V P-P and a dc-coupled oscilloscope with a bandwidth of at least 3 MHz.

Start by setting all of the 10-turn potentiometers (R1 through R5) at midrange. Next, with all chips out of their sockets, power up the generator. Confirm that all IC supply voltages are as they should be at the correct socket pins; make all measurements with common as reference. When you're satisfied that all is well, remove power and insert all chips into their proper sockets. Turn the power supply back on and check for overheating, smoke, etc. If all's still well, proceed to the next step.

Now your frequency counter comes into play. Check for a 2.457600-MHz signal at pin 3 of U1. If necessary, adjust C1 to bring the oscillator to precisely this frequency. If your efforts with C1 won't bring the oscillator to exactly 2.457600 MHz, there are several approaches to try. First, replace U1 with a different 4001 if you have any available. If this doesn't help, and if the frequency is too high, add capacitance in parallel with C1. If the frequency is too low, remove the 22-pF capacitor already in parallel with C1. One of these solutions should do the trick. In any case, try to bring the oscillator to within 10 Hz of 2.457600 MHz.

Measure the frequency at pin 7 of U2. It should be 614.400 kHz. At pin 14 of U2, you should measure 2400.000 Hz. Attach the counter probe to pin 10 of U6 and toggle S1 between its 120- and 240 -lines/min settings. At 120 lines/min, you should read 1024.000 Hz; at 240 lines/min, 2048.000 Hz. Has DS1 been flashing all along? Good. Its flash rate should change with each throw of S1. When S1 is set to 120 lines/min, DS1 should flash at 2 Hz; at 240 lines/min, it should flash at 4 Hz. If DS1 fails to blink at you, you've installed it backwards or a problem exists at U6 or U7.

Set your oscilloscope for a sensitivity of 2 V/cm, and attach its probe to pin U12. Adjust R1 for the most symmetrical sine wave you can get. This peak will occur when the filter is tuned to a center frequency of 2400 Hz. No further adjustment of R1 is necessary.

The next oscilloscope measurement you'll make will involve waveforms that won't stand still at standard sweep frequencies, so you may have some problems trying to synchronize the pattern properly using your scope's internal triggering system. This is the reason for the SYNC OUT test point between U6 and U7. Switch your scope to the "external trigger" mode and connect its trigger input to SYNC OUT. Set the scope sweep to 50 ms/cm, input sensitivity to 0.5 V/div and the sync level to +. Set the gray-scale generator SHADES switch (S2) to 8 and connect the scope probe to pin 6 of U9. You should see an 8-level staircase spanning 0 to −5 V. A bit of scope tweaking may be necessary before you obtain a stable trace. Next, set scope sensitivity to 1 V/div and connect the probe to pin 6 of U10. You should see another staircase pattern, but now the steps will span 0 to 1 V. Set the scope sensitivity to 0.5 V/div, place the probe on pin 6 of U11, and adjust R5 for a symmetrical staircase spanning +0.5 to −0.5 V, centered on 0 V. Now, set the scope sensitivity to 5 V/div, connect the probe to pin 6 of U14 and once again adjust R3—this time to obtain a displayed signal spanning −5 to +5 volts centered on 0 V.

With the scope sensitivity set to 0.2 V/div, at pin 6 of U13 you should see a waveform that sweeps symmetrically in eight even steps. If you increase the scope sweep speed to 0.5 ms/cm, you'll see a 2400-Hz sine wave (the carrier) inside the staircase.

Set the scope sweep back to 20 ms/cm and vertical sensitivity to 1 V/div. Place the scope probe on pin 6 of U15 and adjust R4 for a waveform of eight steps perfectly centered around 0 V. Readjust R2 so that the peak of the waveform has the same amplitude, both positive and negative, about 0 V. With SHADES-select switch S2 in the 32-shade position, adjust R5 so that the first step is almost at 0 volts (Fig 4). Be positively certain you can view the beginning of the staircase, however, because what you're looking for is a symmetrical 32-step staircase starting *almost* at 0 V. The slight first step on the staircase represents black in the FAX system, and the 32nd step represents white. Switch back and forth among the 8, 16 and 32-shade scales with S2, making sure all are present. (Fig 5 shows the 16-shade

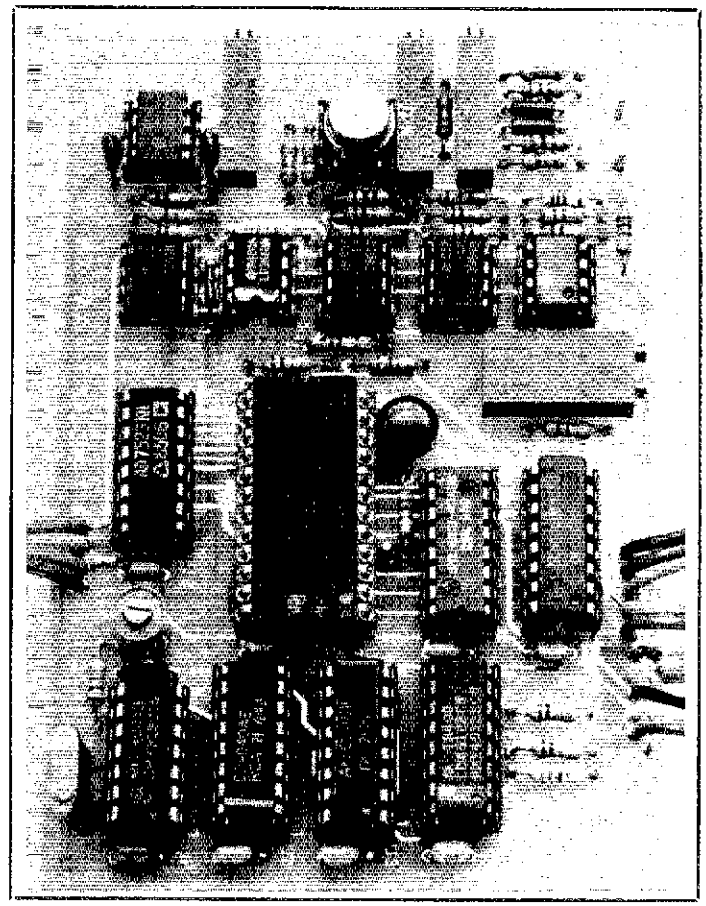


Fig 3—The PC-board version of the gray-scale generator makes a neat package. This board, a component overlay and a programmed EPROM are available from the author; see text.

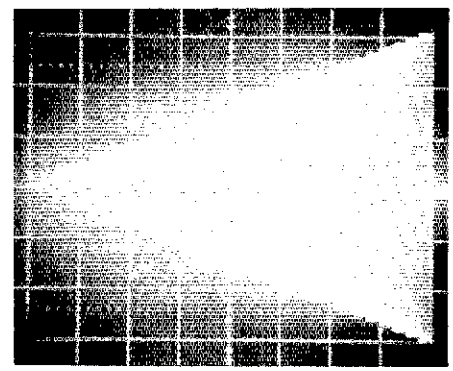


Fig 4—Oscillogram of the 32-shade gray-scale signal. The staircase spans full black (first step at left) to full white (highest step at right) and repeats at the frequency determined by the generator's RATE switch. Output amplitude is controllable, too; here, maximum output has been set at roughly 6 V P-P.

(continued on page 29)

How to Build a 160-Meter "Shortie"

Part 13: How about a half-size wire vertical antenna for 1.8 MHz? Emphasis is on construction methods that are applicable also for the HF bands.

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

Are you an urbanite with limited real estate? Have you missed 160-meter operation because you have insufficient space for a full-size top-band radiator? It's a common lament among amateurs, and I have sung the same blues melody a time or two!

The usual solution to the space problem is to erect a short dipole or vertical antenna. Alternatives to the foregoing may include the use of a low-height, random-length wire, or getting by with an 80-meter dipole with the feed-line shorted to provide a so-called top-loaded T-type vertical.

Unfortunately, most short antennas suffer from narrow bandwidth. Many of them, especially at 1.8 MHz, exhibit a 2:1 SWR bandwidth of, say, 10 or 15 kHz. This is not satisfactory for moving about within the 160-meter band! A remote-control matching network can be used at the antenna feed point to permit large frequency excursions, but such a circuit can be tricky and expensive for an inexperienced ham. In 1985, I decided to develop a short 160-meter antenna that could be built easily, and which could provide good performance for DX and local operation. I recognized that physically short radiators do not perform as efficiently as full-size antennas, but the trade-off can ensure better performance than one can expect from a vast number of "make-do" antennas that are used by 160-meter operators.

The 160-Meter "Shortie"

A 60-foot, multiwire vertical antenna was selected for the design exercise. This style of radiator eliminates the need for costly aluminum tubing (such as used for a typical short vertical), and it eases the mechanical requirements for mounting a loading coil near the top of the antenna. Furthermore, a wire antenna lends itself

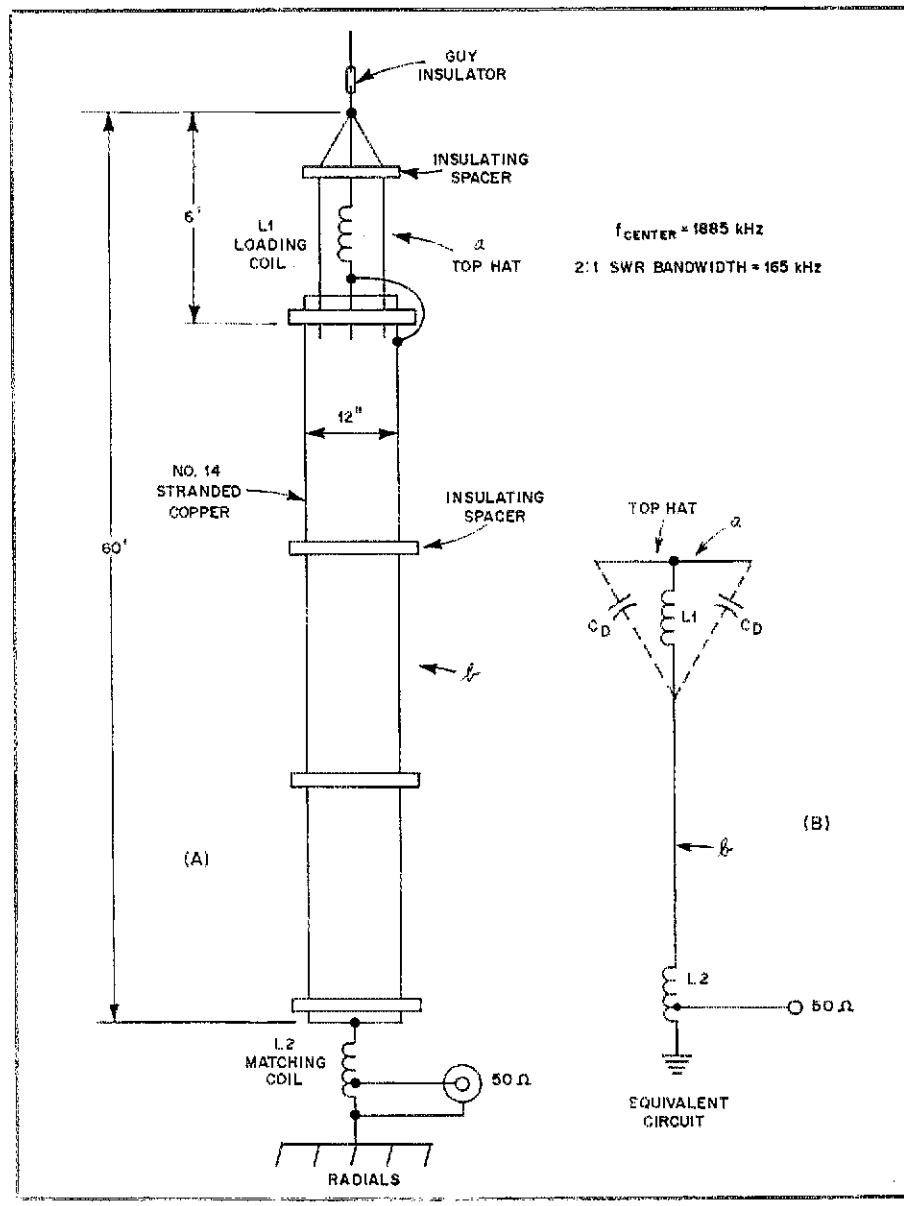


Fig 1—Diagram of the 160-meter vertical antenna (A). An approximate electrical representation of the system is depicted at B.

readily to being supported by a tree or an existing tower or mast. Also, a capacitance hat is much easier to construct if it is made from wire, as opposed to the type of rod structure needed for an aluminum vertical antenna.

Fig 1 illustrates the antenna I developed along the foregoing lines. It is approximately 1/8 wave long, physically. It is tuned, however, as a resonant quarter wavelength antenna by virtue of top-loading coil L1 and matching/loading coil L2. The top 6 feet of the system (part *a*) represents a three-wire top hat for L1. The top inductor provides sufficient inductance for system resonance at roughly 2.5 MHz. The lower coil, L2, furnishes the remainder of the inductance for resonating the antenna in the 160-meter band. L2 also has a tap near the grounded end for matching the system to 50-ohm transmission line. The larger the top-hat area and the heavier the wire gauge for part *b* of the antenna, the greater the antenna bandwidth. For example, my prototype model contained no. 18 conductors for part *b*. The 2:1 SWR bandwidth was 145 kHz. Model no. 2 has no. 14 stranded copper wire for part *b*, and the bandwidth is 165 kHz. Perhaps a third (center) conductor for part *b* would increase the bandwidth even more. I haven't tried this idea.

The multiwire principle seen in Fig 1 is not new. Cage antennas with multiple wires were almost the rule rather than the exception in the early days of wireless. Bandwidth was obtained by using several wires in parallel.

The illustration of Fig 1B shows the approximate electrical equivalent of the system at Fig 1A. C_D is the distributed capacitance across L1. The greater the C_D, the fewer turns required on L1, and hence the lower the coil loss from ac resistance.

Ground System

This form of grounded quarter-wavelength antenna depends on an image half of the system, which occurs in the earth. Therefore, the better the ground system, the more efficient the antenna. Ideally, we would deploy 120 radial wires, each a quarter wavelength long. This is often impractical on a city lot, but I strongly suggest, in the interest of top performance, that you bury as many radials as you can. You may place them on top of the ground if the antenna is to be used in an area where a lawn is not maintained. I use 20 on-ground radials with my version of the antenna, plus two 6-foot ground rods driven into the soil near the antenna feed point. It is possible that a single counterpoise wire and some ground rods will provide acceptable performance for those of you who can't manage a large ground-radial system. If possible, include the cold-water pipe system of your home as part of the ground system. Well pipes are also worth considering as part of the ground screen, as are chain-link fences. Use whatever you can round up for ground conductors, then try the antenna. You will probably be pleased with the performance.

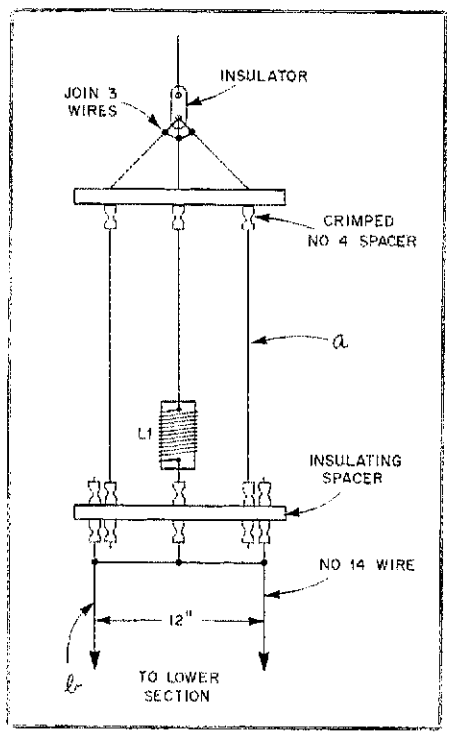


Fig 2—Top portion of the antenna showing the upper loading inductor and multiwire hookup. Crimped metal spacers affix the spreaders to the wires (see text). L1 has an inductance of 80 μH and an unloaded Q of 110. It consists of a 4-inch winding (close wound) of no. 14 enameled wire on a 2-inch-OD coil form. Two coats of exterior polyurethane varnish are used on the coil to protect it from dirt and moisture.

Construction Ideas

Fig 2 shows the top portion of the 160-meter antenna. The spreaders for the wires should be strong and lightweight. My first model was built with ½-inch PVC pipe spreaders. The coil forms for L1 and L2 were made from 2-inch-OD PVC pipe. PVC material is a bit "iffy" in terms of dielectric quality (especially where high RF voltages are present), and the overall weight of the system was fairly great. However, I experienced no melting or voltage breakdown with the PVC stock at 600 watts output from my amplifier. My current version of the antenna contains thin-wall, high-impact polystyrene tubing, ¾ inch OD. I obtained it from an industrial plastics dealer. This company has a catalog that lists all manner of plastic rod, tubing and sheeting, including Teflon.® [1] I used 2-inch-OD high-impact polystyrene tubing as coil forms for L1 and L2. Your local plastics dealer may have just what you need.

One problem was determining how to attach the wires to the spreaders in a secure fashion. An easy fix is to use thin-wall no. 4 spacers (aluminum) on each wire, above and below the spreaders, as shown in Fig 2. A crimping tool is used to lock the spacers snugly on the wires. Pieces of small copper tubing will work satisfactorily in lieu of the spacers. This technique may be applied also to homemade open-wire feeders.

You will notice in Fig 2 that the top three wires *(a)* are joined only at the top where they enter the end insulator. Section *b* (lower) has the two wires joined just below the spreader and L1. Top-loading coil L1 is held in place by the center wire of the top hat, as shown.

Fig 3 shows the bottom section of the antenna. L2 may be attached to the bottom spreader by means of two long no. 6 or no. 8 screws, as indicated. This requires a 90° bend in each screw, just below the screw head. No. 6 spade bolts may be substituted, which will require a 3/8-inch hole on the top of the spreader, directly above each spade bolt. The large hole will

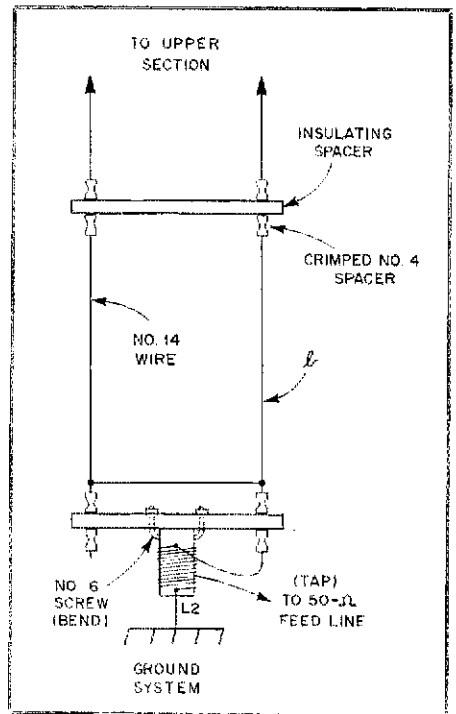


Fig 3—Bottom section of the antenna. L2 is the resonating/matching inductor. It has a maximum inductance of 30 μH and has 42 turns of no. 14 enameled wire (Q_U = 150), close wound on a 2-inch-OD coil form. The 50-ohm tap is 5 turns above the grounded end of L2 at the 3.2-μH point of the coil. When L2 is pruned for midband resonance of the antenna, the turns ratio of the L2 autotransformer is approximately 6:1 for a 50-ohm match. Use two coats of exterior polyurethane varnish for weatherproofing purposes.

[1]Notes appear on page 29.

permit insertion of a ¼-inch nut driver for tightening the spade-bolt nuts. Other mounting methods may occur to you as you plan the layout of your antenna.

The 50-ohm coaxial cable is attached directly to the bottom of L2 and to the tap point. The open end of the cable needs to be sealed to prevent dirt and moisture from entering it. Epoxy cement or Coax Seal® may be used for this purpose.

Fig 4 shows details for building L2. I used close-wound, no. 14 enameled wire for my coil. A piece of Miniductor stock of the appropriate inductance will work as a substitute for the hand-wound coil. Fig 4B shows how the tap is placed on L2. Scrape the enamel from the wire where the tap is made. Solder a no. 6 lug to the bare area after bending the lug tightly around the wire. Make a U-shaped insulator to place around the tap area. This will help prevent shorted turns at that point on the coil. I used a piece of meat-wrapping paper that had been soaked in mineral oil. Transformer cambric paper or Teflon sheeting would be even better for this purpose.

Fig 4C offers the ideal arrangement for L2. Movable taps permit resonating the antenna and matching to 50 ohms. I used this method while tuning the first version of the antenna. A large piece of Miniductor stock proved ideal for varying the tap positions while observing the reading on an SWR indicator.

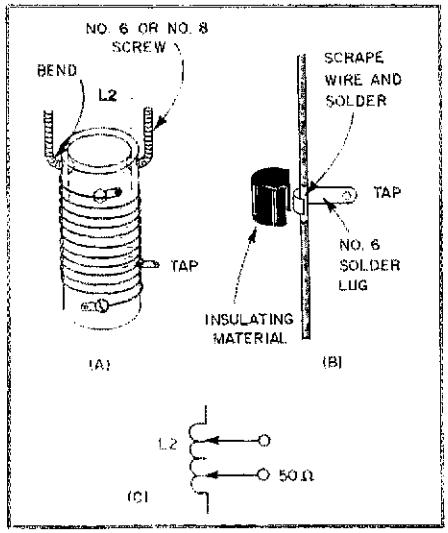


Fig 4—Pictorial details of how to tap and mount L2 (A and B). The principle of the tapped inductor is seen at C.

Suggested Two-Band Version

There is always something I plan to do, but never seem to find time to accomplish. An example of one such fantasy is seen in Fig 5. Here we find a two-band version of the 160-meter antenna of Fig 1. This scheme permits operation on 160, and 80 or 75 meters. The outer pair of wires form a short 80-meter radiator. They are 54 feet long to allow the use of resonating/matching coil L3. Two relays are needed to enable the operator to switch from 160 to 80 meters from a remote location. A high-quality three-pole, double-throw relay may be used in place of the pair of relays. Contacts with a 10-A rating should be used. The relays should be "floated" at RF, as detailed in an earlier *QST* article.[2]

There is no reason why a third wire can't be added (up the center of the system) for 40-meter operation. In fact, several wires may be included to provide multiband coverage. The relay switching system becomes more complex as extra radiators are used, but we could use a manually operated switch in a weatherproof box for changing bands. This would require a trip to the antenna feed point whenever we wanted to shift to another band.

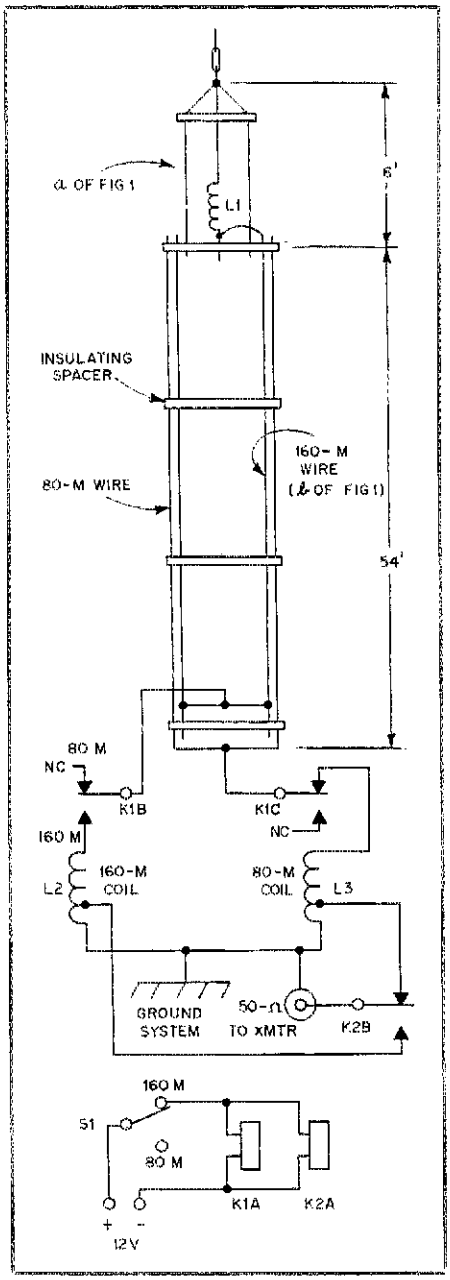


Fig 5—Suggested method for providing operation on 160, and 80 or 75 meters with the short vertical antenna. The outer wires are for 80 meters, and relays are used to change bands.

Antenna Erection

My antenna is supported by a 50-foot Rohn foldover tower, as shown in Fig 6. I have my antenna sloping from the tower, owing to the limited tower height. I find that vertical, low-angle radiation is present, despite the slope condition. A tree or other nonconductive support may be used if available.

In order to prevent the antenna from twisting, it is necessary to stabilize it by fanning the lower guy lines. I drove two pieces of electrical conduit into the ground, five feet apart, as shown in Fig 6. This provides sufficient tension to keep the antenna straight and taut. It has sustained gale-force winds up to 70 mi/h on three occasions, and no twisting occurred. The polystyrene spreaders and coil forms have endured summer heat and winter sub-zero temperatures with no sign of deterioration.

Tune-up

Slightly more inductance than is required should be present in L2. This allows some leeway for making final resonance adjustments. The coil specifications in this article allow approximately four turns too many for L2. The system may be resonated by using a dip meter coupled to the bottom end of L2. Caution: Do not connect the feed line until after the system has been tuned to resonance in your chosen part of the band. The feed line will cause false resonance readings.

The best tune-up method is to insert an SWR indicator in the line, near L2. Prune the turns at the top end of L2 for an SWR of 1:1. The tap placement specified in this article is correct for 50 ohms.

Performance

I have used this antenna for 10 months. It has been effective for local QSOs as well as DX. I have received signal reports from Hawaii and Europe of RST 559 to RST 589 while using 400 watts of output power. I have compared it on the air to a 3/8-wavelength inverted-L antenna (50 feet vertically deployed), and signal reports have been almost the same. The short 160-meter multiwire vertical provided identical signal-strength readings some of the time, and at other times and distances it was approximately 3 dB inferior to the inverted L. I consider this an acceptable compromise for a shorter antenna.

In Closing

It is practical to consider having a tap near the top end of L2 for covering two segments of the 160-meter band. Suggested resonant frequencies are 1850 and 1950 kHz. A relay may be used to select

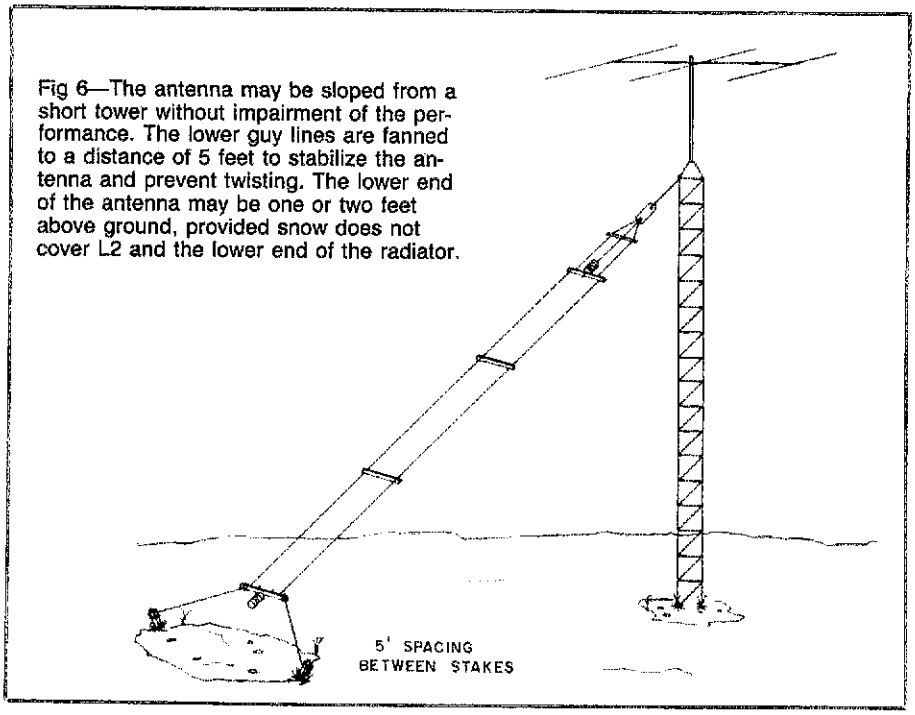


Fig 6—The antenna may be sloped from a short tower without impairment of the performance. The lower guy lines are fanned to a distance of 5 feet to stabilize the antenna and prevent twisting. The lower end of the antenna may be one or two feet above ground, provided snow does not cover L2 and the lower end of the radiator.

the entire coil or the portion below the extra tap point. If this is done, there is no need to change the position of the lower (50-ohm) tap on L2.

Also, this general antenna design can be applied to half-size wire verticals for such bands as 80, 40 or 30 meters. The small size of these antennas for the middle portion of the HF spectrum should appeal especially to apartment dwellers, campers and vacationers who cannot always find room and support structures for full-size half-wavelength dipoles.

Notes

[1]United States Plastic Corp, 1390 Newbrecht Rd, Lima, OH 45801, tel 419-228-2242.
[2]D. DeMaw, "A Remote Antenna Switcher for HF," *QST*, Jun 1986, p 24.

WeatherFAX Gray-Scale Generator

(continued from page 25)

scale.) Keep in mind that R5 determines the black level, so don't pinch it off too far or you will lose some steps at the beginning of the sweep.

Conclusion

The output impedance of the gray-scale generator is fairly low, but its adjustable 0-8 V P-P output level allows it to drive almost any system. I did not attempt to make the generator output stage *match* many impedances; I only made its output impedance low enough to drive just about whatever you're likely to encounter. I recommend that you use shielded audio cable between the gray-scale generator and your FAX system.

What's the result of all of this construction and calibration? See the title photo again for a look at a display of the 8-shade gray scale. Now you can get down to the *real* work: the satisfaction of optimizing APT reception on your WeatherFAX system.

George T. Isleib was first licensed as W3CPR in 1955. Since then, he has qualified for the First Class Radiotelephone Operator and Amateur Extra licenses. He also holds the DXCC, WAC, WAS and other awards. George has served as chief engineer at several radio stations, and as a communications engineer on Ascension Island during the Apollo 17 space mission. (While on Ascension, he also did a stint at the other end of the pileups as ZD8GTI.) Currently, George works as a project engineer engaged in the design and development of biological and life-science research equipment. His wife, Carol, WB3CTN, takes an active part in his electronics activities. Daughter Cheryl, 11, is studying hard to make the Isleibs an all-ham family.

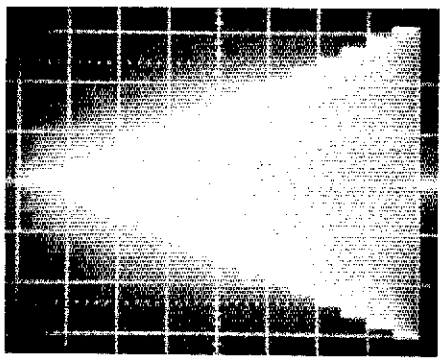


Fig 5—Here's a display of the 16-shade signal. Once your gray-scale generator is producing 8, 16 and 32-shade FAX gray scales with equal success, you're ready to use it to help you achieve your best WeatherFAX images yet.

Notes

[1] K. Sueker, "Real-Time HF WEFAX Maps on a Dot-Matrix Printer," *QST*, Mar 1986, pp 15-20.
[2] M. Wilson, ed., *The 1986 ARRL Handbook* (Newington: ARRL, 1985), p 20-11.
[3] G. Zehr, "The VIP: A VIC Image Processor," *QST*, Aug 1985, pp 25-31.

QEX

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Electromagnetic Pulse and the Radio Amateur

Part 4: What can be done to protect an Amateur Radio station from lightning and EMP transients? Here are some ideas on procedures and protective devices.†

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Acting Assistant Manager
Office of Technology and Standards
National Communications System
Washington, DC 20305-2010

The equipment test program described in the preceding three articles demonstrates that most Amateur Radio installations can be protected from lightning and EMP transients with a basic protection scheme. Most of the equipment is not susceptible to damage when all external cabling is removed. You can duplicate this stand-alone configuration simply by unplugging the ac power cord from the outlet, disconnecting the antenna feed line at the rear of the radio and isolating the radio gear from any other long metal conductors. Or, you can add two transient-protection devices to the interconnected system; that will also closely duplicate the stand-alone configuration.

The ac power line and antenna feed line are the two important points that should be outfitted with transient protection. This is the minimum basic protection scheme

†Parts 1-3 appear in Aug, Sep and Oct 1986 *QST*.

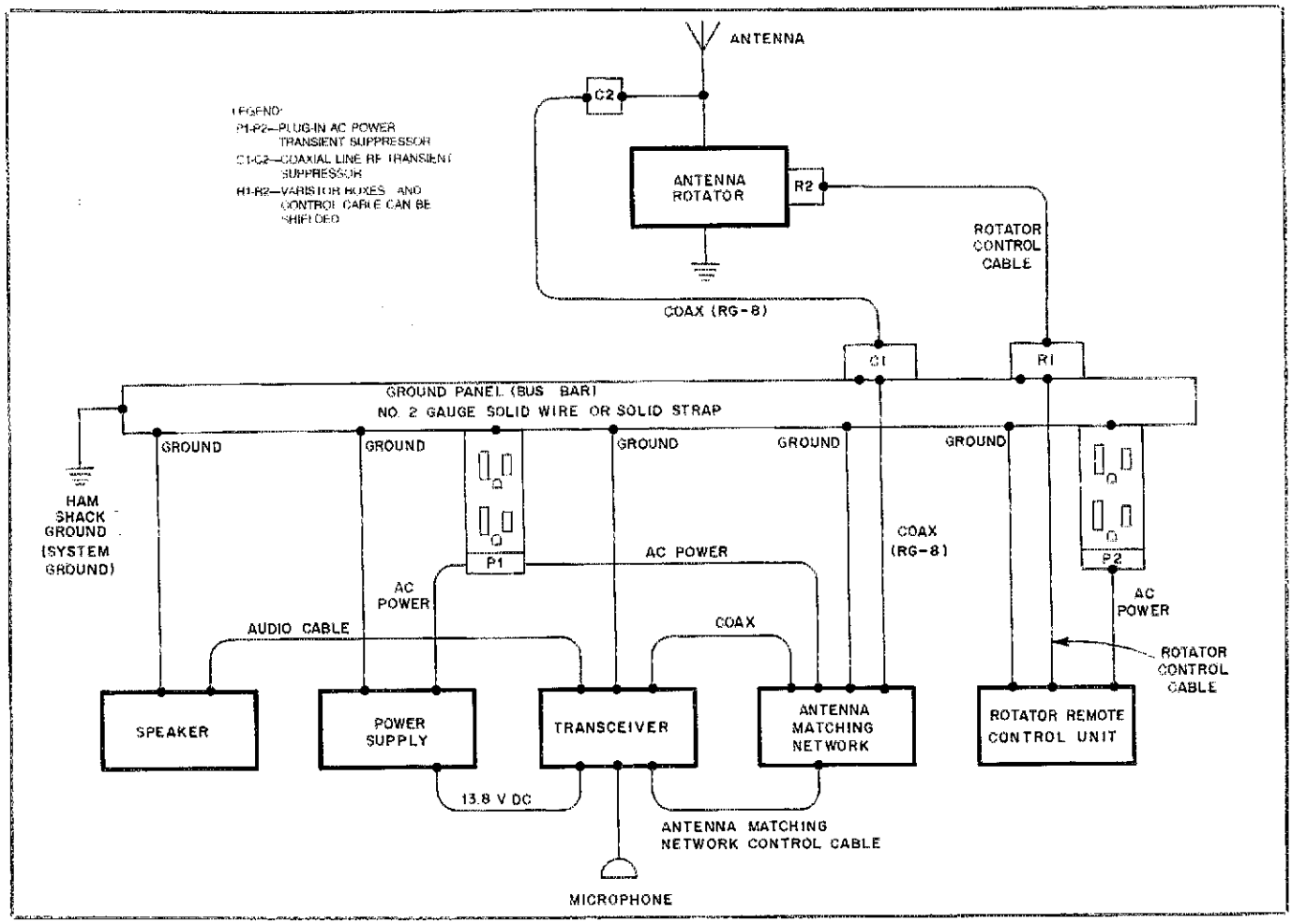

Fig 12—Transient suppression techniques applied to an Amateur Radio station.

recommended for all Amateur Radio installations. (For fixed installations, consideration should also be given to the antenna rotator connections—see Fig 12.) Hand-held radios equipped with a "rubber duck" require no protection at the antenna jack. If a larger antenna is used with the hand-held transceiver, however, a protection device should be installed.

General Considerations

Because of the unpredictable energy content of a nearby lightning strike or other large transient, it is possible for a metal-oxide varistor (MOV) to be subjected to an energy surge in excess of its rated capabilities. This may result in the destruction of the MOV and explosive rupture of the package. These fragments can cause damage to nearby components or operators and possibly ignite flammable material. Therefore, the MOV should be physically shielded.

A proper ground system is a key factor in achieving protection from lightning and EMP transients. A low-impedance ground system should be installed to eliminate transient paths through radio equipment and to provide a good physical ground for the transient-suppression devices. A single-point ground system is recommended (see Fig 13). Inside the station, single-point grounding can be had by installing a ground panel or bus bar. All external conductors going to the radio equipment should enter and exit the station through this panel. Install all transient-suppression devices directly on the panel. Use the shortest length(s) possible of no. 6 solid wire to connect the radio equipment case(s) to the ground bus.

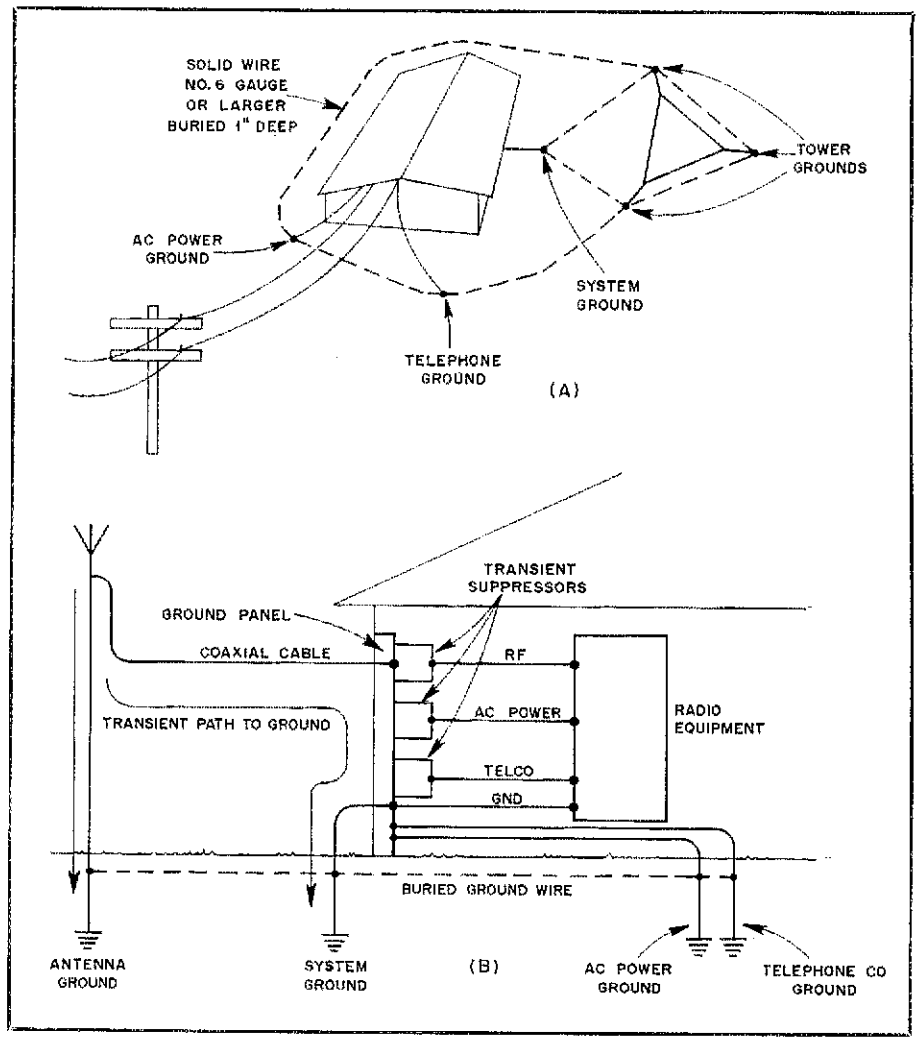

Fig 13—At A, the proper method of tying all ground points together. The transient path to ground with a single-point ground system and use of transient suppressors is shown at B.

Fixed Installations

Ac Power-Line Protection

Tests have indicated that household electrical wiring limits the maximum transient current that it will pass to approximately 120 A. Therefore, the amateur's station should, if possible, be installed away from the house ac entrance panel and breaker box to take advantage of these limiting effects.

Ac power-line protection can be provided with easy-to-install, plug-in transient protectors. Ten such devices were tested (see Table 9). Six of these can be plugged directly into an ac outlet. Four are modular devices that require more extensive installation and, in some cases, more than one module.

The plug-in-strip units are the best overall choice for the typical amateur installation. They provide the protection needed, they're simple to install and can be moved easily with the equipment to other operating locations. The modular devices are second choices because they all require some installation, and none of the units tested provided full EMP protection for all three wires of the ac power system.

Table 9
Ac Power-Line Protection Devices

Manufacturer	*Device*	*Approximate Cost (US Dollars)*	*Measured High-Z Clamping Voltage (Volts)*
	Modules		
Fischer	FCC-120F-P	55	420
Joslyn	1250-32	31	940
General Semiconductor	587B051	56	600
General Semiconductor	PHP 120	50	400
	Plug-Ins		
Joslyn	1270-02	49	600
TII	428	45	410
Electronic Protection Devices	Lemon	45	580
Electronic Protection Devices	Peach	60	1000
S L Waber	LG-10	13	600
Archer	61-2785	22	300

We consider the TII model 428 Plug-In Powerline Protector to be the best overall protector. It provides transient paths to ground from the hot and neutral lines (common mode) as well as a transient path between the hot and neutral lines (normal mode). The model 428 uses three MOVs and a 3-electrode gas-tube arrestor to provide fast operation and large power-dissipation capabilities. This unit was tested repeatedly and operated without failure.

Several other plug-in transient protectors provide 3-wire protection, but all operate at higher clamping voltages. Other low-cost plug-in devices either lack the 3-wire protection capability or have substantially higher clamping voltages. Some of these are the:

- Joslyn 1270-02. It provides full 3-wire (common and normal mode) transient-path protection, but at a slightly higher cost and at a higher clamping voltage.
- Lemon and Peach protection devices manufactured by Electronic Protection Devices, Inc. The Lemon provides full (command and normal mode) 3-wire protection, but at a higher clamping voltage; the Peach has a dangerously high (1000 V) clamping voltage.
- Archer (Radio Shack) 61-2785 [Replaced by a new model.—Ed.]. This unit provides excellent clamping performance at low cost, but it offers normal-mode protection only (a transient path between the hot and neutral leads). It will provide some protection for lightning transients, but not enough for EMP.
- S. L. Waber LG-10. The lowest-cost device does not provide full three-wire protection (normal mode only) and has a clamping voltage of 600. This unit can provide limited transient protection for lightning, but not the 3-wire protection recommended for EMP transients.

The transient suppressors require a 3-wire outlet; the outlet should be tested to ensure all wires are properly connected. In older houses, an ac ground may have to be installed by a qualified electrician. The ac ground must be available for the plug-in transient suppressor to function properly. The ac ground of the receptacle should be attached to the station ground bus, and the plug-in receptacle should be installed on the ground panel behind the radio equipment.

Emergency Power Generators

Emergency power generators provide two major transient-protection advantages. First, the station is disconnected from the commercial ac power system. This isolates the radio equipment from a major source of damaging transients. Second, tests have shown that the emergency power generator may not be susceptible to EMP transients.

When the radio equipment is plugged directly into the generator's outlets, transient protection may not be needed. If an extension cord or household wiring is used, transient protection should be employed.

An emergency power generator should be wired into the household circuit only by a qualified electrician. When so connected, a switch is used to disconnect the commercial ac power source from the house lines before the generator is connected to them. This keeps the generator output from feeding back into the commercial power system. If this is not done, death or injury to unsuspecting linemen can result.

Feed-Line Protection

Coaxial cable is recommended for use as the transmission line because it provides a certain amount of transient surge protection for the attached equipment. The outer conductor shields the center conductor from the transient field. Also, the cable limits the maximum conducted transient voltage on the center by arcing the differential voltage from the center conductor to the grounded cable shield.

By providing a path to ground ahead of the radio equipment, the gear can be protected from the large currents impressed upon the antenna system by lightning and EMP. A single protection device installed at the radio's antenna port will protect the radio, but not the transmission line. To protect the transmission line, another transient protector must be installed between the antenna and the transmission line (see Fig 12).

RF transient-protection devices from three manufacturers were tested (see Table 10) using RG-8 cable equipped with UHF connectors. All of the devices shown can be installed in a coaxial transmission line. Recall that during the tests the RG-8 cable acted like a suppressor; damaging EMP energy arced from the center conductor to the cable shield when the voltage level approached 5.5 kV.

Low price and a low clamping-voltage rating have to be considered in the selection of an RF transient-protection device. However, the lower-cost devices have the higher clamping voltages, and the higher-cost devices have the lower clamping voltages. Because of this, we selected medium-priced devices manufactured by Fischer Custom Communications. The Fischer Spikeguard Suppressors (about $55) for coaxial lines can be made to order to operate at a specific clamping voltage. The Fischer devices satisfactorily suppressed the damaging transient pulses, passed the transmitter RF output power without interfering with the signal and operated effectively over a wide frequency range.

Polyphaser Corporation devices are also effective in providing the necessary transient protection. However, the available devices limited the transmitter RF output power to 100 W or less. These units cost approximately $83 each.

The Alpha Delta Transi-Traps tested were low-cost items, but not suitable for EMP suppression because of their high (over 700-V) clamping levels. [New Alpha Delta "EMP" units have clamping voltages about one-third that of the older units tested here.—Ed.]

RF coaxial protectors should be mounted on the station ground bus bar. If the Fischer device is used, it should be attached to a grounded UHF receptacle that will serve as a hold-down bracket. This creates a conductive path between the outer shield of the protector and the bus bar. The Polyphaser device can be mounted directly to the bus bar with the bracket provided.

Attach the transceiver or antenna matching network to the grounded protector with a short (6 foot or less) piece of coaxial cable. Although the cable provides a ground path to the bus bar from the radio equipment, it is not a satisfactory transient-protection ground path for the transceiver.

Table 10
RF Coaxial-Line Protectors

Manufacturer	*Device*	*Approximate Cost (US Dollars)*	*Measured High-Z Clamping Voltage (Volts)*
Fischer	FCC-250-300-UHF	55	393
Fischer	FCC-250-350-UHF	55	260
Fischer	FCC-250-150-UHF	55	220
Fischer	FCC-250-120-UHF	55	240
Fischer	FCC-450-120-UHF	55	120
Polyphaser	IS-NEMP	83	140
Polyphaser	IS-NEMP-1	83	150
Polyphaser	IS-NEMP-2	83	160
Alpha Delta	LT	20	700*
Alpha Delta	R-T	30	720*

Note: The transmitter output power, frequency of operation and transmission line SWR must be considered when selecting any of these devices.
*The newer Alpha Delta LT and R-T "EMP" models have clamping voltages one-third of those shown here.

Another ground should be installed between the transceiver case and the ground bus using solid no. 6 wire. The coaxial cable shield should be grounded to the antenna tower leg at the tower base. Each tower leg should have an earth ground connection and be connected to the single-point ground system as shown in Fig 13.

Antenna Rotators

Antenna rotators can be protected by plugging the control box into a protected ac power source and adding protection to the control lines to the antenna rotator. When the control lines are in a shielded cable, the shield must be grounded at both ends. MOVs of the proper size should be installed at both ends of the control cable. At the station end, terminate the control cable in a small metal box that is connected to the station ground bus. Attach MOVs from each conductor to ground inside the box. At the antenna end of the control cable, place the MOVs inside the rotator case or in a small metal box that is properly grounded.

For example, the Alliance HD73 antenna rotator uses a 6-conductor unshielded control cable with a maximum control voltage of 24.7. Select an MOV with a clamping voltage level 10% higher (27 V or more) so the MOV won't clamp the control signal to ground.

DC Power-Supply Protection

Mobile Installations

The mobile amateur station environment exposes radio equipment to other transient hazards in addition to those of lightning and EMP. Currents as high as 300 A are switched when starting the engine, and this can produce voltage spikes of over 200 V on the vehicle's electrical system. Lightning and EMP are not likely to impact the vehicle's electrical system as much as they would that of a fixed installation because the automobile chassis is not normally grounded. This would not be the case if the vehicle is inadvertently grounded; for example, when the vehicle is parked against a grounded metal conductor. The mobile radio system has two advantages over a fixed installation: Lightning is almost never a problem and the vehicle battery is a natural surge suppressor.

Mobile radio equipment should be installed in a way that takes advantage of the protection provided by the battery (see Fig 14). To do this, connect the radio's positive power lead directly to the positive battery post, not to intermediate points in the electrical system such as the fuse box or the auxiliary contacts on the ignition switch. To prevent equipment damage or fire, should the positive lead short to ground, an in-line fuse should be installed in the positive lead where it is attached to the battery post.

Connect the negative power lead to the chassis on the battery side of the quick-disconnect connector. Although it would help prevent alternator whine, connecting the negative power lead directly to the battery post is not recommended from an EMP standpoint.

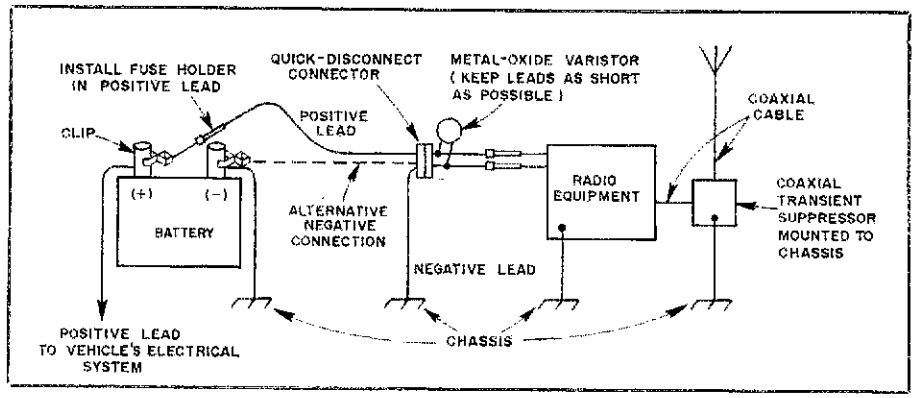

Fig 14—Recommended method of connecting mobile radio equipment to the vehicle battery and antenna.

An MOV should be installed between the two leads of the equipment power cord. A GE MOV (V36ZA80) is recommended for this application. This MOV provides the lowest measured clamping voltage (170 V) and is low in cost.

Mobile Antenna Installation

Although tests indicate that the mobile radios can survive an EMP transient without protection for the antenna system, protection from lightning transients is still required. A coaxial-line transient suppressor should be installed on the vehicle chassis between the antenna and the radio's antenna connector. A Fischer suppressor can be attached to a UHF receptacle that is mounted on, and grounded to, the vehicle chassis. The Polyphaser protector can be mounted on, and grounded to, the vehicle chassis with its flange. Use a short length of coaxial cable between the radio and the transient suppressor.

Clamping Voltage Calculation

When selecting any EMP-protection device to be used at the antenna port of a radio, several items must be considered. These include: transmitter RF power output, the SWR and the operating frequency. The protection device must allow the outgoing RF signal to pass without clamping. A clamping voltage calculation must be made for each amateur installation.

The RF-power input to a transmission line develops a corresponding voltage that becomes important when a voltage-surge arrestor is in the line. SWR is important because of its influence on the voltage level. The maximum voltage developed for a given power input is determined by:

$$V = \sqrt{P \times Z} \times SWR \qquad \text{(Eq 3)}$$

where

P = peak power in W

Z = impedance of the coaxial cable (ohms)

V = peak voltage across the cable

This equation should be used to determine the peak voltage present across the transmission line. Because the RF transient-protection devices use gas-discharge tubes, the voltage level at which they clamp is not fixed; a safety margin must be added to the calculated peak voltage. This is done by multiplying the calculated value by a factor of three. This added safety margin is required to ensure that the transmitter's RF output power will pass through the transient suppressor without causing the device to clamp the RF signal to ground. The final clamping voltage obtained is then high enough to allow normal operation of the transmitter while providing the lowest practical clamping voltage for the suppression device. This ensures the maximum possible protection for the radio system.

Here's how to determine the clamping voltage required. Let's assume the SWR is 1.5:1. The power output of the transceiver is 100 W PEP. RG/8 coaxial cable has an impedance of 52 ohms. Therefore

P = 100 W
Z = 52 ohms
SWR = 1.5

Substituting these values in Eq 3:

$$V = \sqrt{100 \times 52} \times 1.5 \qquad \text{(Eq 4)}$$

$$V = 108.17$$

Note that the voltage, V, is a peak value since the power was measured in peak watts. The final clamping voltage (FCV) is three times this value or 324.45 V. Therefore, a coaxial-line transient suppressor that clamps at or above 324 V should be used.

The cost of a two-point basic protection scheme is estimated to be $100 for each fixed amateur station. This includes the cost of one TII model 428 plug-in power-line protector ($45) and one Fischer coaxial-line protector ($55).

Inexpensive Transient-Protection Devices

Here are two low-cost protection devices you can assemble. They performed flawlessly in the tests.

SIOV AC Box

The SIOV (SIemens metal-Oxide Varistor) power-line protection device shown in Fig 15 is fabricated by installing a duplex receptacle in a metal electrical box. Power is brought into the box through a 6-foot-long, 3-conductor power cord. A fuse is installed in the incoming hot wire to guard against harmful effects if one of the protective devices shorts. MOVs (Siemens S14K130) are installed—with the shortest possible lead lengths—between the hot and neutral, hot and ground and neutral and ground leads. The estimated cost of this unit is $11.

UHF Coaxial T

The radio antenna connection can be protected by means of another simple device. As shown in Fig 16, two spark gaps (Siemens BI-A350) are installed in series at one end of a coaxial cable T connector. Use the shortest practical lead length (about ¼ in) between the two spark gaps. One lead is bent forward and forced between the split sections of the inner coaxial connector until the spark gaps approach the body of the connector. A short length of insulating material (we used Mylar®) is placed between the spark gaps and the connector shell. The other spark-gap lead is folded over the insulator, then conductive (metallic) tape is wrapped around the assembly. This construction method proved durable enough to allow many insertions and removals of the device during testing. Estimated cost of this assembly is $9. Similar devices can be built using components from Joslyn, General Electric, General Semiconductor or Siemens.

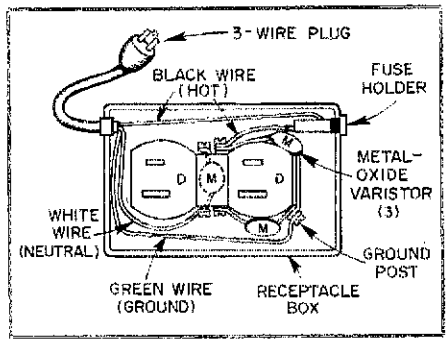

Fig 15—Pictorial diagram of an inexpensive, homemade ac power-line transient protector. This approach may be applied to multiple outlets; see text.

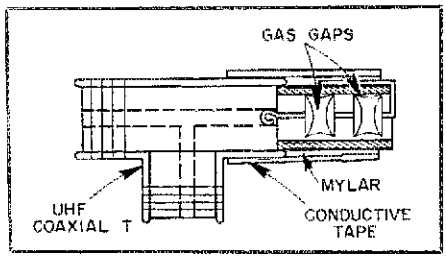

Fig 16—Pictorial diagram of an inexpensive, homemade transmission-line transient protector. See text for description of assembly.

Summary

Amateurs should be aware of which components in their radio system are most likely to be damaged by EMP. They should also know how to repair the damaged equipment. Amateurs should know how to reestablish communications after an EMP event, taking into consideration its adverse effects on the earth's atmosphere and radio equipment. One of the first things that would be noticed, providing the radio equipment is operative, is a sudden silence in radio transmissions across all frequencies below approximately 100 MHz. This silence would be due in part to the damage by the EMP transient to unprotected radio gear. Transmissions from one direction, the direction of the nuclear blast, would be completely out. RF signal loss by absorption and attenuation by the nuclear fireball are the reasons for this.

After an EMP event, the amateur should be prepared to operate CW. CW gives the most signal power under adverse conditions. It also provides a degree of message security from the general public.

Amateurs should develop the capability and flexibility to operate in more than one frequency band. The lower ground-wave frequencies should be useful for long-distance communications immediately after an EMP event. Line-of-sight (LOS) VHF would be of value for local communications purposes.

What can be done to increase the survivability of an Amateur Radio station? Here are some suggestions:

1) If you have spare equipment, keep it disconnected; use only the primary station gear. The spare equipment would then be available after an EMP event.

2) Keep equipment turned off and antenna and power lines disconnected when the equipment is not in use.

3) Connect only those external conductors necessary for the current mode of operation.

4) Tie all fixed equipment to a single-point earth ground to prevent closed loops through the ground.

5) Obtain schematic diagrams of your equipment and tools for repair of the equipment.

6) Have spare parts on hand for sensitive components of the radio equipment and antenna system.

7) Learn how to repair or replace the sensitive components of the radio equipment.

8) Use nonmetallic guy lines and antenna structural parts where possible.

9) Obtain an emergency power source and operate from it during periods of increased world political tension. The power source should be completely isolated from the commercial power lines.

10) Equipment power cords should be disconnected when the gear is idle. Or, the circuit breaker for the line feeding the equipment should be kept in the OFF position when the station is off the air.

11) Disconnect the antenna lead-in when the station is off the air. Or, use a grounding antenna switch and keep it in the GROUND position when the equipment is not in use.

12) Have a spare antenna and transmission line on hand to replace a damaged antenna system.

13) Install EMP surge arrestors and filters on all primary conductors attached to the equipment and antenna.

14) Retain tube type equipment and spare components; keep them in good working order.

15) Do not rely on a microprocessor to control the station after an EMP event. Be able to operate without microprocessor control.

Conclusion

The recommendations contained in this report were developed with low cost in mind; they are not intended to cover all possible combinations of equipment and installation methods found in the amateur community. Amateurs should examine their own requirements and use this report as a guideline in providing protection for the equipment.

[Editor's Note: This series of articles is condensed from the National Communications System report (NCS TIB 85-10) *Electromagnetic Pulse/Transient Threat Testing of Protection Devices for Amateur/Military Affiliate Radio System Equipment.* A copy of the unabridged report is available from the NCS. Write (no SASE required) to Mr Dennis Bodson, Acting Assistant Manager, Office of Technology and Standards, National Communications System, Washington, DC 20305-2010, or call 202-692-2124 between the hours of 8:30 AM and 5 PM Eastern.]

Strays

IT'S ALWAYS APRIL IN NEWINGTON!

☐ We all look forward to the April issue of *QST*—we don't know how the staff is going to "get" us this year. All seriousness aside, many members feel that we've become too gloomy at ARRL HQ. Many readers feel that we have failed to keep the "fun" in ham radio. How do you feel about it? Maybe you have a humorous experience or idea to share with the rest of us. It needn't be long—just complete and technically related to our hobby. Send your idea to Paul K. Pagel, N1FB, Senior Assistant Technical Editor, *QST*, ARRL, 225 Main St, Newington, CT 06111.

Meteor Scatter—European Style

Meteor-scatter operation is more popular in Europe than it is in the US. How do the operating techniques differ? G8VR presents the European story.

By Ken Willis, G8VR
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Broadstairs, Kent CT10 3BH, UK

VHF operation is much more popular in Europe and surrounding countries than it is in the US. Apart from a high level of 2-meter FM activity on both simplex and repeaters, 2 meters regularly hosts long-distance weak-signal contacts using SSB and CW. In an area rather smaller than the US, Europe and its neighbors comprise more than 50 separate countries. Each country has its own language, customs and individual call-sign prefix, enabling the European operator to chase enough prefixes to earn half of a VHF DXCC award. This opportunity largely explains the current popularity of VHF.

Another reason why VHF modes are favored is that several years earlier the Japanese "VHF Black Boxes" premiered in the Amateur Radio marketplace. The "box" changed the nature of Amateur Radio dramatically, allowing a large number of nontechnical people to join the ranks of the radio amateurs without first having served "apprenticeships" as short-wave listeners, the more conventional route to a license in the past. Most European countries encourage the use of VHF bands by issuing a permit for these frequencies only, without the need to pass a Morse code test. As a result, stations operate or listen almost any time of day. No "lift" in propagation conditions goes unnoticed, and, when one occurs, activity on 2-meter SSB and CW reaches levels usually observed only during contests.

For a US operator to work all states on 2 meters, the use of all possible propagation modes (including EME), plus patience, is required. Location is important; an operator on either coast can be at a serious disadvantage compared to an operator centrally located. From the coasts, some states are more than 1500 miles distant and difficult to reach using the conventional modes of VHF propagation. A similar situation exists for the British VHF operator. The mid-European station surrounded by a landmass has an operating advantage over the conditions that exist in Britain because of the Atlantic Ocean lying to the west of the British Isles. The UK amateur quickly learns that useful beam headings are much restricted by virtue of the oceanic distances between landmasses. Nevertheless, from my location in the southeast of England, I have contacted 50 countries and 258 grid squares on the 2-meter band, using only modest power and a single Yagi antenna! My secret has been a full exploitation of all the normal modes of propagation, and particularly CW meteor scatter in the specialized form now used throughout Europe.[1]

Development of the System

Europeans play the grid-squares game, and it is a serious, competitive business. It provides a standings table, with those at the top acting as targets for stations lower down to aim for and emulate. This exercise has contributed to increased activity and improved station performance on VHF. Communication paths now exist which, in the earlier days, would have been regarded as mere pipe dreams.

Many amateurs reside in apartment complexes or own small backyards. It is difficult to obtain permission to erect a large antenna (a 16-element Yagi is considered to be a very large antenna) or to use high power.

Against this background, a European style of meteor-scatter operation has been developed. It is a clinical method used to work a specific square or country up to 1300 miles distant without the need to wait for the arrival of a major meteor shower. In other words, daily meteor scatter supplements the normal Amateur Radio modes. So many operators now use it that it is no longer considered exotic. In fact, meteor scatter is the most reliable mode; it is independent of the weather, solar activity, the position of the moon or the presence of that fickle stuff called sporadic E.

Meteor scatter is not a new means of communication on VHF frequencies. As early as 1957, Walter Bain, W4LTU, wrote his first *QST* article about it, updating his work 17 years later.[2,3] Much more recently, Clarke Greene, K1JX, and M. Owen, W9IP/2, contributed most comprehensive descriptions of meteor-scatter communication.[4,5] Anyone interested in this mode should refer to these articles.

Theory of Operation

Reflections from ionized meteor trails are often strong and frequent. Yet, an operator on the far end of such a path may discover that the reflections are not of sufficient duration to provide useful information such as call signs and reports. This often occurs, even during major showers. Attempted contacts fail for lack of sustained reflections. It is true that in any given period of time more information can be conveyed by voice than by hand-sent CW. SSB is the preferred method for meteor-scatter contacts in the US, but voice communications can result in "gulping" sounds. Short reflections (pings) produce fragments of words and little useful information. Moreover, in the absence of a steady SSB signal, it becomes difficult to tune in a remote station correctly. Even when a good reflection (burst) occurs, the received station must be tuned correctly, otherwise, sounds of an off-tune SSB signal result and information is lost. When using CW, it is less important to be exactly on frequency with the other operator. Only the pitch of the beat note is affected by tuning, and this should not affect copyability.

In the US, CW meteor scatter is hand sent at speeds no faster than the operator can copy. Faster speeds increase the data rate and ensure that as much information as possible is passed during a reflection. With the advent of the microcomputer and its concepts of data transmission, it was hypothesized that if high-speed CW were to be transmitted, even the shortest reflection (ping) might yield useful data. This method would require a means of decoding the message at the receiving end, because the speeds envisaged would be in excess of anything that might be copied by normal means.

The system currently in use throughout

[1]Notes appear on page 39.

Europe employs a memory keyer running at 100 to 200 WPM. The keyer sends a repetitive message for long periods of time to take advantage of any reflections that occur, however short. At the receiving end, the decoding device may be no more than a cassette tape recorder with a tape counter. The recorder may be modified to offer variable tape speeds, controlled over a wide range of, say, ten to one. The speed of the tape is increased during recording and then slowed almost to a stop during playback. This technique enables the receiving operator to record a high-speed Morse message that may be received over a path opened by a meteor-trail reflection. The message is slowed to a readable speed on playback. An obvious advantage of this method is that any operator who possesses minimum CW skills can participate. The keyer memory can be loaded at any speed to suit the operator, while tape playback can be adjusted to suit any code-copying ability. The transmitted signal has a very characteristic sound, somewhat like RTTY, but is identifiable as meteor-scatter CW. Such transmissions are heard often on the European VHF airwaves.

System Operation

The CW meteor-scatter system now in use throughout Europe enables operators to communicate over distances of up to 1300-1400 miles on the 2-meter band. Schedules are arranged on the European VHF Net that meets on 14.340 MHz, ± 10 kHz, frequency shared by an EME net. The net is usually open during daylight hours, depending on skip conditions.

The main use of the net is to arrange schedules with other operators who need certain squares or countries. For example, an operator wanting square JN85 would call "CQ looking for JN85 square" and then wait to receive a reply from a station located in that square. (In the old European locator system, still favored by many operators, JN85 square would be referred to as "IF," so the call would be to "India Foxtrot Square.") The net is sometimes used for general VHF discussions and is useful when events such as auroras or sporadic E are observed.

The schedules arranged on the net define the date and time of the test, the frequency to be used and the CW speed (specified in letters per minute). Typical Morse speeds are 500 to 1000 LPM. The schedule also determines who is to start transmitting, though this is covered by a procedure described next.

Transmitting and receiving periods are normally of a five-minute duration. Lately, operators have been concentrating on increasing the sending speed and reducing the period length to 2½ minutes. Eastern stations directing their antennas to the west always transmit for the first five minutes and other odd-numbered periods of the hour while the western station listens. Then, the situation reverses—the western station points its antenna to the east and transmits during even-numbered periods, then listens during odd-numbered periods. CW schedules are normally of two hours duration.

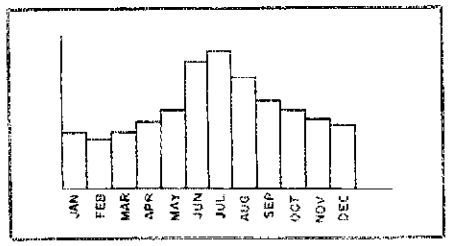


Fig 1—Variation of sporadic meteor rate during a typical year.

Table 1

European Meteor-Scatter Reporting System

First Number

2- Bursts up to 5 seconds
3- Bursts 5 to 20 seconds
4- Bursts 20 to 120 seconds
5- Bursts exceeding 120 seconds

Second Number

6- S2 to S3
7- S4 to S5
8- S6 to S7
9- S8 to S9

The receiving station records signals on a cassette tape recorder operating at a faster-than-normal tape speed. Whenever a reflection is heard, the tape counter reading is noted, together with any comments (signal strength and duration of the reflection). This information will later be used during playback to indicate how much useful information might be contained in the burst.

During a transmitting period, the operator may play back, at slow speeds, those parts of the tape that have been noted as being likely to contain useful information. His own transmitted message is then modified according to the information received. This will become obvious when the message content is described shortly.

A contact is said to be complete when both stations have copied both call signs in full, plus a report consisting of two numbers and at least one ROGER (the letter "R" in CW). The term ROGER indicates that the sending station has copied all the required information and awaits only confirmation that the other station has done the same. It is not a requirement that the call signs and report be copied in one transmission. The information can be built from fragments of received data provided there is no ambiguity (explained elsewhere). This bothers some critics of the system, yet it is no different from any other contact made on other modes. During times of marginal conditions, several attempts may have to be made to copy the call of the other station and to confirm whether he is sending 33 or 43 as a report. In practice, because of the high data rates used, it is commonplace for bursts to be received with complete information in a single string. On the other hand, the system adopted makes it possible to conduct QSOs under very poor conditions when reflections are extremely short and weak. For this reason, the method can be used year-round, and not only during major meteor showers. It is an exciting and useful mode to use when band conditions are flat in regard to other modes. Meteors are present in large numbers daily. Fig 1 shows the relative distribution of sporadic (ie, non-shower) meteors throughout the 12 months of the year. Although there is some falling off in January and February, it is possible to conduct QSOs by this method almost every day of the year. Early morning or late evening hours tend to produce the most meteor reflections. This is convenient as most nonmeteor-scatter operators are asleep. It also reduces the likelihood of TVI, especially in densely populated areas.

Procedures

The procedures used in the European system are different from those used in the US and described in Greene's article. Europeans use a four-part message format that is best described by showing an actual case. Suppose I have arranged a schedule with the Yugoslav station Stane Jeric, YU3ES (a well-known meteor-scatter operator). Because he is transmitting from east to west, YU3ES transmits during the first five-minute period. He will transmit both call signs repeatedly for the full time duration, such as:

G8VR YU3ES G8VR YU3ES...

Note that "de" between calls is not used in this system. It is considered to be redundant information.

During the first period, I listen with my tape recorder running. If nothing is heard, I transmit both calls during the second five-minute period:

YU3ES G8VR YU3ES G8VR...

If, during the first period, I had copied parts of call signs that identify the YU3ES transmission, I would then transmit not only calls, but a two-number report (see Table 1). It would look like:

YU3ES G8VR 26 26 26 YU3ES G8VR 26 26 26.

This would be repeated for the entire five-minute period. Similarly, when YU3ES copies something identifiable, he will also transmit a report. Possibly the reflections he received were stronger, so he might send:

G8VR YU3ES 27 27 27 G8VR YU3ES 27 27 27.

It is important to note that once a report has been established and transmitted, it is never changed throughout the schedule, even if conditions improve or deteriorate. When either station has copied both call signs and a report, that operator acknowledges receipt of the required information by sending a ROGER report:

YU3ES G8VR R26 R26 R26 YU3ES G8VR R26 R26 R26.

When YU3ES has copied both calls and the ROGER report, he, too, has all the information needed to make the schedule complete. He will send:

YU3ES RRRRRRRR YU3ES RRRRRRRR.

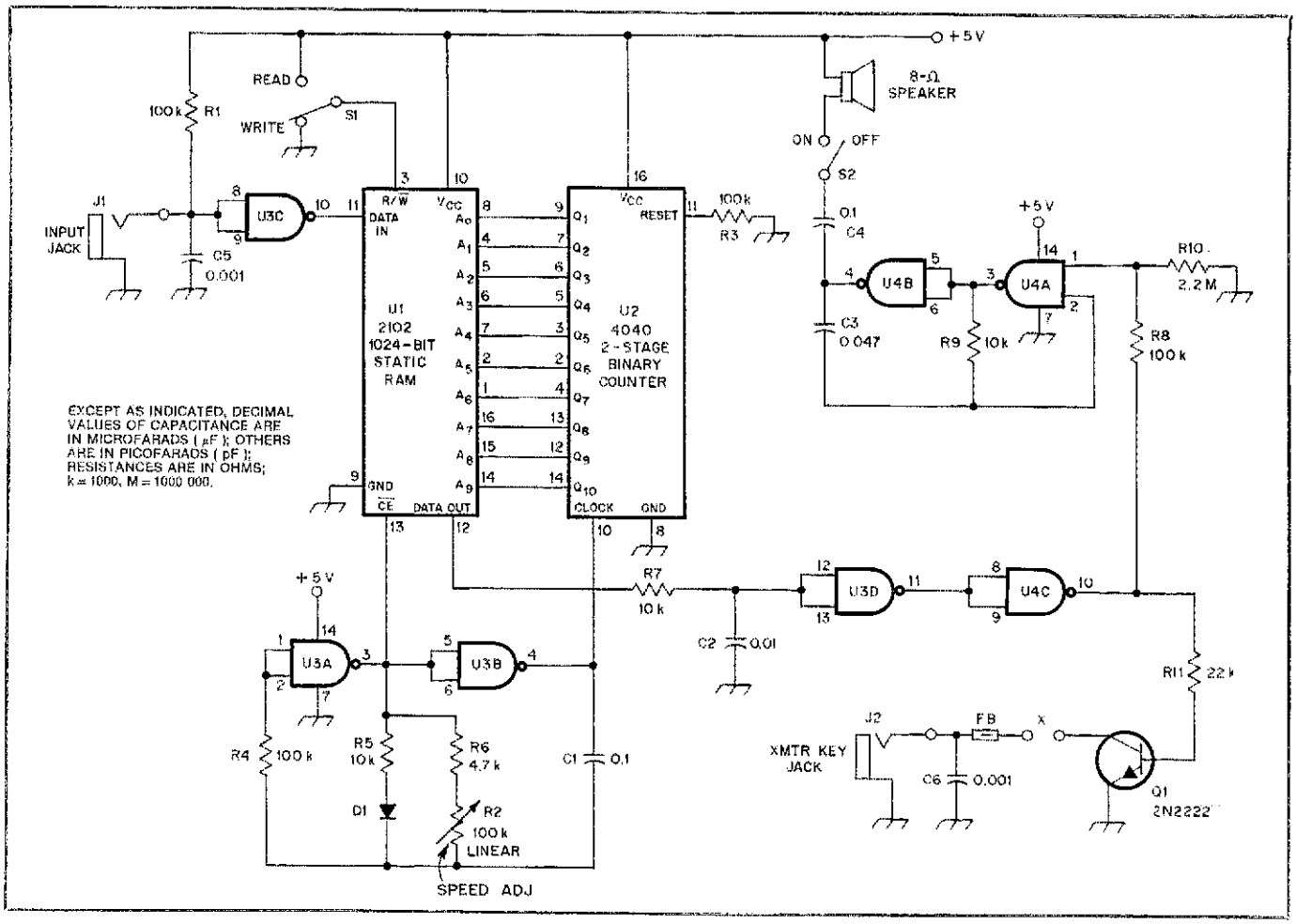


Fig 2—The schematic diagram of the author's memory keyer. Insert message at J1 with a straight key or one which grounds with key down. Adjust transmission speed with R2, and change R6 for coarse speed adjustment. Point X connects to the transmitter key jack, J2. Resistors are ¼-W carbon composition, capacitors are disc ceramic.

D1—1N914 silicon diode or equiv.
J1, J2—2 pole, normally open jack.
Q1—2N2222 or equiv.
SW1, SW2—SPST toggle.
U1—1-kbyte static RAM (Signetics 2102 or TI TMS 4035).
U2—4040 12-bit binary counter.
U3, U4—4011 Quad 2-input NAND gate.

On receipt of these final ROGERS, I respond:

G8VR RRRRRRRR G8VR RRRRRRRR.

This terminates the contact and the schedule is considered complete.

After a study of the system, note that the minimum number of periods to complete a contact is four; five if final ROGERS are sent, but they are unnecessary. The important body of information to receive, at minimum, is both call signs, a signal report and at least one ROGER.

If the periods are of a five-minute duration, the perfect QSO would take 20 minutes to complete and 25 if final ROGERS are sent by both stations. With experience comes a tendency to reduce the period length to 2½ minutes. Good timing is essential; it is amazing that a long burst can be missed by only seconds when changing from transmit to receive.

Ambiguities

We have said that it is not necessary to copy complete information in one transmission, but that it can be assembled from data collected from several reflections. For example, in our previous case, typical reflections might yield:

RYU U3E 6 G8V ES 2.

These are acceptable since the information string can fairly well identify the far-end station. In practice, with speeds of 1000 LPM, a burst of one second duration provides 16 characters. This time is more than enough for an exchange of both calls and a report or ROGER report in the majority of schedules. Thus, it is common for all the required information to be copied in a single burst. Murphy is never far away from the meteor-scatter scene, however, and if a single letter or a simple report is all that is needed, you can be sure that repeated reflections will contain everything except the bits required to complete the contact!

My G8VR call illustrates another problem. The letter R can be easily mistaken for a ROGER, especially during the ROGER report stage. In the following transmission from G8VR to YU3ES, suppose a reflection occurs that yields only the underlined part of the message, that is:

YU3ES G8VR 26 26 26 The copy shows only R 26.

This happens often. At YU3ES, it appears as a ROGER report, R26, leading him to believe that G8VR copied everything. To avoid this situation, stations with the letter R in their call sign would transmit a pair of ROGERS that look like:

YU3ES G8VR RR26 RR26 RR26.

Knowing this procedure, YU3ES would look for a double ROGER before assuming I copied everything needed.

Another ambiguity involves similar letters in the two call signs. For example: EA3LL G3LTF...

A burst that produced 3L would be unacceptable because it could apply to either station. However, 3LL would clearly belong to the Spanish station's call, while G3L would be from the British call area. Both are accepted. Operators take these rules seriously. They are enthused with the mode, and failure to complete a schedule means another—which is what they want anyway!

Random Contact

Not all the activity is confined to schedules. The frequency 144.100 MHz ± several kHz, is allocated to random meteor-

scatter CW contacts. On the random channel, busier during major showers than with sporadic meteors, the same procedures apply. Eastern stations transmit during the first five-minute period of the hour, and east-beaming stations take the second and even-numbered periods. Scandinavian stations wanting to work south into Spain and Italy have to agree who goes first since they are transmitting north to south. There is usually an element of east and west in any path, but this can cause problems. One of the benefits of meteor scatter is that all stations in a given locality transmit at the same time and listen together; QRM is absent. Any station that has to depart from the rules may find themselves transmitting during a receive period and be very unpopular.

On the CW random channel, CQ is used for an entire five-minute period:

CQ G8VR CQ G8VR. . .

Stations reply with a report in the first transmitting period because they will have copied enough to justify this if they know who they are calling. In responding to a random channel CQ, if the call sign of the sending station is not copied, QRZ is used, as it is in any other mode.

The bulk of European activity takes place on the 144-MHz band, but the 50-MHz band recently opened to UK amateurs. It is proving exceptionally good for meteor-scatter work. Many European stations, though not able to transmit on the band, have 50-MHz receivers and work cross-band meteor scatter 50/144 MHz with UK stations. Contacts are presently made with very low power and simple antenna systems.

Equipment Requirements

Several years of experience have indicated that successful meteor-scatter CW, using the techniques described, is possible with about 100 W to a 6- or 10-element Yagi. Anything that delivers a higher ERP than this considerably increases the success rate. At my station, tests with Mats Espling, SM6EAN, have indicated that reflections containing useful information can be achieved with as little as 20 W to a 16-element Yagi. In one memorable contact with the Russian station V. I. Tsigankov, UA3LBO, during the Perseids shower of 1982, TVI forced me to reduce power to under 25 W. Surprisingly, the contact was completed and a report of 37 was received. This was over a distance of 1330 miles!

Keying must be sharp, and the filtering in the keying circuit of some rigs requires attention to achieve this. It is necessary to strike a balance between really sharp characters and the radiation of key clicks, but any code that is too rounded will be difficult to copy when slowed down. This is true, especially in the presence of the Doppler shift, which is often a feature of received signals because of the transient nature of the meteor trail. (*The 1986 ARRL Handbook* includes information to determine if your keying meets CCIR Radio Recommendations.[6])

On the receive side, a front end noise figure of 2 dB or less is adequate for most purposes. Since the received signal is slowed down when it is read, the beat note must be set at an extremely high pitch during recording. If not, as the tape is slowed, the pitch of the note will disappear completely into the noise background and be unreadable. The technique adopted by most Europeans is to set up on channel and switch the clarifier to receive at about 45° to 90° off center, towards the high-pitch side. This causes a slight loss of signal. (For old-timers with high-frequency hearing loss, some reflections are hard to pick out!) Jan Martin Noding, LA8AK, designed an audio upconverter to convert incoming audio signals at normal pitch to around 8500 Hz. When the signals are slowed by a factor of 10 to 1, they are readable at a comfortable 850 Hz.[7]

Concerning the tape recorder, nothing special is needed except for a tape counter. It is imperative to be able to refer quickly to those parts of the recording where reflections occur. Since playback occurs mostly during transmitting periods, it is essential that the recorder be free of RFI. Battery-operated recorders are often best. At G8VR, where this form of communication is serious business, a stereo deck is used simply because it sits firmly on the shelf as a permanent station item. In addition, it is enclosed in a steel case. Several ferrite rings used as "breakers" on its power cord make playback possible alongside a fully operational transmitter.

To modify the tape recorder for variable speed control, several comments are offered. The final solution depends on the actual model used. Often, the less-expensive recorders are the easiest to modify. Many recorders have a small motor-control printed-circuit board built into them that contains two or three transistors, some resistors, capacitors and a small preset potentiometer. If this is fitted, it is necessary only to disconnect the potentiometer and bring out the three wires associated with it to an external potentiometer fitted with a knob. Some operators, not wishing to deface their recorders, simply bring out the wires to an external potentiometer. Others find space to mount the potentiometer inside the recorder. If a higher recording speed is required, it is often possible to find an unregulated dc line in the recorder that can be used to feed the motor so that it runs faster than normal. If the motor can be speeded up above normal on record, this increases the speed range and facilitates the reading of very high-speed CW bursts.

Another less-elegant method is to divorce the motor from the internal power supply completely, bringing out the motor connections and connecting them to an external variable-voltage regulated supply. This technique would have to be worked out so that the normal switching functions in the recorder continue to provide fast forward and rewind facilities. Some experimental work is usually required to achieve a suitable variable-speed recorder, but great technical ability is not required to obtain a result.

For CW sending, any memory keyer can be used.[8] Generally, this class of keyer does not operate fast enough (100 to 200 WPM); manufacturers do not normally provide such speeds simply because they are not demanded. It may be possible to accelerate a given keyer's clock. Some microcomputer Morse-code programs can be made to run fast enough. They also have the advantage that the message is easy to load by typing it in directly—but if the micro causes RFI during the receive stage, it will cause problems.

The Memory Keyer

Many European meteor-scatter operators prefer homemade memory keyers. Fig 2 shows what might be one of the simplest keyer designs available. I have used this circuit in my station successfully for several years. It uses only four ICs and can be hard wired on experimenters' board or something similar. It is an interesting weekend project that requires no special constructional skills.

U1 is a 2102 RAM chip, capable of storing 1024 bits of information. This amount of memory is more than enough to accommodate a typical meteor-scatter message and is accessed or scanned by U2, a type 4040 12-bit binary counter. Interconnections between U1 and U2 permit the memory to be swept through in a sequential manner at a rate determined by a clock circuit, U3A and U3B, (a pair of gates in a 4011 Quad 2-input NAND gate IC). The frequency of the clock circuit, and thus the speed of the keyer, is determined by C1 and R2. R2 is a potentiometer connected to the keyer's speed control knob in both the READ and WRITE modes.

Gates U4A and U4B are connected to a similar clock circuit, but with different time constants. Their function is to provide a sidetone oscillator that monitors data being keyed into the memory or read from it. By varying the value of either C3, R9, or both, an acceptable tone can be achieved. The spare gates in U3 and U4 are used to convey the signal in or out of the keyer unit. This cleans the signal and eliminates unwanted transients that may otherwise be present on the waveforms.

To erase the chip's memory, turn the READ/WRITE switch to the WRITE position and advance the speed control to its highest setting. (This operation is rather like the erase procedure used on a cassette recorder.) After several seconds, the speed control is turned to a lower setting and Morse characters are entered by hand using the input jack, J1. An electronic keyer that produces a low-resistance path on key down or a straight key will work satisfactorily. When the message has been entered, the READ/WRITE switch is moved quickly to the READ location. The stored message should be played back before it is transmitted and it should be heard on the sidetone. The speed of the keyer can be set to the desired value by increasing the speed control.

When the 2102 RAM chip is used for meteor-scatter transmissions, it is customary to enable the memory and have it transmit your message several times at slow speed.

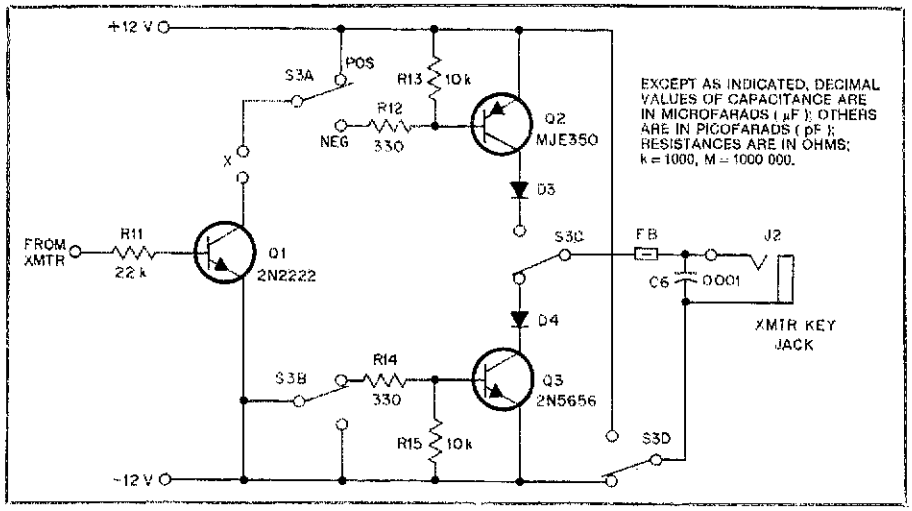


Fig 3—This circuit accommodates either positive or negative keying requirements and is connected to point X in Fig 2. Here, SW3 is set for positive keying. Note that the sleeve on J2 is isolated from ground to prevent the +12-V line from touching the ground line.
D3, D4—1N4006.
J2—2 pole, normally open jack.
Q1—2N2222 or equiv.
Q2—MJE350.
Q3—2N5656.
SW3—Four-pole, 2-position rotary switch.

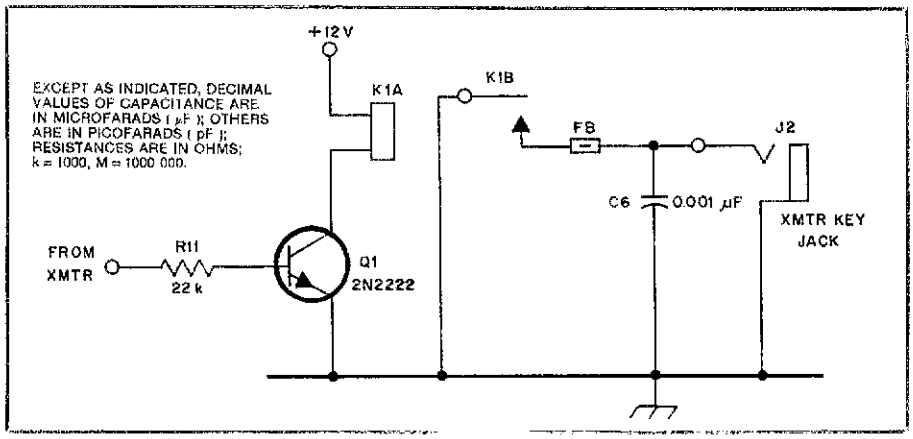


Fig 4—An alternative output circuit using a keying relay. If the voltage across the key terminals measures 6 to 12 volts, but your unit will not key satisfactorily, a keying relay, as shown, must be added to your circuit. The small reed relay can be connected so that its coil connects point X in Fig 2 with a 12-volt source, and the relay contacts are used to key the transmitter.
J2—2 pole, normally open jack.
K1—12-V dc reed relay.
Q1—2N2222 or equiv.

This procedure is used for station identification, after which transmissions are increased to speeds of up to 500 to 800 LPM with the circuit values shown.

The output circuit shown in Fig 2 is for keying a transmitter that requires a positive keying pulse (key down). Fig 3 shows an alternative output circuit to accommodate either positive or negative keying requirements. In this circuit, the two transistors shown will tolerate high voltages. Some rigs have a high voltage across the key jack circuits with key up, but for most modern rigs, a 2N2222 will suffice. Yet another possibility, independent of rig characteristics, is shown in Fig 4. A reed relay is used in the keying circuit. If this design is used, make sure it can follow the high speed keying at what is effectively150 WPM or more!

In the keyer designed by Eric Unruh, WBØRYN, a pair of 2102 memory chips are connected in parallel to increase the amount of memory.[9] This is not necessary for meteor-scatter work, but is useful in a contest memory keyer. Eric's circuit is not designed for the high speeds of meteor-scatter operation, so experimentation is necessary in the clock circuit time constants if it is to be used.

Four memories are available in my keyer and they can be selected by push button. This allows me to prepare the entire four-part meteor-scatter message format in advance. Pin 3 on each 2102 must be kept at positive potential throughout when switching from one memory to another, or the stored information is lost.

My simple keyer has one disadvantage. The time of "dwell" as the 4040 sweeps out the 2102 memory is determined by the speed setting. There is no relationship between the time taken to key in a message and the sweep time. If the input message is too short, there will be a gap at the end of the playback. The gap is transmitted repeatedly, and this might occur during a meteor trail, producing a loss of signal. Equally, if the message is too long, the sweep will eliminate part of the signal as it nears the end of one cycle and starts another. Thus, it is necessary to match the time taken to key in a message to the setting of the speed control. It is easier than it first appears. The speed control is calibrated to accommodate a message of, say, 14, 15 or 16 characters when the gaps are inserted at a steady rate. If the keyer is programmed from an electronic keyer, it is easy to draw a table showing keyer speed setting, memory speed and message length which will permit a message to be entered in the time slot available.

Paul Whatton, G4DCV, developed a more sophisticated memory keyer for meteor-scatter work.[10] His device requires no operator interaction to fill the message slot. The gap will be closed electronically at the end of any length message, provided it is not too long for the storage capacity of the memory chip. The keyer also offers a number of other useful features for the dedicated meteor-scatter operator.

Have fun on the meteor trails! If amateurs in the US become as addicted to this mode as Europeans are, there won't be any vacant frequencies on 2 meters during the evening and early morning hours—and those grid-square scores will increase in an encouraging way!

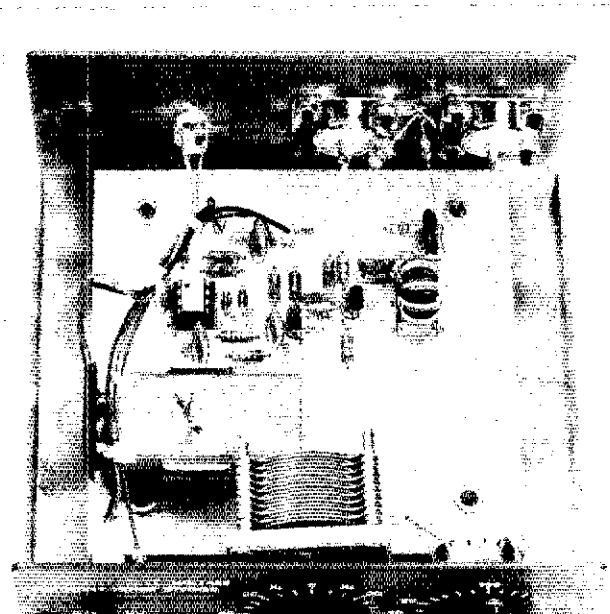
Notes

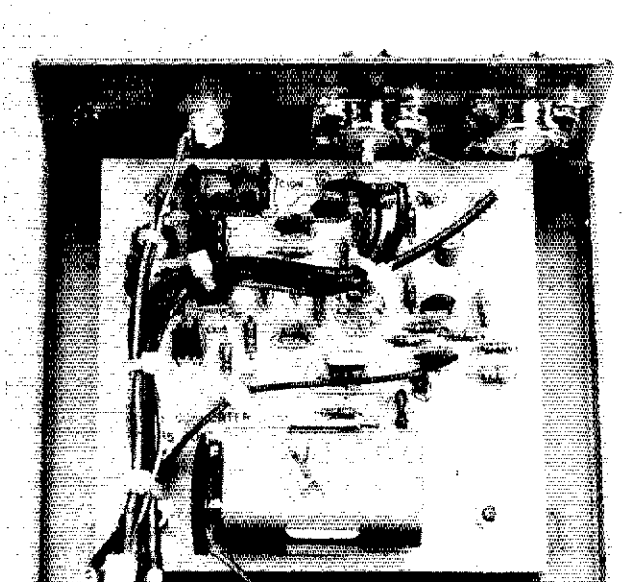
[1]S. Hutson, "The Doctor's VHF Cure for the Low Sunspot Blues," *QST*, Dec 1985, p 59.
[2]W. Bain, "VHF Meteor-Scatter Propagation," *QST*, Apr 1957, p 20.
[3]W. Bain, "VHF Propagation by Meteor-Trail Ionization," *QST*, May 1974, p 41.
[4]C. Greene, "Meteor-Scatter Communications," *QST*, Jan 1986, p 14.
[5]M. Owen, "VHF Meteor Scatter—An Astronomical Perspective," *QST*, Jun 1986, p 14.
[6]M. Wilson, ed., *The 1986 ARRL Handbook* (Newington: ARRL, 1985), pp 9-8 to 9-9.
[7]P. Hawker, "Technical Topics," *Radio Communication* (RSGB), Sep 1982, pp 770-771.
[8]K. Willis, "Simple Memory Keyers For Meteor Scatter, Part 1," *Short Wave Magazine*, Apr 1981, p 91.
[9]E. Unruh, "Poor Man's CW Keyer," *73*, Jun 1979, pp 142-144.
[10]A circuit board is available for this keyer. Further details can be obtained by writing to the author or to P. Whatton, G4DCV, 55 Kingsdown Rd, St Margarets At Cliffe, Dover, Kent, CT15 6AZ.

Ken Willis graduated from the Imperial College, Univ of London, England with a degree in physics. His career activities include working as an electronic instrumentation design engineer associated with the UK nuclear energy program, a member of the British Embassy in Washington, DC, a Director of Administration for the British National Research Development Corp and an Executive Director for the Connecticut Product Development Corp. G8VR has been an Amateur Radio operator since 1936, and his primary interests are VHF/UHF and homemade equipment. Since 1966 he has been a full member of the British Institution of Electrical Engineers. Ken is a member of Council of the RSGB, and is currently its Executive Vice President and a member of several RSGB committees.

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Heath Model HD-1420 VLF Converter and Model HD-1422 Antenna Noise Bridge





Heath has always been famous for providing reasonably priced accessory and test equipment kits with good performance. This month we look at two new accessory items, the HD-1420 VLF Converter and HD-1422 Antenna Noise Bridge, to see if they are keeping up their fine tradition. These kits were introduced late in 1985 and should be of interest to many amateurs.

VLF Converter Description

The '1420 VLF converter allows you to listen to the frequencies between 10 and 500 kHz, below the standard AM broadcast band. For those of us that own one of the new general-coverage receivers or transceivers that cover part of this band, this unit may be of only academic interest. For those like myself, limited to a ham-band-only transceiver, the possibilities of listening in to the VLF portion of the spectrum are fascinating. I have read several publications that describe the numbers of beacons, broadcast stations and "LOWFERS" operating down there. I really wanted to hear them for myself!

The circuit for the converter is exceptionally simple. A 2N3904 bipolar-transistor RF stage (if you can call 10 kHz "RF"), an MPF105 bipolar-transistor crystal oscillator operating at 3500 kHz and an MC1496G IC mixer comprise the converter (see Fig 1). The converter output is 3510 to 4000 kHz, tunable on an 80-m receiver to cover the 10- to 500-kHz range. There is nothing unconventional in the design—a Colpitts crystal oscillator, an untuned RF stage that is connected directly to the antenna, and a straightforward IC mixer. There is a low-pass filter between the RF amplifier and the IC mixer. In addition to the three active components, there is a small handful of miscellaneous resistors and capacitors. The PC board is silk-screened and solder masked. The general layout is uncrowded and easy to work with. The hardware is of good quality, and all attaching parts are included in the kit.

VLF Converter Construction

As usual, Heath's assembly manual is well written. I had only one problem in assembling the converter. I skipped immediately to the instructions for inserting and soldering the resistors into the PC board. Since there were only 21 resistors, this was a quick task. But when I reached the end of the instructions, I still had one resistor left! I used the schematic and the silk screening on the PC board to identify the resistor I had on hand. I determined that it was R109 (1 kΩ) and installed it.

It was a matter of some time—in fact, not until I built the Antenna Noise Bridge—before I discovered my problem. Heath uses R109 as an example in the preassembly instructions, then just before the detailed piece-by-piece instructions, they say, "Make sure you installed R109 in a earlier step." In building the noise bridge I discovered, after putting in all the resistors I could identify in the instructions, that R101 was left over. That's when the lights came on! I couldn't believe that two kits would have the same problem. After *reading* all the instructions, it soon was apparent that I was the problem with both kits. Moral: Read *and* understand *all* of the instructions before you start soldering! It's very easy, if you have built kits previously, to assume that you know everything. It was a humbling experience (that I shared with absolutely no one, until now).

The balance of the construction was simple. In all, I spent about two hours, total, in building and testing the unit. The kit includes a 9-V battery connector and a battery holder. Unfortunately, when the holder is mounted to the PC board with the two no. 4-40 screws provided, a pair of lumps is created by the screw heads right in the center of the holder. The battery will not then fit cleanly into the holder. I would much prefer to see another type of holder used, in which the battery is mounted on its side and the mounting screws do not interfere with the fit. A 1/8-in, 2-circuit jack is supplied with the kit, and it

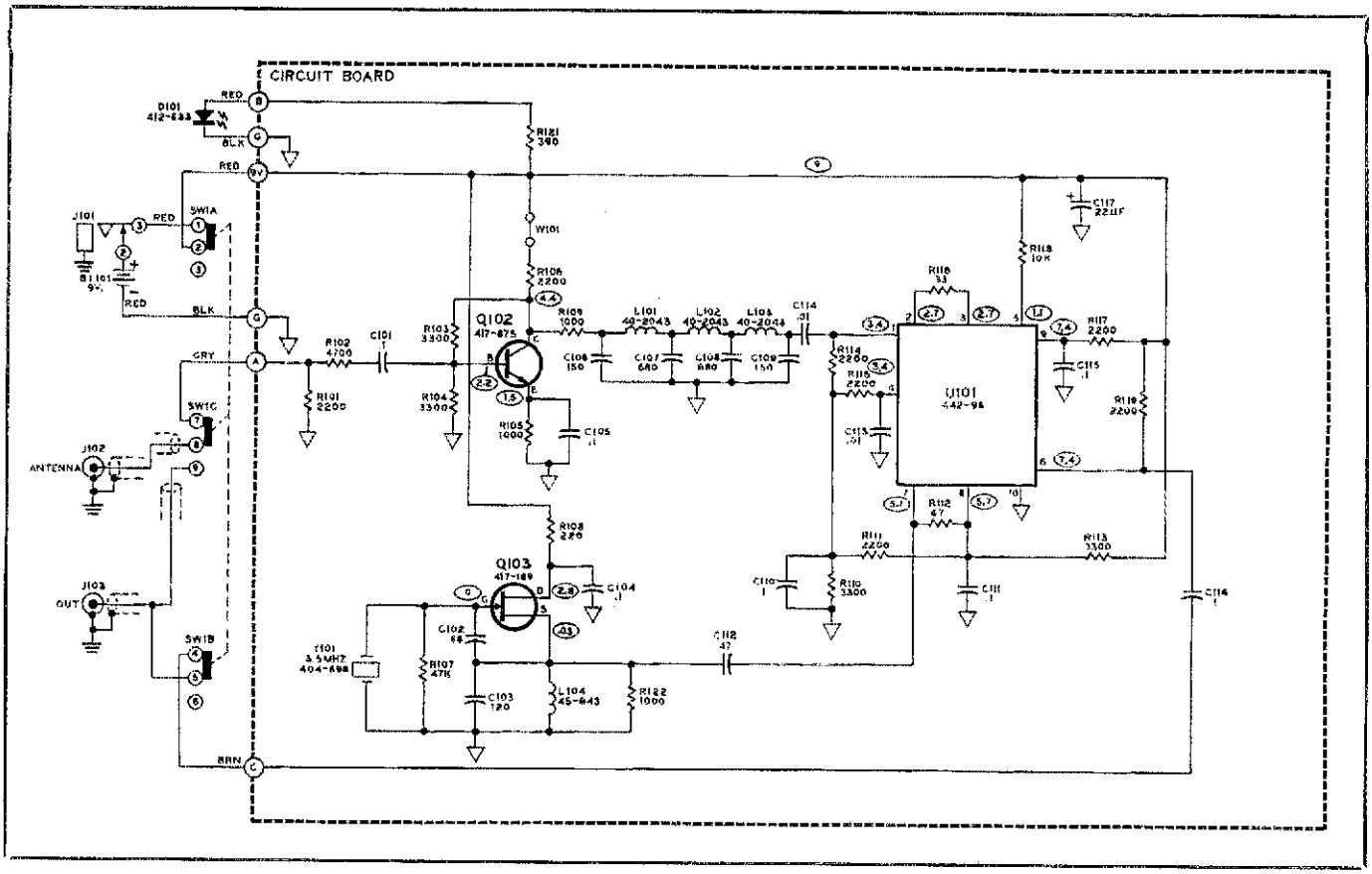


Fig 1—Schematic diagram of the Heath HD-1420 VLF Converter. This drawing is reproduced with permission of Heath Co and does not reflect ARRL style.

is mounted on the rear panel to allow use of an outboard power supply. The 9-V battery will probably not last too long because of the current requirement (20 mA) of the converter.

Performance

I connected the converter to my IC-730 to listen to the VLF band. It was a little disappointing at first—there either were few signals, or the converter was a "leetle mite deef." Since the '730 has no VLF capability, I couldn't compare performance with and without the converter. The manual says to use a long-wire antenna, even a long horizontal wire, or a vertical. I used my 80-m, inverted-V trap dipole. I was able to copy three or four beacon signals, as well as the weather broadcast from station TUK near Boston (about 150 miles away). I then tried a random-wire antenna, but could not copy any additional signals. In several hours of listening, I was unable to copy any "LOWFER" signals. These are stations in the 160-190 kHz band that are permitted license-free operation with transmission power limited at 1 W to an antenna 50 feet long, or less.

In the ARRL Lab, we connected the converter to a Kenwood TS-440S transceiver and used a vertical antenna designed for 30-m operation. We were able to receive the same signals that were copied with the 80-m dipole and the '730. The signals through the converter were about 12 dB (2 S units) below the same signals copied in the TS-440's general-coverage mode on the VLF band. There is either considerable conversion loss in the unit, or the antenna impedance matching is critical. There is no practical way to determine if the converter input mismatch is different than the bare transceiver input mismatch. We did, however, measure the converter MDS (minimum discernible signal, or noise floor). At about 470 kHz, the lowest frequency that our calibrated signal generator can provide, MDS was −108 dBm. Not too bad for this type of equipment. In subsequent tries to use the converter, I found that the antenna is everything. A vertical is best—then a random wire. The dipole that I used at home came in a poor third.

During another long listening session from my QTH, at about sundown, I was able to copy 33 stations, ranging from the low AM broadcast band (540 to 600 kHz) to some unidentifiable stations at around 25 kHz. It was interesting that I could copy AM broadcast at every 10 kHz from 540 to 600 kHz. Some of the signals came from as far as Boston, and others were in New York. There were several beacons (AM CW) identifiable, as well as two or three additional weather broadcasts in addition to station TUK. Apparently my first attempts were during periods of low activity or poor propagation. I was quite impressed by the converter's performance during this last session.

Antenna Noise Bridge Description

The Antenna Noise Bridge generates a tone-modulated broadband noise signal that is coupled to an impedance bridge. Using the station receiver as an indicator, the impedance bridge measures the resistive and reactive components of the antenna. This allows you to trim the antenna to your favorite operating frequency for the most effective reception and transmission of signals. In addition, the noise bridge can be used to preset an antenna matching network for faster tuning, to tune a quarter-wave transmission line and to measure the values of unknown capacitors and inductors.

The circuit of the noise bridge is simple and effective. The noise generator is a Zener diode, D103 (see Fig 2). The NE555 IC timer, U101, generates an approximate 50-percent duty cycle, square-wave audio signal that is applied to the cathode of D103. The audio modulation thus appears on the noise signal and makes null-detection easier when used with an AM receiver. The broadband noise and audio signal is amplified to a level sufficient to produce a fairly high (about S9) level in the receiver. The impedance bridge portion of the circuit consists of C1, R1, C107 and T101. T101 is a trifilar-wound transformer with one of the windings used to couple noise energy into the bridge circuit. The remaining two windings are arranged so that each one is in an arm of the bridge. In operation, the bridge is adjusted for an audio null in the receiver, using C1 and R1. The dial readings of these components then indicate the resistive and reactive components in the antenna at the frequency to which the receiver is tuned.

Noise Bridge Construction

Construction of the noise bridge is straightforward and requires about two hours. All parts of the kit were provided, and there were good instructions for the assembly

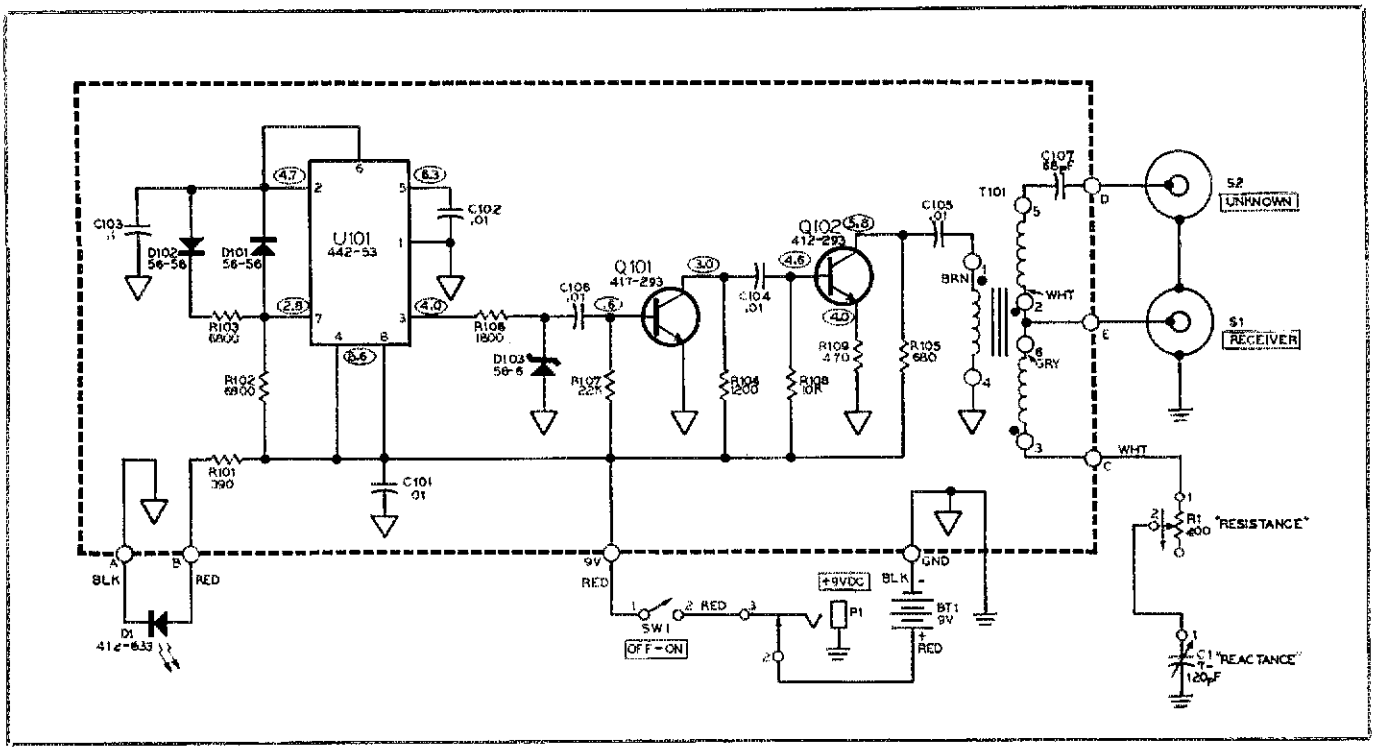


Fig 2—Schematic diagram of the Heath HD-1422 Antenna Noise Bridge. This drawing is reproduced with permission of Heath Co and does not reflect ARRL style.

of the entire bridge. Hardware is of good quality, and there were no shortages.

Performance

The only way I know of to check performance of an Antenna Noise Bridge is to check an antenna with known characteristics to confirm its performance capability. In the ARRL Lab we tested several antennas with the bridge, and invariably it told us exactly what we already knew about the antennas. It is as accurate as any device of its type could be expected to be. I gained confidence in it by also measuring several "unknown" values of inductance and capacitance, and finding that the accuracy was adequate for ham-shack use.

Conclusion

Both kits seem to be reasonable designs at a reasonable price. I was satisfied with the performance of both. The VLF converter seems to operate with a reasonable sensitivity range. It should satisfy the casual VLF listener.

I think that a noise bridge is a must in the shack. With the '1422 you can immediately tell what your antenna is doing. In addition, I see several other ways in which it can help me (in identifying some of those unmarked "goodies" I bring home from time to time).

Manufacturer: Heath Company, Benton Harbor MI 49022. Suggested list prices: Model HD-1420 VLF Converter, $49.95; Model HD-1422 Antenna Noise Bridge, $49.95.
—Bruce O. Williams, WA6IVC

Strays

I would like to get in touch with ...

☐ hams interested in starting a 12-m net to exchange QRP construction-project ideas. Bill Copeland, WB6RVE, PO Box 163, Perris, CA 92370.

☐ anyone with information on finding a vintage WW II US Navy TCK transmitter. Jim Berry, K7SLI, 4205 NE 109, Portland, OR 97220.

☐ anyone with a schematic and/or service information for a Xitox Corp Model 100 Leedex video monitor. Mac Campbell, K9ZKX, RR 1, Box 31, Bruceville, IN 47516.

Next Month in *QST*

- ACSSB or FM—which offers communications effectiveness and spectrum conservation? Learn the what, who and how of Amplitude-Compandored Single Sideband in the two-part series beginning in December *QST*.
- Want ac-line spike protection? Plug into Under Construction for details on building a 6-receptacle outlet box with filtering.
- "Three fine mice, see how they run." You'll easily have these MOuSeFET CW transmitters by the tail. Build models for 80, 40 and 30 meters.
- OSCAR celebrates a quarter century of flying high with an anniversary article on the amateur-satellite program—where it's been and where it's headed.

Please note: Although we try our best to include in the next issue all the items we've advertised, from time to time we have to postpone publication for a month or two. If the item you're looking for doesn't appear "next month," it most likely will be in the following month's issue.

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

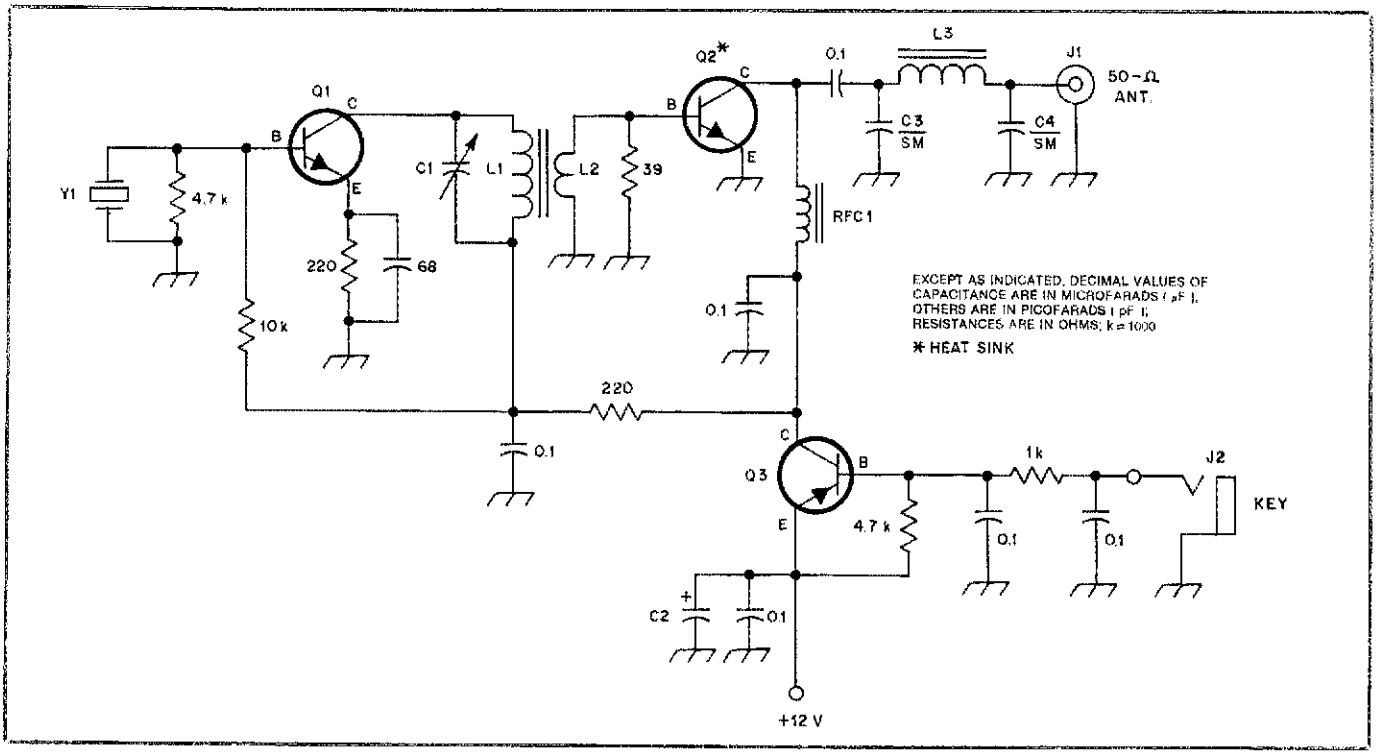


Fig 1—A schematic diagram of the QRP transmitter for 30-meter operation. Fixed-value capacitors are disc ceramic. Inductor cores are available from Amidon Associates or Palomar Engineers.[1,2] The enclosure is from Radio Shack® (RS 270-251), and the circuit board is from Circuit Board Specialists.[3]

Y1—Fundamental-mode crystal for the 30-meter band.
Q1—2N2222A or equiv.
Q2—2N3553 or equiv.
Q3—2N4036 or equiv.
C1—150-pF mica trimmer, ARCO no. 424.
C2—470-μF, 25-V electrolytic or tantalum capacitor.
C3, C4—330-pF silver-mica or polystyrene capacitor.
L1—30 turns, AWG no. 24 enameled wire on a T-50-2 core.
L2—3 turns, AWG no. 24 enameled wire over L1.
L3—13 turns, AWG no. 22 enameled wire on a T-50-2 core.
RFC1—30 turns, AWG no. 28 enameled wire on an FT-37-63 core.
J1—SO-239.
J2—Phone jack or phono jack.

[1]Amidon Associates, 12033 Otsego St, North Hollywood, CA 91607, tel 213-760-4429.
[2]Palomar Engineers, PO Box 455, Escondido, CA 92025, tel 619-747-3343.
[3]Circuit Board Specialists, PO Box 969, Pueblo, CO 81002, tel 303-542-5083.

A QRP TRANSMITTER FOR 30 METERS

☐ Fig 1 shows an inexpensive transmitter for the 30-meter band. The combination of excellent propagation characteristics and a relatively low QRM level on this band make solid communication routine at QRP levels. The circuit shown was adapted from a W7ZOI design shown in "Experimenting for the Beginner" by Doug DeMaw, W1FB, in the September 1981 issue of *QST*. The transmitter can be put on 30 meters with relative ease.

The only major changes required were to resonate the oscillator output circuit, and filter the amplifier output on the new frequency. This was done by changing the number of turns in L1 and selecting an appropriate range for C1. A new output filter (C3, C4, L3) was designed using the component values shown in the schematic. In addition, the antenna output jack was changed to an SO-239 (to suit my personal preference), and a ground stud was added to the enclosure (see Fig 2). My circuit is built on a printed circuit board as in the original article. The transistors shown differ from the original design only because they were available in my junk box.

Fig 2—An interior view of the QRP transmitter as converted for 30 meters. The heat sink is on Q2.

The transmitter performance is excellent, and the keying is clean. Output power is exactly 1 watt when using a 12.8-V dc supply (measured with a VTVM and a 50-Ω resistor). Excellent signal reports have been received from stations in New Brunswick, Florida and from as far west as Kansas.—*Frank Pitman, WD4DSS, Rome, Georgia*

AUDIO-FILTER CONNECTIONS FOR THE TEN-TEC ARGONAUT TRANSCEIVER

☐ I have a Ten-Tec Argonaut 509 transceiver. After I purchased an outboard audio filter, there were some unexpected interface problems. When a sharply tuned filter is placed in the audio line, the sidetone can be filtered out.[4] Also, my filter supplies only about 1 W of audio, which is plenty for headphones, but not for a noisy room.

Some investigation reveals that the 509

[4][The sidetone frequency of the Argonaut 509 is adjustable, and therefore does not necessarily correspond to the receive offset.—Ed.]

audio is generated and preamplified on the IF board. As a matter of fact, the optional Ten-Tec filter is connected within that stage via pins 4 and 5 (FILTER OUT and FILTER IN, respectively) of the rear-apron accessory jack. (These pins are shorted when no filter is used.) There is a mix-up in the nomenclature between the IF-board schematic and the block diagram in my instruction manual: Pin 4 should be connected to the filter output, with pin 5 connected to the filter input.

My outboard filter has a fixed gain of about 1, which is ideal for use in the Argonaut IF stage. If your filter has some gain, the filter amplifier (usually an LM380) can be thought of as an output amplifier that is also capable of higher output power. It will probably work just as well with lower drive levels. Therefore, when placed between pins 4 and 5, most any audio filter should work.[5]

This set up leaves the sidetone and the audio output power much the same as before the filter was connected. In addition, the filter is within the Argonaut AGC loop. I have had no problems with this arrangement.—*Michael Martin, KD4ZF, Huntsville, Alabama*

SYSTEM CONSIDERATIONS IN AUDIO RECORDING AND RETRANSMISSION

It is becoming popular to record and retransmit audio on the ham bands. When done properly, this capability can be interesting and useful for comparing microphones, adjusting equalization and checking speech processing. Most of the recordings I hear on the air, however, are too poor for any practical use. Quality recording and retransmission requires consideration of the overall system involved. Here are some thoughts and suggestions on the subject.

Eliminate transducers (microphones, speakers, speech processors) from the system. Each transducer has its own frequency response. Every one included in the system adds its own modification to the final reproduction. Therefore, recording and retransmission should be done by direct electrical connection, and not by acoustic coupling. Direct electrical coupling also eliminates extraneous room noises that are added twice (once on record, then again on playback) when acoustic coupling is used.

Set signal levels within the range of each element of the system. The built-in AGC in tape recorders provides for a wide range of input levels, but it can ruin a recording by raising the level of hum and background noise. One solution is to disable the AGC. Experience has shown, however, that a good recording without extraneous noise can be made by setting the proper audio level at the recorder input. First, operate the receiver with the audio-output level high enough to eliminate hum and background noise from the receiver. This level will probably be too high for the recorder input, so reduce it with a voltage divider if necessary. Monitor the audio through an unattenuated or separately attenuated receiver output during recording.

[5][Editor's Note: If your filter has a gain control, set it for unity gain. The chief hazard here is that the filter will overdrive the 509 audio stages. If there is such a problem, simply build an attenuator to follow the filter. Part values for both T- and pi-network attenuators are given in Chapter 25 of the 1985 and 1986 ARRL *Handbooks*.]

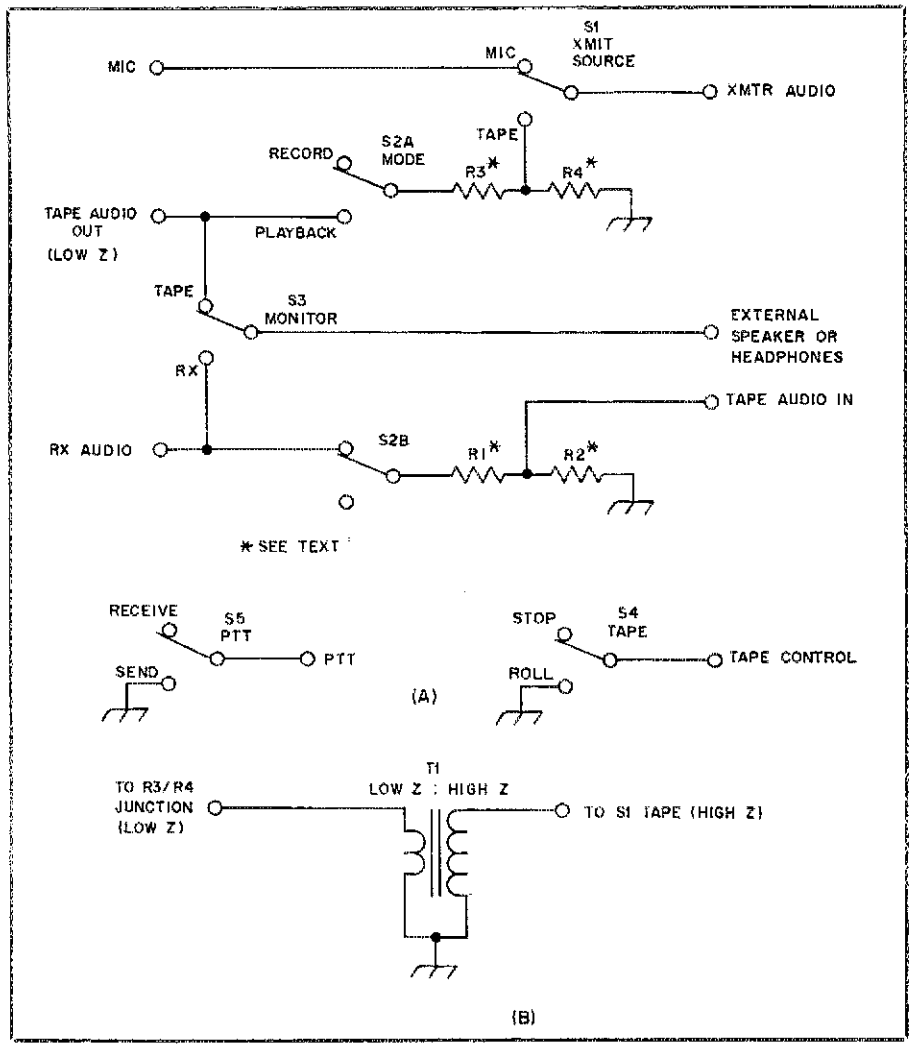


Fig 3—N3BEK's control circuit for recording received audio and transmitting recorded audio (A). If your transmitter has a high-impedance audio-input circuit, use an audio impedance-matching transformer as shown at B.

On retransmission, the audio output of the recorder should be connected to a speaker and the transmitter microphone input. The audio level should be adjusted, by attenuation if necessary, to drive the transmitter to normal undistorted output with the transmitter microphone-gain control at its normal setting.

Control Circuits

Provide at least simple control circuits to allow convenient, smooth operation and to ensure constant audio levels. A more sophisticated and versatile control panel would be appropriate for extensive recording/retransmission, but the one shown in Fig 3 is very workable.

Procedures

1) Tune the receiver to a good quality, noise-free signal. Set the receiver audio-gain control and determine the values of R1 and R2 that provide good-quality, noise-free reproduction at the recorder speaker. Mark the position of the receiver gain control for future reference. (The retransmitted audio will never be any better than the tapes, so take time to do it right.)

2) Determine the best recorder volume-control setting for comfortable listening and mark it.

3) With a dummy load connected to the transmitter, determine the values of R3 and R4 that provide proper transmitter drive with the microphone gain set for normal operation. While using the dummy load, retransmit a good-quality tape while listening to the tranceiver monitor function, or on a separate receiver. The retransmitted audio should be free of hum, hiss or extraneous noise, and it should sound essentially identical to that on the recorder speaker.

4) Make an on-the-air test with a friend that has a feel for what you are trying to accomplish. Do not make this check with a casual contact. The ham on the other end may be reluctant to give an objective evaluation and may not know how a good retransmitted recording should sound.

5) Check carefully for RF feedback. The recorder is an additional element in the system that is subject to RF pick up, and it is probably not built to operate in a strong RF field. RF feedback is evident as distortion, fuzziness or other effects on the external speaker during transmission.

Now you are ready to let your contacts hear what they sound like, and to contribute to the accurate evaluation and adjustment of other hams' equipment.—*Jack Geist, N3BEK, Silver Spring, Maryland*

Technical Correspondence

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

AN EMP EXPERIENCE

☐ Dennis Bodson's paper regarding the effects of lightning and EMP on Amateur Radio gear triggered a memory.[1] Sometime in the late 1950s, I was traveling west into the sunset along the Santa Ana Freeway en route to Los Angeles from Fullerton, California. This was the same route I took each working day. It was my habit each late afternoon to make contact with the RACES station, K6CPT, and its operator, Gerry, W6BVG. Gerry is a great punster, and the contact was always a fun experience.

This particular afternoon, no amount of tuning or adjustment could eliminate the high level of crackling noise on 6 and 2 meters. My "off-the-top-of-the-head" reaction was "sunspots."

The next morning we read that on the previous day, a nuclear device had been detonated high over the South Pacific. The device had been dropped from a high-flying aircraft. It was clear to me that sunspots were not the reason for the severe electrical noise we had experienced. Bodson's article gives the best explanation yet of the EMP phenomenon.

It seems to me that describing how to protect equipment from damage from a nuclear detonation induced EMP is an exercise in the most ridiculous form of futility. If the event that can be expected to trigger an EMP ever does occur, no communications will be possible even if there are personnel in good enough shape to operate the equipment.

It is my opinion the EMP information and its effects on communications must have been known for a considerable period prior to the preparation of the document from which Bodson's article was derived. The nature of the data collected suggests considerable study.

Since it is known what the effects will be, to even consider the use of atomic weapons, let alone to continue to build them, seems to be the highest form of idiocy. It is worse than shooting yourself in the foot. It will be depriving yourself of any contact with anyone because the effect, as Bodson shows in Fig 1, is extensive.

My experience with considerably lower nuclear explosive force than the 10-megaton bomb he projects indicates that the effect can be expected to extend—not just 1500 miles—but probably 6000 to 10,000 miles. What better material can you offer to antinuclear forces than the kind of information contained in the NCS TIB 85-10 document?—*Dr. Norman L. Chalfin, K6PGX, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr, Pasadena, CA 91109*

HALF-SLOPER OBSERVATIONS

☐ I was pleased to see MININEC being used to analyze wire antennas.[2] Unfortunately, as was pointed out, the analysis of the so-called three-element half-sloper is incomplete, since the three-element Yagi on the top of the mast is ignored. [This procedure was necessary because of limitations in the program used for the analysis—Ed.] Since the usual half-sloper is not resonant without the Yagi, it is an essential part of the total radiating system: It acts like an upside-down ground plane.

At first sight, the KØEOU three-element sloper is a most peculiar antenna, but if one sits back and looks at it, the antenna is clearly akin to the usual half-sloper. The feed arrangement using two wires parallel to the ground is a sort of "transmission-line feed" for the grounded tower with its attachments (the sloping wire and the Yagi). If the whole system is resonant, this transmission-line feed can be very efficient. The transmission line I speak of is the two-wire line over the ground. The radiation system is, in fact, driven at the point where these wires are connected to the tower. There are clearly a number of ways to excite a tower and its attachments—this is one of them.—*John S. Belrose, VE2CV, ARRL Technical Advisor, 3 Tadoussac Dr, Aylmer, PQ J9J 1G1, Canada*

WEFAX INFORMATION

☐ [Judging from the response received to the WEFAX articles that have appeared in *QST*, interest in that subject ranks high among radio amateurs. Thanks to John Williams, we have some additional information for you WEFAXers—Ed.]

The third edition of the *Weather Satellite Handbook* is now available. Copies may be obtained from the author, Dr. Ralph Taggert (WB8DQT), 602 S Jefferson, Mason, MI 48854. The book price is $12 plus 50 cents for postage and handling in the US and Canada. For foreign orders, include $2 for postage and handling.

There are bulletin-board systems dedicated to the exchange of information on Amateur Radio, satellite tracking, decoding NOAA weather satellite telemetry and furthering the public's interest in the understanding and interest in the space program. The DATALINK RBBS telephone number is 214-340-5850; sysop is Jeff Wallach, N5ITU. Radio amateurs and satellite trackers should note two specific areas in the 'FILES' subsection of the system: HAMR (Amateur Radio, satellite tracking, NOAA weather satellites) and NASA (space-related topics). Another BBS, the Celestial RCP/M, operates 24 hours a day at 300- and 1200-baud data rates. Sysop is Tom Kelso, 8000 B West Gate Blvd, Austin, TX 78745. This BBS caters to those who are interested in the space sciences. Among the software packages available are a CP/M® version of the AMSAT satellite-tracking program and another version for the IBM® PC that includes a display on a world map. Other data includes information compiled from such sources as the *NASA Satellite Situation Report* and *Jane's Spaceflight Directory*; this database is updated twice a year. The Celestial RCP/M bulletin board telephone number is 512-892-4180.—*John Williams, Sun Exploration and Production Co, Four NorthPark East, PO Box 2880, Dallas, TX 75221-2880*

MORE MAST-MOUNT AMPLIFIER QRM

☐ I'd like to bring to your attention a situation that appears to be bringing bad publicity to the Amateur Radio community through no fault of our own. I was recently appointed an OO (Official Observer) and have been involved with broadcasting in the Chicago area for 26 years. Within the last couple of years, our TV station (Channel 5) has been *deluged* with complaints of severe interference to our off-the-air signal in many diverse locations. The station management asked Engineering to look into the problem (in the interest of viewer relations), and I was given the assignment (being a Radio Amateur and involved in "fox hunting" in the past). We have had very good luck in finding the TVI sources; and most (95%) have turned out to be oscillating TV antenna amplifiers that have been incorrectly installed or operated by nontechnical viewers.

We've discovered that an oscillating antenna amplifier can radiate an interfering signal for ¾ of a mile or more from the source and cause a *complete* blackout of picture and sound within the same block. In most cases, the affected viewer tends to point immediately to "ham" antennas in the area when trying to help us locate the offending signal. We've tried to inform them that amateur interference does not generally behave like that, nor is it on 24 hours a day, but often people believe only what they wish to believe. The problem is quite serious and promises to get worse as more and more gadgets permeate the market only to be hooked up improperly by the general public. It's unfortunate that hams are being blamed in many cases for this situation, but that is our apparent image in the mind of the average person.

Radio Shack markets a 25-dB gain, 300-ohm antenna amplifier that turns into quite a devastating transmitter when the input and output leads are taped together as one viewer decided to do. That one took out a whole town! I'm not trying to indict Radio Shack in particular; any brand of amplifier can become unstable when not properly installed or terminated.—*David F. Miller, K9POX, 7462 West Lawler, Niles, IL 60648*

MORE'N ONE WAY TO SWITCH AN ANTENNA

☐ The W1FB remote antenna switcher caught my attention, as I constructed one serving the same purpose a number of years ago.[3] The arrangement I use differs in the method of energizing the relays and the number of relays required to select four antennas: Only two are needed, one SPDT and one DPDT.

A simplified schematic of my system is

[1] D. Bodson, "Electromagnetic Pulse and the Radio Amateur—Part 1," *QST*, Aug 1986, p 15.
[2] B. Wermager, "A Truly Broadband Antenna for 80/75 Meters," *QST*, Apr 1986, p 23.
[3] D. DeMaw, "A Remote Antenna Switcher for HF," *QST*, Jun 1986, p 24.

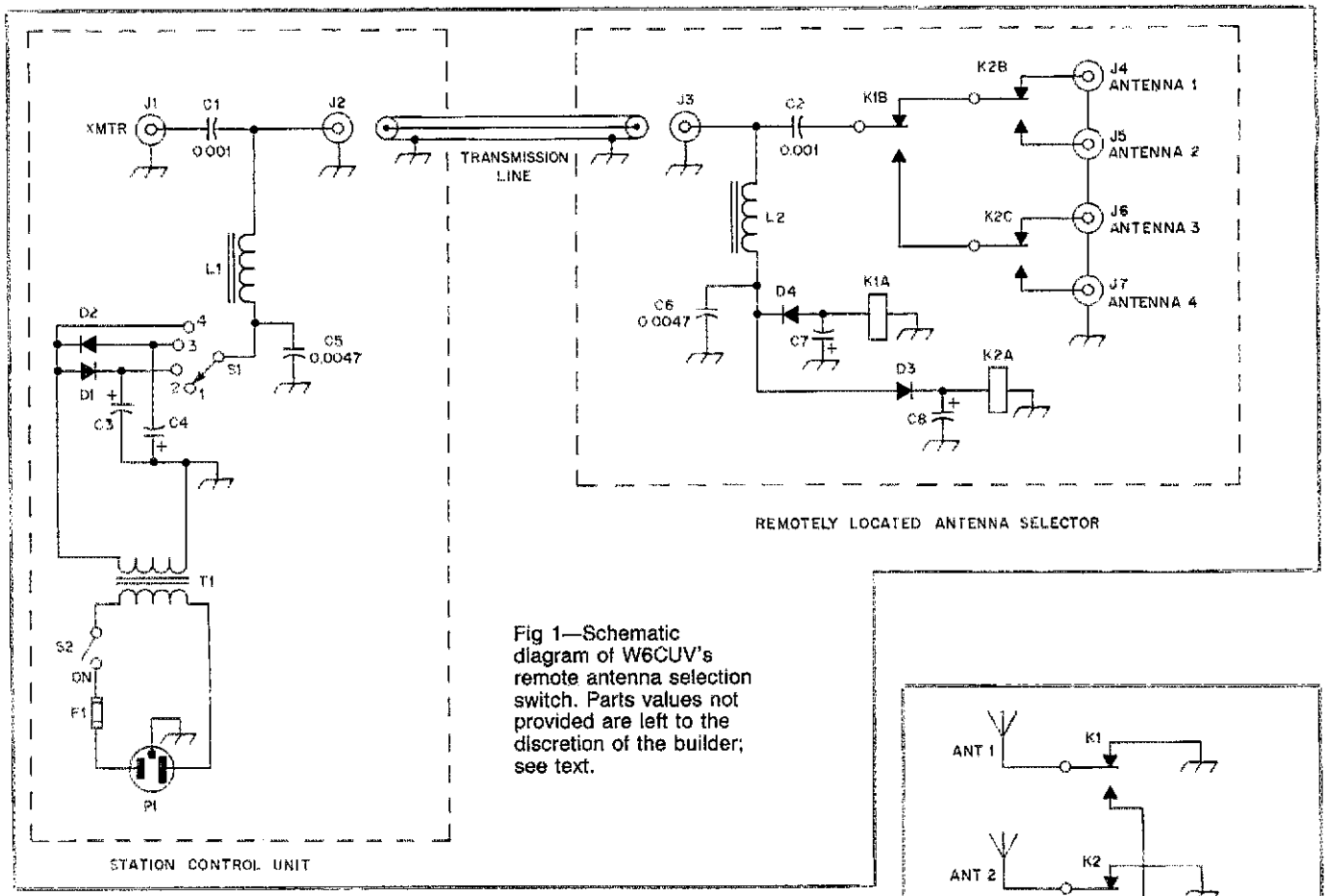


Fig 1—Schematic diagram of W6CUV's remote antenna selection switch. Parts values not provided are left to the discretion of the builder; see text.

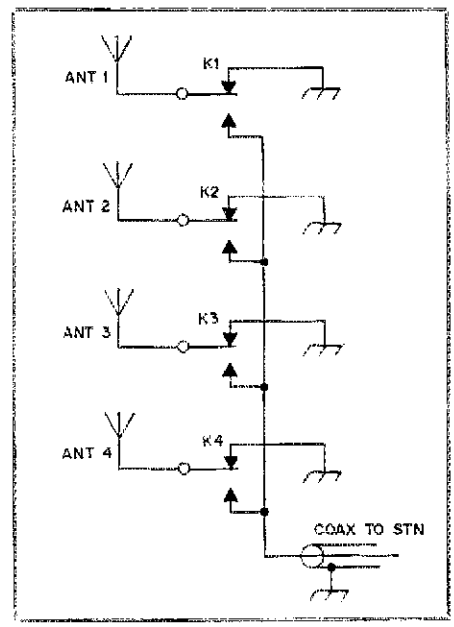


Fig 2—A simplified schematic of N1ACH's antenna switching arrangement.

shown in Fig 1. Note that the remotely located relays are powered through the coaxial cable feed line. Builders will have to determine the optimum transformer/relay operating voltage combination for their particular setup, but the effort is worthwhile as no additional control cable is required. The center conductor of RG-8 or RG-213 is approximately 12 gauge and can easily conduct a current of 2A over a distance of 350 feet or more without detrimental loss of voltage. The real distance, of course, depends on the operating voltage and current requirements of the relays employed.

Refer to Fig 1. Antenna 1 is selected with S1 in position 1 as shown; K1 and K2 are not energized. The transceiver is connected to the selected antenna through J1, C1, J2, the transmission line, J3, C2, K1B and K2B. C1 and C2 are required to prevent the relay operating voltage from reaching the transceiver or the antennas. Each capacitor should have a value of 1000 pF or more. CRL type 858S ceramic capacitors (now produced by ITT Jennings) are recommended because of their low series inductance and high RF current-handling capability. L1 and L2 are needed to decouple the transmission line from the power supply and relay components. The reactance of these inductors must be sufficiently high to serve this purpose, while their dc resistances must be low enough to have negligible effect on the relay control voltage. Inductances of 1 mH will do the trick nicely, though a value as little as 100 μH will provide acceptable decoupling if difficulty is had in obtaining 1-mH inductors with sufficiently low resistance.

Antennas 2-4 are selected by taking advantage of the steering effect of the diodes. With S1 in position 2, the positive voltage energizes only K2A through D3. In position 3, a negative voltage closes K1A through D4. Position 4 of S1 feeds an ac voltage to D3 and D4, which each diode rectifies to provide the dc operating voltage needed to operate K1A and K2A. C7 and C8 provide filtering, but may not be needed in all cases—experiment.

I've not provided relay selection, installation requirements and construction details; refer to DeMaw's article. I recommend a cast aluminum container for the remote portion of the assembly. The somewhat higher cost for this rugged container is more than justified when you consider that it can be weatherproofed easily and requires no effort to fabricate.—*Carlton W. Cleveland, W6CUV, 1843 Finn Hall Rd, Port Angeles, WA 98362*

☐ The simplified schematic of Fig 2 shows one more antenna switching arrangement. This method provides for grounding all unused antennas. I use it with my Beverages for receiving, but I'm sure it would work okay for transmitting as well. Only one relay at a time is powered. Over a three-year period, I've lost three relays and one transformer because of lightning-induced surges. I don't think much else would have survived. —*J. Craig Clark, Jr, N1ACH, Rindge, NH 03048*

Feedback

☐ In Fig 3 of "An Automatic Rotator Controller," *QST*, Sep 1986, p 44, some pull-up resistors are missing. P1 pins 16 through 20, inclusive, should each have a 4.7 kΩ resistor tied to the +5-V bus. (These pins connect the keypad to lines PB4-PB0.) For purposes of reference, identify the resistors as R23-R27, with R23 being the one attached to pin 16 and R27 attached to pin 20. The PC boards, patterns and overlays for the project reflect the presence of these resistors.

Happenings

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

ARRL National Convention

"The 1986 ARRL National Convention is quite possibly the finest Amateur Radio gathering ever held in the western US, and set a new standard for ARRL Conventions," said Dave Sumner, K1ZZ, Executive VP of ARRL. A crowd of nearly 6000 attended the Convention, held in San Diego September 5-7. Over 50 forums and technical sessions were held, as well as many alternate events for nonlicensees. Some of the sessions held were: ARRL Forum, Update on ACSSB, Moonbounce, ATV, Organizing a Local ARES Unit, RTTY, Ham Radio and the Law, HF Antenna Design, Seminar for New Hams, RFI, HF Propagation, Satellites, Packet Radio, MARS, Traffic Techniques, AMSAT, FCC Forum, Public Information Forum, DXing and Contesting, Instructor's Forum, Spread Spectrum, and many others.

The banquet Saturday night was sold out, with over 1100 in attendance, and the WØORE Youth Forum attracted over 250 attendees. The International Breakfast on Saturday morning, with ARRL President Larry Price, W4RA, officiating, attracted many foreign amateurs including Pablo Mooser, XE1SR, president of the Liga Mexicana de Radio Experimentadores.

Also at the convention, Mark J. Schreiner, NK8Q, was selected to be the recipient of the 1985 Hiram Percy Maxim Memorial Award. The Award is given annually to the licensed radio amateur under the age of 21 whose accomplishments and contributions are of the exemplary nature within the framework of Amateur Radio. The winner receives a cash award of $1000, a suitably engraved plaque, and travel and accommodations expenses to enable him or her to attend an ARRL convention at which a formal presentation will be made.

"I'm sure many ARRL members will be attending the ARRL Atlanta National Convention next July to see how the Southeast compares," concluded Sumner.

FCC DISCUSSES POSSIBLE NEW CALL SIGN PROGRAM

FCC officials Michael Fitch, Deputy Chief, Private Radio Bureau, and Ray Kowalski, Chief, Special Services Division discussed the Amateur Radio call-sign program at the FCC Forum at the ARRL National Convention. The pair noted that the Volunteer Examiner program was "working extremely well" and they felt that a "special call sign program" would perhaps work equally well. This "special call sign program" would basically work this way: The FCC will continue to issue what it calls "routine first licensed" call signs only. These are the 2 × 3 call signs presently assigned to each new Novice class licensee. Some other possible features are:

- An amateur could continue to use this 2 × 3 call sign, no matter what class of license he held, for as long as he holds a license. There is no requirement for him ever to get another call.
- If an amateur wants another call sign, he could go to the private sector where he could pay for another special call sign in his license-class group. The Commission estimates that the cost of a call sign issued by the private sector will be $20-30.
- The Commission has not decided just how many call signs an amateur could be allowed to have.
- There should be a grace period at the beginning of the program where, for example, previously held call signs or call signs of deceased family members could be obtained by their previous owners or other licensed family members, respectively.
- The Commission will leave the details of the program up to the organization or organizations which will issue the call signs.
- This program must cost the FCC nothing.

Ray Kowalski concluded, "I am optimistic that...we can go forward and give the amateurs the call sign program they desire." Formal Commission proposals are expected around the first of the year.

PERMANENT AMATEUR FACILITY ON SPACE STATION DISCUSSED

Representatives of NASA, AMSAT and ARRL met recently to initiate a long-term program which could lead to Amateur Radio literally being built into the NASA Space Station. Leaders of SAREX (Shuttle Amateur Radio Experiment) and others met at the ARRL National Convention in San Diego September 6 to discuss initial ideas on what Astronaut Dr Tony England, WØORE, is calling the SSAR Project (Space Station Amateur Radio). The SSAR program will be one of the longest ever undertaken in Amateur Radio, running at least nine years from concept to fruition. The Space Station is currently slated to fly in 1995.

The meeting was organized by Roy Neal, K6DUE, of NBC News as a follow-up to his pivotal work in the SAREX missions and his work with Astronaut Owen Garriott, W5LFL, on the Ham-In-Space program. Dr Tony England, WØORE, stepped into Owen's position within NASA's Space Station program upon Owen's recent retirement. Tony co-hosted the meeting with Roy. Representing AMSAT were Chairman John Browning, W6SP; President Vern Riportella, WA2LQQ; and Vice President For Manned Space Operations Bill Tynan, W3XO. On hand for the ARRL were President Larry Price, W4RA; First Vice President Jay Holladay, W6EJJ; Executive President Dave Sumner, K1ZZ; and International Affairs VP Tod Olson, KØTO.

A working group was organized to develop the basis for a plan which would lead to a formal proposal to NASA during 1987. AMSAT will be the lead agency in the working group for the first steps.

According to WØORE's view of the project, it could play a strong role in developing interests in students for engineering, mathematics and science education.

WØORE also emphasized the pivotal role an AMSAT geosynchronous capability could have on SSAR success. Tony pointed out that since the Space Station's orbital inclination will be 28.5 degrees, it will need the potential relay capability an AMSAT Phase-4 system could provide to reach the more extreme northerly and southerly latitudes.

SATELLITE NEWS

AMSAT-OSCAR 10 has relapsed and is again in serious condition. The result is that AO-10 has been uncommandable since mid-August. Because of the random configuration of the memory, the Mode B transponder has been locked on full-time since approximately August 20. Consequently, hopes for the long-term survival of the satellite are growing poorer.

On August 29, it was decided that light use of Mode B during part of the orbit would probably not notably decrease satellite life. The decision to allow minimum Mode B use was made against a background of little hard information about the AO-10 battery condition since the telemetry has been inoperative.

If nothing changes with the memory loss, AO-10 will expire from lack of sunlight sometime this autumn. Heavy transponder use will certainly expedite ultimate failure. Moderate to light use may not affect overall life at least for the present since ample sunlight is available for the next couple of weeks. After that, however, the sun angle will reach a point where the batteries will obtain insufficient charge current from the solar panels. Because the memory is inoperative,

there is no way to reorient the satellite for seasonal sun-angle changes, and AO-10 will be lost.

Meanwhile, operations on the new Japanese Fuji-OSCAR 12, or FO-12, have commenced with overwhelming success. Thousands of users, newcomers and veterans alike, have taken to the air to try out the latest offering of amateur-satellite technology.

Users of FO-12 have found it sensitive and fun. It's easily accessed using well under the 100-watt ERP level when transponder loading is low. The most frequent comment voiced by users remarks on the high Doppler shift and rapid antenna pointing required to stay on target. Others have bemoaned the fading of the downlink. Sources indicate the QSB is due to spacecraft tumbling and should dampen out in a few weeks. As of late September, there was already some indication of reduction in tumble-QSB.

AMATEUR RADIO AMBASSADOR AWARD WINNER SELECTED

Mary Duffield, WA6KFA, a retired Santa Cruz, California school teacher, has been named winner of the first Amateur Radio Ambassador Award by Advanced Electronics Applications of Lynwood, Washington. The award includes a $1000 prize.

Mary was chosen from a list of 50 nominees for her work encouraging young people to communicate with the world using computers and Amateur Radio. The award was created with the hope of encouraging radio amateurs to promote the Amateur Service to the public. The award was presented at the Grand Banquet of the 1986 ARRL National Convention on September 6.

VICTOR CLARK YOUTH INCENTIVE PROGRAM

HQ has received a number of proposals for grants from the Victor C. Clark Youth Incentive Program with the objective of providing support for the development of Amateur Radio among high-school-age youth. Though there's no formal application form, we do ask that applicants provide as complete a proposal as they can, including such items as

- names, call signs (if applicable), address and telephone numbers of sponsors
- objectives of their program
- existing resources if relevant (eg, status of school station)
- description of local Amateur Radio support
- local resources, (eg, matching funds, specific financial and/or equipment/material contributions)
- commitment of relevant local nonham group (eg, school, school science coordinator and/or principal, school board)

The ARRL Foundation is eager to assist worthy local Amateur Radio youth projects through the Victor C. Clark Youth Program, and welcomes inquiries and proposals (send c/o ARRL HQ).

MODIFIED PROCEDURES FOR RESEARCH AT GETTYSBURG FCC

The Consumer Assistance Branch of the Private Radio Bureau's Gettysburg Licensing Division is modifying its procedures for handling requests by the public for research and/or retrieval of Commission documents for inspection. Because of the large number of such requests and the limited staff time available for response, all requests will be handled on a time-available basis and may not be fulfilled on the day of the request. When necessary, similar types of requests may be aggregated and handled as a batch. All searches requiring more than one hour will be billed in accordance with the Commission's Rules. Any questions on this change should be directed to Shirley Blickenstaff, FCC, Gettysburg, PA, tel 717-337-1212.

STUDY OF ARRL ADVISORY COMMITTEES

A study on how to improve the functioning of ARRL Advisory Committees is underway. Current and former Advisory Committee members are especially invited to comment, and inputs are welcome from any League member. Address your comments to First Vice President Jay Holladay, W6EJJ, 5128 Jessen Dr, La Canada, CA 91011, or to Karl Muller, W3UBQ, at ARRL HQ.

K6DUE RETIRES

The Dayton HamVention® 1986 Radio Amateur of the Year, Roy Neal, K6DUE, has announced his retirement on October 1 from his position as West Coast Bureau Chief of NBC News.

Although he will remain with NBC on a consulting basis, Neal plans to devote much of his time to making personal appearances and lecturing on the space program and allied topics.

In addition, he plans to be involved in various television projects through his own company, Talent Connections. Included will be at least one new production on his favorite subject: Amateur Radio.

AEROMEXICO PLANE CRASH

Amateur Radio provided emergency communications during the AeroMexico DC9 crash in the Los Angeles area August 31. Shortly after the crash, the Orange County ARES was activated to provide primary communications for the Red Cross as well as other disaster agencies. The ARES primarily used the facilities of the N6ME and KC6K repeaters. Several mobile and portable packet stations came from as far away as 75 miles from the crash to assist in communications efforts. Approximately 50 ARES members were involved. WB6QDG, the Red Cross Chapter station in nearby Santa Ana, was also activated, and it became the main hub of Red Cross relief activities. Amateurs continued to provide communications for relief efforts for several days after the crash.

ARRL FOUNDATION SCHOLARSHIP WINNERS ANNOUNCED

Senator Barry Goldwater Scholarship, $5000—William J. Hulka, KA9AKI, of Kokomo, Indiana. Bill ranked second in his high school class of 135 and is an Eagle Scout. He is attending GMI Engineering and Management Institute in Flint, Michigan. He has been licensed since 1978.

Perry Hadlock, K2IK, Memorial Scholarship, $500—Michael R. Dargel, N1AMR, of East Lyme, Connecticut. Mike is presently attending the University of Connecticut School of Engineering in Storrs, and is an Eagle Scout.

The Paul and Helen Grauer Scholarship, $500—John A. Alcorn, KAØEMS, of Sedalia, Missouri. John ranked second in his high school class of 270 and is presently attending the University of Missouri at Rolla, majoring in Aerospace Engineering. He has been licensed since 1979.

NEW SOVIET SATELLITE

W4HHK reports reception of an apparent new Russian satellite on 2304.0 MHz beginning on September 6. Acquisition time is 1148 UTC at an azimuth of 37 degrees. Loss of signal occurs five hours later at 90 degrees azimuth and 15 degrees elevation. Total positive Doppler shift is 21 kHz. Its signal to noise ratio is better than 23 dB on an 18-foot dish. Its format is the same as the 1984 and 1985 Cosmos satellites. For more information, contact Paul Wilson, W4HHK, PO Box 73, Collierville, TN 38017.

FCC NORFOLK OFFICE MOVES

Effective September 8, 1986, the new address for the FCC Norfolk Office is 5656 Shell Rd, Virginia Beach, VA 23455-3725, tel: recording number—804-363-0900, public number—804-441-6472. Public inquiries concerning telecommunications matters, complaints of electronic interference and schedules of commercial radio operator examinations should be directed to the above address. Office hours are 8 AM to 4 PM.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Montana, Mississippi, Iowa, Arizona, Orange, North Texas, Arkansas, Kentucky and Wyoming Sections: You are hereby solicited for nominating positions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

(Place and date)

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

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

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

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time December 5, 1986.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before January 2, 1987. Returns will be counted February 24, 1987. SMs elected as a result of the above procedure will take office April 1, 1987.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two year term beginning April 1, 1987. If no petitions are received for a Section by the specified closing date, such Section will be resolicited in April *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by the Field Services Manager. You are urged to take the initiative and file a nomination petition immediately.

Richard K. Palm, K1CE
Field Services Manager

REPEAT NOMINATING SOLICITATION

Since no petitions were received for the North Dakota Section by the petition deadline of June 6, 1986, as a result of notices in April and May *QST*, nominating petitions are herewith resolicited. See the above notice for details on how to nominate.

SECTION MANAGER APPOINTMENT

In the Washington Section, Bradley Wells, KR7L, has been appointed to complete the term (until September 30, 1987) of Gene Sprague, KD7G (resigned).

SECTION MANAGER ELECTION RESULTS

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

Uncontested

Eastern Massachusetts
Luck Hurder, KY1T

Missouri
Benton C. Smith, KØPCK

Nebraska
Vern J. Wirka, WBØGQM

New York City-Long Island
H. L. "Woody"Gerstner, WB2IAP

South Carolina
James G. Walker, WD4HLZ

Southern New Jersey
Richard Baier, WA2HEB

Western Pennsylvania
Otto L. Schuler, K3SMB

—*Arline Bender, WA1VMC*

Amateur Radio Call Signs

Amateur Radio operators often ask the FCC what call signs have been assigned lately. This list shows the last call sign in each group to be assigned for each district, as of September 1, 1986.

Radio District	*Group A Extra*	*Group B Advanced*	*Group C Tech/Gen*	*Group D Novice*
0	NUØM	KEØHS	NØHKE	KAØYQH
1	NG1K	KB1ZV	N1EIP	KA1OVY
2	NT2I	KD2VC	N2GPP	KB2BNJ
3	NC3S	KC3ZB	N3FCR	KA3QAB
4	AA4VS	KJ4ZC	N4OQL	KB4UQB
5	WQ5G	KF5QL	N5JQV	KB5ARZ
6	WX6E	KI6JY	N6OER	KB6OAK
7	NW7L	KE7TP	N7INQ	KA7ZOZ
8	NT8J	KE8HB	N8HTI	KB8AHI
9	NN9L	KD9ZE	N9GAR	KA9WAV
Hawaii		AH6HG	NH6HC	WH6BLC
Alaska		AL7IH	NL7JE	WL7BLA
Virgin Is	KP2O	KP2BA	NP2BV	WP2AFD
Puerto Rico	WP4V	KP4KV	NP4YT	WP4GAR

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant, ARRL

DISNEY DOES IT AGAIN

☐ Disney studios strike again! On the 31st of August, the Sunday night Disney movie, *My Town*, contained one story about two kids who thought they knew of a spy in town (his name was Mr Slovac). The two boys caught Mr Slovac talking to Moscow on a radio. His call was W6FRM and he said he was "calling on schedule." When the two boys were taking pictures of this "spy equipment" in Slovac's cellar, they were caught by him. He explained that it was a ham radio. He said he was helping a friend in Moscow find his brother in Ohio. Because immigration was slow, Slovac thought ham radio was his friend's answer to find his brother! Bravo Disney! Now maybe some of us won't be mistaken for KGB agents. Hi!—*Bob Inderbitzen, KA2PZD, New Fairfield, Connecticut*

HERTZ STRIKES AGAIN!

☐ Regarding the letter by KA4TGY in June *QST*, he is very incorrect in "setting the record straight." Mahlon Loomis did not communicate with electromagnetic waves in 1866 or any other year. The Loomis apparatus merely altered the electric field gradient of the atmosphere and this alternation was detectable with dc instruments at 18 miles distance. This phenomenon does not involve electromagnetic waves in any way. It's the difference between dc and ac; dc does not and can not generate electromagnetic waves.

History is correct in giving credit to Heinrich Hertz for the first demonstration of electromagnetic waves, and to Marconi for the first utilization of Hertzian waves for practical communication.—*Fred Brown, W6HPH, Palomar Mountain, California*

ON GEVA R'IT PARUSKI!

☐ In 1917, my mom came to America as an immigrant from Russia and, like many others, passed the Statue of Liberty and landed on Ellis Island for processing. My father, also from Russia, arrived several years later, met my mom in New York, got married and gave birth to me, W1GPJ.

My home life was typically American with the exception that I learned Russian at home at a very early age.

I received my General license when I was 13, enjoyed "Ancient Modulation" for several years, became silent for several decades and just returned to ham radio early this year.

One of my many goals was to work DX with fellow hams in the Soviet Union using the Russian that I thought I still remembered from my childhood. During the past year, I have spoken on sideband with 200 Soviet radio amateurs in every corner of the vast USSR.

Unquestionably, Russian is a very difficult language to learn and speak. As far as I know there are only a handful of US Amateur Radio operators that can speak the language.

Many, many times I have spoken with Soviet Amateur Radio operators whose knowledge of English was so limited that either they have never carried on a conversation with an American, or have just given signal reports, QTH, hello, and goodbye. Please QSL via Box 88, Moscow.

I have heard that many Americans consider this limited QSO rather rude, not realizing that the Soviet's mastery of English can be so limited that a further discussion is really impossible. Instead of talking English why don't we all try to learn Russian? I plan to continue speaking with Amateur Radio operators in the Soviet Union in Russian and plan to continue to answer their many questions about our great nation.

While speaking Russian, we are certainly not trading military secrets but merely carrying on simple people-to-people type conversations.—*Alexander Kalbouss, W1GPJ, Carmel, Indiana*

[Note: *On Geva R'it Paruski* is Russian for "He speaks Russian."—Ed.]

NOVICE ENHANCEMENT

☐ This letter is in reply to Mr John R. Culleton, Jr's letter in the Correspondence section of the August issue of *QST*. I suspect that Mr Culleton suffers from the "exclusive club" syndrome, which I believe affects many amateurs that have been in this hobby for a few years. The proposed extension of privileges to Novices is a very fair idea. The Novice license examination is the door through which past and present radio amateurs have entered.

The ten-year license and the proposed Novice Enhancement program will provide a greater incentive to more young people to become involved in Amateur Radio and give them the opportunity to stay in it!—*William A. Swanson, KA8ZZH, Dearborn, Michigan*

A SHEET FOR YOUR SHACK

☐ Reading this month's Strays "Safety First" (p 88, Sep *QST*) reminds me of the following additional safety tip. An ordinary bed-linen contour sheet fitted over your rig and desk-top accessories affords dust and pet protection and deflects curious eyes and knob-twiddling fingers. Various sizes and colors are available; and the elastic sheet corners fit nicely around the edges and corners of rectangular tables. A small fire extinguisher might be a good idea also. Halon is currently thought best for electronic gear.—*John D. Weinland, N1ATB, New Haven, Connecticut*

THE IMMORTAL "GIL"

☐ You can't imagine the thrill it was when my mother surprised me with *The Gil Cartoon Book*. As Gil's daughter, I spent much of my time in the "backroom" that served as his art studio and radio room. Dad's ability to work so quickly and seemingly without effort, along with never-ending patience, made it possible for me to spend many happy hours including him in my play while he worked. Little did I know of deadlines. It didn't seem to matter though. He managed to be a successful cartoonist, radio operator, and playmate all at the same time.

Most of the cartoons in *The Gil Cartoon Book* are unfamiliar to me. However, there are a few I recall Dad working on the quick transition from pencil on paper to the finished product. I never really understood Jeeves, but I will never forget him.

It's been twenty long years since Dad died, but this book, along with his watercolors, make the memories come alive and the years melt away. I can't thank you enough for creating this tribute to my father. He will live on through this wonderful book, and we will all be able to enjoy his cartoons time and time again.—*Barbara Gildersleeve Tripoli, Portland, Connecticut*

OUR UNLIMITED POSSIBILITIES

☐ I implore all hams to remember that this is a hobby. There are enough varied avenues of exploration available to keep us all interested and at peace with ourselves and our fellow amateurs. There is simply no need or excuse for boorish behavior on our bands. If some amongst us have become disenchanted, I can't help but think they have allowed themselves to become lazy and unimaginative. So 10 meters is often silent, and 20 meters is no longer open worldwide twenty-four hours per day. How about trying the lower bands, or 10 MHz? Can't seem to fit a 160-meter antenna on your 30- × 80-ft lot? Don't give up; rise to the challenge as others have done. Perhaps you will even come up with a design which will benefit thousands of those similarly situated. What about satellite or packet or RTTY, etc? The possibilities are virtually limitless.

Along this line I stress the need to support the League as our voice in the wilderness. If you don't like something, make your opinion known—stand up and be counted. Remember: The League doesn't just represent radio amateurs on each coast. There is a vast and wonderful country in between and opinions as diverse as our citizenry. It is this diversity, and our ability to recognize and constructively utilize this multifaceted richness, which forms the bedrock of America and, in turn, our hobby. If you remain in disgruntled silence, you have yourself to blame for your unhappiness.—*Warren E. Berbit, K2UVV, Suffern, New York*

THOSE WONDERFUL MEMORIES

☐ What interesting memories were aroused by the article "A 1935 Ham Receiver" in September 1986 issue of *QST*! Harry Hyder, W7IV, and I had many of the same experiences back in the '30s, and I'll bet that there are a lot of other hams out there who fall into our group.

My thanks to Harry for his interesting autobiography. You are not alone yet, Harry! There are still a bunch of us OTs around. —*John B. Broughton, AD4I, Charleston, South Carolina*

How's DX?

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

What's in a Name?

DXing is far from a short-lived interest. You can be away from it for a number of years, fairly happy in pursuit of stamp collecting, star gazing, furniture refinishing or whatever non-DXers do! But, just when you think you've kicked the habit, along comes good conditions, a particularly interesting article in *QST*—or the acquisition of some awesome new state-of-the-art gear. And, suddenly, there is a resurgence of interest in the DX pursuit. Chances are, though, if you've been out of the day-to-day DX activity for several years, you're liable to find out that not only have the prefixes changed, but so have the country names!

There will be some major surprises in store for you as you attempt to update your list of credits. However, I'll just concentrate on those countries that have experienced a drastic change in name (compared with that shown on your "old" DXCC credits list)—a change occurring over the past 20-or-so years. (See Table 1.)

Keep an ARRL DXCC "packet" at your operating position, as well as a copy of the ITU prefix allocations for those unusual calls that pop up from time to time. To reacclimate yourself to the world's new look, you might find a tip used at this QTH to be helpful at yours. Cover your operating table with one of the ARRL world maps, protected by glass or plastic. While you're tuning the bands, you'll get a renewed and relatively painless indoctrination into the world today: prefixes, zones, times, country names, and all—and an appreciation of the Great Circle aspect of our world.

Good DXing to you this winter season!

Table 1
Country Names and Prefixes

New		*Old*		*New*		*Old*	
A2	Botswana	ZS9	Bechuanaland	T32	E Kiribati	VR3	Line Is
D6	Comoros	FB/FH	Comoro Is	V3	Belize	VP1	British Honduras
FH	Mayotte			V4	St Christopher & Nevis	VP2K	St Kitts & Nevis
J2	Djibouti	FL	French Somaliland	XT	Burkina Faso	XT	Upper Volta
J5	Guinea-Bissau	CR3	Portuguese Guinea	XU	Kampuchea	XU	Cambodia
JD1	Minami Torishima	KG6	Marcus Island	YJ	Vanuatu	FU	New Hebrides
JD1	Ogasawara Is	KG6	Bonin & Volcano Is	Z2	Zimbabwe	ZE	Southern Rhodesia
KC6	Fed States of Micronesia	KC6	E Carolines	ZS3	Namibia	ZS3	Southwest Africa
KC6	Rep of Belau	KC6	W Carolines	3CØ	Pagalu Island*	3CØ	Annobon Island
S2	Bangladesh	AP	E Pakistan	7Q	Malawi	ZD6	Nyasaland
T3Ø	W Kiribati	VR1	Gilbert & Ocean Is	9J	Zambia	VQ2	Northern Rhodesia
T31	C Kiribati	VR1	British Phoenix Is	9Q	Zaire	9Q5	Congo

*The Aug 15 Dutch *DXpress* notes that this name change may have reverted to the "old" Annobon!

DXCC, FRESH START?

The following is contributed by John Parrott, W4FRU, Chairman of the ARRL DXAC.

By now it should be common knowledge in the DX world that the ARRL Board of Directors (at its 1986 second meeting) directed the DX Advisory Committee (DXAC) to study the advisability of restructuring the DXCC.

The post-World War II DXCC has emerged to its present form since the return of Amateur Radio following WW II. During that period, there have been many changes (as well as natural evolution) in the philosophy of accreditation, verification, criteria and administration. Viewing the simple manner in which administration of the earlier years of DXCC was conducted, compared with the today's rigid interpretation of the rules, has long struck me as being a bit unfair to many DXers who still are (or will be) climbing the DXCC Awards ladder. This now may be a good time to consider giving the venerable DXCC a new face.

In conducting this Board-mandated study, the DXAC will consider all aspects of the DXCC Award, including the number and types of certificates, accreditation criteria, administration of the awards, operating ethics, country criteria and the *Countries List*. The *big* question to be decided is whether the DXCC should continue unchanged, be restructured with a fresh start (as was the case in 1945, following the end of the war) or provide a transition mechanism to a new DXCC Program (without loss of credits for one's present standing in the DXCC).

In pursuing this study, the DXAC will ensure that the high standards and prestige of ARRL's DXCC Program are not diminished by any recommended restructuring of the DXCC.

The DX Advisory Committee's final report to your ARRL Board of Directors is presently scheduled for December 31, 1988. The DXAC needs your input on this matter. Send your comments to ARRL, Attention: DXAC, 225 Main St, Newington, CT 06111.

[Editor's Note: DX-interested groups can well use this period to have a number of thoughtful club meetings exploring ways of enhancing a DX program as venerable and respected as the DXCC.]

CALL SIGNS

On a pretty regular basis, most of us develop a decoding headache trying to remember those "new" prefixes. The ITU Table of Allocation of International Call Signs is particularly useful to refer to when something unexpected comes up. But, the most queries this column editor receives seem to revolve around the letter-number-letter prefixes that haven't as yet appeared on *The ARRL DXCC Countries List*. Keep the following on hand, and perhaps you'll be able to guess better about where to swing that beam!

C4A-C4Z	Cyprus	J4A-J4Z	Greece
C8A-C9Z	Mozambique	L2A-L9Z	Argentina
D5A-D5Z	Liberia	P3A-P3Z	Cyprus
D7A-D9Z	Korea	P4A-P4Z	Netherlands Antilles
H2A-H2Z	Cyprus	P5A-P9Z	North Korea
H3A-H3Z	Panama	S6A-S6Z	Singapore
H6A-H7Z	Nicaragua	T4A-T4Z	Cuba
H8A-H9Z	Panama	T6A-T6Z	Afghanistan

QSL? QSL!

The following is courtesy W6BDN.

I love to get QSL cards! Sending them out, however, is a chore and a real pain. But sow not, reap not.

The Bureau is the easiest way and the cheapest in cost. I have had cards make the round trip in six weeks, but it usually takes a lot longer, three years (maybe) from Box 88. Stateside managers, when the DX station has one, are a convenient, usually reliable and fairly rapid route.

If you go direct or to an overseas manager, buy your International Reply Coupons (IRCs) at the post office and send at least two for an Airmail return. At that rate, it costs about the same as using the DX Stamp Service (7661 Roder Pkwy, Ontario, NY 14519). If you buy your IRCs from a "broker," then it might be less expensive that way. It is obvious that you increase the convenience to the DX station if you send a SASE complete with *his* country's stamps. However, it appears that convenience isn't the total story.

Some cards just seem to zip right back, maybe with a nice note that says, "You surprised me with the Greece stamps," or the like. Some might eventually appear via surface mail or the Bureau. (On the other hand, I've received cards via Airmail that I've sent out via the Bureau.)

Replies to some cards that do complete the journey sometimes arrive with fewer stamps than you sent on your SASE. The envelope is usually marked "printed matter" or the equivalent. It really isn't of great consequence. You get your card at the cost you anticipated. (I mention it only to set the stage for what I consider to be a singular experience.)

I sent a card for A35SA (in Tonga) to his manager, JM1MGP, including an Airmail return SASE with 150 Yen in Japanese stamps. Atsuyuki carefully removed my stamps and typed out my address, etc on a brand new Airmail envelope inscribed "printed matter." The postage affixed was 100 Yen. *Inside* was the wanted QSL, along with the other 50 Yen stamp neatly clipped to it! That certainly is above and beyond the call of duty! In fact, I've saved that stamp as a memento.

Troster's Tips for Easy Listening

CW Speed

You are the DX operator and have a big pileup going. That means QRM. If conditions are also poor, you must do your best to make it easy for your listeners to copy your CW.

Don't blaze away at 35+ WPM. Under poor conditions or QRM, your listeners will have problems knowing who you go back to—problems even copying their own calls. Find a code speed that will require the least number of "repeats" of calls to the station you go back to (ie, you have to call a station a second time because he couldn't copy you).

If you are sending fast, you're inviting listeners to respond the same way. Slow down, and others will follow with the understanding that this is the speed at which you can best receive them.

Adapt your code speed to the conditions. You do not have to be a "show boat." After all, you are the DX station the whole world is calling, and you've got it made. Relax. Set your own pace for maximum QSLs.

THE CIRCUIT

☐ **Andorra:** C30AAN planned all-band WAE phone operation. QSL direct to Dieter Schuster, Uhlandstr 28, D-4902 Bad Salzuflen 1, Fed Rep of Germany, op via DL9OH/DARC Bureau.

☐ **8R1Z:** NQ4I is returning to Guyana for the 1986 CQWW sideband event. Cards for Rick go to Carol, W14K.

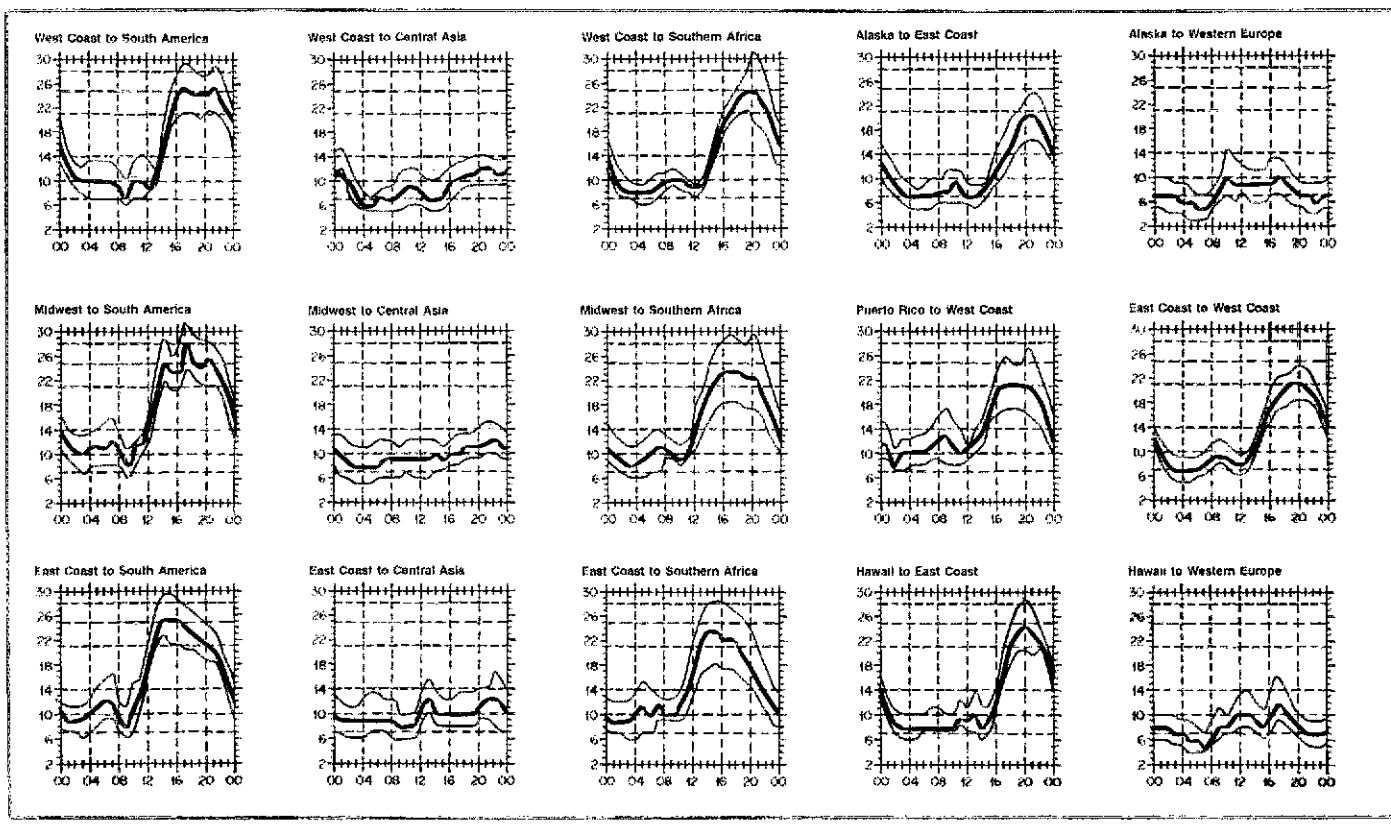
☐ **VP2MU:** April 11-18, 1986, *only* via W1SD, Chek Titcomb, Shore Rd, Sebago Lake, ME 04075.

☐ **INDXA:** The International DX Association has a new secretary, NB5L, and a new address: Box 363, Richardson, TX 75083. The club's motto: World Radio Amateurs—Goodwill DX Fellowship—two hands clasped in friendship, across the world. *(tnx W4WMQ, president)*

☐ **ON4NC:** Christian Nolf of Melle, Belgium, a top DXer (362 countries) and a great DXer, joined the ranks of Silent Keys June 16. Sincerest regrets to Christian's son (ON5NC) and family. ON5NC currently is going through the necessary red tape to assume his father's call.

☐ **VE3SR:** Longtime DXer VE3SR (VE2NV) particularly wants to thank the W/VE DX fraternity, who individually made defense of his case possible.

☐ **K5KG:** George has once again moved, from



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

Missionary 5Z4DU in Nairobi specialized in 21-MHz phone. Cards go via KE4DA.

Al-Jubail, Saudi Arabia, to Buenos Aires, Argentina (LU6KG). K5TU continues to handle his cards: 8302 Clover Gardens Dr, Houston, TX 77095. In addition he has all the cards and logs for George's past operations as K5KG/OHØ, K5KG/OHØOJØ/K5KG/VS6 J3ABP and JY8GW. If you're in Buenos Aires, give George a call at 313-7531/5061.

☐ **ZA1GB:** W8MJG is looking for confirmation help on his 1962 contacts with this station, ditto BV1USA during the early '60s.

☐ **Nepal?: Last year** NØCEE wonders if someone was pulling his leg last year on 40 meters by signing AT4TFS in Kathmandu, Nepal.

☐ **DXAC:** The new chairman is John Parrott, W4FRU, Box 5127, Suffolk, VA 23435, Tel 804-934-8130.

☐ **AH8A:** KT2D notes that AH8A is William Faulkerson, who signed KH6WF when he was in Hawaii. The "local" address shown on his card is Box 2567, Pago Pago, American Samoa 96799. His manager in late '84-early '85 was Doris, the wife of K6EDV.

☐ **7X2AX:** OT Andy, F2MA, tells W1NV that Abdel, 7X2AX, is on 3.5 MHz with 50 watts CW, around 0000, with good signals into the Paris area.

☐ **FT8YA:** F6DZU recently operated from Adelieland, Antarctica, around 0500 on 10.106 MHz.

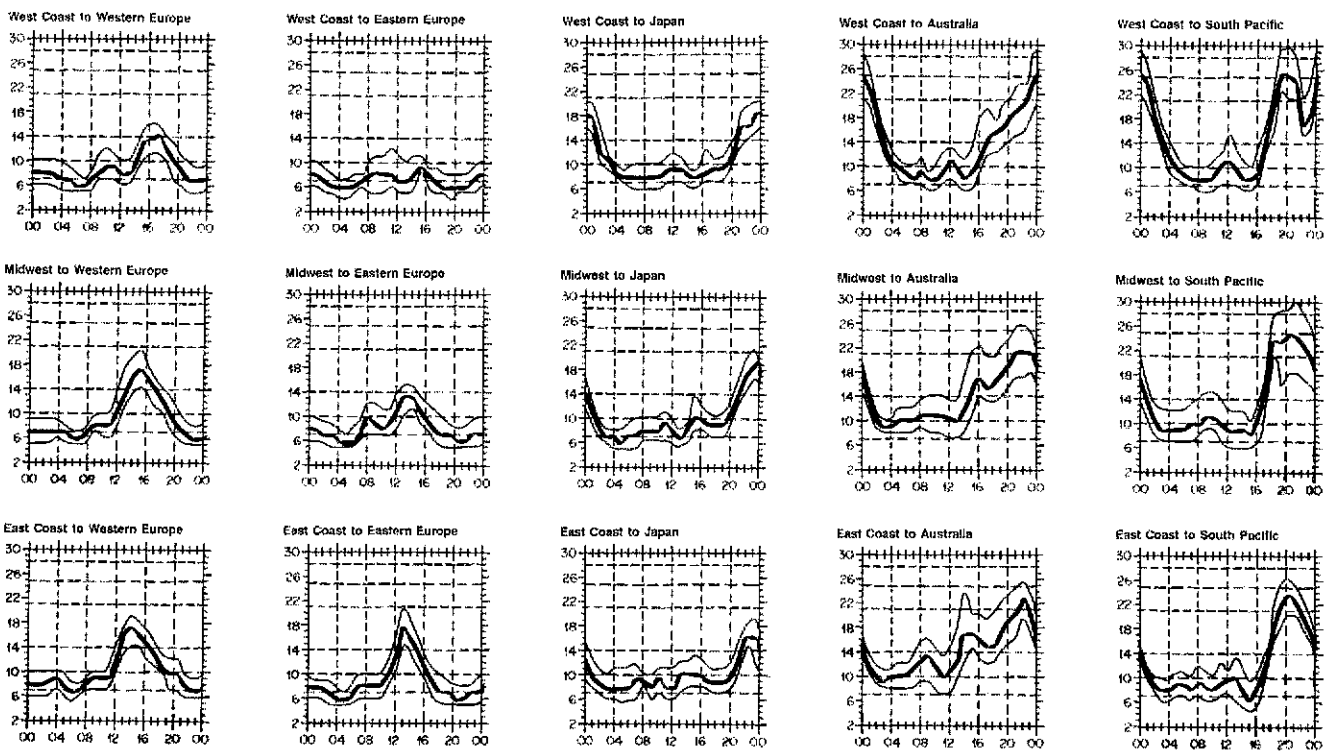
☐ **EL2AY/TU2NG:** In case we forgot to mention it, N5GAP now handles these cards—via Carol McClure, 3428 Kilrush Dr, Arlington, TX 76014.

☐ **BY1QH:** W8PHZ's recent trip to China included operation at BY1QH, the Amateur Radio Station of Tsinghua University. Founded in 1911, the school is located in the northwestern suburb of Beijing and has the largest campus in China. It is a comprehensive university, incorporating science and technology, liberal arts and management, with special stress on engineering. A clue to the size of the school is the size of its staff: about 800 professors and associate professors, and more than 2300 lecturers.

☐ **T3ØAC/AH2BE:** New manager for Willie, T3ØAC, in W Kiribati, is Jerry Branson, AA6BB, 93787 Dorsey La, Junction City, OR 97448; Edward, AH2BE on Guam, goes via Joanie Branson, KA6V (same QTH). Joanie notes that she has logs for Edward's operations as KB6DAW/KH2 and KB6DAW/KH9. Edward should be a HL9 in Korea at this writing.

(continued on page 72)

Mike, A92MB, at the Amateur Radio Association of Bahrain (ARAB) club station A92C. *(tnx DK7PE)*



QST, page 58, September 1977 *QST*, page 35, and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for November 16 to December 15, 1986, assume a sunspot number of 9, which corresponds to a 2800-MHz solar flux of 71.

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 31, 1986. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

A92NH/100 F6HUJ/278 IK2EGL/212 JA6GZJ/116 XE1HTT/105 K4AF/107 N5HH/283 KE6US/100 NF9E/102
D68AZ/100 GW4LFO/100 IKØFWI/138 OZ8WD/111 ZP5XDW/129 KA4TUU/210 K5HGX/101 NE7L/110 KØOST/134
DK3LM/130 HA8ZC/110 JH1HLO/318 UA6JD/322 WB2BXO/119 KJ4KB/168 K6XJ/326 NF7E/102 KAØTVS/104
DL1EK/149 I1BRB/109 JH4IFF/263 VE3OIT/104 KY3R/109 WV4I/108 KA6PPQ/100 W8JRK/107

Radiotelephone

A92NH/100 DL1EK/124 JI2KAR/107 YCØBYW/119 KF5MP/103 K6DMN/117 W6IGK/137 W8JRK/101 KCØNY/109
CX2AAL/108 I1CAW/311 JA6VA/278 5Z4DU/157 N5HH/282 KD6LV/112 N7AXW/104 KA9TNZ/108 NØEXW/100
DF3GY/285 IK2EGL/193 PY7ZZ/320 9K2SA/102 WB5TGL/101 N6LTN/104 KB8OM/103 NF9E/102 WØJS/115
DJØAF/103 JH1HLQ/315 XE1HTT/103 W1WRN/161

CW

DJ5NT/118 I1HLI/151 JH4IFF/110 PY7ZZ/300 ZP5XDW/125 W3KYN/134 W4FRU/135 K6ATV/125 W8RLG/108
EA5BEH/131 IK2EGL/114 OZ4RS/110 UA6JD/210 N2EAW/101 KJ4KB/168 WQ4I/101 N6LHN/104 WØJM/103
HA8ZC/105 IKØFWI/108 PY2KP/155 YV5IWT/107 W3BBL/258 N4LS/171 WC5M/104

160 Meters

HB9CIP/103 OK3CQD/105 UA2FF/104 UB5ZAL/109 W2LZX/100 K4CNW/100

RTTY

CE3GN/105 F6HUJ/158

5BDXCC

RT4UA WØEJ RA8YD IT9JLA W5TO W9ITT AKØP KB5DQ Y22JJ
UD6DJH KØSR K4CNW W7ULE K1TO WA3LJP K4PYD 5B4JE WD8IXE
KR9U HA8UB K9PSN N8DE F6HUJ G4AMT N5HH DL8WX N8MC
VE3CE HA3NU NP4CC

Endorsements

Mixed

CT1YH/227 OE7HHW/175 4X4JO/248 KA2NRR/135 W3UM/308 WZ4S/206 AA6EE/183 K8MNG/309 N9BUS/272
CX3BH/264 ON4SH/302 4X6AG/287 N2EAW/129 WA3AFS/225 K5JG/314 K6JB/325 K8MW/254 W9NNE/314
DF7AU/252 ON5WQ/287 K1AP/308 W2AXZ/293 K4CNW/298 K5PP/307 KK6X/280 K8ST/326 W9RW/301
DK6NP/310 ON6YH/276 K1JYM/150 W2BTG/276 K4KUZ/309 KB5EK/270 N6VF/305 N8BIB/281 W9TX/296
F2GL/319 ON7EJ/307 K1OXD/261 WA2TMP/151 K4LR/313 NA5S/250 W6MUS/308 W8DX/331 AIØO/291
G3KLL/281 ON7WW/306 KA1EJ/175 WB2CZB/276 KB4HU/303 ND5H/163 W6YQ/304 W8FEM/150 KØARR/228
HC1HV/257 PY1HQ/355 N1DCM/234 WB2PCF/227 KC4B/298 W5ASP/263 WA6FIT/318 W8OBI/318 KØHQW/280
I3BLF/278 PY5EG/308 W1RFW/234 AE3S/304 N4BSN/279 W5DJ/330 WA6TKT/248 WA8CZS/278 KDØHN/210
IT9QDS/175 SP6BFK/202 AA2Z/275 AF3E/325 N4DW/321 W5QKR/324 WK6E/260 WB8ZRL/300 KF8H/312
IØZUT/242 SP6FER/292 K2AIO/304 K3BEQ/305 N4TX/310 W5ZWX/330 N7UT/307 K9ALP/259 NØDGE/127
JA3APL/333 SP6RT/335 K2OWE/300 KZ3H/133 W4TK/326 WB5HBR/181 NT7Y/131 KA9LTR/224 NØYC/244
JE3LWB/310 VE3CEY/219 K2QF/300 W3KV/334 WA4AYC/187 WB5ZKR/286 W7RO/216 KD9OT/130 WØULU/300
JE8CIS/204 VE3UOT/212 KA2ESQ/130 W3PLI/224 WQ4I/151 WC5E/184 WA7HHX/126 N9ALC/293 WBØWRU/251
KP4L/294 VK6PP/233

Radiotelephone

CX3BH/263 JH4IFF/206 UA6JD/320 KA1SK/160 K3BCG/317 W4BIM/301 W6GTL/322 WD8PUG/296 W9GBC/278
CX4HS/251 KL7IEN/132 VE2WY/342 N1DCM/216 K3BEQ/305 WA4AYC/183 W6IBU/150 AA9F/150 W9MMZ/320
DK6NP/297 ON4DH/357 VE3CEY/219 WA1PEL/285 K3ZPG/156 WD4LJY/144 W6TGI/277 K9ALP/231 W9NNE/270
DK9KD/317 ON5WQ/282 VK9NL/267 K2HWE/307 N3EHD/130 WQ4I/137 K7ICW/306 K9ZO/302 W9RW/281
G3KLL/280 ON7EJ/305 VK9NS/291 NA2M/263 W3UM/291 KB5EK/265 NK7Y/200 KC9LB/158 W9TX/279
HK8BVN/281 ON7WW/304 XE1VV/291 W2BIE/260 K4LR/309 W5DJ/320 KS8M/234 KD9EB/228 WB9YZE/153
IK1AOD/250 OZ2RM/140 YCØBLO/149 W2LZX/314 KB4HU/303 W5ZWX/322 N8BIB/280 KD9OT/130 KØHQW/280
I8IXO/226 PY5EG/307 Z21BP/300 WA2ICE/133 KE4SQ/150 WB5ZKR/258 WA8CZS/275 N9BUS/251 KBØHJ/280
IØZUT/183 SV1VS/126 4X6AG/263 WB2CEI/308 N4BSN/277 WC5E/182 WA8OLM/124 NE9I/232 KDØHN/209
JA3APL/331 TR8SA/188 KA1BRD/282 WB2PCF/157 N4DW/274 W6CCB/331 WB8ZRL/294

CW

CT1YH/203 JA1UQP/289 ON6YH/236 VK9NS/237 WA2HZR/281 N4DW/283 W6YQ/267 K8MNG/202 W9TX/232
DJØGD/251 JE3LWB/285 ON7EJ/305 4X6AG/201 W3GG/269 KB5EK/190 WA6PES/200 K8MW/232 AIØO/275
DK6NP/278 JA8EAT/309 ON7WW/299 W1KSZ/280 W3KV/191 W5ASP/240 WK6E/127 WB8ZRL/252 KØOST/127
HA7RB/225 LA4YW/226 OZ2JI/176 W1WAI/224 W3PLI/213 AA6EE/175 N7UT/281 KA9LTR/173 KØVZR/180
I3BLF/240 ON4SH/278 PY2RRG/195 K2ENT/251 W3UM/236 KK6X/255 W7KZK/187 W9BW/309 KCØQ/288
IØZUT/210 ON5WQ/260 VK9NL/213 KA2DYB/129 K4KUZ/299 N6DAZ/156 W7QN/125 W9RW/259

160 Meters

WØZV/162

RTTY

W2FXA/151 W3KV/228 W5HEZ/154 WB5HBR/170

Conducted By Bob Atkins, KA1GT
103 Division Ave, Millington, NJ 07946

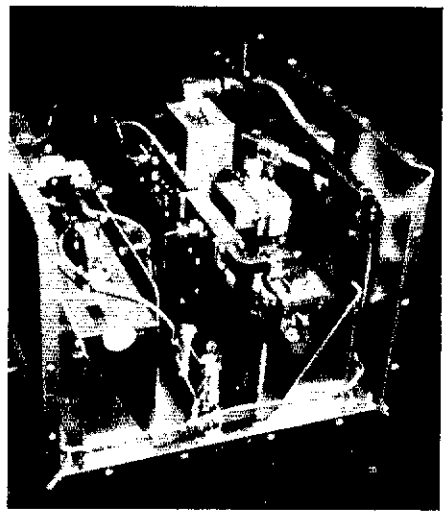
Microwave News from Oregon

Tom Hill, WA7RMX/7, has written from Beaverton, Oregon to report on the current status of microwave activity in the Pacific Northwest. He writes:

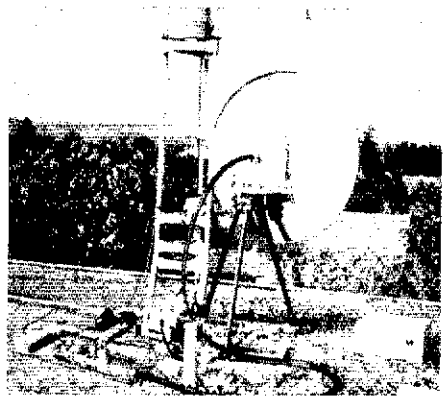
There is a lot of development of narrow-band microwave amateur equipment underway in Oregon. Tom, WA3RMX/7, has designed a three-band phase-locked system that operates SSB and CW on 2304, 3456 and 5760 MHz. WB7UNU has also built one of these rigs, and they now have VUCC nos. 7 and 8 on 3456, and VUCC nos. 6 and 7 on 5760. This equipment has 100-milliwatts output and 2.8-dB noise figure on all three bands. With these rigs and 28-inch dishes, contacts of 65 miles have been routinely made with more than 50 dB of margin. Just to prove this, they once operated from CN93IQ to CN82XW with 50 dB of pads in the antenna lead.

Lynn, WB7UNU, went mobile in CN93, and the result was very educational. Using a Big-Wheel antenna cut for 2304, they had good contacts for about 20 miles, even when he drove through dense trees. The mobile signals had a characteristic of sounding both hollow and spread in frequency. These effects became more pronounced as they went to the higher bands, and sounded much like aurora. The antenna didn't help much, as it had worse than 20 to 1 VSWR on 3 and 5 GHz. This was all done with Tom on a mountain, about 3500 feet above Lynn.

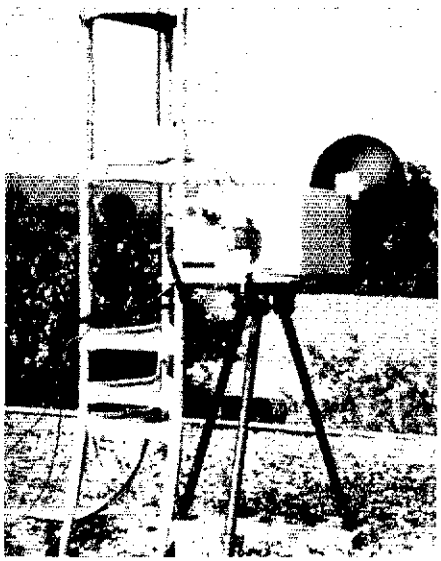
They have used the same converted surplus gear on 10.368 GHz, which they used last year in the UHF GHz, to get VUCC nos. 6 and 7 on 10 GHz this year. W7UDM, W7ADV and K7RUN have also now converted the same surplus gear, and all five went out as the K7AUO group for this year's UHF contest and qualified the club for VUCC on 2, 3, 5 and 10 GHz. W7UDM used his rig under his own call to qualify for VUCC on 10 GHz.



Inside the 24.192-GHz transverter.



The 6-meter SSB rig with 10.368-GHz transverter (on the ground).



The 6-meter SSB rig with a 24.192-GHz transverter. *(WA3RMX photos)*

WA3RMX and WB7UNU have also built rigs for SSB/CW on 24.192 GHz. These have about 100-microwatts output and about 10-dB noise figure. They made the first SSB contact on 13 June at 0016 PDT. They have made 70-mile contacts so far (CN93IQ to CN92BT), and each have three grid squares worked. They expect to have five worked in the next month or so, even though there is not yet a VUCC award established for 24 GHz.

These rigs have only a 5-PPM crystal in an uncompensated oscillator circuit, so the drift is terrible. Although a phaselocked ovenized reference is under development, the rigs now have to be continuously tuned to keep the other station copyable. Tom has a 20-milliwatt TWT amp on his rig, and Lynn plans to have one soon. This will extend the range quite a bit.

Here in Oregon we now have SSB gear for all bands up through 24 GHz, and development has started on the higher bands.

In addition, Tom also sends news that he and Lynn now have FM equipment for 47 GHz and are currently working on developing SSB capabilities for that band, too. As Tom comments, there is not currently a VUCC award for 24 GHz (no one has yet applied!), but a 5-square award seems a likely choice and will be retroactively applied to all contacts made after 1 January 1983.

MICROWAVE SAFETY

One of the subjects we should all be interested in is that of microwave safety. It should be quite evident to all who have seen a microwave oven in operation that high-power microwaves can have profound effects on organic tissue! The September issue of *Scientific American* (pp 32-39) carries an article ("The Microwave Problem" by K. R. Foster and A. W. Guy) on the biological effects of microwave radiation, which should be of interest to microwave experimenters.

Although most amateur microwave systems pose no hazard when operated properly, we should not ignore the potential for injury. Particular care should be exercised when working with high power, taking care never to stand close to transmitting antennas. When working with waveguide, even at low power levels, never look down the waveguide when the transmitter is operating. Don't forget that by the time you feel an effect from microwave radiation, you have been exposed for too long!

PROPAGATION CALCULATIONS

With current computer technology and propagation studies, it has become possible to calculate, with a fair degree of accuracy, the performance of a given set of equipment over a given path. The August 1986 issue of *RF Design* carries an article describing a program that performs such calculations ("100 MHz to 3.5 GHz Propagation Curves—Computer Programs for Communications Range Calculations" by L. A. Gerig and J. R. Hennel). The program is based on an ESSA Technical Report—ERL 111-ITS79—*Transmission Loss Atlas for Select Service Bands from 0.125 to 15.5 GHz*, Institute for Telecommunications Sciences, Boulder, CO, May 1969. This report is available for $1.25 from Superintendent of Documents, US Government Printing Office, Washington, DC 20402.

A copy of the program for the Commodore 64 or the IBM PC is available from the authors. For the C64 version, send a blank cassette tape (C-30 or longer) or a formatted disk (1541 format). For the IBM PC version, send a formatted disk. Also required is a self-addressed, stamped mailer and a check or money order for $5. Send requests to Lynn A. Gerig, RR 1, Monroeville, IN 46773. QST

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.

The 1986 E_s Season—Part 2

Last month, I attempted to summarize the past sporadic-E season as it affected both 6 and 2 meters. Because it had to be written in early August to meet the column deadline and before I began a West Coast trip, I was not able to include much information on August happenings. Besides, we all know that the E_s season is largely over by the end of July. I am afraid that I fell into the trap of believing that widely held view, and thought that I could summarize the 1986 season by writing about it in early August. Wrong! In fact, August 1986 was a rather good month, for E-Layer propagation—better than it is most years. Including the August openings, it certainly tends to increase the esteem in which many will regard this year's E_s season.

In an attempt to sketch a more complete picture of the 1986 sporadic-E season than that presented last month, this space will be used to continue, into August, the summary of this summer's 6- and 2-meter openings.

The first few days of the month produced very extensive openings affecting both 6 and 2 meters in several parts of the country. See the On the Bands section for details. Suffice to say here, that 6 meters was open widely around the country for about the first week of August, and 2-meter propagation existed from the West Coast to the South Central and Southwest parts of the country the evening of the 4th, with evidence of the presence of the Field Aligned Irregularities (FAI) mode. The following night, 2 meters put on a real show from the Midwest to the Southeast, Mid Atlantic states, New England and nearby Canada. Another short 2-meter opening occurred August 16 from New Mexico to the Southeastern states and, on the 22nd, between Georgia and Puerto Rico. Six meters, although certainly not open every day of the month, exhibited a general pattern of good propagation for so late in the season. It even staged a good 45-minute double-hop session between the Mid Atlantic states and portions of California the next to the last day of the month.

Thus, I believe that we can upgrade our evaluation of the 1986 sporadic-E season somewhat and classify it as significantly better than most. If it hadn't been for those two periods of none-to-few openings during late May and late June, we would probably have considered it to be excellent.

ON THE BANDS

6 Meters—The band continued a pattern of late season openings right up through the end of August. Naturally, all of the E_s openings chronicled for 2 meters were accompanied by 6-meter openings featuring very strong signals and short skip. Double hop was in evidence on a number of occasions, including a fine session between the Mid Atlantic states and portions of California Saturday, August 30. After having missed most of the good 6-meter openings and all of the 2-meter E_s openings this summer, this conductor was happy to get a chance to hold several good QSOs with California stations WA6PEV, W6XJ and W6SMS. Signals were excellent, with WA6PEV running over S9 for over a half hour and the others a good S7 to 8. W4CKD reported that the previous day, August 29, after having worked VE1RG at 1945Z, he heard a weak SSB station replying to one of his CQs at 2008Z. Although he couldn't identify the call, Bob said that it sounded like a G4. At 2148Z, he worked VO1LO, and at 2227 VP9GE was in. Another interesting report received was from Finnish station OH1ZAA, who called the answering machine at 2110Z Sunday, August 3, to alert the North American gang to the fact that he was hearing the OX3BHF beacon at 50.045 and was trying for crossband contacts on 28.885. Unfortunately, I didn't check the machine until the following day. Also from overseas comes a note from JA4MBM, who tells of a rather exotic mobile QSO that he completed (date not given). The contact was with Chinese station BY4RB. Apparently, BY4RB worked about 1000 JAs in the course of a stint of operation during the summer. How's that for something to make your mouth water for the next solar peak?

2 Meters—The evening of August 4 was a big night on the West Coast for ionospheric propagation. Apparently, it began as normal E skip, with a number of Southern California stations working into Texas and Oklahoma. Then, according to WB6FCS, West Covina (just east of Los Angeles), the character of the signals changed to something resembling aurora and stations from New Mexico began to be heard. He also noted that beam headings shifted considerably to the north of the true path. Warren then worked several stations in New Mexico, including W5HM and NQ4C/5. The characteristics of the circumstances strongly suggest the FAI mode as the propagation involved. This mode of 2-meter propagation, described a few years ago by W1JR and others, usually occurs during, or following, extensive 6-meter sporadic-E openings, and often displays the beam heading and signal characteristics noted by WB6FCS. Another reporting the same opening is KK6C Campbell, CA CM97. Pat, who is a new convert to VHF, says that from 0235 to 0307Z, he worked New Mexico stations W5HM DM63, NQ4C/5, WA7EPU/5 and N5JHV—all DM62. He doesn't indicate signal quality or beam heading on these contacts, but does note that 6 meters was open to Oregon and Washington at the time.

Much of the rest of the country was in for some excitement of its own, beginning about 2200Z August 5, when 2 meters put on quite a show. One reporting on the event is W8QXO/4 Albany, GA. George says that he was able to work stations in New York, Pennsylvania and Vermont as well as VE2 and 3. The VEs included VE3FN, VE3KKL and VE3MPG in FN25, VE2FF FN35 and VE2GZD FN45. Beginning at 2345Z, and lasting for about 20 minutes, the band shifted to the northwest, enabling George to pick up four new states: KØGJX Minnesota, WD9FSA Illinois, WØIZ Iowa and KD9IV Wisconsin. Fellow Georgian, WS4F has a similar tale. Steve, who lives in Cornila, about 50 miles northeast of Atlanta, lists 15 2-meter E_s contacts between 2220Z on the 5th and 0025 on the 6th, ranging from KA1BJ FN43 to WBØTEM EN12. From near Baltimore, W1DGA/3 lists stations heard and worked beginning at 2218Z, but notes that New Jersey and Pennsylvania stations were working the opening at least 15 minutes earlier. Dick's heard/worked list includes stations in Ohio, Illinois, Iowa, Missouri, Arkansas, Oklahoma, Mississippi, Louisiana and Texas. Another Marylander, WB3GOP, also made good use of the opening, completing 2-meter contacts with W5NZS Oklahoma EM15, KBØHH Kansas EMØ7, WBØVZW Kansas EM17, NW5E Texas EMØ3, K5UT Arkansas EM35, W9BN/5 Arkansas EM34, WB5VPC Texas EM12 and KE5WP Texas EM13—all between 2342Z and 0022Z. The evening's work amounted to eight new grid squares and four new states for Gary. W2GU/4 Signal Mountain, TN says that, for him, this opening and the February 8 aurora have jointly accounted for 50 new grid squares. As with most other reports on the opening, Ken's account begins about 2200Z. In his case, the band opened to the New England states and adjacent Canadian provinces. That phase of the opening lasted for nearly an hour, with very good signal strengths and many stations active. When the band faded, Ken could hear stations in the Carolinas working into Arkansas and Mississippi. Then, at 2350Z, his break came again with a solid opening to WBØTEM and WDØFOY, both EN12 in Iowa.

From Vermont, a state not often heard from, WA1ZOJ Rutland says that he picked up nine new grid squares from the opening, working into the Southern states, including W4GJO, WD4EWK, WA4CRO, KJ4GK, WB4GFO, WB4CTW, W8QXO/4 and KD4WF. Hang in there, Earle; a lot of people need your state, not to mention your FN33 grid square. WØJRP Joplin, MO caught the opening beginning about 2350 and, for him, it lasted about 20 minutes, allowing nine contacts from Virginia to Georgia. Stations worked were: K4JQU FMØ6; WS4F and KB4FQ FMØ4; WB4TWX EM95, WA4VCC and KB4CSE EM94; PE1AHX/W4 EM93; WC4G EM92, and W3EP/4 EM83.

It's always nice to hear from new converts to VHF who get on and catch a particularly good opening. One such person is N5HUP Shreveport, LA. Glen says that he had been on 2 meters just one week when this E_s opening hit and, not surprisingly, he got a real thrill from it. His list of stations worked includes WB2OYC, K2BWR, K2GAL, WB2RVX, K2TXB—all in southern New Jersey and FM29; KT8W FMØ9 West Virginia; W3OTC, WA3UJE, WB3BAX and W1DGA/3 FM19 Maryland; K4HWG FM18 in the Virginia suburbs of Washington; W3RYG FNØØ western Pennsylvania; K3HEC FN1Ø eastern Pennsylvania; K2LWR FNØ2 western New York; and WA2ZPX FN31 eastern New York.

Probably the longest list of stations worked, 25, is turned in by W5NZS Oklahoma City. Larry's roster includes contacts from North Carolina to western New York with WA3FYJ FNØØ western Pennsylvania representing state number 37 and N8II FMØ8 and KT8W FMØ9 West Virginia state number 38. The log of K5MA/1 West Falmouth, MA FN41 is also very impressive. It lists 18 QSOs in 14 grid squares, beginning at 2153Z. Stations in Georgia, Tennessee, Kentucky and Arkansas were worked. W4HHK says that the event began in western Tennessee at about 2225Z. Both he and N4MW made a number of contacts in the Northeast, with the best DX for both being VE1UT in FN63. In his report, K5SW notes that many of the signals appeared to be coming from a direction north of the path, which might suggest

the FAI mode. Thus, it appears that FAI occurred on two successive evenings—first on the West Coast, and then in the Midwest.

Just to show that she wasn't quite through for the 1986 season, Mother Nature put her E clouds to work again August 16 to produce still another 2-meter opening. W5FF New Mexico reports working NB4S, WS4F, W4GJO/M, KJ4GK, WQ4V, W4CPZ and WA5SKG. Then, on the 22nd, KP4EOR writes to summarize the season in his part of the world and notes working W4BCL St Mary's Island, off the coast of Georgia, at 1420Z. David reports that WP4G also worked W4BCL plus W4ISS Augusta, GA during this opening.

E skip wasn't all that occupied the attention of VHFers during August. There was the Perseids, which was quite productive this year, including several contacts on 1¼ meters. I'll try to have a full report on that shower of showers next month.

In addition to the taste of E skip and FAI that visited the West Coast during early August, their famous tropo duct to Hawaii also blessed them with its presence. The duct was in full swing when I arrived in San Diego late in the evening of August 5. Upon discovering it the following night, I headed for a place I could go to hear VHF signals traversing 2500 miles of ocean. The trail led to the Point Loma QTH of K6DYD, about one half mile from the Pacific and about

The 50-MHz Standings will appear in this column next month.

250 above it. When I arrived, the signals of KH6HME on the slope of Mauna Loa, which had been S9 a few minutes before, had faded out completely. A few 807s and a hamburger later, we began to hear something, and there was Paul about S4 on 144.170. I was able to say hello and thank him again for kindness he had shown my XYL and me on our trip to the Islands earlier this year. Finally, after hearing about and writing about this fascinating propagation for many years, I was able to experience it for myself, thanks to Jerry, K6DYD, and family and their hospitality. While I was at K6DYD's QTH, WB6NMT and K6MYC were south of the border down Mexico way, operating XE2BC from somewhere south of Tijuana. Their efforts resulted in the first contacts between XE and KH6 on both 2 meters and 70 cm. An attempt at a 23-cm QSO was not successful. WB6NMT did work KH6HME on that band several nights later from San Diego, for what should be a new 23-cm DX record. N6CA, operating from Palos Verdes (southwest of Los Angeles), was also successful in contacting KH6HME on 23 cm. This opening, which lasted 10 days, turned out to be monumental in the history of this propagation. W6PJA says in his report that more West Coast stations made contact than he can keep track of, but that KH6HME filled 8½ pages of log. Rather than the usual one station opening well up on the slope of Mauna Loa, this time there were several stations active on the Hawaii end. In addition to KH6HME, who made some contacts from down in Hilo as well as many from his customary spot at the 8000-foot level on Mauna Loa, KH6IAA, KH6CC and KH6FOO made a number of contacts from near-sea-level locations on The Big Island. In addition, if not for the first time ever, certainly in many years, there was activity from Maui. KH6IBA was on from a near-sea-level QTH on that beautiful island. K6JYO had the honor of being the first Californian to work Maui from his new location north of San Diego. According to W6PJA's report, KH6IBA went on to work several other 6s, but I do not have a list of his contacts. W6PJA notes that this long-lived opening was also notable by the lack of any tropical depressions or storms, but that there was a continuous low-altitude cloud formation stretching from California to just east of Hawaii. He says that when it started to show breaks, the propagation disappeared.

Amateur Satellite Communications

(continued from page 66)

114 10/11 JA1RL ALL JAS-1 new schedule
113 10/11 WA2LQQ ALL ALINS for Phase-3C
112 10/10 JA1DSI ALL WHO MANAGES HKØXX QSL?
111 10/10 G3AAJ * Harry in London
110 10/09 WØRPK ALL P-3C countdown #8
107 10/09 9M2CR ALL NMCR AMTOR mailbox now QRV
103 10/06 JR1FIG JA9BOH Uchiawase wa raishuu?
102 10/09 N7FDA * RS-232C card for PC-108

JAS>F

101 10/09 G3RUH ALL New software for BBC
100 10/08 JR1ING JR1FIG Sara ni kogata no TNC
99 10/08 JA1TUR ALL AFDEM-JA #3 in progress
98 10/08 N5AHD ALL Call for papers
96 10/08 KA9Q ALL TCP/IP on TAPR NNC
95 10/08 N5AHD JR1FIG Automatic tracking system
94 10/07 DJ5KQ ALL IPS-RA enhancements
93 10/07 DB2OS ALL Wettersatelliten
92 10/07 DB2OS ALL RUDAK-Statusreport
85 10/07 5H3KK ALL Now QRV on FO-12

3.2 The "R" Command

R <file#1>, <file#2>, <file#3>...<file#7>, <file #8>

R = READ. Read file(s) (messages) specified by file number(s) you got from the "F" command. Up to eight files can be specified. (The WØRLI/WA7MBL equivalent command is also "R" except that you may specify multiple files to be read on FO-12.)

Example:

JAS>R 95,102
Posted: 86/10/08 17:33 UTC
From: N5AHD
To: JR1FIG
Subj: Automatic tracking system

Dear Saya,
Thank you for the compliments on the manual you received from G3AAJ. Two computers are now used—one for control of antenna system, radios [etc]

Posted: 86/10/09 03:21:42 UTC
From: N7FDA
To: JR1FIG,JA1JHF
Subj: RS-232C card for PC-1089

Saya, I need one more RS-232C card for my old faithful PC-1089. Would you ask Kanawa san if he could still get one in Akihabara? Miki

3.3 The "W" Command

W [call1, call2, call3... call7, call8]

W = Write. Send a message (file) to others. As many as eight destination addresses can be specified. The part of the command line in brackets [call1, call2, call3...] is optional. A message without specific destination is "public," ie, addressed to "ALL."

The JAS-1 mailbox will then prompt you to send the subject field by sending "Subj:". You can send a subject field with up to a 32 character string. After receiving the "Text:" prompt, you enter the message text, ending each line with <cr> (carriage return). You terminate with either a

<cr>.<cr> or
<cr> <ctl-Z> <cr>

(ie, a line containing only a period or a control-Z) to indicate the end of your text. (The WØRLI/WA7MBL equivalent command is "S" except that multiple addressees can be used. Entering only W is equivalent to S ALL)

Example:

JAS>W N7FDA Subj: Roger, wait for a while.
Text:
Miki,
Roger, I'll immediately call him up and get an info for your "Main Frame." I am going to put that info during next orbit. Saya ^Z

3.4 The "K" Command

K <file#1>, <file#2>, <file#3>...<file#7>, <file#8>

K = KILL! Delete file(s) (messages) specified by file numbers. The <file#> is the same one described in R command. Up to eight files can be specified in a command line. A user can only delete files addressed solely to himself (ie, not to multiple users) or files he posted. (The WØRLI/WA7MBL equivalent command is also "K", except that multiple files can be killed at one time.)

3.5 The "H" Command

H = HELP! Entering H <cmd> gives additional information on that command. Entering only H will give a list of all available commands.

3.6 The "M" Command

M = Mine. List the latest 10 files (messages) that are either to or from the current user. Additional M commands list additional active messages. This command will be useful to save channel time when the user only wants to see his messages. (The WØRLI/WA7MBL equivalent command is "LM".)

JAS>M

NO.	DATE	FROM	TO	SUBJECT
111	10/10	G3AAJ	*	Harry in London
103	10/06	JR1FIG	JA9BOH	Uchiawase wa raishuu?
102	10/09	N7FDA	*	RS-232C card for PC-1089
100	10/08	JR1ING	JR1FIG	Sara ni kogata no TNC
95	10/08	N5AHD	JR1FIG	Automatic tracking system

On Line

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

Computer-Controlled Radio

Controlling ham radio equipment from a computer is becoming easier as each new generation of ham radio equipment is introduced. Today, many Heath, ICOM, Kenwood and Yaesu transceivers permit some degree of interfacing that allows a computer to control certain transceiver functions.

On Memorial Day weekend, our workhorse HF rig for the last five years met an untimely death. I replaced it with a Kenwood 440S. Along with the transceiver, I purchased the optional Kenwood IF-232/IC-10, which gave me the capability to connect a computer to the radio for control. I hooked everything up to my Apple Macintosh computer and checked it out running a data communications program at 4800 bit/s (the data rate required by the radio/interface).

Twenty-two commands perform a variety of functions; most are frequency and mode related. You can select the frequency and mode of either VFO and any of the radio's 100 memory channels. And you can read and write to any memory channel. You can change the frequency of the RIT and XIT and the currently displayed frequency. You can switch between the transmit and receive modes, and enable and disable the memory channel-scanning function and split-frequency operation. You can also enable the Auto Information function, which checks the condition of the radio every 1.5 seconds and reports any changes to the computer. Needless to say, the computer control capabilities are very powerful.

Well, that's nice, but what do you do with all that power? Think contests. Now, I can write a program that will log and dupe the contest and control my radio.

Imagine a Friday evening in October, around 2359Z. I turn on the radio and computer. Load a program. The computer asks, WHAT IS THE NAME OF THE CONTEST?

I type CQ WW

The computer asks, WHAT MODE DO YOU WISH TO OPERATE?

I type SSB

Now the fun begins. The computer asks, WHAT BAND DO YOU WISH TO USE?

I type 40 and the computer programs the radio to operate LSB on 7.153 MHz (the lowest carrier frequency I can use for LSB and still be above the 7.150-MHz band edge with all of my signal). The frequency is busy (Radio Moscow, 15 over 9 on 7.150), so I hit the S (for scan) key on my computer's keyboard and the radio starts tuning up the band. At 7.154 I hear YV5AJ calling CQ TEST.

I hit the S key again to stop scanning and I enter the call sign YV5AJ. The computer checks the log for a dupe and, finding none, asks, REPORT?

I hit the X key to transmit YV5AJ WA1LOU. I hit the X key again to stop transmitting and hear YV5AJ return WA1LOU YOU'RE 59 09.

I hit the X key again, ROGER, 59 05 from WA1LOU. After he acknowledges, I type 59 09 and the program reads the time from the computer's built-in clock, reads the frequency from the radio, and enters all of the information in the contest log and awaits my next command. Finding 40 meters less than optimal, I type, CF 80 for change frequency to 80 meters and the computer programs the radio for 80-meter LSB operation, as well as noting in the contest log the time and change of frequency.

I can operate the whole contest from the computer with hands off the radio. During the contest, the program can provide various statistics: current score, multipliers needed/worked per band, etc. At the end of the contest, the program can print out a summary sheet, dupe sheet and complete log. As long as no typing errors were entered, the log should be clean—that is, free of dupes and ready to turn in to the contest administrators.

Besides contests, general operating and logging programs can be written. The possibilities are limitless with the computer-radio combination. The only limitations are our imagination and programming prowess.

Table 1
Ham Radio-Related Landline BBSs

Location	*Name*	*Tel No*	*Parameters*	*SYSOP*
CA, Greenfield	Elmer II*	408-674-3439	3/12 8N1	WA6LMM
CA, Lancaster	Superbyte**	805-942-0329	3 8N1	NE6I
CA, northern	BBS-JC	415-961-7250	3/12/24 8N1	K6LLK
CA, southern	CSC Ham BBS	818-998-0319	3/12/24 8N1	K6IYK
CT, Bridgeport	Dave's FIDO	203-366-1234	3/12	
FL, Pensacola	Hot Muddy Duck	904-651-8684	3/12 8N1	N4HMD
FL, Satellite Beach	Computer Hustler	305-773-5033	3/12 7E1	
GA, Atlanta	Flagship Express***	404-491-6365	12/24 8N1	KC4ME
IA, Dubuque	Sunshine BBS	319-557-9659	3 8N1	KAØJAW
IL, Chicago	Elk Grove Village TBBS	312-529-1586	3/12 8N1	N9DKO
MD, Aberdeen	Aberdeen Interface BBS	301-272-5313	3/12 7E1	
MD, Gaithersburg		301-670-9621	3/12 8N1	W3INK
MI, southeastern		313-238-4984		KA8OCN
MN, Apple Valley	Ham-Line BBS	612-431-1149	3/12 8N1	WAØCQG
NJ, southern	RATS-South	609-268-9597	3/12 8N1	KA2BQE
NM	Teacher's Pet****	505-646-5194		W4GHV
NY, Long Island	South Shore ARC	516-661-3643	3 7E1	WB2VOZ
NY, New York	Friends	212-781-4723	3/12 8N1	WB2RSI
NY, New York	Hamnet	718-698-7875	3/12 8N1	
OH, Akron	Akron Computer Group	216-745-7855	3 8N1	WA8SNF
ON, Toronto	Humber College BBS	416-252-9692	3 7E1	VE3OOZ
TX, Dallas		214-960-2730		NN5I
TX, Houston		713-242-6041	3/12/24 8N1	KC5UP
TX, San Antonio	Radio Flyer	512-734-3521	3 8N1	KA5SWI
VA, McLean	AMRAD	703-734-1387	3/12 8N1	K8MMO

*M-F 1900-0700 PST, Sa-Su 24 hrs
**2200-0700 PST
***IBM PC oriented
****FIDO 15/1006

HAM RADIO BULLETIN BOARDS

Table 1 represents information concerning ham radio-related landline bulletin board systems (BBS) that I have received since the last listing of BBSs in April. The Parameters column indicates the BBS data rate (3 = 300 bits/s, 12 = 1200 bits/s, 24 = 2400 bits/s) and the number of character bits, parity and stop bits (7E1 = 7 data bits, even parity, 1 stop bit; 8N1 = 8 data bits, no parity, 1 stop bit). Unless noted otherwise, the BBSs operate 24 hours a day.

VK-PACKET NEWS

There are about 250 amateurs on packet in Australia. Packet radio started about 1978 with a group in Sydney and Melbourne using VADCG equipment. AX.25 was introduced in 1984, and has become widely used throughout Australia. Most of the TNCs in use are the TAPR TNC 1 and 2 and a few of the commercial units. The planning of a Brisbane-to-Melbourne (1200 miles) network is being studied at the moment.

The Australian Amateur Packet Radio Association (AAPRA) has a packet-radio hardware and software package ($33 US) for the Commodore 64 and 128 computers. The hardware portion of the package consists of a bare 1200/300 bit/s modem PC board (requiring the

(continued on page 68)

FM/RPT

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

What's Happening with the Amateur Auxiliary?

Last time, I described a proposed automated direction-finding/packet-radio system to track down intentional repeater interference. This month, Tom Frenaye, KIKI, ARRL New England Division Director, describes the Amateur Auxiliary, which can also be used to track down repeater interference and other violations of the FCC rules.

A couple of years ago, the FCC and the ARRL signed an agreement setting up a formal process of handling problems within the Amateur Service: The Amateur Auxiliary to the FCC's Field Operations Bureau. This agreement allows amateurs to formally assist the FCC in resolving rule violations among amateurs. So, you might wonder how well the program is working. The answer is that it is working, but it could sure use some additional help.

The job of the Amateur Auxiliary is to try to resolve problems before they get to the FCC, or to take problems referred from the FCC and solve them before official action is taken. It is a system that allows us to be more responsible for regulating our own service. The FCC is still there if we can't resolve the problems ourselves.

The most common complaints seem to be related to interference on repeaters, and the best solution to those problems is for the users of those repeaters to join the Amateur Auxiliary and establish Local Interference Committees. With some cooperation and coordination at the local level, enough data can be gathered to locate the individual(s) causing the problems. Don't expect a SWAT team to be available to be called upon—though there is a good training program in place and the expertise can be shared among different areas. If you are willing to step forth and work on resolving a problem situation, you'll find others willing to pitch in.

In New England, each ARRL Section signed a basic agreement of intent to begin the Amateur Auxiliary on January 1, 1986. A regional monitoring station was also appointed, and the structure of the Amateur Auxiliary is taking shape. To date, several repeater interference problems have been resolved, a Novice licensee who was active in packet radio was "encouraged" to upgrade, and preliminary data have been provided to the FCC in a number of other areas. In other areas, the Amateur Auxiliary has been of great help in resolving problems on 75 meters, and in Southern California.

Remember that the Amateur Auxiliary will only be as good as the people who get involved in it. The FCC does not have the time or resources to deal with anything but the most serious rule violations. If you are interested, you can get involved by contacting your Section Manager (listed on page 8).

AMATEUR REPEATER SITES HARD TO COME BY

Over the years, the numerous repeaters in the Richmond (VA) metropolitan area have efficiently served the amateur community with only an occasional few hours of down time (to replace tubes or make tests and adjustments). Everyone expects that the repeaters will always be there.

Last winter things changed. The "repeater flu" struck with a vengeance! First, the 147.03 repeater, then the 34-94, the 04-64, and finally the 145.11 repeater were all off the air for extended periods at the same time. However, after a few weeks off the air, most returned to service with new equipment, parts or antennas.

The above, while written humorously, shows how we expect our amateur repeaters to be in full service all of the time just as public utilities are. Amateur Radio and its operators are one of our nation's greatest resources. Equipment, owned and maintained at no cost to government, provides an emergency and community service operation.

Dedicated and trained amateur operators give their expertise and time to emergency and public

(continued on page 68)

W1AW Schedule

October 26, 1986—April 26, 1987 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; on Wednesday at 2300 UTC they are beamed south.

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 1986 *QST*, pages 9 and 84," 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 84.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

On Wednesdays at 2330 UTC, an IARU Region 2 bulletin in English and Spanish on 45.45-baud Baudot is sent on the regular teleprinter frequencies, beamed to Central and South America. The 2300 UTC Teleprinter Bulletin transmission is also beamed south on Wednesdays.

On Tuesdays and Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45 baud Baudot 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 ThFSn. During other transmission times, AMTOR is sent only as time permits.

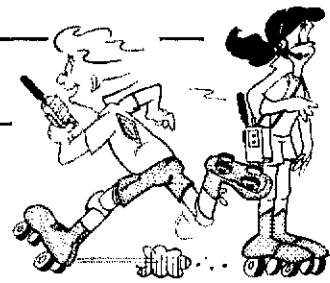
CW bulletins are sent at 18 WPM.

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 27 and 28, December 25 and 26, January 1, February 16 and April 17.

Making Waves



Conducted By Scott Springate, N7DDM
2095 Broadview, Eugene, OR 97405

The questionnaire that was run in the May issue of Making Waves was a success. I received letters from many states, plus some from Puerto Rico, France, Germany, Great Britain and Thailand. While there weren't as many replies as I had hoped, some offered good suggestions. This month's column will deal with the results of the questionnaire, plus some thoughts on the comments I received.

Not everyone answered every question, and some people gave more than one answer to a question. In the case of the question about favorite bands and modes, many people said they liked them all!

Three hundred and fifty-five questionnaires were filled out and returned. The percentages were taken from the number of answers to the question, not from the number of questionnaires received. The original questions, as they appeared in the May issue, are in boldface.

Age. The age of this column's readers varied from 9 to 84, with the highest percentage falling in the 31-50 age bracket.

Under 10	1%
11-30	21%
31-50	37%
51-70	28%
Over 70	13%

Age First Licensed. According to your responses, the age when you were first licensed covered almost as wide a range as did your current ages. This varied from 7 to 79, proving once again that anyone can become a ham. But the typical first-licensed age was much lower than the current age, with over half of you getting your first license when you were under 30 years old.

Under 10	3%
11-20	40%
21-30	21%
31-50	25%
51-70	11%
Over 70	1%

Present License Class. I thought that most readers of this column would be relative beginners, but you surprised me. The results indicate differently, showing that many upgraded operators also read Making Waves.

Total Number of Answers = 355	
Novice	9%
Technician	11%
General	25%
Advanced	31%
Extra	24%

Do You Plan to Upgrade? Although over 50% of the respondents were Advanced or Extra, more people planned to upgrade than not.

Total Number of Answers = 353	
Yes	52%
No	48%

The Results Are In

Are There Other Hams in Your Family? Most often it was a father/spouse who was the original ham in a family.

Total Number of Answers = 350	
Yes	31%
No	69%

Do You Belong to a Ham Club? The results here were as I had hoped. I think that clubs have done much to advance ham radio and need to be supported.

Total Number of Answers = 347	
Yes	70%
No	30%

How Many Hours a Month Do You Get on the Air? Answers to this question ranged from 0 to 404 (whether this is actual operating or just listening, I am unsure). Many of you (39%) are on the air less than 10 hours a month, and another 34% are on the air between 10 and 30 hours per month. A few are on the air over 100 hours each month.

What Is Your Favorite Band and Mode? This is a question for which people had more than one answer. That's why the total number of answers is greater than the number of questionnaires received.

Favorite Band

Total Number of Answers = 453	
2 m	16%
6 m	2%
10 m	8%
15 m	13%
20 m	25%
40 m	20%
75 m	5%
80 m	8%
160 m	2%

Favorite Mode

Total Number of Answers = 324	
Phone	51%
CW	44%
RTTY	3%
Packet	2%

CW Speed. I didn't know how many people still used code these days with all the new modes available. But code speeds ranged anywhere from 0 to 75 words per minute, with most of you in the 10-20 WPM range.

0-5	7%
6-10	19%
11-15	25%
16-20	24%
21-30	17%
30+	8%

How Often Do You Read the Making Waves Column? Most people who said they never read this column stated that they were unaware of its presence. People who said they occasionally read this column usually said that they didn't have time to read it more often than "occasionally."

Total Number of Answers = 351	
Never	12%
Occasionally	29%
Usually	28%
Always	30%

Would You Like to See Making Waves Appear Every Month, or Is Every Other Month Okay? Not all respondents were satisfied with the choices for answers on this question so they added their own answer.

Total Number of Answers = 291	
Every Month	77%
Every Other Month	22%
Never	1%

Are Any of Your Friends Hams?

Total Number of Answers = 344	
Yes	87%
No	13%

Are You Aware of the New, Low Membership Rates for Young Hams Who Meet Certain Requirements?

Total Number of Answers = 340	
Yes	63%
No	37%

Are You a League Member?

Total Number of Answers = 353	
Yes	94%
No	6%

How Would You Rate Your Experience as a Novice?

Total Number of Answers = 349	
Wonderful	39%
Average	27%
Terrible	12%
Never held a Novice ticket	22%

One fact bothered me about the results of the questionnaire. Out of the 355 responses, only 44 (12%) were from the target group this column is aimed at: high-school youth. Even more disturbing is the information that only one person had a ham club at school. Some of the students said they would be interested in joining or starting one, though.

Thanks to all of you for taking the time to fill out the questionnaire. The information will be a great help in writing this column. All the suggestions and comments were read and given consideration. Thanks also to my sister, Lisa, who put in countless hours helping me tally up all the answers.

Canadian NewsFronts

Conducted By Harry MacLean, VE3GRO
500 Riverside Dr
London, ON N6H 2R7
Tel 519-473-1668

Meet Your New Directors

By the stipulated cutoff date, 1986 August 20, the CRRL Elections Committee was in receipt of five nominations for CRRL Regional Director, one from each CRRL region. All nominations were found to be valid, and the nominees were declared elected. Effective 1987 January 01, Regional Directors on the CRRL Board will be David Fancy, VE7EWI (Pacific Region), William Gillespie, VE6ABC (Midwest Region); Raymond Perrin, VE3FN (Ontario Region), Claude Brunet, VE2ZZ (Quebec Region), and Ronald Hesler, VE1SH (Atlantic Region). Dave, Claude and Ron are new to the CRRL Board. We'll introduce them to you now.

Dave Fancy, VE7EWI, was first licensed in 1979. He received his Advanced Amateur certificate in 1981. Since 1981, Dave has served as a CRRL Assistant Director, working closely with Pacific Director Bill Kremer, VE7CSD. As Assistant Director, Dave often represented CRRL at hamfests in the lower mainland and on Vancouver Island.

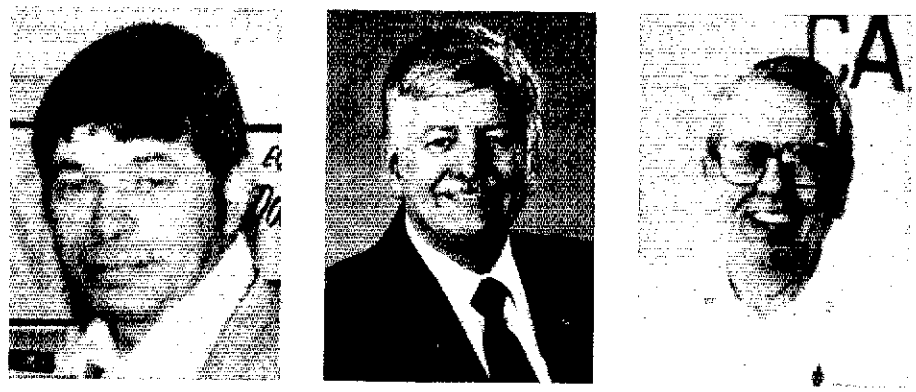
Dave can often be heard on 2-metre repeaters and the 80- and 40-metre evening traffic nets. He's active in club work and presently serves as Treasurer of Burnaby Amateur Radio Club. Dave is an Assistant Fire Chief with the Surrey Fire Department. Non-Amateur Radio interests include computers, photography and a bit of hunting. Dave is 50 years old, married with five children, and lives in Surrey, British Columbia.

Claude Brunet, VE2ZZ, was first licensed—2nd Class Commercial certificate—in 1945. He received his 1st Class Commercial certificate in 1960. That's not the easiest route into Amateur Radio, but there's a reason, as you'll see!

Claude enjoys chasing DX. He serves as a Regional Coordinator of Reseau d' Urgence, Quebec's Amateur Radio emergency net, and as a Publicity Officer for his radio club, Societe de Radioexperimenters et de Teleinformatique de la Maurice. Recently, he's begun to investigate computers and packet radio. Claude is retired now. Before his retirement, he was manager of a District Office of DOC. (That's why all those commercial certificates!) Non-Amateur Radio interests include skiing and cycling. Claude is 60 years old, married with four children, and lives in Trois-Rivieres, Quebec.

Ron Hesler, VE1SH, may be a new CRRL Regional Director, but he's not new to CRRL; he was CRRL's founding president. Ron was first licensed in 1937 as VE1KE. Later, he held the call VE2QF. In the 1970's Ron served as ARRL Canadian Vice Director and later as ARRL Canadian Director. During his term as ARRL Canadian Director, Ron had the Canadian Division of ARRL incorporated as CRRL. While he was president of CRRL, Ron was conductor of this column in *QST.* Later, Ron served as Director of QCWA.

Ron is active on the air. Over the years, he has earned many operating and public-service awards. Ron is retired now. Before his retirement, he owned and operated a successful business engaged in the manufacture of ranges, heaters and furnaces. Non-Amateur interests include computers, photography and golf. Ron is 65 years old and married. He makes his summer home in Sackville, New Brunswick, and his winter home in Naples, Florida, from which he plans to keep up with developments in the Atlantic Region through regular on-the-air contacts and his trusty typewriter.



New Directors on the CRRL Board (l-r): David Fancy, VE7EWI, Claude Brunet, VE2ZZ, and Ronald Hesler, VE1SH.

SECTION MANAGER ELECTION RESULTS

Congratulations to Gordon Kosmenko, VE5GF, who was recently elected Saskatchewan Section Manager, and to Harold Moreau, VE2BP, who was recently re-elected Quebec Section Manager. Both ran for office unopposed. Their new two-year terms of office begin on 1987 January 01.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Ontario 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 Ontario Section. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be on the petition.

Petition forms, FSD-129-C, are available from the ARRL Headquarters office in London, Ontario, but are not required. The following form is acceptable:

(Place and date)

The CRRL Secretary
Box 7009, Station E,
London, ON N5Y 4J9

We, the undersigned Full members residing in the Ontario 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 Canadiam Amateur Certificate or higher, and have been a CRRL Full member for a continuous term of two years at the time of nomination. Petitions will be received at the CRRL Headquarters office until 1600 EST 1986 December 05. If only one valid petition is received by that time, 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 before 1987 January 02. Returns will be counted after 1987 February 20. A Section Manager elected as a result of these procedures will begin a two-year term of office on 1987 April 01.

If no valid petition is received, the Ontario Section will be resolicited in 1987 April *QST.*

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

Harry MacLean, VE3GRO
CRRL Secretary

(continued on page 72)

YL News and Views

Conducted By Joan Gibson, KG1F
RR 1, Box 1465, Waterbury, VT 05676

YLISSB Gathers in Seattle for Annual Convention

June is the month for members of the YL International Sideband System to meet the persons behind the familiar voices as well as to be reunited with old friends. This year's annual convention, under the direction of KU7F, Flo Reitzel, was held June 26 through June 29 in Seattle, Washington at the Edgewater Inn. Months of meticulous planning were required for the success of the YLISSB convention, "but it was worth it and I wouldn't hesitate to do it again," says Flo.

Members and their families came from all parts of the US as well as DX countries. Two of the earliest arrivals were DX stations HB9ARC and TG9EP, and by Monday more members had arrived to enjoy Seattle's blue skies during a day of sightseeing. VE7DAD hosted a wine and cheese party for the registrants, and on Thursday, the 25th, more members had arrived in time to take an all day cruise to Victoria, British Columbia on the *Princess Marguerite*. The amateurs and families were met in Victoria by VE7DCZ and his wife, Mary, who assisted the group in their tour of the city.

Friday was official registration day, and a total of 96 members came for the reunion and warm, social reception. Other DX members who were fortunate to make the journey to Seattle included J37AH, HA5DW, LA8PF, KH6QI, VE3KVB, VE5WF and VE7FW.

Friday evening, many of the group assembled at Pier 56 to board the *Goodtime* for a narrated cruise to Blake Island Tillicum Village. Depending on your taste and interests, the highlight of the evening was either the dinner of salmon cooked over an alder fire, or an Indian dance in which the participants wore wooden masks rather than the traditional feather headdresses.

The business meeting was held Saturday morning, and in the afternoon the group was entertained with slide shows brought by DX stations. Countries featured were the Bahamas, Peru, Galapagos Islands, Iraq and Austria.

WAØAVW flashes a proud smile as he watches his XYL, Marilyn, receive her special trophy in recognition of her many years of service to YLISSB through the management of The Boutique.

DX membership registration was well represented by HB9ARC (left) and VE7DAD. Greta traveled across the Atlantic Ocean from Switzerland, and Gloria skipped across the channel from Victoria, BC.

After many months of planning, KU7E and KU7F can now relax and enjoy the activities of the YLISSB convention, held in hometown Seattle. *(KB9OC photo)*

YLISSB members had an extra surprise by the visit of Bill Bennett, W7PHO, of DX and the Family Hour fame. For many of the members who check into the Family Hour on 14.227, this was their first chance to meet Bill. Also present were K7LAY and ARRL Northwestern Division Director Mary Lewis, W7QGP.

Thoughout the convention, members had a chance to purchase items from The Boutique, a YLISSB tradition that for many years has been supervised and directed by Marilyn White, XYL of WAØAVW. Marilyn's outstanding contribution and efforts for YLISSB were rewarded this year at the Saturday banquet. YLISSB members presented her with a special trophy for her many years of service and contribution to the organization. Items for The Boutique come from the talents of members in the form of beautiful handcrafts, including quilts, afghans and jewelry. This year, two members designed and donated jewelry. The proceeds from the sale were designated for the YLISSB Scholarship fund. One lucky member went home with a pin and pendant designed by N9APE depicting the Torch of Friendship, the symbol of YLISSB.

The highlight of the convention was the awards banquet on Saturday night. During this gala evening, members take time to honor and thank colleagues for their special dedication and contribution to YLISSB. The Rigel Trophy is given each year to System control stations and/or assistants in recognition and appreciation for their outstanding efforts. This year's recipients of the Rigel Trophy, YLISSB's most prestigious award, were WAØAVW, W7GUR, WA7MOK and WB2RWT. The Top Hat Award, begun by Dr Fred, WØUUE and now administered in his memory by J37AH, went to W7GUR and WB2RWT for their continued dedicated service to the System.

The morning after the banquet, the amateurs met again for breakfast, and then reluctantly packed their luggage and traveled homeward. It will be another year before Sidebanders meet in person again, but they left Seattle knowing that keeping in touch is a matter of dialing to 14.332, the official gathering place of the YL International Sideband System. [For more information about YLISSB membership, activities and award program, send a business-size SASE to WA1KVC.—Ed.]

This year's YLISSB President, N7YL, presides at the business meeting. A longtime member of the System, Jan Weaver devotes much time and energy to the running of the YLISSB.

IARU News

Conducted By Richard L. Baldwin, W1RU
HC 60, Box 60, Waldoboro, ME 04572

What Is the IARU?

Okay, so for the past couple of months we've beguiled you with a bunch of pictures—some of distinguished delegates and visitors, others of some pretty girls. Now, it's time for more words and fewer pictures. What we'd like to do this month is to tell you briefly (honest!) what IARU is.

Well, first we have to point out (although you *know* all this) that in many—no, in most—countries there is a national Amateur Radio society organized to serve the amateurs in that country. And so we have the American Radio Relay League, the Canadian Radio Relay League, the Japan Amateur Radio League, the Radio Society of Great Britain, the Radio Club of Argentina, the Wireless Institute of Australia, and so on. There are at least 125 of these national societies, each of them representing the national interests of radio amateurs in its own country. But there are more than national interests involved in Amateur Radio. There are international interests, and to address these the national Amateur Radio societies are banded together in the International Amateur Radio Union, the IARU.

Each of these national societies is a member not only of the IARU itself, but also of the regional IARU organization that represents that particular part of the world. Why are there three regional organizations? Well, we decided to mimic the International Telecommunication Union. Why does the ITU have the world split into three regions? For purposes of frequency allocation. In the earlier days of international radio regulation, the demand for frequency allocations was light enough so that it was possible to have a single allocations table for the entire world. But as communications grew and the number of users multiplied, frequency allocation became far more complicated, and it became necessary to share in the allocation of the spectrum. The way to more efficient sharing of the spectrum lay in making use of the vagaries of radio propagation, recognizing that allocations made to users in, say, Europe and Africa could be reused (shared) in the Americas and again in the Orient and Oceania without causing interference. This breaking up of the world into three regions because of the technical characteristics of radio propagation created, eventually, the three IARU Regions. Region 1 is comprised, broadly, of Europe and Africa; Region 2 is comprised of the Americas; and Region 3 is the rest of the world, ie, the Orient and Oceania.

IARU has a number of goals and objectives clearly spelled out in its Constitution. Over the period of the next several months, we're going to review these objectives and try to point out how each of them works to the advantage of Amateur Radio nationally and internationally. In other words, we're going to try and show you how IARU benefits *you*. (We won't hit you with this stuff *every* month, as occasionally we'll have some reports for you on current activities on the international scene, and some photographs.)

Right at the very beginning of the IARU Constitution, in Article 1, Section 2, it says as follows:

2. Its objectives [those of the IARU] shall be the protection, promotion, and advancement of the Amateur and Amateur-Satellite Services, especially within the framework of regulations established by the International Telecommunication Union, and to provide support to Member-Societies in the pursuit of these objectives at the national level, with special reference to the following:

a) representation of the interests of amateur radio at and between conferences and meetings of international telecommunications organizations;

b) encouragement of agreements between national amateur radio societies on matters of common interest;

c) enhancement of amateur radio as a means of technical self-training for young people;

d) promotion of technical and scientific investigations in the field of radiocommunication;

e) promotion of amateur radio as a means of providing relief in the event of natural disasters;

f) encouragement of international goodwill and friendship;

g) support of Member-Societies in developing amateur radio as a valuable national resource, particularly in developing countries;

h) development of amateur radio in those countries not represented by Member-Societies.

Faithful readers of this column (well, there must be *some*body!) will recognize that these objectives have previously been treated in some detail. On the other hand, there have been hundreds, if not thousands, of new readers of *QST* in the past year or so, new readers who may not previously have had an opportunity to learn about IARU. And even if you've read all this stuff before, it bears repetition so that you'll have a better understanding of how Amateur Radio works out its problems and achieves cooperation on an international basis.

QTC. QRX.

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	May 1986, p 48	November Sweepstakes Rules	Oct 1986, p 90
Club Challenge for the '80s Rules	Sep 1986, p 58	Novice-Enhancement NPRM	Jun 1986, p 49
Club Contest Rules	Jan 1986, p 94	OSCAR 10 Band Plan	Jul 1986, p 27
DX Contest Awards Program	Feb 1986, p 83	QSL Bureaus Incoming	Jun 1986, p 56
Frequency/Mode Allocations	Jan 1986, p 62	Outgoing	Sep 1986, p 73
Golden Jubilee of DXCC Award	Sep 1986, p 60	Reciprocal-Operation Agreements	Jun 1986, p 52
Hamfest Calendar Rules	Sep 1986, p 84	Spread-Spectrum Rules	Apr 1986, p 45
License-Renewal Information	Jan 1986, p 62	Third-Party-Traffic Agreements	Jun 1986, p 52
Major ARRL Operating Events and Conventions—1986	Jan 1986, p 61	10th ARRL International EME Competition Rules	Sep 1986, p 100
MARS Information	Jul 1985, p 46	902-MHz Interim Band Plan	Jan 1986, p 74

Hamfest Calendar

Administered By Bernice Dunn, KA1KXQ
Convention Program Manager

Attention: The deadline for receipt of items for this column is the 5th of the second month preceding publication date. Hamfest information is accurate as of our deadline; contact sponsor for possible late changes. For those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.

Alabama (Opelika)—Dec 5: The Society for the Promotion of ARC will sponsor their Auction at the Lee County Fairgrounds on Hwy 431. First in, first sold. Opens 7 PM, sale at 7:30 PM. Consignment donation 10% on all items. Bring your consignment items by the "bag or truckload." For more information, call 205-745-2838.

†Florida (Ft Lauderdale)—Nov 8-9: The Broward ARC will sponsor their Broward Hamfest 9 AM-5 PM Sat and 9 AM-4 PM Sun. Admission $4.50 in advance, $5 at the door. Activities include dealers, swap tables, forums, seminars, hands-on live demonstrations. Talk-in on 146.31/91 and 146.52, 449.825 (444.825 input). For more info, contact Jim Lorah, 2407 Flamingo La, Ft Lauderdale, FL 33312, tel 305-584-7822.

Illinois (Grayslake)—Nov 2: The Civil Air Patrol is sponsoring their Hamfest at the Lake County Fairgrounds on Rtes 45 and 120. Gates open 7 AM until you leave. Large, indoor heated building supplied with a cafeteria. Admission $3; tables $5. Dealers welcome. For more information and table reservations, send SASE to CAP, 637 Emerald St, Mundelein, IL 60060.

†Indiana (Ft Wayne)—Nov 9: The Allen County Amateur Radio Technical Society will sponsor their 14th annual hamfest 8 AM-4 PM. Admission $3.50 in advance, $4 at the door; 11 and under free. Activities include ARRL forums, packet radio, AMSAT, women's activities and flower-arranging demonstration. Talk-in on 146.28/88. Parking $1. For more information and reservations, write to Hamfest Chairman, PO Box 10342, Ft Wayne, IN 46851. No reservations will be accepted by phone! For information only, call 219-485-0164 (6 PM-10 PM EST).

Michigan (Hazel Park)—Dec 7: The Hazel Park ARC will hold its 21st annual Swap & Shop at the Hazel Park High School, 23400 Hughes, north of 9-mile, west of Dequinder. Admission is $2 in advance, $3 at the door; under 11 free. Tables $1 per ft. Plenty of free parking. Talk-in on 146.52. For tickets and table reservations, write to HPARC, PO Box 368, Hazel Park, MI 48030.

Michigan (Oak Park)—Nov 30: The Oak Park High School Electronics Club presents the 17th annual Swap & Shop at the Oak Park High School. Donation $2. Tables $8 per 8 ft. Refreshments available. For more info, contact Oak Park High School, 13701 Oak Park Blvd, Oak Park, MI 48237.

Minnesota (Faribault)—Dec 6: The Annual HANDI-HAM Winter Hamfest will be held at the Eagles Club. Registration starts at 9 AM. Activities include an equipment auction, dinner at 12 PM and program. Talk-in on 146.19/79. For more info, contact Don Franz, WØFIT, 1114 Frank Ave, Albert Lea, MN 56007.

Missouri (Grandview)—Oct 26: The Southside ARC will hold its annual hamfest at the Grandview Senior High School 9 AM-5 PM. Amateur exams for the Novice through Extra will be given 9:30 AM. Send 610 Form plus $1 to Rick McLeod, 1603 Richmond, Pleasant Hill, MO 64080. Talk-in on 147.72/12. For more info, write to SSARC, PO Box 412, Grandview, MO 64030, tel 816-987-3936.

New Jersey (Orange)—Nov 16: The West Orange Repeater Club will sponsor their hamfest at the Orange Elks Club, 475 Main St 9 AM-3 PM. Doors open 7 AM for sellers. Admission is $2.75 in advance, $3 at door. Refreshments available. Talk-in on 224.80 (223.20 input) and 146.55. Dealers tables are $10 in advance, $12 at door. For more info, call Mike or Rob at 201-674-0507 anytime.

†Ohio (Massillon)—Nov 16: The Massillon ARC will sponsor Auction Fest 86 at the Massillon KFC hall, off Rte 21, 8 AM-5 PM. Sellers setup 7 AM. Admission is $3.50 in advance, $4 at door. Many tables available at $7 per 8-ft space. Refreshments available along with a sit-down dinner. Plenty of free parking. Auction starts at 11 AM. Talk-in on 147.78/18. For advance reservations and information, SASE to MARC, PO Box 73, Massillon, OH 44646.

Ontario (Newmarket)—Nov 8: The York Region ARC invites you to the 10th edition of The Newmarket Fleamarket at Huron Heights Secondary School from 9 AM-3 PM. Admission $3; under 12 free. Doors open 6:30 AM to vendors and 9 AM for the public. Tables $5 and must be reserved in advance. To reserve tables, contact Geoffrey Smith, VE3KCE, 7 Johnson Rd, Aurora, ON L4G 2A3, or call 416-727-6672 after 6:30 PM. The York Region Board of Education has a No Smoking policy, so all smoking must be done outside. Refreshments available. Talk-in on 146.52 and 147.825/225. Seminars begin at 4 PM at St Andrews College, 300 Yonge St N, Aurora, ON, about a 10-minute drive from the flea-market site. Following the seminar there will be a banquet at the College. For information and reservations about the banquet, contact Evan Herriott, VE3IND, 8 Lindal Ave, Scarborough, ON M1L 1W8, or call 416-757-4284 after 4:30 PM.

Pennsylvania (Sellersville)—Nov 2: The RF Hill ARC will conduct its 11th annual Hamfest at the Pennsylvania National Guard Armory, Rte 152. Doors open 6 AM for dealer setup and 8 AM for buyers. Refreshments available on site. Admission is $4 per ham with accompaning non-ham spouse and children free. Dealer space is $8 per 8 ft wide by 6 ft deep inside and $6 per 8 ft frontage outside. Dealers must provide their own tables. Talk-in on 145.31 (144.71 input), 146.28/88 and 146.52. To reserve space, contact Frank Benner, W3BRU at 215-257-2450 or write to Hamfest Chairman, RF Hill ARC, 523 Vine St, Perkasie, PA 18944.

Wisconsin (Milwaukee)—Nov 15: The Milwaukee Repeater Club is proud to sponsor the 2nd annual "6.91 Friendly Fest" 8 AM-1 PM (sellers admitted at 7 AM). Located at the Eagles Club, 24th and Wisconsin Ave. Food and beverages available. Free parking. Talk-in on 146.31/91 and 146.52. Tickets $3. Tables (4 ft) are $4. Send SASE with payment to The Milwaukee Repeater Club, PO Box 2123, Milwaukee, WI 53201 before November 8 and save $1 off the admission or table price. For more info, call 414-444-4589 (24-hr answering machine).

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

Coming Conventions

November 7-8
Nevada State, Las Vegas

November 16
Illinois State, Rockford

1987

February 7-8
Florida State, Miami

March 13-15
Southeastern Division, Orlando, Florida

March 20-21
Michigan State, Muskegon

March 28-29
Nebraska State, Kearney

ARRL NATIONAL CONVENTIONS

July 10-12, 1987—Atlanta, Georgia

July 21-24, 1988—Portland, Oregon

ILLINOIS STATE CONVENTION

November 16, Rockford

The Rockford ARA and Experimental ARS are co-sponsoring the Illinois State 1986 ARRL Convention in conjunction with the Ham Fest/Computer Fair at Forest Hills Lodge, 9900 Forest Hills Rd. ARRL speakers, discussion groups plus VE on a first-come, first-served basis. Plenty of free parking and ground-level entry. Tables (8 ft with 2 chairs) are $5. Commercial booths available. Excellent food on premises. Tickets are $3 in advance, $4 at the door. Doors open 9 AM-3 PM. Flea-market doors open at 8 AM for exhibitors. Talk-in on 146.01. Easy entry from I-90 or Illinois 251. Send SASE for tickets and tables to Gary Hilker, K9LJN, 804 Otto Rd, Rockford, IL 61111, or call 815-654-3282.

Affiliated Clubs in Action

WHERE THE ACTION IS

Why do Amateur Radio clubs exist? Why do groups of hams gather together? Some folks try to claim that ham clubs aren't needed. Yet, in the past three months, the ARRL has affiliated 20 new clubs, two-thirds of which included more than a couple of dozen members.

Many Signs of Life

What are you hams up to? Something is going on, obviously, or the Club Services Department at ARRL HQ wouldn't be up to its windowsills in Annual Reports from clubs. You must be doing lots of things right—in the past 12 months alone, over 3000 would-be hams have contacted HQ's Club Services Department for information about becoming ham radio operators. Many of them mentioned that *you* told them to contact Newington for more information.

The contents of our mail sacks reveal that a few pamphlets and books from ARRL HQ are rarely enough to turn an interested prospective ham into a full-fledged Amateur Radio operator. *You* made that transformation happen. We have a large stack of ham course registrations to prove that you've been busy introducing people to our hobby and preparing them for license exams. Likewise, the ARRL/VEC's records prove that radio clubs are the mainstay of the Volunteer Examiner Program's success, and *QST*'s Public Service column is filled each month with impressive stories of ham club members serving their communities during communications emergencies and other times of need.

Picture This

Take a look at our featured photo this month, and you'll see one club's fine effort to bring ham radio to the school kids of their town. The Montrose (Colorado) ARC made sure that Amateur Radio was presented as a part of the school district's "Super Saturday" hobby fair. Each of the two-dozen kids who saw the Amateur Radio demonstration was given a QSL card by a club member who was willing to be "on call" to answer questions and help the aspiring ham start right. That's commitment—going the extra mile to help others.

Decades ago, clubs existed for the exchange of technical information. But they also existed for social exchange between persons who shared a common interest in radio. (Has much changed in all of these years?)

Your club also provides the warm bodies and gear necessary to conduct various communications operations connected with anything from walkathons to tornado chasing. If you read any book about radio history, you'll see hams there in the thick of many communications emergencies from the earliest days.

Resolved: Give Credit Where Due

Ham clubs aren't the only game in town, but when emergency communications are needed, an organized group of hams who already know each other can provide a wealth of community service. Our aim is to use this column to recognize ham clubs and the things they do to help make Amateur Radio exciting and useful. We can't take you out to dinner as a reward for all your hard work, but we can give you a well-deserved pat on the back.

Just as radio clubs serve the needs of many, we're taking a hard look at how this column can benefit the most people. We welcome your suggestions.

A NEW HAND ON THE HELM

We now have a new Club Program Manager, Lee Hayford, AH2W, came to HQ from Michigan last spring by way of a two-year teaching assignment on Guam. Lee has been licensed since 1969 and holds a bachelor's degree in communications. Lee assumed the position of Club Program Manager on August 21, transferring into the Club Services Department from the HQ DXCC desk.—*Curt Holsopple, K9CH, Club Services Department Manager* QST

The Montrose (Colorado) ARC demonstrated ham radio to school children, giving each student an "Elmer" to call on if more help is needed later. Eight club members participated, including (adults, l-r) Ike Topliss, W7XG, Hal Reid, KJØJ, and John Wieder, WAØJYJ.

Volunteer Examiner Information

from the ARRL/VEC, 225 Main St, Newington, CT 06111

Locating A Test Session: Sessions are advertised publicly via local Amateur Radio club newsletters and repeaters. A printout of sessions in any state and some overseas locations is available from ARRL HQ for an SASE. We list ARRL/VEC sessions plus those of other VECs who inform us of their testing schedules.

Registering to Take an ARRL-Coordinated Test: A completed FCC Form 610 application and a check or money order for the test fee, payable to the "ARRL/VEC," should be sent to the local VE Team where you intend to be tested. "Walk-in" candidates may be allowed at some sessions, but registering in advance helps. If you write to a VE Team, send an SASE to cover postage and handling.

Test Fee: For ARRL-coordinated sessions held during calendar 1986, the test fee is $4.25, payable to "ARRL/VEC." This fee is to cover expenses incurred by administering examinations. A check or money order is preferred.

What to Bring to the Session: Bring the *original* plus a photocopy of your current FCC-issued Amateur Radio license, and the *original* plus a copy of any temporary upgrade certificate issued by a VE Team less than 1 year prior to the test date. (Duplicates of lost licenses are available through the FCC's Gettysburg office.) Also bring two forms of positive identification (including a photo ID, if possible) and at least two pencils and a pen. Scratch paper and answer sheets are provided.

Calculators: Nonprogrammable and "scientific" calculators are welcome. Pocket computers that store words are not allowed. Programmable calculators will be allowed only at the discretion of the VE Teams; be prepared to demonstrate that the memories have been cleared.

Exam Format: Written element exams are four-choice multiple-answer tests. A score of 74% or more is required to pass a written element exam. Most VECs assemble tests based on the ARRL-issued multiple-choice question pool. Code test transmissions are played from an audio tape prepared by the ARRL/VEC with message contents similar in format to an Amateur Radio QSO. The code test is "fill-in-the-blank" style and may be passed by answering at least 7 out of 10 comprehension questions correctly *or* by copying on paper at least one continuous minute of perfect copy from the code test transmission. The ARRL/VEC does not require a code sending test, based on the FCC's recommendation. Code tests may be copied on typewriters, but prior arrangement with the VE Team is required so that other candidates are not disturbed.

Question Pool	*Revised by FCC*	*ARRL/VEC Tests Change(d)*
Element 2 (Novice)	Jul 1985	Jan 1, 1986
Element 3 (Tech/Gen)	Oct 1985	Apr 1, 1986
Element 4A (Advanced)	Jan 1986	Jul 1, 1986
Element 4B (Extra)	Apr 1986	Oct 1, 1986

ARRL/VEC Retest Policy: A candidate who fails a written element and who has exhausted all code test possibilities at a session may not be retested during that same session. If a convention or ham-fest test session schedules multiple sittings, a failed candidate may request that the VE Team retest him or her at a subsequent sitting. Retesting is allowed *if* the VE Team has a *different* test version available and the VE Team determines that it has the time and resources available to accommodate the retest. A candidate for retest is required to pay another test fee, and may be required to complete a fresh application Form 610 at the Team's request.

Special Tests: Candidates who require special assistance, materials or equipment because of physical disability must attach to the application a signed and dated physician's statement certifying the nature of the disability, plus a letter explaining what special assistance, materials and/or equipment must be used to conduct the examination. (See Section 97.26[g] of the FCC Rules.) Be sure to notify the VE Team well in advance so that special arrangements can be made. If Braille or tape-recorded written tests or special-pitch code tapes are needed, contact the ARRL/VEC at least one month in advance to ensure materials will be available. Further questions about testing persons with disabilities should be addressed to the ARRL Program for the Disabled at HQ.

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

Operating the Flying Mailbox: FO-12 Mode JD

In the June 1986 column, we introduced JAS-1. With its successful launch on August 12 and the commencement of operations shortly thereafter, JAS-1 has become Fuji-OSCAR 12, or FO-12.

Last month, we traced the excitement accompanying FO-12's birth. Literally thousands of QSOs have since occurred on FO-12's Mode JA transponder. It's a linear transponder best suited for SSB and CW QSOs. Soon, however, FO-12's Mode JD digital transponder will be placed on line.

This month, we'll look at how to operate Mode JD's electronic mailbox. The following was adapted by Tom Clark, W3IWI, to whom we are indebted. Frequencies for Mode JD were provided in the June column.

FO-12 Telemetry Data Format

JAS-1 FF YY/MM/DD HH:MM:SS

```
xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx xxx xxx xxx xxx
xxx xxx xxx xxx xxx xxx xxx yyy yyy yyy
sss sss sss sss sss sss sss sss sss sss
```

FF: = Frame Identifier RA: Realtime Telemetry (ASCII)
RB: Realtime Telemetry (Binary)
SA: Stored Telemetry (ASCII)
SB: Stored Telemetry (Binary)
M0: Message -0
M1: Message -1
. . . . . .
M9: Message -9

YY/MM/DD = Date

HH:MM:SS = Time (UTC)

(Following is valid only for RA and SA frames)

xxx = 000-999 Format: 3 digit decimal (Analog Data) 27 samples in row 0 column 0 through row 2 column 6 (denoted #00-#26 below)

y = 0-F One byte Hex (System Status Data) 9 samples in row 2 column 7 through row 2 column 9 (denoted #27a-#29c below)

s = 0 or 1 Binary Status Data 30 samples in row 3 through row 3 column 9 (denoted #30a-#39c below)

FO-12 Telemetry Calibration Equations

Channel	*Item*	*Equation*	*Units*
#00	Total Solar Array Current	1.91 * (N − 4)	mA
#01	Battery Charge/Discharge	3.81 * (N − 264)	mA
#02	Battery Voltage	N * 0.0210	V
#03	Half-Battery Voltage	N * 0.00937	V
#04	Bus Voltage	N * 0.0192	V
#05	+5 V Regulator Voltage	N * 0.00572	V
#06	−5 V Regulator Voltage	N * −0.00572	V
#07	+10 V Regulator Voltage	N * 0.0116	V
#08	JTA Power Output	5.1 * (N − 158)	mW
#09	JTD Power Output	5.4 * (N − 116)	mW
#10	Calibration Voltage #2	N / 500	V
#11	Offset Voltage #1	N / 500	V
#12	Battery Temperature	0.139 * (689 − N)	Deg C
#13	JTD Temperature	0.139 * (689 − N)	Deg C
#14	Baseplate Temperature #1	0.139 * (689 − N)	Deg C
#15	Baseplate Temperature #2	0.139 * (689 − N)	Deg C
#16	Baseplate Temperature #3	0.139 * (689 − N)	Deg C
#17	Baseplate Temperature #4	0.139 * (689 − N)	Deg C
#18	Temperature Calibration #1	N / 500	V
#19	Offset Voltage #2	N / 500	V
#20	Facet Temperature #1	0.38 * (N − 684)	Deg C
#21	Facet Temperature #2	0.38 * (N − 684)	Deg C
#22	Facet Temperature #3	0.38 * (N − 690)	Deg C
#23	Facet Temperature #4	0.38 * (N − 683)	Deg C
#24	Facet Temperature #5	0.38 * (N − 689)	Deg C
#25	Temperature Calibration #2	N / 500	V
#26	Temperature Calibration #3	N / 500	V

FO-12 System Status Telemetry Bytes

Channel	*Item*		
#27a	Spare (TBD)	#28c	Memory Unit #0 error count
#27b	Spare (TBD)	#29a	Memory Unit #1 error count
#27c	Spare (TBD)	#29b	Memory Unit #2 error count
#28a	Spare (TBD)	#29c	Memory Unit #3 error count
#28b	Spare (TBD)		

FO-12 Binary Status Data Points

Channel	*Item*	1	0
#30a	JTA Power	On	Off
#30b	JTD Power	On	Off
#30c	JTA Beacon	PSK	CW
#31a	UVC Status	On	Off
#31b	UVC Level	1	2
#31c	Main Relay	On	Off
#32a	Engineering Data #1	—	—
#32b	Battery Status	Tric	Full
#32c	Battery Logic	Tric	Full
#33a	Engineering Data #2	—	—
#33b	PCU Status Bit 1 (LSB)		
#33c	PCU Status Bit 2 (MSB)		
#34a	Memory Unit #0	On	Off
#34b	Memory Unit #1	On	Off
#34c	Memory Unit #2	On	Off
#35a	Memory Unit #3	On	Off
#35b	Memory Select Bit 1 (LSB)		
#35c	Memory Select Bit 2 (MSB)		
#36a	Engineering Data #3	—	—
#36b	Engineering Data #4	—	—
#36c	Computer Power	On	Off
#37a	Engineering Data #5	—	—
#37b	Solar Panel #1	Lit	Dark
#37c	Solar Panel #2	Lit	Dark
#38a	Solar Panel #3	Lit	Dark
#38b	Solar Panel #4	Lit	Dark
#38c	Solar Panel #5	Lit	Dark
#39a	Engineering Data #6	—	—
#39b	CW Beacon Source	CPU	TLM
#39c	Engineering Data #7	—	—

Example:

```
FO-12 RA 86/08/01 09:00:00
500  xxxxxx xxx xxx xxx xxx  xxx xxx xxx
xxx  xxxxxx xxx xxx xxx xxx  xxx xxx xxx
xxx  xxxxxx xxx xxx xxx xxx  000 004 yyy
01s  sss sss sss sss sss sss  sss sss sss
```

Real time ASCII frame sent on 86/08/01 at 09:00:00 UTC

Total Solar Array Current = 947 mA
Memory Unit #0 error count = 4
JTA power Off
JTD power On

FO-12 Packet BBS User Interface Information

Mailbox Commands (Basic users training)
(WØRLI/WA7MBL equivalences added by W3IWI)

1. Summary

1.1 Available Commands

F: List files addressed to ALL or to current user
H: Help
K: Kill file(s)
M: List file(s) to/from current user
R: Read file(s)
W: Write file

1.2 Command Syntax

The general format is: <a command letter> <space> <argument>. At least one blank is required between <a command letter> and <argument>.

2. Command Prompt

FO-12 Mailbox supplies a prompt "JAS>" with no CR nor LF to indicate that the system is ready to accept a command from the user. A user can "type ahead" commands while FO-12 is sending messages or data to the user. FO-12 will execute the commands in the waiting queue later.

3. Commands

3.1 The "F" Command

F = FILES. Shows the latest 10 files the first time it is entered during a session. Subsequent 'F' commands will list the next 10 active files (messages). A message posted to multiple users has "*" in its 'To:' destination field. See also the "M" command described below. (The WØRLI/WA7MBL equivalent command is LL 10 the first time you send an "F".)

Example:

```
JAS>F
NO. DATE FROM TO SUBJECT
117  10/12  F8ZS ALL ARSENE update
116  10/12  DL3AH ALL Abgleichanleitung
115  10/12   W3KH ALL Dish Design Specs
```

(continued on page 57)

Silent Keys

Administered By Nancy A. Slipski

It is with deep regret that we record the passing of these amateurs:

W1ALA, N. Henry Larson, Sarasota, FL
K1AYE, Frank E. James, Natick, MA
W1BPM, Thomas R. Dunn, Scarborough, ME
KA1BWL, James W. McCluskey, Jay, ME
W1DAS, Burton H. Austin, Ellsworth, ME
W1DPV, Robert C. Franson, Iron Station, NC
W1DSD, Carl W. Smith, Waltham, MA
WB1EVF, Arthur N. Rosengrant, Manchester, CT
WA1FLG, William M. Mitchell, Bucksport, ME
KA1FNJ, Roderick W. MacKenzie, Littleton, NH
W1FZI, Richard E. Bliven, Osterville, MA
W1GFJ, Arnold O. Woodward, Oakland, ME
W1IDR, Norman Davis, Dedham, MA
WA1JGJ, George W. Later, Greenville, ME
W1JHK, Louis G. Massey, Greenfield, MA
W1JMA, Nathan A. Hallenstein, Wellesley Hills, MA
W1JRI, Joseph A. Meshako, East Haven, CT
W1JRM, Fergus P. Lea, Portland, ME
W1KBQ, Richard C. Arnold, Haverhill, MA
W1KLY, C. H. Hastings, Groton, MA
K1KO, T. E. Hopkins, East Orleans, MA
KA1LUY, Charles Stroup, Brookfield, CT
W1OMX, Berton E. Romine, North Pembroke, MA
W1PM, Andrew Malashuk, Stamford, CT
K1PWG, Marguerite Holden, Ashland, ME
K1QES, Donald W. Morgan, Laconia, NH
W1RBO, F. Carlton Perkins, Windsor, CT
W1RTB, Nell F. Waterman, Easton, CT
W1TDK, G. Myron Kimball, Fryeburg, ME
WA1WVB, Alice G. Cataldi, Groton, CT
N2AM, Arthur F. Miller, Avalon, NJ
W2AXI, Bertram C. Wohlafka, Rio Rancho, NM
N2BQK, Nathan Borsuk, Brooklyn, NY
W2CA, Harold P. Westman, Middletown, NY
WB2EAF, Clifford G. Fick, Schenectady, NY
WA2FHO, Edward F. Fabiszewski, Cherry Hill, NJ
N2FZH, Curtis R. Damm, Cranford, NJ
K2HHJ, Albert F. Roche, Harrisville, WV
W2ISI, Andrew J. Graham, Stony Brook, NY
K2JOJ, Leonard S. Corey, Victor, NY
WB2LNY, James F. Herkimer, Caledonia, NY
W2LXE, John S. Tylee, Joppa, MD
KA2NNI, George J. Quinn, City Island, NY
W2NVW, Donald L. Moon, New York, NY
N2PB, Sherburn M. Becker, Little Silver, NJ
WA2PJH, Richard T. Dick, River Edge, NJ
K2QBL, Kenneth G. Butts, Maryland, NY
W2QQD, Francis J. Bruce, East Quogue, NY
*N2RE, Rose E. Bills, Pennsville, NJ
KA2RWN, Wilbert V. Jacobsen, Lake Havasu City, AZ
W2SOQ, Harold D. Davie, Hornell, NY
K2SPD, John G. Mussall, Knapp Creek, NY
WA2TOB, Dominic De Filippo, Schenectady, NY
WB2UUS, Herbert A. Greene, FPO Miami
*WA2YDG, Robert G. Babcock, Watervliet, NY
W2YZA, George M. Deegan, Corning, NY
W3BDK, Melvin W. Lehman, Chesapeake Beach, MD
K3BUR, Irvin P. Buck, Baltimore, MD
W3CJA, Edward J. Casey, Springfield, PA
*K3CVM, Fred H. Jones, York, PA
KA3DHC, Richard E. McCullough, Grove City, PA
K3EVR, Francis K. Mikesell, Monroeville, PA
N3GN, Richard N. Coan, Aberdeen, MD
KC3GW, Robert E. Weil, Pompano Beach, FL
*W3IMJ, Frank L. Swaim, Damascus, MD
W3LOD, Harold L. Passenger, Oil City, PA
KA3NKF, Clarence E. Baker, Somerset, PA
W3PZX, Joshua Batt, Wingate, PA
W3RWW, Albert M. Magagna, Ellicott City, MD
*K3VBD, Taylor D. Ames, Baltimore, MD
K3WJT, Lee C. Main, West Alexander, PA
WA3YZW, Henry Ford, Bethel Park, PA
K4AJ, Robert L. Stewart, Ocala, FL
N4ANZ, Willard C. Chinn, Miami, FL
W4ARU, Walter J. Holzman, Marietta, GA
KB4BSJ, Nelson F. Naylor, Alexandria, VA
W4CBU, James M. Welch, Kingsport, TN
W4CSY, Leonard M. Garriott, Nashville, TN
K4DCU, Keith F. Cooper, Greensboro, NC
WD4DGU, Ralph W. Clemons, Chattanooga, TN
KP4DR, Valentin Torres-Velez, Rio Piedras, PR
*WB4DTS, Rev. Donald S. Walch, Jacksonville, FL
KF4DV, Edmund J. Chaffee, Palm Harbor, FL
N4DYS, Russell W. Haworth, Colorado Springs, CO
N4EZH, Gabriel Tirado Lopez, Temple Terrace, FL
WB4FER, Diane B. Gillespie, Greenville, SC
W4FQS, Walter H. Sturdivant, Hartwell, GA
WB4FXY, John A. Conroy, Murfreesboro, TN
K4GHG, Ronald C. Smith, Jacksonville, FL
N4GUF, Edward E. Cava, Miami, FL
KD4HD, Harry L. Post, Lantana, FL
W4HUK, John O. Sandefur, Hickory Withe, TN
W4IMF, Robert L. Lindsey, Plant City, FL
WA4IRY, John W. McSwain, Memphis, TN
WA4JBK, Cordell H. Winfree, Watertown, TN
WG4J, Wallace R. Anderson, Tavernier, FL
N4JZT, Chet Klug, West Palm Beach, FL
W4KE, William J. Keating, Senoia, GA
W4KIL, Frederick H. Powell, Jr, Sarasota, FL
W4KO, Glenn E. Roof, North Miami, FL
WA4KTD, Robert L. Clark, Des Plaines, IL
*W4LHB, John B. J. Glanzman, Montross, VA
W4LKS, David Anderson, Pompano Beach, FL
K4MD, Harvey B. Savage, Jr, Coconut Creek, FL
KA4MER, James R. Hilton, Tampa, FL
N4MTY, William P. Stiegmann, Virginia Beach, VA
K4OQQ, Waldo S. LaFon, Ashland, KY
K4PEX, Gerry Wisler, Lorton, VA
W4PVG, Wendell D. Wilhide, Florence, AL
WA4RBY, Buckner Miller, Campbellsville, KY
W4UMW, Raymond F. Adams, Rock Hill, SC
WA4UVW, Steve Hantz, Lake City, FL
WB4VFG, Jack W. McGill, Knoxville, TN
WB4VFJ, Faye C. Hopson, Knoxville, TN
W4WW, Kenneth P. Roberts, Jr, Suffolk, VA
W4YCL, Herbert N. Ludwig, North Fort Myers, FL
W4YLU, Russell A. Gray, Burlington, NC
W4YPX, Ronald J. Locke, Jacksonville, FL
W4YVG, John R. Stewart, Chesapeake, VA
W4YYP, Sanford J. Ozburn, Tampa, FL
KA4YYT, John H. Moore, Orlando, FL
*K4ZEY, Frank C. Ziglar, Raleigh, NC
KF4ZF, Gunther O. Peters, Largo, FL
*WB5ACC, Paul J. Roch, New Orleans, LA
W5DG, Dee L. Gould, Houston, TX
WA5DRO, Joe M. Fooshee, Austin, TX
WD5ISH, Jimmie Q. Phillips, Moore, OK
K5JKR, James D. Verret, Houma, LA
KA5MPR, William A. Kaltenback, Jasper, TX
WA5NDK, Joseph A. Denton, Jr, San Antonio, TX
W5QIK, Julius J. May, SJ, New Orleans, LA
KA5QZB, Charlie Moore, Dallas, TX
K5QZS, Leon J. Breedlove, Baton Rouge, LA
W5RGX, Roger J. Chaffin, Albuquerque, NM
W5RLM, Bryan Hall, DeKalb, TX
W5SK, Willie C. Murphey, Guthrie, OK
W5TMM, Donald J. Morris, Oklahoma City, OK
W5UQV, Carl F. Cupp, Hattiesburg, MS
K5WJI, G. David Ford, LaMarque, TX
*WA6AQQ, Robert L. Bright, Northridge, CA
K6BGO, Victor D. Davis, Coalinga, CA
W6CHL, Arthur L. Martini, Auburn, CA
K6CUF, Salvadore A. Lask, Lancaster, CA
WA6DEA, Fred S. Duke, Porterville, CA
WB6EBW, Walter B. McMenamy, Los Angeles, CA
K6EKT, Ernest A. Tavares, Sun Valley, CA
W6FFN, Charles N. Fisher, Covina, CA
W6FGP, Roy A. Borgerson, Daly City, CA
KA6FNJ, David D. Muir, Van Nuys, CA
WD6FVF, Donald Spiva, Vallejo, CA
KB6FY, Kenneth J. Hedstrom, Sacramento, CA
KA6GBC, Joseph R. Smith, Petaluma, CA
NH6G, Roger H. Parker, Honolulu, HI
W6JBL, John Mullin, Fresno, CA
N6KET, William B. Meyers, Santa Maria, CA
KE6KM, M. John Rowe, Jr, Long Beach, CA
W6LWL, Joseph Adams, Palmdale, CA
N6MCS, Helen Stokes, Redwood Valley, CA
KB6OB, Arthur C. Grupe, El Cajon, CA
K6PDE, Charles A. Strobel, Arnold, CA
WB6PGF, Pauline E. McCafferty, Wofford Hts, CA
K6QOM, Gene Reynolds, Palo Alto, CA
W6RHN, John C. Brown, Jr, Corona Del Mar, CA
W6RON, Mark L. Stephens, Campbell, CA
W6RW, Roger D. Mace, Los Angeles, CA
WA6UCP, Foster N. Lockwood, Santa Rosa, CA
K6VPF, Le Roy P. Wallick, Sr, Paradise, CA
*WA6ZHA, Harold D. Seielstad, Corte Madera, CA
WA6Z, D. R. Stephenson, Madera, CA
W7AXE, Charles S. Hofstatter, Seattle, WA
W7BEG, Charles Thurston, Medford, OR
K7BH, Wallace F. Keller, Sandy, UT
W7CAR, Irving Meredith, Hillsboro, NH
W7CCI, George R. Himes, Hillsboro, OR
W7CY, Raymond R. King, Spokane, WA
W7DZX, John T. Kane, Wenatchee, WA
KE7ES, Wesely J. Drummond, Anderson Island, WA
W7ETZ, John B. Ellenwood, Virginia Beach, VA
W7GAD, Victor McClelland, Centralia, WA
W7GJU, Lloyd F. Jordan, Tumwater, WA
N7GOT, Frank H. Smith, Boise, ID
N7HAR, Everett Eastman, Lebanon, OR
N7HCF, Robert P. Sharpley, Olympia, WA
KC7HR, Marshall P. Dorman, LaConner, WA
KS7I, William A. Connor, Olympia, WA
W7KIH, Hal E. Teegarden, Phoenix, AZ
K7KVS, David B. Blalock, Manzanita, OR
KB7LL, William Hosmer, Scottsdale, AZ
K7LLQ, Ronald D. White, Spokane, WA
KA7LNE, Helen R. Swearingen, Port Townsend, WA
W7MYC, Irvine C. Graham, Meacham, OR
K7ONZ, LaVern H. Robson, Everson, WA
WB7PJF, Larry Greenwald, Mesa, AZ
K7QOQ, Dan Benson, Camano Island, WA
WB7RLE, Milford F. Dinner, Pearce, AZ
W7ZAW, Edward G. Wainwright, Port Townsend, WA
W8AYS, Charles J. Scott, Chardon, OH
W8BJP, E. A. Wenzel, Ann Arbor, MI
KA8BMO, Dennis D. Holt, Newton Falls, OH
K8CEP, Homer W. Carlson, Cridersville, OH
KA8CJZ, Donald D. Newman, Canton, OH
KA8CQB, Edward N. Fellows, Las Vegas, NV
W8CR, Paul M. Regn, Peninsula, OH
K8DKG, John M. Westcott, Springfield, OH
*W8DSN, Paul F. Braden, Fort Lauderdale, FL
WD8DYT, Keith Conrad, Toledo, OH
WD8EMY, Larry Baker, Wheeling, WV
W8FJE, Taulbee P. Mountz, Jr, Dayton, OH
N8GCZ, Samuel W. Enterline, Canfield, OH
WA8HSS, William D. Anderson, Amherst, OH
WA8IEF, Andrew Borsch, Jacobsburg, OH
WA8IPG, Walter M. Vandecar, Carleton, MI
W8IUM, James B. Rogers, Mount Gilead, OH
KA8JNC, Jonathon Van Putten, Davisburg, MI
W8JSK, Orson C. Curtis, Jackson, MI
WD8LMW, W. Henry Garrison, Wellington, OH
N8LN, Leonard P. Nocerini, Iron River, MI
W8MAK, Charles R. Moss, Lyndhurst, OH
W8OSS, William R. Stuart, Mt Clemens, MI
W8PTF, Hyde E. "Rube" Ruble, Dayton, OH
KA8VDM, Norman W. Schiefelbein, Berea, OH
W8VUI, Fredrick J. Looft, Jr, Fairview Park, OH
W8YFX, John C. Schneider, Wheeling, WV
K9APT, William B. Ferguson, West Lafayette, IN
K9ATD, Clinton Keedy, Varna, IL
W9CCD, Herbert J. Parish, Milwaukee, WI
W9EAS, Charles Alborn, Barrington, IL
W9EIU, Joseph A. Westerlund, Green Bay, WI
KA9GOW, Donald J. Wade, Wautoma, WI
KD9JW, Lester J. Doeden, Linden, IN
WA9KEQ, Louis Mallory, Bloomington, IL
W9LQC, Thorvald C. Nelson, Hudson, WI
W9NGS, Harold D. Trosper, Indianapolis, IN
W9NHG, Harold E. Strothmann, Milwaukee, WI
W9OEC, George William Pierce, Cornell, WI
WB9OYX, William A. Thomas, Chicago, IL
K9UWN, Jack B. Stuman, Rockford, IL
WA9VOB, Sterling M. Pelton, Pembroke Pine, FL
W9WZO, Ralph B. Netzley, Naperville, IL
K9ZCT, Ralph R. Minkler, Phoenix, AZ
W9ZXZ, Mary Madden, Ingleside, IL
*NØAQZ, Edward W. Maxwell, Aurora, MO
KØBLP, Irving B. Wilcox, Holton, KS
WDØCRP, Lewis J. Stibal, St Louis, MO
KØDYI, Virgil J. Eddy, Grimes, IA
WØEKD, Robert A. Hawley, Denver, CO
KØELG, Harold Cunningham, Sikeston, MO
NØFHB, Warren H. Schafer, Scottsbluff, NE
KCØFR, Irvin E. Koelling, Lilburn, GA
WØGAS, Emil Darges, Ord, NE
WØHN, Ray E. Bolin, Ballwin, MO
WØIJ, Lowell M. Divinia, Wichita, KS
WBØISG, Richard Goetz, Peidmont, MO
KØJDK, Alvin H. Butler, Webster City, IA
KAØNLV, William B. Rogers, Independence, MO
KAØNUS, Gene Lamphear, St Charles, MO
*WAØRCY, Wilmer J. Thaemert, Sylvan Grove, KS
*WBØRYP, Carl R. Gardner, Jr, Arlington, TX
WØSP, James M. Benjamin, Manhattan, KS
KØUAZ, Ed B. Berglund, St Paul, MN
WØUCK, George F. Schmidt, St Louis, MO
KØUOZ, Helen V. Van Cleve, Amenia, ND
WØVDJ, Max E. Femmer, Denver, CO
WØVHE, Robert Packer, Waite Park, MN
WBØWMA, John Duke, Omaha, NE
KØWRL, Glenn C. Cox, Pueblo, CO
VE3IYY, Mary M. Drummond, Brampton, ON
VE3LZ, Joseph Goodier, Seeleys Bay, ON
VE4CK, George Anderson, Point Du Bois, MB
VE4PA, Lyall H. McDermid, Dauphin, MB
VE7FSB, Sherman Barbank, Sooke, BC
VE7GDD, Garth Drakeley, Lantzville, BC
VE7ZI, Herbert Tetz Ginther, Chilliwack, BC
Y21DC, Carl B. Rothe, Waren, East Germany
VK3IY, A. P. Thornton, North Balwyn, Victoria, Australia
ON4NC, Christian J. Nolf, Melle, Belgium
YV5BOI, Jesus Reina Morales, Caracas, Venezuela
VP9AN, Harvey Gilbert, Somerset, Bermuda

*Life Member, ARRL

50 Years Ago

November 1936

☐ Tired of meaningless "R9-plus" reports, W4ES suggests individual calibration of an indicating meter with a shunt so that only a few of the really strong signals will "pin" the needle.

☐ Separate high-power 'phone and c.w. transmitters, each with its own antenna, for each band 80 through 10, well describes W1CCZ on Cape Cod. We're envious, yes, but also can get some good ideas from the extensive description.

☐ For some years, Technical Editor Jim Lamb has been concerned that single-tone heterodyne reception is hard on the ears and monotonous to the brain—facts borne out by earlier scientific tests. He proposes a "heterotone" system where the incoming signal acquires a pair of sidebands in the i.f. amplifier and arrives at the second detector as a complex wave.

☐ W2BRO continues his summary of uses for the new 6E5 "magic eye" tube—for transmitter adjustment, as a modulation meter, and a visual tuning indicator.

☐ George Grammer says we hams often try new antenna setups purely on speculation, hoping to be lucky and put out a stronger signal, rather than first checking theory to see whether improvement is likely. He claims reliability for charts of field strength with various heights and lengths of horizontal antennas, at several vertical angles.

☐ The League announces a new *Map of the World*, six colors in a modified azimuthal projection, to show distance and beam direction from the U.S. to any part of the world. National and district prefixes are shown, along with a "standard" countries list. Price: $1.25 postpaid.

☐ Associate Editor Ross Hull, along with W1SZ and W1JPE, wax enthusiastic over rhombic antennas they have tried, despite "haywire" through tree branches, variance in height, and similar diversions from the norm. Communication with Australia, e.g., is solid for an unbelievable 19 hours out of 24. The authors recommend cancelling that order for two half-kilowatt bottles and putting up a diamond instead!

☐ A two-band 6L6 tri-tet rig is designed by W1JPE to be effective for portable and emergency work as well as at home.

☐ RCA has gone the 6L6 one better by revamping physical construction to make it more suitable for r.f. transmitting applications; it is called the 807.

☐ No longer a grueling week, the Sweepstakes this year will occupy two November weekends, where you can enter either voice or c.w., but not operate more than 40 hours out of the 66-hour period.

25 Years Ago

November 1961

☐ Yippee! Nominal approval by the several Government agencies concerned has now been received for an imminent launch of the OSCAR amateur satellite—piggy-backing on an Air Force missile.

☐ How successful will it be? K2QBW adds to much satellite material previously in *QST* by dealing with noise sources and the all-important signal-to-noise ratio.

☐ A transmit-receive switch for RTTY work is not as simple as for other modes, and W4ISM points out the differences along with a control system circuit.

☐ More than 13,000 participants manned 3,000-plus rigs in the 1961 Field Day fracas. Favorable media coverage of amateur emergency preparation was a bonus.

☐ Then the real thing. Massive flash floods struck West Virginia in July, and with the AREC organization at the core, amateurs did a yeoman job of providing vital links for and between a number of relief agencies.

☐ Charting path loss vs. distance on each of our bands above 50 Mc., K2LMG shows us how to make reasonably reliable predictions on potential DX. Of course, items such as antenna gain, power, receiver sensitivity, etc., must be factored in.

☐ W1HDQ says the craze for "40 dB over S9" type of reports has spread to v.h.f. operators. He points out how ridiculous some of our reporting procedures are, the inconsistencies of manufactured receiver S-meter calibrations, and how you can calibrate your own on a sensible basis.

☐ Letters to the Editor applaud the League's stand against license fees for amateurs.

☐ No motor vehicles allowed—you have to use your feet in the European-type foxhunts. This calls for small, lightweight, shock and waterproof receivers. Both 80 and 2 meters are used.

☐ Mounting 20/40-meter beams on a split level house is no easy task, but W3YZI did it and shows us just how—including pacifying the XYL.

☐ W1ICP's wide-range transmatch uses a capacitor divider for smooth variation of loading adjustments and for simplifying band switching.

☐ For the ultimate in convenience, K9LKA has separate grounded-grid linears for 10 through 80 meters, but the design ideas can be useful to us single-banders as well.

☐ The League has requested the Commission to ease requirements for log-keeping while mobile, primarily to discard specific contact times for each station worked. The aim is better safety while driving; the amateur can later fill in the individual calls and times of beginning and ending mobile activity, rather than a time for each contact.

☐ The Federal Communications Commission is attempting to enforce our rules on all fronts. Recent license suspensions came from (1) use of profane language, (2) a Technician operating in the 10-meter band, and (3) moving and failing to apply for modification of license within the required period.

☐ W6ISQ gives us a good laugh with his tale of the ham who intended to make an all-out effort in the Sweepstakes—and suddenly discovered he missed the entire first weekend.—*W1RW*

FM/RPT

(continued from page 59)

service requirements. The cost of constantly updating equipment and personnel requirements cannot always be met by municipalities. Yet, public service events, parades, walkathons and floods, hurricanes, earthquakes, nuclear power plant drills and other emergencies (large or small) find the amateurs proudly there!

Amateur repeater site problems, particularly in flatland and large metropolitan areas, are increasing. In cities such as Richmond, buildings, water tanks, towers and other structures sprout antennas like porcupine quills. Sites, if available, are generally at high commercial cost.

If you have a site—private, business or governmental—you would like to make available for amateur use, please make it known. It will provide a real service to your community and nation. (Jim Fitzgerald, K4OJE, from *The CVRA-SERA Repeater Journal*)

REPEATER LOG

According to July 1986 reports received, repeaters were involved in the following public-service events: 331 vehicle emergencies, 33 medical emergencies, 23 fire emergencies, 21 weather emergencies, 13 drills/alerts, 12 public-safety events, 5 power failures, 3 criminal activities and 3 search-and-rescues.

The following repeaters were involved (followed by the number of events): W1DGW 13, W2UL 43, W2ZWP 3, W4BVW 4, W4CUE 13, WD4JWO 10, W4SWF 3, K4TQR 3, WU4Z 5, W6BJY 4, W6FNO 313, W6NBJ 11, K8DDG 7, W8MVE 12.

On Line

(continued from page 58)

2211-2206 chip set) that plugs into the Commodore. The modem board contains provisions for a watchdog timer and a PTT relay. The computer powers the PTT circuit to ensure that a transmitter is not activated when the computer is turned off.

The software portion of the package, which is on disk, emulates the function of a TNC. Written by Chris Mills, VK4BCM, it supports AX.25 and has a user interface similar to WA8DED's for the TNC 1. There are about 25 of these packages on the air now providing a very economical way into packet radio for someone who has a Commodore 64. (Barry White, VK2AAB, AAPRA, 59 Westbrook Ave, Wahroonga, NSW 2076)

PX: Computer-Aided Antenna Design

Designing, building and testing antennas is a popular Amateur Radio pastime. To help you design your next antenna are the following five computer programs.

Program 135: Design antenna-matching sections with this BASIC program by Jack Johnson, KC9A.

Program 136: Design a duo-band loaded vertical antenna using this Commodore 64 BASIC program by Warren Dion, N1BBH.

Program 137: Marion Ryder, N1AIE, modified AF4K's BASIC antenna-length-calculator program for the TRS-80 Color Computer and a Star SG10 printer.

Program 138: Design an inverted wire dipole antenna with a BASIC TRS-80 Model III program written by Henry Leggette, WD4Q.

Program 139: WD4Q also wrote a BASIC TRS-80 Model III program for designing helical antennas.

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members can send their SASEs to CRRL, PO Box 7009, Stn E, London, ON N5Y 4J9). Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

A list of all 139 programs in the PX library is also available by sending a business-size SASE with 22 cents postage to ARRL, Dept PX, 225 Main St, Newington, CT 06111.

Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

Amateurs Lead Miamisburg through the Thick of Phosphorous Fog

The emergency plan that emerged from the Monsanto Amateur Radio Association (MARA) was put to a test on a sweltering, hot summer day when a toxic, white phosphorous cloud drifted over the city. That was a day that residents of Miamisburg, Ohio, and surrounding communities will not soon forget.

At 4:38 PM on July 8, 1986, a train derailed on the west-side tracks of Miamisburg, Ohio. Among the derailed cars was a tanker car containing 12,000 gallons of toxic, white phosphorous. The tanker car was dragged close to a full mile, coming to rest south of the Bear Creek bridge and in the process was punctured. As the white phosphorous vapor and oxygen in the air met, it ignited spontaneously, which sent white phosphorous clouds rising up to 15,000 feet into the air over the city.

White phosphorous clouds rise from the burning railroad tanker car.

MARA President Dennis McNeil, KA8QAY, was told of the derailment at 4:48 PM. He alerted Junior Hart, K8ZQQ, the Emergency Coordinator (EC) for the MARA club. Junior Hart contacted Sam Capper, WA8VIW, who was bicycle mobile, and sent him to the scene of the derailment, and K8ZQQ set off the emergency-communications pagers. By 4:58 PM, Lou Lang, W8KOO, was set up at the Miamisburg Police Department. Harold Honious, W8RJY, had assumed net-control station (NCS-1) and began to dispatch radio amateurs to posts as requested by the police and fire departments.

In short order, 40 of 42 (95%) MARA Amateur Radio operators had checked into the emergency net and were soon on their way to assigned posts or to the Police Department Central Dispatch Office to assist the police in evacuation of certain sectors of the city. By 9:30 PM, the danger sectors had been evacuated, and several sectors had been covered twice. The W8DYY emergency net continued to operate, and K8ZQQ began to put the emergency plan into full effect. When he contacted Ron Moorefield, W8ILC, District Emergency Coordinator, Ron was asked to set in motion a possible large area emergency for relief operators. Ron, in turn, contacted Ohio Section Manager Jeffery Maass, K8ND, and Ohio Section Emergency Coordinator, Larry Solak, WD8MPV, to apprise them of the situation.

The Dayton Amateur Radio Association, W8BI, was contacted for assistance. The W8BI van coordinators, John Kovacs, WB8EOL, David Morris, N8EEK, and James Orihood, WD8JCI, reported to the emergency net and were assigned to set up a net (NCS-2) on the secondary MARA repeater to take check-ins for relief shifts. They also handled the task of supplying operators for road blocks and other outposts. Radio amateurs coordinated food delivery to emergency-service personnel and volunteers. These operators were also scheduled and assigned by W8BI.

The Kettering Medical Center Amateur Radio Club EC, Bill White, WB4LAI, established a net-control station (NCS-3) on their repeater to assist in recruiting amateurs to assist in relief duty. June Stith, WB8UUH, assigned to Kettering Medical Center Emergency Room, kept the amateurs stationed at the Ladies Professional Golf Association Tournament in Kettering advised of the plume's course. The Miami Valley FM Associations's repeater was assigned to Frank Warnock, K8NLM, to operate NCS-4 between the Red Cross and all shelters.

A second and larger flare-up of the tanker car on Wednesday evening caused the Miamisburg Police Department to call for additional cruisers from the Dayton Police Department, the Kettering Police Department, the Montgomery County Sheriff's Department and police departments of nearby communities. The call included a request for 50 Amateur Radio operators. The patrolmen were not familiar with the streets of Miamisburg and required assistance. A radio amateur was dispatched with each patrolman to assist him in locating his particular sector to evacuate. The Dayton patrolmen could not communicate with the Miamisburg Police Department, thus the amateur network was able to provide this valuable communications link. The second evacuation went as smoothly as the first, although it covered more of the city.

Shelters were set up at the Miamisburg High School, Germantown High School, Jefferson Township High School, University of Dayton Arena and the Dayton Convention Center, to mention a few. It was estimated that the Red Cross shelters managed over 7000 evacuees. Radio amateurs provided needed communications between the Red Cross Chapters Director and the Red Cross vehicles handling supplies. It was often necessary to evacuate one shelter to another that was safe from the phosphorous plume, which changed direction with each wind change.

Steve Gibson, N8DNG (left), and Louie Merrill, WA8SPN, maintain contact with others at the scene of the train derailment and chemical spill. *(Curtis Cobbler photos)*

Mike Carter, WD8BSI, stationed at the command post, was often asked to ride with the Ohio State Highway Patrol helicopter to provide a reliable communications link to the Environmental Protection Agency and other key officials regarding the size and density of the phosphorous plume. Constant radio contact was also set up with WB8CQK at the National Weather Service in Vandalia. This proved to be a very vital key in assisting the city officials in planning the evacuations, location of shelters and location of the command post.

In addition, wind direction and wind speed were also received every 15 minutes from the Monsanto Atmospheric Release Advisory Capability (ARAC) direct to the emergency net. This information was quickly passed on

The Monsanto Amateur Radio Association operated from this command post to assist community-wide agencies in evacuation and disaster-relief efforts. WA8SPN (left) and N8DNG take their turn at the controls.

The fire, lasting for nearly four days, spread toxic smoke over Miamisburg, Ohio.

to the key officials. The officials were so reliant upon receiving updated information from ARAC, they often had a radio amateur beside them to avoid any delays.

The tanker car was set level on July 11 at the same time a thunderstorm passed overhead. This movement increased the burning area from approximately 20 feet to 60 feet, but the rain helped keep the plume low to the ground and diluted it as well. The coordination of setting the car level at exactly the right time was achieved with the constant contact with the SKYWARN Group, WB8CQK, and other operators between the site and the storm. Incoming weather information proved to be invaluable to the Miamisburg Fire Department command post as the area was in a severe-thunderstorm watch.

On Saturday, July 12, the fire finally subsided at 10 AM. The MARA emergency net was not released by the city officials until 7:29 PM that evening. This completed 99 hours of continous emergency net operation. A total of seven repeaters were used. There were often three amateur operators assigned to the command post and two or more to the Miamisburg Central Dispatch Office. In addition, amateurs were needed to assist out-of-town police patrolmen at the five roadblocks, three to six shelters, evacuation buses, four repeater net controls, and three to six shadows for key personnel. A total of 357 Amateur Radio operators volunteered their help, logging over 3520 hours of assistance to the city of Miamisburg, Ohio, and neighboring communities.

Much was learned and will be documented as time goes on. One fact stands out: Amateur Radio can provide vital communication services on short notice when needed, and should be a part of every city's emergency-preparedness team. There are few recorded instances where amateurs have been given as much responsibility and authority. To the operators' credit, requests were carried out almost flawlessly without exceeding their assigned responsibilities.

A letter of appreciation to the Monsanto Amateur Radio Association from Barbara C. Ellison, Assistant Vice President, Professional Services, Sycamore Hospital, stated "We really needed you. You responded professionally and graciously, and we are grateful." City of Miamisburg Mayor, Robert H. Mears, Sr, expressed his gratitude on behalf of the City of Miamisburg to all Amateur Radio operators on a well-organized and disciplined corps of communicators. According to Federal officials, this was the largest mass evacuation ever caused by a train accident.

The Monsanto Amateur Radio Association and Amateur Radio operators of neighboring communities have verified that HAM radio truly stands for "Helping All Mankind."—*William Frost, WD8DFP*

IN SERVICE...

☐ Pittsburgh, PA—May 30. The Allegheny County ARES was activated after heavy rains caused serious flooding. Anywhere from 1½ to 3 inches of rain fell in the period of 1 to 2 hours. Many areas were devastated as runoff from the hills carried brush and trees to compound the problems of the flood. Radio amateurs provided communications for the Red Cross in setting up emergency shelters on Friday evening.

On Saturday, the hams supported Red Cross as they provided emergency services, including food, cleaning supplies and medical treatment. Allegheny County radio amateurs were joined by operators from Beaver County and Ohio to assist search teams for survivors and fatalities of the disaster.—*William E. Kristoff, Jr, N3BPB, EC, Allegheny County*

☐ Torrance, CA—Jun 27-29. The South Coast Radio Amateur Network (SCRAN) provided communications for the California Special Olympics which was held at the UCLA Westwood Campus. Thirty-seven SCRAN members provided continuous communication at each of the 11 venues. A nerve center was established at the Track and Field venue to coordinate all the events as well as to dispatch celebrities to various game locations for presentation of ribbons and medals to the winners.—*Terry, KG6NA, and Bob DeLorenzo, KV6D*

☐ Lone Pine, CA—Jun 29-30. At 2100, N6JOY radioed WA6KZV from the summit of Mt Whitney to report that his hiking party planned to stay on the summit overnight because of icy conditions on the trail. WA6KZV phoned the parents of the four young people involved and informed them. That evening, N6JOY called again to say that hikers were feeling the effects of hypothermia in the 20-degree weather and light clothing. WA6KZV called the Inyo County Sheriff, who got in touch with the Mountain Search and Rescue Team (SAR) from Ridgecrest. At 0330, N6EXK accompanied the SAR Team to a base camp in Lone Pine to supply communications with N6JOY and WA6KZV. A helicopter rescued one of the four hikers and ground teams rescued the other three. KA6CIE and WB6VQY monitored the activity and helped where needed.—*Lloyd Brubaker, WA6KZV, EC Eastern Kern County*

☐ Victor, NY—Jul 8. At about 1100 UTC, a utility crew digging to set a power pole accidently severed an underground telephone cable. This disrupted telephone service to much of the town of Victor, which borders both Monroe and Ontario Counties in western New York. The Monroe County Fire dispatcher requested backup communications from the County Office of Emergency Preparedness. RACES/ARES EC WA2UGE dispatched NF2Z to the Fishers Volunteer Fire Department. Using a public-safety access feature of the N2JC 146.28/88 repeater, communications were established with the Ontario County Sheriff's Department and the Monroe County 911 Center. NF2Z remained at the scene until telephone service was restored at approximately 1715.—*Edwin J. Holdsworth, N2EH*

☐ Irving, TX—July 27. The eastern half of Irving lost its telephone service in the morning of July 27. Twenty-five members of the Irving Amateur Radio Club were summoned by city emergency-management coordinators. The radio amateurs were assigned to various areas of the city to patrol the streets and inform businesses of the situation. In addition, an operator stood by at a local nursing home in case an emergency situation came up. Radio amateurs received praise from the city's police, fire and community officials following the telephone emergency. —*Everett Dickey, KD5HE, EC, Irving, TX*

Field Organization Reports
August 1986

ARRL Section Emergency Coordinator Reports

Thirty SEC reports were received, denoting a total ARES membership of 17,506. Sections reporting were: AB, EMA, ENY, EPA, IA, IN, KS, LAX, ME, MDC, MI, MN, MO, NFL, NH, NLI, NNJ, OH, ONT, PAC, SC, SD, SDG, SFL, SK, SNJ, VA, WI, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	114	91.9	613	1213
TCC Central	80	86.0	276	626
TCC Pacific	109	87.9	474	897
Summary	303	88.6	1363	2733
Cycle Four				
TCC Eastern*	226	91.3	815	1570
TCC Central	54	87.1	266	593
TCC Pacific	106	85.4	124	543
Summary	772	97.9	1205	2709

*TCC Eastern operates both cycles 3 and 4.

TCC Roster

KK1A KA1AE N1BHH W1CE W1EFW K1EIR WA1FCD K1GRP WB1GXZ W1ISO KN1K W1NJM KT1Q W1QYY KA1T W1TN KW1U AK1W N2AKZ WB2EAG WA2FJJ W2FR W2GKZ NN2H KB2HM N2IC W2LWB KU2N W2RQ WA2SPL N2XJ W2YGW K2ZM W3ATQ N3COY KK3F WB3GZU W3OKN W3PQ KQ3T KB3UD AA4AT WA4CCK W4CKS N4EXQ WD4FTK N4GHI WB4HML WA4JDH W4JL WA4JTE WN4KKN WB4PNY WB4UHC K4WJR K4ZK N5AMK N5BB N5BT W5CTZ WB5CIC N5DFO W5GHP K5GM AE5I W5JOV AJ5K KD5KQ K5OAF KD5RC ND5T N5TC W5TFB K5TL W5TNT NX5V W5VMP KB5W NQ5W KV5X WB5YDD KU6D W6EOT W6INH K6LL WF6O W6VZT N7BHL KA7CPT W7EP KB7FE W7GHT NN7H W7JMH NK7K W7LG W7LYA KA7MUL KR7L K7OVK KF7R W7TGU W7VSE WB7WOW W8BO KA8CPS KD8G WD8LDY W8PMJ W8QHB N8XX WB8YDZ W8YP W9EHS KA9FEZ W9FC W9JUJ KA9RII WB9UYU AD0A KØDJ KA0EPY KØEZ WØHI NØIA KJØG WAØOYI KSØU VE3AWE VE3CYR VE3DCX VE3FAS VE3GSQ

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	942	29.30	.613	92.5	
CAN	31	641	20.70	.452	100.0	
PAN*	57	508	8.91	.479	91.9	
Region Nets						
1RN	62	490	7.90	.420	91.7	100.0
2RN	52	172	3.30	.245	63.5	90.3
3RN	31	196	6.30	.400	92.0	100.0
4RN	60	464	7.70	.321	74.4	100.0
RN5	62	674	10.87	.455	88.0	100.0
RN6	58	212	3.66	.350	100.0	100.0
RN7	62	415	6.70	.381	88.5	100.0
8RN	62	284	4.58	.230	84.0	100.0
9RN	62	282	5.00	.309	88.0	100.0
ECN						64.5
TEN	62	424	6.80	.397	86.0	100.0
TWN	55	248	4.61	.350	61.6	100.0
TCC						
TCC Eastern	114	1213				
TCC Central	80	626				
TCC Pacific	303	2733				
Cycle Three						
Area Net						
EAN	31	354	11.42	.482	84.9	
Region Net						
1RN	29	107	3.69	.340	81.0	96.7
2RN	30	237	7.90	.546	92.0	87.1
3RN	26	7	0.27	.049	57.7	93.5
4RN						80.6
8RN						58.0
ECN						93.5
Cycle Four						
Area Nets						
EAN	31	1501	48.40	1.259	96.7	
CAN	31	815	26.30	.898	100.0	
PAN	29	848	27.10	.776	94.8	
Region Nets						
1RN	62	423	7.70	.590	93.8	100.0
2RN	61	366	6.00	.466	84.3	83.8
3RN	62	235	3.79	.312	100.0	100.0
4RN	62	501	8.10	.340	100.0	100.0
RN5	62	651	10.50	.533	82.7	100.0
RN6	58	391	6.70	.480	94.0	96.5
RN7	62	320	5.20	.500	88.4	98.2
8RN						100.0
9RN	62	472	7.60	.520	95.2	100.0
TEN	59	242	4.10	.373	68.2	100.0
ECN	60	277	4.62	.472	57.8	96.7
TWN	61	218	3.57	.271	90.6	89.6
TCC						
TCC Eastern	226	1570				
TCC Central	54	593				
TCC Pacific	106	543				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AL, AR, AZ, DE, EPA, GA, IA, IL, IN, KS, KY, MDC, MN, MO, NC, ND, NFL, NH, NLI, NNJ, NTX, OH, ONT, OR, ORG, RI, SB, SC, SCV, SF, SFL, SJV, STX, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA.

Public Service Honor Roll

This listing is available to amateurs whose public-service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max 30; (2) Checking into phone/RTTY nets, 1 point each, max 30; (3) NCS CW nets, 3 points each, max 12; (4) NCS phone/RTTY nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public-service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

198 KK1A
169 WB2OWO
159 W7LRB
154 KK3F
153 K5CXP
144 KE8BE
140 KA3DLY
135 N4JRE
134 N4NLK
132 WB5SRX WB2IDS
130 KØZBJ W7VSE WD9DZU
126 KA9FFO
125 W8FPA
122 N5AMK
121 WA2SPL K5MXQ N4GHI
118 WX4H KB4WT
116 WB2IKL
115 W2MTA NC9T
114 N1DMU
113 KT1Q
112 AA4AT N8EFB KJ9L
111 KAØEPY KD7ME W0IKT
110 N3DPF ND2S WB7WOW
109 W9YCV KA8TIK
108 KA2MYJ KA9RII AG9G
107 WD4KBW
106 W3FA WB8KWC NQ2H AA4MP
105 N3EMD VE4AJE WB4HRR
N2XJ WD8LDY
104 N7FXJ KA4TLC K2YQK
103 W9JUJ VE7BNI WF6O WA2FJJ WØOYH WB8RFB
102 W3YVQ KA2UBD WB8JGW W4ANK
101 WA4JDH N7BHL KD2UV WA4CCK N4EXQ K4JST N8HBI
100 WB6DOB WD5GKH
99 WAØTFC K4ZK W2PKY
98 KØSI W9CBE NJ8R
97 WA6ZUD AA4JV
N3AZW WD8KQC
96 W4CKS N4KSO WB2VUK N9BDL W9FZW
95 KA1GWE
93 WA4PFK KJ3E N3EGF KA2DQA
92 WB1CBP NOØA W9EHS
91 AA4HT WD6BZQ WB1HIH WB4WII K8UQY
90 W6VOM VE3DPO KØGP N3COY NR8C K2ZVI N6AWH
89 KT9I W4PIM N1CPX KA5SPT
88 WA1JVV
K3RXK KA8KHS AA4UO
87 K4MOG K4VWK
86 W9DM W7GHT KE7MO NN2H
85 K5OAF KJ9J W5CTZ
84 KC4VK AJ5K
83 AE1T AE5I N8EVC AC5Z
82 KA7AID
81 W5VMP NE2W KC2TF KI4YV K9CNP KA4MTX
80 N6CVF W4JWO KA1LMR WB5YDD WD8RHU
79 W6INH N2FKA WA4RUE K2YAI WB8SIW
78 KD4KK
77 WA6WJZ WA7VTD K5EVI KA8CPS WB8SYA
76 N7BGW WB6QBZ NF8B
75 WA4RNP WA6QCA N1AKS
74 NØCLS KQ3T WB3ANC KD8WI
73 W7LNE KU2N
72 WDØGUF KB4LB KC3Y KF8J W9NXG N8GJO
71 KØERM NG2T KA4FZI NJ4L
70 WB9PFZ KB9LT KP4DJ
69 VE2FMQ W5KLV WB2QMP
W4FMZ N8AHA WD8OUO
68 WD8KBW KA8TNT NØGCC N7GGJ
67 WF4Y VE3GSQ KF4FG W4JLS
66 NTØC K6UXO K8JDI W4TYU K4ZN
65 KA4GUS KA4YHS W7JMH K8ND N1EDD WB5FQU WB5EPA
64 KAØODQ N4PL KØPCK WA3GYW NK8B KA1KTH N2DXP K3HXC
63 AIØO NS7C VE4IX KB4JPN W2FR KB4BZA
62 K3JL
VE3CYR VE3WM WB2NLU/T W2ZOJ WA4LJI KB4PW KC8IJZ WA2VJL W7LG WA8DHB
61 K6APW N1DHT WBØWNJ K9ZBM W4HON WD4OCW N8FWA WA4MNR KA4BCM
60 KAØFSM KDØNH WB9ZQE N6HYM WA4EYU WB3CLW KA1HPO/T W2GJ NN4I W1RWG
56 N2EVG/T N4KRA/T
52 N6FWG/T
48 KA7RFD/T
46 N4MMM/T
45 W1YOL/T KA8GZY/T
42 KA2SJG/N

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	730	797	1226	98	2851
WB9YPY	0	687	52	477	1216
W8TO	585	0	585	0	1170
KK3F	2	527	467	60	1056
W3VR	275	266	370	21	932
WA4JDH	0	440	438	0	878
VE3FAS	0	445	418	0	863
W9JUJ	1	392	384	2	779
N3AZW	10	354	329	43	736
WF6O	1	334	294	2	631
KW1U	—	—	—	—	615
N4GHI	50	275	259	20	604
KA8KHS	13	278	272	29	592
N4EXQ	20	239	270	37	566
WB2IDS	145	167	198	48	554
WA3DFU	277	0	277	0	554
WX4H	0	265	245	13	523
VE3GSQ	4	252	247	8	511

BPL for 100 or more originations plus deliveries:

VE3CNE	376
N4EDH	152
WB2OWO	147
KB8QT	139
KJ4JE	131
KK1A	116
KE8BE	101

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	57	143	157
Central Gulf Coast Hurricane Net	31	146	2860
Clearing House Net	31	352	385
Early Bird Net	31	630	301
Empire Slow Speed Net	31	67	367
Golden Bear Amateur Radio Net	31	193	1796
Hit and Bounce Net	31	239	569
IMRA	30	759	1509
Mission Trail Net	31	105	742
NYSPTEN	31	62	585
Southwest Traffic Net	31	217	1329
West Coast Slow Speed Net	31	76	415
20ISSBN	27	539	280
75 Meter Interstate SB Net	969	341	31
7290 Traffic Net	47	564	2415

How's DX?

(continued from page 53)

MORE OF THE CIRCUIT

☐ **JA3YKC/T32:** JH4RHF, JH4WER, JI3ERV and JK3GRR operated /T32 before and after the CQ WPX SSB using their own calls /T32 and JA3YKC/T32 during the contest, totaling 6500 two-ways in all. Cards via JH4RHF.

☐ **Volunteers:** KA6SAR would like to be a QSL manager. Mike Baker, 2421 S Olive, Santa Ana, CA 92707.

☐ **ZS5IV/ZS6CDZ/ZS6XS:** Cards now go via Ron Poloske, KA1ERN, Berry Hill Rd, Hooksett, NH 03104.

☐ **4A1HC/2:** The 48-hour May 23-25 contest operation from Juarez, Mexico netted 2200 contacts, 80-10 CW; cards via AA5B only.

☐ **C3Ø:** During 3-and-a-half days of operation from Andorra, five hams from Germany made over 7500 two-ways using CEØs BAX CEA LDM LDN CSA. Cards for any of these calls go to Stefan Radtke, Mainstrasse 29, D-2805, Stuhr 2, Fed Rep of Germany.

☐ **Complete DXer:** After reading W9KNI's book, formerly anti-DXer KC9EJ has become excited about DXing and hopes to make it with his wires and barefoot rig, applying diligence and patience.

☐ **NCDXC:** Last month the Northern California DX Club was 40 years old. To commemorate this event, the board of directors enacted a 40-year award (free of charge) to hams *outside* the USA (KH6, KL7 are eligible) who work 40 NCDXC members (Oct 10, 1986-Oct 10, 1987). Proof of contact required; include an alphabetical list with date/time (Z) accompanied by cards to NCDXC, Box 608, Menlo Park, CA 94026, USA.

☐ **DX Convention:** NCDXC will also be sponsoring the 1987 DX Convention at the Grosvenor Hotel in Visalia, CA (formerly Holiday Inn), next Apr 3-5. Reserve *now* to assure a convenient room. Call the hotel directly at 209-651-5000. Additional info will appear herein as available from Publicity Chairmen W6GO/K6HHD.

☐ **FG/FS/VP2E:** WA4TLI and AA4VK should be just about finished with their 3-island cruise/DXpedition. Cards go via Bert Carter, WA4TLI, 1006 Reedy Creek Rd, Cary, NC 27511.

☐ **9H3DX:** DF2UU worked 13,000 (6000 USA) from Malta. QSL (new address) via Peter Hans, Hardbergstr 8, D-7550 Rastatt, Fed Rep of Germany.

☐ **BY5RA:** KB6MGT proudly reports snagging this station at 0630Z on 14050.5 MHz; op "Lin."

☐ **ZL6A:** This special commemorative station celebrated the 60th anniversary of the NZART mid-August, in New Plymouth. Cards via the bureau.

☐ **Botswana:** Commemorating the early fall 20th anniversary of the independence of the Republic of Botswana; full license holders were eligible to use 8O2 in place of A22, and novice 8OØ, in lieu of A24.

☐ **7P8CM:** Martin left 7P land mid-September, after almost 4 years of continuous HF and satellite operation. All cards for him should now go via his home call G4GFI and no longer via the Lesotho QSL Bureau. He notes that the only other resident active is 7P8CI, Gunter, who also provides an excellent service by running the 7P QSL Bureau.

☐ **KH9AC:** Bob (Wake Island) reports that his manager is WK6T.

☐ **GMØCFK:** Chris is now in Transvaal (ZS6), and hopes to be active from 3D6, 7P and C9. This is a permanent move for him, as he is now in charge of the world's largest and most technically advanced pulp machine. Bob Howe, K1MZB, will manage the QSLs.

☐ **LAØFH:** Dave Fox, KC3VU, will be in Norway operating under this call for a year while participating in the student exchange program. Cards for him go via WA3YJA.

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.

C3ØCAX (DL4VB)
EI8EM (W2ORA)
EJ5EP (ON5KL)
FM5CT (N7RO)
FOØASJ (N5DD)
FOØMIR (N5RM)
HL9CW (N4GNR)
HL9OB (N4GNR)
KG4XO GARC, POB FBPO, Norfolk, VA 23593
OD5AS (I5WVI)
OHØMD (OH2BH)
TKØP/SAN (F6EYS)
TK5UC (FC9UC)
TI2BEV (W4ZD)
T32AU (G4GED)
VKØSJ (WB6AFJ)
VP2MU (W2BIE) July 1986 only
VP2VCW (N6CW)
VP2VDH (N6CW)
VQ9ZZ (N4GNR)
VR6HIJL (G4AAL)
V44KAR (WB2LCH)
YM3KA POB 937, Izmir, Turkey
ZF9SV (VE7SV)
ZK1XP (G4AAL)
ZP5XDW (N4DW)
3CØA (TRØA)
4N3E (YU3HAM)
4X6TT (N4GNR)
5H3ZR (OH6ZR)
5T5SR (N4GNR)

QSL Manager Volunteers

WA2YMX
DL1HBT/KA9STS

Special Notes

☐ W3VW is no longer manager for 9Y4VU.

☐ KB3MC is no longer manager for LX1BI.

☐ WD5P is no longer manager for DUIDBT. Europeans may QSL via DJ8CV.

☐ QSL information for VP5Y was incorrect in July 1986 *QST*. The correct manager is N6EK.

☐ The ARRL Outgoing Service still has a number of KZ5 QSL cards, which was the Canal Zone call-sign prefix prior to Oct 1, 1979, before the prefix change to HP, when control of the canal reverted to Panama. If you wish to have these cards returned to you, please send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.

From left to right are 9J2JN (seated) with W6KG and W6QL during the Colvins visit to Zambia earlier this year. In the right photo, Lloyd is shown visiting Kanu, 9J2KL, in Lusaka.

Canadian NewsFronts

(continued from page 61)

NOTES FROM ALL OVER

☐ A reminder: ARRL no longer keeps CRRL membership records. If you have a change of address, please send it to CRRL, not ARRL. Two months' advance notice would be most appreciated. Give your call sign and the seven-digit number on your *QST* label, and please make certain that the spelling of your new address is clear.

☐ It appears that the appeal in the Jack Ravenscroft case will not be heard until the spring of next year. By press time, 1300 separate donors, many from the United States (Jack asked us to pass along a special "thanks" to you), and some from Australia, Finland, the Netherlands, Sweden and the United Kingdom had contributed $55,000 to the Jack Ravenscroft Susceptibility Defence Fund. The Canadian Association of Broadcasters and several Amateur Radio dealers were particularly generous. To date, $24,000 has been spent, and your donation is still needed. Please send it to the JRSD Fund, Box 8873, Ottawa, ON K1G 3J2.

☐ Many thanks to Dennis Pekrul, VE7CXN, who recently retired as Manager of the CRRL VE7 Incoming QSL Bureau. Best wishes to new Manager Alex Ivsic, VE7CNE, who is taking cards at the bureau's new address: 1107-7434 Kingsway, Burnaby, BC V3N 2B7.

☐ Finally, according to legal counsel for the City of Rossland, British Columbia, "Regulation of transmissions towers is wholly and exclusively within federal jurisdiction." That's good news for Ray Pichette, VE7ETG, whose application to erect a 12-metre antenna tower was held up because such a tower would exceed the 4-metre height restriction on "accessory building" in Rossland. In dealing with Rossland officials, Ray used support material provided by CRRL Counsel Bob Benson, QC, VE2VW. If you're ever in a similar situation, call CRRL. Bob and all your CRRL reps and workers are there to help.

Field Day 1986

How about using mosquito bites as a multiplier? That would easily push us over the 1-million-point mark.—*N7HTF*

By Michael B. Kaczynski, W1OD and Billy Lunt, KR1R
Contest Manager, ARRL HQ Assistant Contest Manager, ARRL HQ

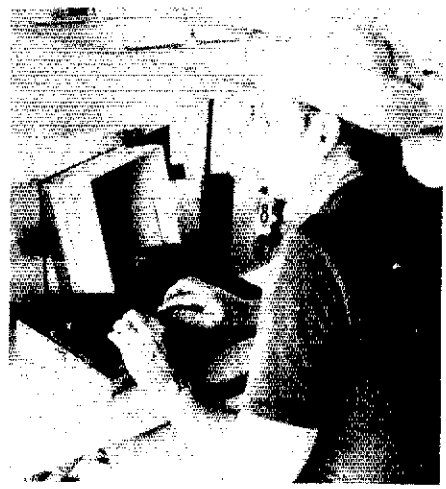
When taken slightly out of context, N7HTF's comments pretty well sum up Field Day 1986. Many more amateurs were bitten by the FD "bug" in 1986, with participation up by more than 200 entries from the 1985 event. This year, a total of 1697 entries were received as a result of the hottest activity in Amateur Radio.

Let's look at some numbers. A total of 25,449 participants were logged in by the ARRL Contest Desk. Over one million contacts were reported (1,146,881, to be exact) during the 27-hour FD period. The amateur fraternity scored very well in FD '86, to the tune of over 4 million points! Not bad for a "fun" time, eh?

Category 2A was again the most popular, with 515, or 30% of all entries. Battery power was utilized by 273 (16%) of the participants. In all, 1243 groups, over 73% used generator power. Only 166 groups relied on commercial power for their operations.

This year's W1AW Field Day bulletin announced bonus points for making 10 QSOs on 24 MHz. This proved to be a very productive bonus for many entrants, upping the bonus point total of this year's activity to 678,120.

We have listed comments from several groups below. Which category does your club's Field Day effort fall into? Your club didn't participate? Why not give it a try next year, on June 27-28? All you'll have is fun!



N6EXC at the packet keyboard of K6QEH, the HFEA ARC (3A).

Table 1
Entries Per FD Class

1A—249	11A— 2	1C — 24
2A—515	12A— 2	2C — 1
3A—292	13A— 1	1D —106
4A—127	15A— 1	2D — 9
5A— 66	19A— 1	3D — 1
6A— 26	23A— 2	4D — 1
7A— 16	1B1— 71	1E — 56
8A— 11	1B2— 60	2E — 8
9A— 4	2B2— 21	3E — 5
10A— 2		4E — 2

SOAPBOX

NRØR, 1A Battery

Enclosed you will find the entry from NRØR. Over the past few years, this same team has operated Field Day under the call sign WØRCZ.

As usual, there was another "operator" present that never seems to appear in the log, mainly because he doesn't have a license, Mr Murphy (he brought along all of his laws of physics). Murph did more operating at times than the licensed operators. Like when he "operated" by doing a little surgery on the belt for our only generator. Of course Murphy said "If anything can go wrong, it will, and it will go wrong in the worst possible way." The belt broke at 0900 UTC Sunday morning. Then there was the tribander that decided to go on the fritz just as things were heating up on Saturday afternoon. We also can't forget the display on the CRT monitor for the computer logger that wanted to jump up and down more than the S-meter did on 80 meters.

Some things did go well during the normal course of events: The barbequed chicken was the best thing that have hit these taste buds in quite some time. The rainmaker passed over and left things fairly livable overall. And, last, but certainly not least, we must pay tribute to our midnight visitors that climbed to the top of the lookout tower that supports our antennas. The couple, after being heard making unusual noises from atop the tower, were caught underneath a blanket enjoying the stars (both real and imagined, as it were).

It was a very satisfying Field Day for all involved. Thanks to those that took the time to pull out our 1-watt signal.

W6WJ, 2A

This was a first-time effort for the Lee De Forest Radio Club of Hemet, California. It was fun! Our 2A operation was on 40/75 meter SSB, 20-meter CW and 2-meter packet. Our Novice station operated on 10 meters.

We used a double zepp on 40, which was converted to a dipole on 75. A tuner was used on both bands. The 20-m antenna was a half-wave vertical. Packet used a pole-mounted ringo. We used a three-element beam on 10.

Individual power generators were used on each setup. In addition, the packet station was run off a heavy equipment battery that was charged from one of the generators.

Shelters consisted of a motor home at each of the operating positions. Awnings were extended, refrigerators were full, and facilities were immediately available. We were located in a county park with plenty of space available for antenna construction. Our site was accessible to the public and we had several curious visitors.

The only glitch in the whole operation was an inadvertent simulated rain shower from the park lawn sprinkler system which halted the 40-m operation for a time very early Sunday morning. We also found out how bad a perfectly good CW fist can get after a long layoff. Wait 'til next year!

K5QHK 1A

This was a landmark for Amateur Radio in Snyder, Texas, as the 1986 Field Day was the first one to be held locally in about 25 years. The club had been inactive until October 1985, when we (re)organized. Although we didn't make a large number of contacts, we had very good participation from 75% of the active members. We tried just about all modes, and made contacts on all but satellite.

The neat thing about our Field Day operation was the location. We set up on an old 300-foot tower site near the small town of Fluvanna. From the tower, we hung two wire "v" beams that were primarily designed for 20 m, but were tunable to any band. The legs of the northwest beam were 397 feet long. Another beam was aimed at the East Coast. A trapped sloper was also set up. The beams really worked! On packet, a four-element beam and rotator were mounted 50 feet up the tower.

In our minds, our FD operation was a great success. The public relations that we received from our local radio station, KSNY, and our newspaper, the *Snyder Daily News*, made the town more aware of Amateur Radio and its use.

Thanks and keep up the good work!

N4BDH, 1A

This Field Day effort was a rather impromptu, last minute, last ditch procrastinator's delight. At our last club meeting, it was unanimously decided that there would be no Field Day effort this year. But there are always a few restless souls who won't let a sleeping dog lie. So as Dave, KA4OEY and I were laying final plans on our local 2-m repeater, we managed to draw a small crowd.

Dave located the spot, a campground in the middle of the "Great dismal swamp of

Chesapeake," a tent and a huge lead-acid battery for dc power. Norm, N4NGV, came through with some really fine antennas. I supplied a makeshift operating table. Jim, N4FZA, Dave, my two sons and I went out Friday evening and strung some antennas.

Saturday was a disaster! We were wiped out by thunderstorms until late in the evening. After getting zapped several times by lightning while trying to connect antennas, I decided to disconnect everything. Later that night, Norm came and salvaged what was left of the day by making a few contacts while I logged with a splitting headache. Every now and then we would have to dump the water off the canopy to keep it from drowning us. After a couple of hours, we decided to quit for the night.

My two small sons (ages 6 and 9) had been wanting to go "camping" for some time. That night, in a tent full of mosquitoes, was "real fun"! I spent until 3 AM swatting the bugs. Meanwhile, everyone but my sons and I had left.

Around 8 AM Sunday, as Dave and Norm began to get things going again, I ran my sons home and took a break. Norm had returned with a much needed ground rod on the second trip.

The huge battery held out stupendously. It never indicated any fatigue, according to the voltmeter used to monitor its output.

When I returned from home, Dave and Norm had things in good shape. The weather turned out to be fantastic, and things finally got rolling! We got somewhere between five and six good hours of operating a real Field Day. I did most of the logging, while Dave did most of the phone operating. Norm occasionally relieved Dave at the operating position, and managed to experiment with a couple of different antennas. All said and done, Sunday turned out to be a magnificent day! We learned what to do and what not to do next year. Thank you!

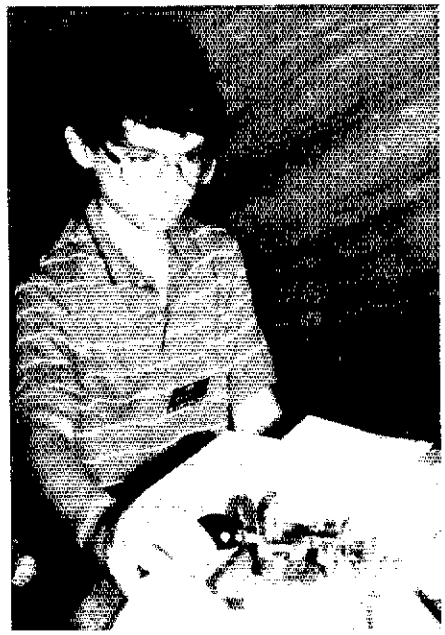
NØDJS, 3A

Our plan for this activity was to begin setup at 0800 local and go on the air at 1300 local and operate for 24 hours. However, 15 minutes prior to the station opening, there was a 2-car head-on collision. Immediately, members of our group activated a local two-meter autopatch and contacted the police. We had police and an aid vehicle on site within five minutes of the occurrence of the accident. In addition, members of our group provided radio-assisted traffic control for over an hour before the local authorities could take over. This was a major accident, which incurred three fatalities. There would have undoubtedly been secondary accidents had we not provided the assistance we did. The bottom line this year is that we all learned a lot, and once again proved the effectiveness of short-and long-range Amateur Radio communications.

KGØN, 5A

The Carver/Scott ARES and HTCSCARS began setup at 9 AM on June 28, at Carver Park Reserve, 15 miles west of Minneapolis and St Paul. The sky didn't look very promising, as it was cloudy and looked like rain could begin at any time. By 10:30, however, we noticed that it had suddenly cleared up and looked like it was going to be a perfect day.

We were to be class 5A again this year, but this year we had decided to use more wire antennas. This shortened the antenna and tower erection process considerably. A tribander for 10, 15 and 20 was installed on a 35-foot tower. The remainder of the antennas were various wire



Andy, KA3PGJ, at the Novice station of the Mid-Atlantic ARC, W3SC.

arrays and configurations we thought we would experiment with. Some interesting results were observed on 40-meter CW with a full-wave loop and on 80/75 meters with an end-fed random wire.

For power, we had a 3-kW diesel generator feeding three of the stations, with two gas-powered generators for the other stations. The VHF packet station was also run off the big generator (we made 11 contacts).

It was a great Field Day, with lots of interesting spectators looking on and asking questions. Amateur Radio also got a big boost in the arm from a local newspaper that did a front-page article on our operation. We are already making plans for next year!

K7TR, 4A

Approximately 60 members of the Scottsdale ARC and their families attended this year's Field Day. The weather was near perfect at the 6800-foot site near the town of Strawberry, Arizona on the Mongollon Rim. Temperatures ranged from a warm 85 degrees in the daytime to the low 40s at night. We even had a momentary sprinkle of rain early Sunday morning.

All stations were spaced around the periphery of an 800-foot circle clearing with tall pines around the edge and a natural 30- to 40-foot depression in the center where the two gasoline generators were located. This resulted in almost inaudible engine noise ... Yes, it was a super site!

Thanks for the unexpected opportunity for additional bonus points for 12-meter contacts. The band opened up for just long enough for us to garner the required QSOs!

W7FHI, 4A

Field Day has come and gone for another year, and I'll have to say I'm sorry that it's all over. Our club is rather small and it always seems that we have a hard time getting enough people that are interested in coming along on this most important weekend. Nevertheless, we did manage to have an exceptional outing this year.

As always, things don't always work as planned. Brian, KA7SSB, spent most of this year restoring a World War II vintage 5 kW generator for use, only to trailer it up to the FD site and have it refuse to start. After six hours of cranking, and with help from W7FHI and K7ZUR, it was running. It was a good thing the club brought along their own 2.4-kW unit. W7JHS and K7IAW were on 75 phone and 40 CW running off battery power while the generator work was going on.

All looked good, so I started the 40-m phone and 2-m packet stations around 0100 UTC. We only managed one packet contact over the entire event.

At 0500 UTC, disaster struck. On a routine check of the generator, it was discovered that the radiator was leaking! We had no choice but to shut the generator down and use our two backup generators. All in all, we were quite pleased with the club's performance. We improved our score by almost 500 points from past years.

KS3L, 3A Battery

This was the first attempt by the Baltimore Amateur Radio Television Society to run a QRP Field Day. The site chosen was on the end of a high ridge in the McKeldin area of the Patapsco State Park in Maryland. Three screen tents were set up with a TS-130 in each, throttled back to 5 W output and run on batteries. All antennas were dipoles or inverted Vs; the lowest of which was the driven element off an old tribander, which was suspended from ropes about 65 feet up. The highest antenna was a dipole for 40 meters, the ends of which were at about 100 feet. The park had some tall trees!

As a result of our press release, we were visited by a photographer from WBAL-TV Saturday afternoon. If he had arrived about 15 minutes later, we would have probably received better coverage. Just after the photographer left, a rather upset mother drove down to the site and asked if we had seen three lost children. Fortunately, all six of us were equipped with 2-meter hand-helds and an immediate search party was formed. One ham went back to the mother's camp site, another stayed on top of the ridge to act as net control, while the remaining four of us began searching in different directions down the sides of the ridge. After a short time, the children were located trying to find their way back to the camp site. The search party was then disbanded.

Since I have been in FD operations for the past 18 years, the logs were given to me to double-check and redupe. In almost 15 years of serious contesting, this was the first time I had to dupe almost 2000 contacts. Phew! Our club is primarily a VHF club, and in 18 years of Field Day operations, I have never seen so much cooperation and a desire to do it right by a group of 37 hardworking people.

W6SKQ, 3A Battery

The Zuni Loop Mountain Expeditionary Force is a group of hams who are all QRP enthusiasts. We met on the QRP ARCI Western States Net and have become friends over the years on the air. This year was our second attempt at Field Day. What makes it a unique group effort is that none of us lives less than 40 miles from any other. Our planning is done on the air and through the mail.

Our FD location is a public campground in the San Gabriel Mountains about 50 miles east of Los Angeles, at an elevation of 7300 feet. The various loops inside this campground are named for Indian tribes, hence our name. At this

location we have a good view to the north and east across the Mojave Desert, plus many 90-foot pine trees to hold up our antennas. The potential of these trees has not been lost on us. This year, we used them to hold up a VK2ABQ "Button Beam" for 80 meters, a three-element Delta-loop beam for 40 meters and a Six Shooter (three collinear half waves stacked over three collinear half waves) on 20 meters. A ZL Special for 15 meters rounded out the antenna farm. Equipment consisted of two Argonauts and an HW-9. Power was supplied by a battery and solar panel.

Nine licensed amateurs participated in the operation. Our tenth participant, Wayne, is presently a nonham, but will soon become licensed. Our long-distance champ was Bill, WF6D, who drove more than 200 miles to go to FD! Our score probably suffered from the fact that this is the only chance we have during the year to eyeball each other at one gathering. If we could add "Stories Told" to our point total, we would have a winner!

FEEDBACK

Please refer to November 1985 *QST*, pp 95-102, for the following corrections. In 2A, W8VWY scored 4324, rather than 3324 points. In 2B 2 opr battery, WA2SOC operated with N3AE, not N3AC. In 3A, N4EE scored 5228, rather than the listed 4228 points. In 3A Commercial, Streator ARC, K9CAU, should have been listed as 249-B-11-780. In the same category, KI3I, the Pottstown Area Repeater Team should have been listed as 1302-B-14-4,000. In 1D, KJØB should have been listed as 1649-B-3-5,214. To 1E, add K7FC, with a line score of 169-A-1-1,650. K3MJW should have been listed in 4E, rather than 4A. QST

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, letter indicating highest power output used (A is less than 5 W; B is less than 150 W; C 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 (number of operators) QSOs, power 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

NCG
K4PJ 621-A- 15- 6,710
Panama City ARC
W4RYZ 1160-A- 20- 6,685
Callaway ARL
KSØM 803-A- 8- 6,530
Colgan-Bramalea Club
VE3XD 580-A- 4- 5,830
NCG
WB6ITM 588-A- 5- 5,665
NCG
KD8TX 579-A- 4- 5,440
Virgin Islands ARC
KP2N 571-A- 8- 5,185
Point Loma ARC
K6ZH 527-A- 7- 5,116
CRA Sorel-Tracy
VE2CBS 435-A- 20- 5,050
MJFDP
W1MJ 475-A- 6- 4,930
RCA ARC
N9RJ 820-A- 18- 4,600
University ARC
KS7Q 574-A- 14- 4,350
Principia College ARC
WØVM 375-A- 12- 4,150
Northern New Mexico ARC
KT5X 1163-B- 18- 4,004
Three Musketeers ARC
VE7ZAP 419-A- 3- 3,375
Chaffee Lake ARA
WØLSD 619-A- 7- 3,295
Cent North Carolina DX Chasers
N4DAZ 463-A- 4- 3,215
Resurrected River Rats
W3NNL 270-A- 3- 3,000
Hiawatha ARC
KØNL 280-A- 19- 2,885
Surreal McCoys QRP FD Group
NM2O 348-A- 6- 2,825
Generic ARC
K2WI 889-B- 5- 2,810
Davis Co ARC
NA7G 208-A- 14- 2,780
South Carroll ARG
W3FQR 656-B- 6- 2,728
Maui ARC
KH6RS 695-B- 24- 2,500
Winesprings Bald CW QRPers
N4FFV 228-A- 6- 2,480
Houston QRP Society
N5EM 243-A- 3- 2,390
Albemarle ARC
KC4D 549-B- 20- 2,276
Surely Temple Solar Soc
WB8EET 207-A- 7- 2,220
El Paso QRP Group
W5XE 201-A- 4- 2,210
Beacon Radio Amateurs
W3AA 564-B- 10- 2,184
Overlookers
NRØR 231-A- 10- 2,105
Austin Suds Suckers
N5GXB 584-B- 5- 2,090
Connecticut Amateur TV Society
NF1E 745-B- 7- 1,998
Ontario FD Assn
VE3LPM 454-B- 6- 1,982
Arrowhead RAC
WØGKP 280-A- 8- 1,940
DBARS
W6HCP 277-A- 12- 1,885
SCAR
K4DZR 209-A- 7- 1,810
Cent OK Elmers Homebrew FD Station
WI5W 143-A- 7- 1,730
Gunnison Valley ARC
WØGYV 651-B- 7- 1,714
Independence ARC
KØPVX 704-B- 30- 1,706
Blue Mountain Crew
NS7P 417-B- 4- 1,334
NCG
KU6X 553-B- 4- 1,218
Novatel ARC
VE6NOV 235-B- 6- 1,140
Kennydale Key Klicks
W7JIE 281-B- 5- 1,090
Koolau ARC
KH6IJ 248-B- 30- 1,044
Sheridan RAL
W7GUX 326-B- 4- 950
Magic Valley Chap ISRA
KE7MO 265-B- 7- 932
NCG
NØEKK 396-B- 3- 916
E Ohio AWA and N Panhandle ARC
W8ZQ 234-B- 25- 872
Tumbleweed Field Day Group
WD5IQR 326-B- 11- 852
Goshen ARC/Goshen College ARC
K9TSM 271-B- 9- 846
NCG
KD8AJ 217-B- 6- 768
Harrison Co ARES
N8TF 241-B- 7- 766
Dugald Farm Boys
VE4ADS 144-B- 3- 708
Hampton Roads RA
N4BDH 284-B- 5- 688
State Tech ARC
WA8JXE 278-B- 5- 666
Washington Co ARC
W9SIZ 237-B- 7- 660
Just Friends and Nerds
K8TE 177-B- 3- 646
Elmer's Bunch
KB6JXE 126-B- 4- 634
Frontier Technicians
W2CIL 104-B- 5- 514
Hays ARC
NNØN 178-C- 14- 471
Huron ARC
WØNOZ 178-B- 8- 456
Sam Houston ARK
N5AF 33-A- 7- 430
NCG
WB9RAB 37-A- 3- 370
Entwhistle's Pig Farm
N7CFO 109-B- 6- 228
Low Station Traffic Net
NF7J 18-B- 6- 72

1A

SVARFDG/MRRC
K3LR 2026-B- 3- 7,016
Rotten Radio ARC
WK4D 1672-B- 6- 5,280
Idaho Contest Conspiracy & DX
K7TM 1139-B- 5- 5,132
Belleville ARF
K9BGL 1126-B- 3- 5,028
Bozo & the Lids
W9TG 1079-B- 4- 4,916
Voice of Volga
KØDD 1896-B- 5- 4,824
NIDXA
K9KM 1183-B- 6- 4,652
High Country Rebels
K7SL 1257-B- 19- 4,626
ARC of Ohio State University
W8LT 971-B- 6- 4,190
FMCC
W5EW 1182-B- 5- 4,116
River Rats FD Group
KB9S 951-B- 3- 4,090
Mad River RC/Backwoods Contesters
KU8E 1245-B- 4- 4,038
Alphalpha High RC
AL7H 2691-C- 3- 3,872
NCG
N7FU 326-A- 4- 3,860
IITRI ARC
W3MR 1088-B- 7- 3,630
WNY DX Assn
W2RR 1113-B- 5- 3,554
Dr Loomis Mem Jr Mechanics League
N4YE 989-B- 9- 3,406
Thibodaux ARC
W5YL 1029-B- 20- 3,368
Radio Amateur Megacycle Society
W9DY 717-B- 6- 3,276
OSU ARS
W5YJ 905-B- 5- 3,266
Tyro Trio
NIØU 763-B- 3- 3,248
Indian River Island Rats
N9NB/4 774-B- 7- 3,228
Aether Tweakers
KØDIA 1190-B- 6- 3,220
The Molley Crew ARC
KK9H 998-B- 10- 3,204
Annapolis RC
W3HVQ 1029-B- 10- 3,150
Ten Bigger Better Novices
N9BBN 1103-B- 10- 3,140
Hannibal MO ARC
WØKEM 729-B- 14- 3,086
NCG
KI3L 863-B- 3- 3,080
Anoka Co ARC
WØCF 997-B- 25- 3,048
Collins ARC
K5CQ 1028-B- 24- 2,968
Mad River Radio Club Northern Pikes
KN8S 807-B- 4- 2,886
ARA of Tonawandas
W2SEX 728-B- 9- 2,872
RACOONS
K4ZM 656-B- 9- 2,750
Coverdale's Commandos
VE3ICV 704-B- 7- 2,652
SJ and The Bayonne Band Busters
WØMHK 672-B- 3- 2,646
IBM ARC-San Jose
N6KL 631-B- 30- 2,586
Orangeburg ARC
AD4U 704-B- 38- 2,576
Tucson IBM ARC
K7KZ 725-B- 8- 2,540
Ramseu Co ARC
NAØO 1000-B- 14- 2,500
N Okalossa AR Group
WS4Y 518-B- 18- 2,464
Tamaqua Transmitting Society
W3TI 597-B- 7- 2,448
Red River Valley ARC
WB5RDD 525-B- 13- 2,376
NCG
WABGNO 949-B- 3- 2,372
Candlewood ARA
W11Q 745-B- 15- 2,368
NARS
N5HF 606-B- 30- 2,328
ARA of SW Florida
K4FA 722-B- 17- 2,278
Canton ARC
W8AL 542-B- 52- 2,268
First State ARC
K3QBD 651-B- 14- 2,264
Case ARC
W8EDU 592-B- 3- 2,228
Ogden ARC
N5CT/7 1560-C- 15- 2,212
GSLRBIA
AF7Z 844-B- 5- 2,150
Randallstown ARC
N3IC 622-B- 5- 2,130
Oregon State University ARC
KI7N 880-B- 8- 2,106
Sussex ARA
K3JL 576-B- 8- 2,100
Thunder, Mayhem and Science
K5TMS 768-B- 3- 2,094
N Augusta Belvedere RC
K4FR 525-B- 30- 2,092
Theodore Roosevelt ARC
KØND 775-B- 20- 2,060
Cubs ARS of Sedro Woolley HS
KC7UH 769-B- 15- 2,038
3-D Brothers Contesters
KS3H 515-B- 3- 1,980
Sharon ARA
K1JNQ 603-B- 14- 1,988
Steubenville-Weirton ARC
N8RH 717-B- 22- 1,950
Douglas Co ARC
K4PI 612-B- 18- 1,948
Canadian Police College ARC
VE3CPC 585-B- 10- 1,912
NCG
NJ7A 792-B- 6- 1,894
Metropolitan ARC
NM5O 768-B- 17- 1,836
ARA of SNE
W1AQ 528-B- 15- 1,826
Trailer Buddies
K7SF 396-B- 3- 1,758
Marinette And Menominee ARC
WD8JTQ 418-B- 7- 1,754
Williamson Co ARC
AG5C 451-B- 7- 1,720
Merrymeeting ARA
N1MA 584-B- 15- 1,678
Three Rivers ARC
KNØA 681-B- 18- 1,672
Isacomm ARC
WA4ETN 458-B- 7- 1,668
Imperial Valley ARA
WK6M 420-B- 17- 1,660
Medina Two Meter Group
K8TVG 882-C- 12- 1,637
Lake Country ARC
NF5T 702-B- 10- 1,636
Fauquier ARA
K4MZ 390-B- 7- 1,626
ARES District 22
NØAUS 549-B- 7- 1,616
Relay RC
KG6AX 708-B- 17- 1,616
NCG
VE5QM 647-B- 5- 1,594
Fed of Amateur Radio Trans
KA9EES 398-B- 6- 1,590
Navy/Marine Corps MARS
K3VPZ (+KA3PEB) 392-B- 9- 1,566
Athens County ARA
NC8V 350-B- 10- 1,552
WSU REARC
W7YH 386-B- 6- 1,542
Utica-Shelby ECA
N8BWG 451-B- 9- 1,528
Amecom ARC
K3TM 1121-C- 6- 1,515
Cache ARC
WA7MXZ 379-B- 3- 1,510
Crook Co ARC
KØHP 498-B- 6- 1,486
Silicon Gulch ARC
AE6C 1380-C- 5- 1,480
Miami Co ARC
W8FW 538-B- 22- 1,474
NCG
N4HGZ 502-B- 1- 1,468
NCG
N2AE 865-C- 3- 1,461
Lehigh Co Red Cross
W3VQ 592-B- 12- 1,398
Virginia Amateur Communication Assn
WB4YVE 501-B- 16- 1,390
SRO/CFMC
W9EJ 437-B- 67- 1,368
No Name ARES
KØAMB 459-B- 17- 1,360
US Center ARC
N6LI. 267-B- 8- 1,348
Telephone Pioneer ARC
K4FUM 718-C- 10- 1,339
Hastings ARC
WØWWV 412-B- 8- 1,324
Bristol ARC
N4KTB 332-B- 25- 1,322
NCG
WØKZU 492-B- 5- 1,314
Eastern Shore ARC
AA4BO 824-C- 22- 1,288
Sleepy Hollow Badgers
W8URM 267-B- 3- 1,266
WX4O Group
WX4O 501-B- 5- 1,248
Captain and Crew
K1DII 598-B- 17- 1,242
Robinsdale ARC
KØLTC 327-B- 9- 1,224
North Kitsap ARC
KI7T 358-B- 20- 1,222
HERO
KD8IE 949-C- 14- 1,220
Jefferson Co ARC
WSSSV (+KA5ZGZ) 276-B- 25- 1,214
Clarksville ATS
KF4L 498-B- 20- 1,208
WB8NSL Muddy Madmen
WB8NSL 476-C- 5- 1,202
Skagit ARES/RASC
W7JGM 327-B- 10- 1,198
WRECS
KØLP 448-B- 10- 1,192
Oskosh ARC
KD9BC 494-B- 5- 1,188

West Alabama ARS
WD4DAT 484-B- 20- 1,168
DSM Independent RA
NC0P 385-B- 9- 1,162
Bedrock ARC
NN0I 226-B- 12- 1,148
Crawford Co ARC
NF9Y 467-B- 6- 1,134
Lima Area ARC
W8EQ 354-B- 15- 1,132
Shafamma
N8ESV 413-B- 4- 1,128
Eastern Nevada ARS
W7JMN 559-B- 8- 1,118
Baston Co AS
K4AFU 429-B- 13- 1,118
Anaheim ARA
K6SYU 331-B- 15- 1,112
Waldo Co ARA
K1BZ 381-B- 7- 1,096
Morgan Family
W7VLG 485-B- 5- 1,090
Nanticoke ARC
W3XU 384-B- 25- 1,070
Amateur Radio Interest Group
KT3W 391-B- 10- 1,068
N District & Saratoga Co RACES
KT2M 229-B- 10- 1,064
North Island ARS
VE7ARK 426-B- 5- 1,036
Last Mountain RC
VE5I.M 311-B- 15- 1,014
Lockheed ERC ARC
W6LS 256-B- 11- 1,006
North Shores ARC
K6HAI 202-B- 22- 986
Iowa City ARC
W0JV 207-B- 17- 986
Hopkins Co ARC
NR4C 295-B- 20- 966
Columbia ARA
K3EF 356-B- 10- 964
Union Metro des Sans Filiste
VE2UMS 230-B- 25- 954
ICARES
W8QOY 180-B- 9- 916
NCG
N0FIB 193-B- 6- 902
3M ARC
K9MBS 395-B- 5- 890
Huntington Hamsters ARC
KC2KY 192-B- 6- 884
NE Mississippi ARA
K5DGL 278-B- 5- 840
Snyder ARC
K5QHK 188-B- 14- 824
Saskatoon ARC
VE5AA 577-C- 10- 822
NCG
N9CHA 260-B- 9- 822
Southern Maryland ARC
W3PT 359-B- 12- 818
Hellertown Hams
W3POX 189-B- 4- 818
Irvington Roseland AC
K2GQ 395-C- 20- 818
South East ARC
K8EMY 250-B- 8- 806
Georgia Tech ARC
W4AQL 339-B- 5- 778
Lower Yellowstone AR System
WA7GVT 212-B- 6- 776
Marshall Co ARC
W0GCJ 321-B- 7- 744
R.A.D.I.O.
AA6GM 203-B- 5- 732
Humboldt ARC
W4IGW 618-C- 7- 718
Nightowls
NA5H 245-B- 5- 712
Turtle Mountain ARC
VE4LB 511-C- 8- 711
North Saskatchewan ARC
VE5EEE 255-B- 9- 710
Strath-Hood Co Chigger Chasers
KB6CC 303-B- 17- 706
Hillsboro ARS
KY4G 301-B- 12- 702
Atlanta RC
W4DOC 192-B- 15- 702
Univ of Missouri at Rolla ARC
W0EEE 156-B- 6- 636
Beaver Valley ARC
VE7BWI 183-B- 25- 634
Cricket Wireless & Glastonbury CP
K1SSO 135-B- 15- 590
Steuben Co ARC
KD9GK 377-C- 8- 577
Lake Success RC
W2YKQ 230-B- 10- 564
Alameda Co RACES
W6RGG 147-B- 4- 548
South Poconos FD Group
K1ET/3 224-B- 3- 548
Advarks Mangling Yuppies RS
VE6AMY 167-B- 3- 534
River City ARCS
KG6XX 209-B- 8- 518
Hastings Area Amateurs
N0FKC 104-B- 10- 444
Conemaugh Valley ARC
WA3WGN 89-B- 11- 430
Southport Is FD Marching & Chowder
W1GGA 428-C- 5- 428
Pinewood Mountain AR Group
WB0LTV 151-B- 4- 402
The 80 & 40 M Terrors
KA1HTQ 75-B- 3- 400
Flathead Valley ARC
K7LYY 143-B- 10- 386
NCG
N0CMW 92-B- 4- 384
ARA of Cleveland State University
WB8ADF 77-B- 5- 376
Charlotte ARC
W4CQ 124-B- 6- 348
Microtel ARC
VE7MAC 68-B- 4- 272

1A Commercial

Indianapolis P&L ARC
K9FC 569-B- 11- 1,624
FBC FD Ham-sters
N0FBC 646-B- 25- 1,618
STX ARC
K5DG 165-B- 6- 690
Louisiana Tech & the Houston ARC
W5HGT 244-B- 12- 566
Connecticut Minutemen
KA1FEM 77-B- 11- 254

2A Battery

Arapahoe RC
K0NA (+KA0YAA) 1919-A- 28- 15,805
Southern Humboldt ARC
W6JTI (+KB6LAG) 875-A- 13- 7,600
Zygo ARC
W1ECH (+KA1MWR) 904-A- 6- 7,355
East Alabama ARC
KE4T 838-A- 21- 6,245
Walton RA
W2LZ 542-A- 10- 5,940
Berry's Mt ARC
W3TS 509-A- 6- 5,085
Williamsburg Area ARC
K4RC (+WD4UYQ) 1327-B- 35- 5,018
NCG
N6FL 410-A- 4- 4,600
Tamaqua Area ARA
W3VA 1244-B- 16- 4,306
Central Georgia ARC
KN4A 1046-B- 16- 4,020
Knox Co ARC
W9GFD 1225-B- 18- 3,920
Bloomington ARC
W9NX (+KA9IPQ) 480-A- 15- 3,880
Athens RC
AA4U 1075-B- 8- 3,806
Cyprus Mountain Boys
K6FI 326-A- 3- 3,725
Thumb ARC
W8AX 406-A- 8- 3,705
Carroll Co ARC
K3PZN (+KA3KDG) 1163-B- 15- 3,630
Capital ARS
K4BWC 1557-B- 9- 3,620
OBRA
K2SC (+KA2ZID) 886-B- 25- 3,550
St Charles ARC
N8GL (+N8HDL) 821-B- 28- 3,550
LARA ORPers
K2ECO 413-A- 8- 3,495
Morton ARC
W9EEB 995-B- 19- 3,482
Columbiana Co ARC
NN8B (+N8HGN) 414-A- 18- 3,370
Carolina DX Assn
W4FHI 471-A- 3- 3,310
West Park Radiops
W8VM 1043-B- 13- 3,136
Chariton FD Group
AA2S (+KA2CDI) 391-A- 4- 3,105
Pocono ARK
KB3TS (+KA3OPT) 650-B- 21- 2,836
Massillon ARC
W8NP (+KA8ZQC) 730-B- 35- 2,714
Big Bear Lake Amateur Oprs
WO6B 424-A- 12- 2,650
SW Virginia WA & R ARES
WY4D (+N4LSS) 761-B- 24- 2,624
NE Iowa ARA
W8MG 1010-B- 25- 2,556
Lake of The Ozarks ARC
NI0V 524-B- 15- 2,486
Iowa-Illinois ARC
W8LAC 598-B- 14- 2,404
Pecos Valley ARC
K5LWU 548-B- 18- 2,398
Sandy River ARC
KI1B 581-B- 26- 2,158
Rideau ARC
VE3BPC 529-B- 15- 2,046
Kerr Lake Campers
N4SW 541-B- 5- 1,906
Central Louisiana ARC
K5MS 744-B- 30- 1,824
Rolla Regional ARS
W0GS 658-B- 25- 1,716
Western Quebec VHF/UHF Assn
VE2RM 411-B- 8- 1,696
Mogollon Monsters
NS7C 411-B- 18- 1,644
San Andreas Fault Line Survivors
NZ6N 564-B- 16- 1,628
Nanaimo ARA
VE7NA 319-B- 12- 1,568
Rockville Independents
W3CKU 491-B- 8- 1,450
VE7QRP ARC
VE7QRP 104-A- 4- 1,320
Great River ARC
W0OM 496-B- 22- 1,240
Triangle ARC
W4LEN 294-B- 19- 1,174
Milford ARC
W8YDK 290-B- 15- 1,134
NCG
KC5OV (+KA5ZLW) 278-B- 4- 1,116
Algonquin ARC
KB1WW 341-B- 10- 1,098
Panhandle Mavericks
WA5ZKL 154-A- 4- 1,070
Cass Co ARC
K0LA 338-B- 6- 1,024
Central PA DX Club
K3EQN 150-A- 5- 950
Arlington ARC
W4WVP 198-B- 4- 878
Santa Fe ARC
W5RM 87-B- 7- 532
Elk Co RA
WB3BQO 153-B- 4- 520

2A

Silicon Junction RC/IBM Burlington
K1VT (+KA1OIT) 2745-B- 12- 8,240
NCG
K1AR 2464-B- 6- 7,768
Western MA YCCC
KY1H (+KA1NYD) 2290-B- 22- 7,548
Batesville AR ARC
NG5M 2510-B- 17- 7,480
Heart of America RC
W0RR (+KA0REN) 2115-B- 25- 7,418
Radio Amateur Technical Society
W9RW 2340-B- 8- 7,058
Salt City DX Assn
W2FR (+N2FJW) 1812-B- 13- 6,978
Ohio Valley ARA
W4FU/9 (+KA8YSU) 2155-B- 8- 6,882
09 DX Group
K2SG 2280-B- 5- 6,648
Muskogee ARC
W5EJK 2849-B- 16- 6,632
Rochester DX Assn
W2TZ 2029-B- 7- 6,364
Midland ARC
K5CFA (+N5IST) 1773-B- 30- 6,356
Owensboro ARC
K4HY (+KB4RIP) 1742-B- 21- 6,296
Overlook Mountain ARC
W2XL (+KA2ZPD) 1817-B- 30- 6,286
Lake Co Races
K9SA (+WD9IEV) 1840-B- 25- 6,284
Central Kansas ARC
AB0S (+KA0WGG) 1797-B- 20- 6,280
Mountaineer ARA
W8SP (+KA8RHJ) 1787-B- 13- 6,256
Albuquerque DX Assn
N5RR (+KA5RDX) 1809-B- 20- 6,074
W/K ARC of Greater Milwaukee
N9AW 1906-B- 8- 6,010
Norwood ARC
K1JMR (+KA1OMO) 1935-B- 20- 5,894
Treaty City ARA
W8UMD 1936-B- 15- 5,802
SCAN & McDonnell Douglas ARC
W6VLD (+N6KOA) 1892-B- 14- 5,780
Desert DX Corps
AA7A 1754-B- 4- 5,778
Kanawha ARC
W8GK (+KA8TIK) 1785-B- 20- 5,772
Reading RC
W3BN (+KA3OPB) 1938-B- 35- 5,714
Motor City RC
W8MRM(+KA8WRA) 1582-B- 50- 5,570
Muncie ACS
W9MA (+W9CSI) 1602-B- 23- 5,514
St Louis ARC
K8IJR (+KA8NLK) 1552-B- 20- 5,452
NCG
K9NG 533-A- 12- 5,220
Falmouth ARA
K1GN (+KA1NBI) 1335-B- 25- 5,118
Kingsport ARC
W4TRC 1567-B- 30- 4,902
Utica ARC
K2IQ (+KA2WKE) 1480-B- 20- 4,876
Southwest Missouri ARC
W0EBE (+KA0WQU) 1521-B- 41- 4,854
St Paul RC
K0AGF 1484-B- 16- 4,798
Arlington ARC
K5SLD 1393-B- 27- 4,796
York Co ARS
K4YTZ (+KB4LYP) 1429-B- 45- 4,780
Anderson RC
W4FX (+N4NWB) 1232-B- 32- 4,756
Sussex Co ARC
N2WM 1381-B- 20- 4,742
Cedar Valley ARC
W0GQ 1278-B- 18- 4,730
Ham Assn of Mesquite
AK5K (+N5IRO) 1332-B- 25- 4,668
NW Arkansas ARC
N5XR (+KA5WXU) 1362-B- 38- 4,664
Central Michigan ARC
W8MAA 1317-B- 28- 4,632
Garland ARC
K5QHD (+KA5ZWY) 1542-B- 55- 4,586
Satellite ARC
W8AB 1550-B- 20- 4,530
Carnegie-Mellon Univ ARC
W3VC (+KA3ORW) 1172-B- 8- 4,504
Fareut ARC
WB8SMC (+KA8GOV) 1198-B- 18- 4,466
Elgin ARS
W9IKN (+KA9RVN) 1135-B- 15- 4,442
Mid-MO ARC
N0SS (+WB0TPN) 1251-B- 15- 4,404
Brazosport ARC
NJ5O 1184-B- 63- 4,396
Big Bend ARC
K5FD (+KA5VFV) 1388-B- 22- 4,068
Calumet ARES
KN9P (+KA9USW) 1023-B- 11- 4,322
Cornell University ARC
W2CXM 1369-B- 10- 4,298
REDXA
N6IP 1117-B- 6- 4,266
Cherryland ARC
KBXX (+KA8SOC) 1227-B- 30- 4,248
Spartanburg ARC
K4JLA (+KB4IIV) 1063-B- 17- 4,164
Gower Gulch Gang
N6LL 1184-B- 16- 4,154
San Angelo ARC
W5QX 1138-B- 15- 4,044
South Lyon ARC
N8AR 1382-B- 6- 4,040
Harris ARC
KS4N (+WB3KES) 1168-B- 25- 4,024
Tri-Co ARA
KS9O (+KA9TIM) 1264-B- 10- 3,990
Putnam Emergency ARL
K2AV (+N2EGS) 1065-B- 40- 3,970
BARA
W8MAI (+WD8AOA) 1108-B- 50- 3,960
MATPARC
W4QO (+KB4SLV) 972-B- 18- 3,960
Hoosier Lakes RC
K9RD 1341-B- 12- 3,960
South Platte ARS
NE0X 1304-B- 25- 3,930
Suburban Cincinnati ARS
KB8Z 1191-B- 20- 3,798
Tuscaloosa ARC
W4XI 1118-B- 25- 3,770
Emerson Electric ARC
W0PEV (+KA9HNT) 1084-B- 8- 3,770
NCG
W2RO 2689-C- 5- 3,769
Cape Fear ARS
K4MN (+N4EWG) 1026-B- 32- 3,764
Baltimore ARC
W3FT 856-B- 17- 3,750
Central WI RAL
W9NN (+KA9TLZ) 1025-B- 18- 3,730
Lake Co ARC
W9LJ 1029-B- 58- 3,724
MOFO RC
AI0O 930-B- 4- 3,688
Parkersburg ARK
K0UC (+WD0BTI) 901-B- 20- 3,674
Grand Mesa Contesters
K0UK (+KA0VFM) 1164-B- 14- 3,646
Rankin Co ARC
KV5R (+WB5WUV) 1328-B- 22- 3,636
Kishwaukee ARC
WA9CJN(+KA9TGB) 859-B- 23- 3,556
West Texas ARC
KB5MM (+KA5QLO) 1220-B- 20- 3,554
Kaw Valley ARC
W0CET (+KA0SEY) 995-B- 40- 3,530
New Providence ARC
NA2R (+KA2UGR) 944-B- 20- 3,526
Union Co ARC
WK4S (+KB4NMD) 956-B- 25- 3,514
Tuscola Co ARC
K8DU 945-B- 8- 3,478
Arkansas River Valley ARF
K5PXP (+KA5UQM) 947-B- 24- 3,478
Lynchburg ARC
K4HEX (+N4NIB) 864-B- 20- 3,454
Farmington ARC
W8RC (+KA8ZME) 1138-B- 30- 3,442
Ozarks ARS
K0FA 1100-B- 15- 3,416
Inland Empire DX Assn
W7TJ (+KA7ZAE) 1091-B- 15- 3,404
Delaware ARA
W8QLS (+KA8SSJ) 858-B- 34- 3,358
Wake Technical College ARC
WB4TOP 816-B- 45- 3,356
Edison-Tin Lizzie-The Last Fling
K8VA 1063-B- 51- 3,326
Riverland ARC
KV9U 1390-B- 15- 3,306
PHD ARA
NJ0X (+KA9WZU) 894-B- 26- 3,292
Blackstone Valley ARC
W1DDD 964-B- 18- 3,286
Blue Ridge ARS
WK4O (+KB4LYE) 982-B- 25- 3,260
Lewis and Clark RC
K9SD (+KA9TOS) 1157-B- 15- 3,250
Bass Hill Repeater Group
W1KX 792-B- 5- 3,226
Bartlesville ARC
W5NS (+KA5WBC) 876-B- 36- 3,218
Mountain ARC
W8JAW (+N8CMD) 778-B- 15- 3,202
Club AR de Quebec
VE2CQ 721-B- 45- 3,184
Middlesex ARC
W1HEB (+KA1NML) 1015-B- 24- 3,168
Pikes Peak ARA
WA0VTU(+KA7NNX) 939-B- 40- 3,136
Humboldt ARK
K0GP (+N0GME) 760-B- 22- 3,132
Ole' Virginia Hams ARC
N4FS (+KB4RME) 1013-B- 30- 3,112
Milford ARC
W8SDL 844-B- 22- 3,042
Frontier ARS
W9RU (+WA7MVA) 732-B- 40- 3,038
Lake Geauga ARC
W8OXS (+N8GAK) 883-B- 20- 3,032
CRES ARC
W8ZPF 1109-B- 12- 3,032
Huntington Co ARC
W3VI 796-B- 18- 3,010
Story Co ARC
W0YL (+N0HDT) 887-B- 20- 3,004
FARS/EMARC
K8YA 999-B- 25- 2,972
Dufferin ARC
VE3NN 800-B- 8- 2,966
Northeast MO ARC
W0CBL 736-B- 12- 2,932
Tupelo ARC
K5JG (+N5JHG) 801-B- 30- 2,922
East Bay AWA
N1RI 877-B- 5- 2,918
Gadsden ARC
K4JMC (+KB4NZV) 668-B- 48- 2,916
Dayton ARA
NS8A 1127-B- 6- 2,912
Terracom ARC
N7CW 971-B- 6- 2,906
Ramapo Vly Emerg Net/Morris Co OEM
K2SE 732-B- 17- 2,898
Decatur ARC
W4ATD (+WB4NQP) 854-B- 28- 2,894
NCG
W7GB 854-B- 6- 2,876
Dept of State ARC
W3DOS 797-B- 6- 2,866
Laurel ARC
W5NA (+KA5IMU) 690-B- 20- 2,864
Skywide ARC
VE3ATD 789-B- 12- 2,858
Tampa ARC
W4DUG 807-B- 25- 2,856
Regina ARA
VE5NN 912-B- 22- 2,844
Reidsville AR Group
N4IV 775-B- 7- 2,840
DR0NK Radio Network
NN6E 909-B- 14- 2,798
Charleston ARS
N4LS 1020-B- 20- 2,776
Acadiana DX Assn
WD5DBV (+KA5YUC) 949-B- 32- 2,748
Hattiesburg ARC
AG5Z (+N5IEL) 770-B- 15- 2,706
Sabine Valley ARA
WG5J (+KA5YVV) 1129-B- 20- 2,702
Loveland Repeater Assn
W0OZ (+KA0UYX) 812-B- 21- 2,700
Twin State RC
W1FN 681-B- 10- 2,698
Rockwell Autonetics RC
WB6YPX (+KB6MRK) 856-B- 18- 2,686
Saline Co ARC
K5NE 691-B- 27- 2,682
Hardin Co RC
KX5C 820-B- 15- 2,658
Inter Co ARC
W2LWB 767-B- 10- 2,638
Granite State Hill Toppers
AF1T 955-B- 7- 2,634
OKC Autopatch Assn
K5OK (+N5GUN) 741-B- 39- 2,618
RA Club of Knoxville
W4BBB 737-B- 10- 2,614
Falls ARC
K9RHH 805-B- 10- 2,614
Mt Baker ARC
K7SKW (+KA7ZBM) 891-B- 30- 2,606
Centerville ARS
K8GN (+WD8QAI) 737-B- 25- 2,602
Watertown ARC
N9HR 741-B- 15- 2,600
Penticton ARC
XL7PRC 897-B- 12- 2,592
Western Kentucky DX Assn
WA4QQV 778-B- 8- 2,592
Amateur Radio Transmitting Society
W4CN (+KA4VFI) 653-B- 45- 2,584
Yellowstone RC
K7EFA 651-B- 8- 2,582
Tandem RAC
KE6N (+KB6ISF) 626-B- 12- 2,538
Forsyth ARC
W4NC (+N4IOZ) 625-B- 30- 2,538
Elk Lake Foursome
N4YX 822-B- 4- 2,536
CRA Vallee du Richelieu
VE2CVR 805-B- 8- 2,528
Viking ARS
K0RVN 844-B- 6- 2,520
Tri-State ARC
AK3M 773-B- 30- 2,512
N Providence RC
KW1Z (+KA1JFT) 688-B- 10- 2,464
Algoma ARC
VE3SOO 670-B- 11- 2,452
ZOT ARS
WB6QLM 730-B- 3- 2,446
North Ridgeville RA
K8JK (+N8HMG) 716-B- 20- 2,440
Aroostook ARA
KA1B (+KA1OOV) 676-B- 35- 2,432
Just Another Club
VE4RFI 831-B- 4- 2,430
Northern Kentucky ARC
AA4QE 725-B- 20- 2,424
St Peters ARC
KB0J 925-B- 20- 2,422
GRAM Club
W2RCX 841-B- 25- 2,420
State Line RC
K2LSA 649-B- 5- 2,398
Secret Underground Radio Empire
NO7Z 933-B- 3- 2,388

The Novice station of the Fresno ARC, W6TO. From the left are KB6NCE, KB6JCU and KB6NCF.

Assistant Contest Manager Billy Lunt, KR1R, operated 24 MHz from KY1H (2A) during FD '86.

Field Day is a great time to get publicity for Amateur Radio. Here, the group from WY4D (2A) is being videotaped by their local TV station.

MOTHERS
K9UA (+KA9UPP) 607-B- 7- 2,382
Tulare Co ARC
WA6BAI (+KB6FEK) 584-B- 21- 2,380
Shenandoah Valley ARC
W4HKC 733-B- 24- 2,376
Old Post ARS
W9EOC (+KA9NNW) 901-B- 20- 2,372
Faulkner Co ARC
W5LL 691-B- 15- 2,368
North Coast Contest Club
WB8BTO 841-B- 6- 2,356
South Canadian ARS
W5OU 807-B- 30- 2,350
Alamance ARC
K4EG 686-B- 15- 2,340
Natrona Co ARC
NA7R 605-B- 15- 2,310
Gonzaga Prep HRC
KC7FJ (+N7ICU) 818-B- 17- 2,304
Piscataway ARC
KO2K 999-B- 33- 2,298
Detroit Metropolitan RC
W8RJI 696-B- 6- 2,294
Clackamas ARC
KX7T (+KA7KIL) 573-B- 15- 2,282
Pioneer ARC
AA4HF 823-B- 17- 2,280
Fork ARC
KE8A 705-B- 21- 2,276
HP Lake Stevens ARC
NN7N 714-B- 14- 2,266
North Central ARES
NGØY 658-B- 24- 2,258
Southern Catskill ARS
KV2U 629-B- 12- 2,258
Utah ARC
W7SP (+KA7YRU) 881-B- 12- 2,258
Chy Wy RC
W7NE 716-B- 30- 2,250
Central Vermont ARC
W1BD (+KA1MLY) 573-B- 15- 2,250
SFDXA
WB4OSN 610-B- 6- 2,250
AuSable Valley ARC
KB8TS (+KA8VQS) 453-B- 12- 2,242
LAMARS
W9HOQ (+KA9VNP) 627-B- 20- 2,234
Texoma ARC
K5GQD 664-B- 8- 2,232
Ogdensburg ARC
NR2B (+KA2CCU) 606-B- 14- 2,230
Great Falls ARC
K7ABV 774-B- 46- 2,228
Fresno ARC
W6TO (+KA6KJE) 513-B- 41- 2,224
Free State ARC
K3IVO 708-B- 14- 2,208
Lakeview ARC
KS7G 771-B- 8- 2,194
Waterton ARS
W8NT 570-B- 6- 2,174
Green Mountain Wireless Society
N1VT 1417-C- 15- 2,169
SCRA
W9EIP 656-B- 13- 2,168
Nappanee ARC
KQ9B (+N9EWN) 871-B- 30- 2,166
Sheboygan Co ARC
NI9Z (+KA9VIA) 622-B- 10- 2,150
Yolo ARS
NZ6A 797-B- 22- 2,132
Lockport ARA
W2RUI (+KA2AJD) 573-B- 23- 2,130
Trident ARC
N4EE (+KA4OGM) 498-B- 42- 2,130
Southwest Dallas Co ARC
K5HJ (+N5BKM) 706-B- 50- 2,130
Ada ARC
NY5J (+KA5WLB) 706-B- 12- 2,130
Long Island DX Assn
KW2P 603-B- 13- 2,124
Fulton ARC
W2CXV 570-B- 23- 2,124

PEI ARC
VE1PEI 1285-C- 10- 2,110
Northern OH ARS
K8KRG (+KA8VTS) 635-B- 49- 2,092
RA of Greater Syracuse
W2AE 542-B- 30- 2,092
Cote St Luc ARA & Concordia Univ
VE2CSA 755-B- 15- 2,086
BEARS & Vashon Island RC
K7NWS 732-B- 20- 2,076
Bay Area ARS
KM3I 632-B- 15- 2,068
Greater Norwalk ARC
KV1A 622-B- 5- 2,052
Gulf Coast ARC
WC4D 493-B- 33- 2,048
Patrick AFB MARS Team
WA4A 619-B- 10- 2,046
Mc Kean Co ARC
W3VV (+KA3BEI) 599-B- 8- 2,040
ATTARC
KN9K 606-B- 10- 2,028
Huber Heights ARC
N8TD 459-B- 11- 2,024
Brandon ARS
K4TN 516-B- 40- 2,024
East Pasco ARS
AA4RU (+KB4SVS) 588-B- 12- 2,020
VSPARC
KV4D 801-B- 10- 2,014
Lakes Area ARC
WB9PZH (+KA9HQW) 571-B- 15- 2,012
Lowndes Co ARC
K5BX 571-B- 5- 2,008
Athens ARC
W5CR 454-B- 8- 2,008
Xerox ARC
KE2T 624-B- 5- 2,006
University of Idaho ARC
W7UQ 578-B- 8- 2,000
Rip Van Winkle ARS
W2FSL (+KA2QYG) 569-B- 30- 1,996
Goddard ARC
WA3NAN (+KA3OBH) 611-B- 21- 1,982
Clark Co ARC
W9WWI 577-B- 53- 1,976
Tri-City ARC
KS1I 475-B- 20- 1,976
Pioneer ARC
VE3NA 466-B- 12- 1,968
Franklin ARC
NT4K (+WD4STK) 470-B- 24- 1,964
North Bay ARA
K8LI 426-B- 14- 1,962
Eastern OR RS
W7NYW 828-B- 7- 1,956
Bullitt ARS
W4MDY (+KB4SLG) 722-B- 75- 1,952
Mobridge Area ARC
KØERM (+KAØRBN) 377-B- 8- 1,948
Neshoba ARC
WG5I 554-B- 17- 1,934
Horse Creek FD Society
KY9Y 866-B- 3- 1,932
Sand Hills ARC
AC0E 663-B- 14- 1,926
Redcomseven
W4NUS 400-B- 6- 1,918
Nevada ARA
W7YN 459-B- 12- 1,908
ARC of El Cajon
WA6BGS 598-B- 30- 1,906
New Ulm ARC
KØYST (+NØGQJ) 473-B- 14- 1,900
Douglas Co ARC
KOØW 554-B- 20- 1,886
Missouri Valley ARC
WØNH 602-B- 27- 1,880
Central Kentucky ARC
WA4UXJ 468-B- 10- 1,880
Clinton Co ARC
W9PC (+KA9RIK) 501-B- 8- 1,880

Texins ARS
KJ4NA 505-B- 7- 1,876
Robeson Co ARES
KS4S 623-B- 5- 1,872
Wiregrass ARC
WE4P 659-B- 15- 1,862
Tri-City RAC
WØVQN 503-B- 30- 1,858
Issaquah ARC
W7BI 544-B- 28- 1,856
Montachusett ARA
W1GZ 454-B- 13- 1,848
Des Moines RAA
WØAK (+KAØVSL) 469-B- 30- 1,842
Lancaster Co ARC
AK4N 435-B- 12- 1,834
Bethel Educational ARS
N1DNA (+N1EES) 566-B- 17- 1,824
Clinton Co ARA
KE8E 558-B- 15- 1,816
Stockton AC
W8SF 473-B- 20- 1,816
Ascension ARC
WB5KKM 571-B- 30- 1,804
Butler Co UHF Assn
W8CCI (+KA8SSB) 797-B- 10- 1,798
Benicia ARC
KE6IA (+KA6VVJ) 394-B- 15- 1,792
Atlantic Co ARCs
K2BR (+KA2ZZH) 384-B- 40- 1,790
Parkland RC
VE5PRC 728-B- 8- 1,782
Hiawatha ARA
KG7Z 480-B- 22- 1,764
BSA Communication Explorer Post 177
NC5H/4 (+KB4QIA) 341-B- 7- 1,762
TOG
W7AC 430-B- 5- 1,760
Centralina ARC
WT4Z (+N4NYD) 518-B- 26- 1,754
Garden City ARC
W8WI (+KA8UAJ) 617-B- 25- 1,750
MPLS RC
WØCKF (+KAØWPX) 433-B- 14- 1,746
NCG
WK6O 490-B- 10- 1,732
Jupiter-Tequesta RG
KE4VR (+KB4TBI) 537-B- 20- 1,720
Grand Rapids ARA
W8DC (+WD8RET) 652-B- 22- 1,708
Newport News ARK
N4HOG 608-B- 29- 1,704
Chestnut Hill Hams
AC1J 443-B- 11- 1,690
Lake Co ARS
KB8LY (+KB8LWW) 487-B- 26- 1,686
Juneau ARC
KL7GPG (+KL7TG) 846-C- 15- 1,683
Northern Chautauqua ARA
W2SB 422-B- 12- 1,680
Staten Island AR Communicators
WA2OGV 722-B- 11- 1,646
Olympia ARS
NB7N 567-B- 45- 1,644
Parsons Area ARC
NBØV 514-B- 15- 1,644
Hilltoppers
WA5CMI 625-B- 4- 1,618
Glynn ARA
K4TVE 288-B- 13- 1,614
Better Luck Next Year ARG
KB7KY 431-B- 14- 1,612
Bethel ARC
KU8O (+KA8RVQ) 398-B- 14- 1,606
Salem ARC
W7SAA (+N7HZT) 842-C- 19- 1,606
Upper Valley ARC
W8LH 611-B- 5- 1,602
ECHO
N4ES (+KB4QIK) 287-B- 10- 1,602
Atchinson ARC
NBØZ 263-B- 10- 1,588
Tioga Co ARC
WA3RRS 544-B- 22- 1,588

Fort Dodge ARC
WØUL 593-B- 8- 1,586
Coastal Area RS
AB4B 443-B- 25- 1,568
Wilderness Trail ARC
KI4B (+KA4OKG) 464-B- 15- 1,566
Victoria ARC
W5DSC (+KA5ZQZ) 404-B- 15- 1,540
West Morris Wireless Society
KS2M (+N2GCP) 475-B- 20- 1,538
Monterey Park ARC
K6GIP 601-B- 18- 1,528
Flint Hills ARC
WØHT 596-B- 7- 1,526
Audrain
WBØJAE 529-B- 25- 1,522
Port Elgin Repeater Team
VE3QST 506-B- 12- 1,520
Sweetwater ARC
N7ERH 633-B- 11- 1,506
Wise Co ARES
AE5B 507-B- 18- 1,504
Manistique ARA
NK8G 513-B- 5- 1,504
Three Rivers ARC
WØBRN 575-B- 20- 1,502
Headwaters ARC
NØCRO (+KAØPTV) 457-B- 8- 1,494
Pilot Knob ARC
NØSF (+KAØVPO) 370-B- 12- 1,490
York RC
W9POS 440-B- 15- 1,484
Charlottetown ARC
VE1CRC 904-C- 15- 1,482
21 Repeater Group ARC
W9WM 564-B- 11- 1,478
Columbus ARC
W9SIO (+KA9UUP) 488-B- 10- 1,476
Kent Co ARC
W3HZW (+KA3MIY) 540-B- 25- 1,474
HTTY-AMSAT Houston
NK5E 492-B- 15- 1,466
Kansas Nebraska RC
WØBBM 367-B- 10- 1,456
Transylvania ARC
WA5DJJ 598-B- 12- 1,456
Metrocrest ARS
KB5A 374-B- 23- 1,456
Scranton/Pocono ARK
K3CSG 474-B- 14- 1,448
Comm Club of New Rochelle
K2DN (+KB2AOH) 204-B- 15- 1,448
Stilling Farm Expedition
W9RVP 343-B- 3- 1,440
Charter Oak Wireless Society
K8CH 313-B- 4- 1,438
Henry Co ARC
N9WS 441-B- 35- 1,434
Greater Bridgeport ARC
W1VW 512-B- 17- 1,412
Lee De Forest RC
W6WJ (+KD6LTU) 265-B- 29- 1,412
NCG
KD2QO (+KA2PDR) 507-B- 6- 1,394
Suburban ARC
WØDCW 427-B- 15- 1,392
Whitewater Hills ARC
N9FKF 343-B- 25- 1,386
NCG
K6EID 544-B- 3- 1,380
Big Island ARC
AH6P (+WH6BDM) 390-B- 58- 1,374
Delta Co ARS
K8ZAS 447-B- 10- 1,372
Pike Co ARC
W9CZH 276-B- 6- 1,358
Kamloops ARC
XL7UT 366-B- 9- 1,352
Shelby Co ARC
KJ4DD 308-B- 15- 1,344
Central Carolina ARS
WR4E 404-B- 10- 1,340
Ft Madison Iowa ARC
KUØP (+KAØYAN) 333-B- 7- 1,338

Columbia ARC
N4WR 436-B- 15- 1,330
Conneaut ARES
W8SD 461-B- 7- 1,324
Miami Co ARC
K9ZEV 228-B- 10- 1,314
Cedar Mountain ARC
NE7C (+KA7UTV) 322-B- 6- 1,304
Victor Valley ARC
K6QWR 296-B- 26- 1,302
Yellow Thunder ARC
WB9FDZ 341-B- 10- 1,294
ARA of Bremerton
W7VE 382-B- 9- 1,282
Dist RC of Middletown
W8BLV 441-B- 24- 1,282
Black River Valley ARC
W2AWB (+KB2APZ) 362-B- 11- 1,262
Borderline ARC
KE7GW 473-B- 34- 1,258
Moose Horn ARC
KL7IEJ 228-B- 10- 1,254
Cabarrus ARS
W4DSU 362-B- 12- 1,204
Grays Harbor ARC
W7ZA 381-B- 5- 1,196
Tradewater ARC
KJ4NS 757-C- 12- 1,194
Otsego Co ARA
NC2C 332-B- 8- 1,192
Hi Line ARC
N7EOL 256-B- 9- 1,180
Mc Donnel Douglas ARC
WAØCGV 270-B- 16- 1,178
South Brevard & FIT ARCs
KU4J 318-B- 25- 1,176
Yucaipa Valley ARC
W6CV 792-C- 30- 1,175
South Plains DX Society
KO5D 451-B- 4- 1,172
Jefferson Co RAC
KC2RJ 359-B- 35- 1,164
Matanuska ARA
KL7JFU 323-B- 10- 1,162
Maryland ARA
WB3CXD 403-B- 10- 1,162
NW Amateur Radio/Electronics Assn
KG6I 261-B- 10- 1,160
Wellesley ARS
W1TKZ 272-B- 20- 1,158
West Seattle ARC
W7AW 279-B- 14- 1,156
Kenton ARC
W8VMV 255-B- 8- 1,150
Chicago Community RL
NG9U 405-B- 6- 1,148
ARC VE2CRG
VE2ABO 223-B- 15- 1,146
Capilla Peak FD Group
K5FSB 408-B- 7- 1,142
Ft Pierre ARC
AA4TD 282-B- 40- 1,138
Hermiston ARC
KD7VX 412-B- 16- 1,136
Indianapolis Red Cross ARC
WA9LGQ 363-B- 20- 1,126
Griffiss AFB ARC
WA2ZXS 410-B- 7- 1,120
Coon Valley ARC
KV0N 245-B- 40- 1,116
NCG
KE4EV 406-B- 9- 1,116
Chippewa ARC
KØVEV 285-B- 16- 1,110
Ruff Creek Society of Green Co
WN3VAW 235-B- 8- 1,106
Lewisville Texins ARC
K5WSD (+KA5ZCN) 407-B- 15- 1,106
Cape Ann ARA
W1RK 354-B- 15- 1,094
Wantagh ARC
W2VA 463-B- 8- 1,090
Northwoods ARC
K9RMN (+KA9LER) 209-B- 44- 1,084
Gratiot Co ARA
W8AWE 245-B- 6- 1,066

Truro ARC
VE1AO 273-B- 10- 1,058
Stewart Park Group
NK2V 336-B- 29- 1,056
S TX STAR-LPA
WG5A 329-B- 11- 1,054
Grand Strand ARC
WD4JMT 275-B- 15- 1,046
Irving ARC
WA5CKF (+N5BFG) 210-B- 20- 1,044
Fannin County ARC
WG5P 326-B- 20- 1,034
Yakima ARC
W7AQ 267-B- 6- 1,034
Western Arizona RC
KD7PS 391-B- 6- 982
Longmont ARC
WBØVFN 260-B- 10- 976
Tippecanoe ARA
W8REG (+WB9YXN) 225-B- 14- 966
Lake Huron ARC
W8JC 233-B- 16- 966
Radio Amateur Society of Norwich
AI1O (+KA1MMH) 171-B- 18- 962
St Mary's Co ARA
K3HKI 177-B- 12- 958
BBDBB AR & TS Soc
WD4EIQ 229-B- 6- 952
GE Evendale ARS
K8LUC 235-B- 10- 942
Amherst ARC
KB1T 240-B- 4- 938
Allegany Highlands ARC
W2SAM 262-B- 6- 936
HP Spokane Division
NO7Q 399-B- 7- 930
NCG
N8GUE (+KA8TWR) 320-B- 6- 926
Western IL UARC
W9YOL 359-B- 7- 924
Navajo Co ARC
KE7GP (+KA7YYV) 299-B- 8- 910
Arctic ARC
KL7KC (+NL7HI) 440-C- 21- 906
North Shore ARC
VE3NSR 192-B- 10- 902
West Jersey Radio Amateurs
W2JUG 247-B- 9- 894
Dublin ARC
WA4HZX 289-B- 13- 878
Rockport AR Group
NV5Z 139-B- 18- 872
Neptune ARC
N2GT (+WB2TZJ) 253-B- 24- 866
Santa Clarita ARC
W6JW (+KA6VJF) 319-B- 34- 856
RAMS
W6HIR 273-B- 14- 846
D-CAT
K5CVD 164-B- 8- 842
Quad Co ARC
NA3Y (+KA3HFV) 262-B- 12- 830
Ellis Co ARC
WD5DDH 349-B- 14- 830
Clearwater Valley ARC
KD7ZY 74-B- 10- 828
NCG
AL7GI 370-C- 6- 827
Monterey Renegades
K6DYX 212-B- 3- 822
Western PA FD Assn
K53N 255-B- 6- 816
Washington Adventist ARA
W3TSA 257-B- 25- 814
Kings Co RC
W2RAK 273-B- 30- 810
Newington AR League
W1OKY 253-B- 10- 808
Blue Ridge ARC
N4FBC 200-B- 8- 802
Williston Regional ARC
KØAYZ 297-B- 5- 794
New River Valley ARC
K2VW 217-B- 8- 774
NCG
N8CG 206-B- 3- 720
Lake ARA
K4FC 198-B- 20- 716
KE7PV Users Group
K7MEA 247-B- 12- 694
Snowline ARC
KI6DJ 166-B- 9- 680
Chas E Newton Jr ARC
K4HYB 186-B- 15- 672
Wallaceburg ARC
VE3WAA 174-B- 9- 636
Hollywood ARC
WB4TON (+KB4TMN) 279-C- 12- 623
Crete ARC
KØJOO 109-B- 6- 618
Staten Island UHF RA
KA2PBT 156-B- 3- 612
AAERC
NN4R 49-B- 25- 596
Mountain Top ARC
N4LLD 140-B- 5- 580
Wheatstraw ARC
WA5IPE 61-B- 9- 522
Stu Rockafellow ARS
W8NJH 140-B- 6- 480
Orumlins ARC
WA2AAZ 135-B- 11- 470
Club de RA de L'Outaouais
VE2CRO 162-C- 15- 462
Westcum ARC
VE1WRC 118-B- 12- 454
West Volusia ARS
AA4CU 54-B- 3- 414

Miracle Strip ARC
N4HUA (+KB4RUL) 96-B- 13- 398
Heart of Texas Ham Oprs Group
WD5H (+KA5YYA) 44-B- 16- 392
Green Valley ARC
WØROD 20-B- 10- 354
Dunnville ARC
VE3HOP 21-B- 5- 342
Tri Co ARC
KA8ILO 120-B- 5- 240

2A Commercial

Greater Fairfield ARA
W1NU (+KA1NSG) 997-B- 27- 3,584
Order of Boiled Owls
W2AO 1948-C- 12- 3,017
Pottstown ART
N3LR 900-B- 10- 2,466
Sumter ARA
WA4UMU 946-B- 25- 2,306
Cameron Co ARC
KA3MMM 653-B- 8- 2,240
Tallahassee ARS
KC4N (+N4IPH) 535-B- 75- 2,072
Beitler Boys
KG7B 572-B- 4- 2,042
The Parking Lot Attendants
VE3CTV 640-B- 9- 1,920
Portsmouth RC
WD8LXX 596-B- 5- 1,776
Pittsburg Co ARC
W5CUQ 461-B- 8- 1,760
Pearl River Co ARC
W5UO 520-B- 22- 1,314
Green Fox ARC Inc
KB9WC (+KA9VOA) 244-B- 10- 998
PWARF
K8PW/8 782-C- 10- 992
East Kootenay ARC
VE7IP 306-B- 16- 950
Hub City ARC
KA8FIF (+WD8HWM) 291-B- 20- 874
Central Iowa ARS
N8DKG 287-B- 8- 814
Eden Area Amateurs
WA4RDX 297-B- 15- 742
Iron Range ARC
NE8Y 155-B- 9- 720
Streator ARC
K9CAU 175-B- 10- 472
Keowee-Toxaway ARC
WA4YIX 185-B- 10- 370

3A Battery

Baltimore AR Television Society
KS3L 1861-A- 37- 12,740
Univ of Maryland ARA
W3EAX 1237-A- 12- 9,200
Zum Loop Mtn Expeditionary Force
W6SKQ 712-A- 10- 6,255
Anne Arundel RC
W3VPR (+KA3PRA) 697-A- 30- 5,480
Oregon Tualatin Valley ARC
K7JF (+KA7SIK) 1379-B- 50- 4,342
The A Team
W4RRW 372-A- 8- 4,120
Madison ARC
W9EFU (+KA9OKV) 1163-B- 31- 3,770
Western Carolina ARS
W4MOE 326-A- 35- 2,975
Livermore ARK
NF6S 744-B- 15- 2,848
Elkhart Red Cross ARC
AD9V 1035-B- 8- 2,734
Mammouth Cave ARC
KD4SS 523-B- 26- 2,402
Raleigh ARA/Midsouth VHF
KI4I (+KB4SQV) 769-B- 25- 2,342
Michigan QRP Club
WB8IEK 200-A- 9- 2,150
Pine State ARC
K1AG 516-B- 10- 2,148
Silverado ARS
N6XN 509-B- 4- 1,836
Heart of Texas ARC
WK5N 417-B- 12- 1,652
Big Unorganized Radio Project
K9TJ (+N4NGB) 584-B- 4- 1,640
LA Co Disaster Comms Service
N6ZH 336-B- 40- 1,436
NCG
W8ZCG 169-B- 6- 1,322
Chehalem Valley ARC
K7FM 389-B- 9- 1,226
NCG
N1DEA 273-B- 3- 1,156
Santa Cruz Co ARC
K6BJ (+KB6ICM) 234-B- 12- 1,004
Suncoast DX Club
N4HAY 162-B- 10- 742

3A

Texas DX Society
K5DX 3519-B- 30- 11,416
Dallas ARC
W5FC (+KA5TXL) 3767-B- 60- 11,258
Ashtabula Co ARC
W8CY (+KA8OTI) 2992-B- 18- 10,028
Poughkeepsie ARC
N2YL (+N2FRZ) 2720-B- 40- 9,104
Hughes Fullerton Employees Assn ARC
K6OEH (+KB6MSG) 2527-B- 40- 8,046
Acton Boxboro ARC
W1UC (+KA2DJH) 2272-B- 25- 7,956
Red Ryder Contest Club
W8VS (+KA8BFF) 2312-B- 18- 6,886
Waterbury ARC
K1EB (+KA1NTB) 2374-B- 30- 6,754

SE Michigan ARA
KB8YI (+KA8WGL) 1736-B- 20- 6,082
North Ottawa ARC
KC8P (+N8HDB) 1852-B- 33- 5,870
Providence RA
W1OP (+KA1KWE) 2138-B- 15- 5,810
Southern Peninsula ARK
W4PRO (+N4IIC) 1584-B- 48- 5,552
The Selden Repeater
NQ2D (+KB2AIL) 1738-B- 25- 5,534
North Florida ARS
W4IZ 1908-B- 45- 5,526
Band Dit-Dahs
K2MP 1688-B- 14- 5,428
Surrey ARC
VE7SAR 1422-B- 15- 5,300
Codex Corp ARC
KR1B 1474-B- 10- 5,290
Rappahannock Valley RC
N5II 1832-B- 5- 5,288
General Dynamics ARC
W5IU (+KA5VRT) 1792-B-100- 5,262
Jones Co ARC
WØGN 1717-B- 10- 5,234
North Shore Repeater Assn
W1ND (+KA1OMA) 1392-B- 29- 5,222
Columbus ARA
W8TO (+KA8WQC) 1547-B- 27- 5,174
Paso Robles ARC
W6LKF 1373-B- 24- 5,172
Champlain Valley ARC
W2UXC 1313-B- 20- 4,868
Boulder ARC
WØDK (+NØAWZ) 1280-B- 20- 4,838
Virginia Beach ARC
K4IX (+N4IBY) 1270-B- 40- 4,792
Independent ARC
NØII 1309-B- 14- 4,780
Cowichan Valley ARC
VE7CVA 1373-B- 27- 4,722
Colonial Wireless
K1BB 1269-B- 15- 4,666
Penn-Mar RC
W3MUM (+KA3OGL) 1521-B- 17- 4,644
Santa Barbara ARC
K6TZ (+N6MUU) 1513-B- 71- 4,616
Dauberville Dx Assn
KI3N (+KA3PKN) 1587-B- 24- 4,606
Montgomery ARC
N3BE (+N3ESR) 1255-B- 50- 4,530
Shreveport ARA
W5AU (+N5HUP) 1460-B- 46- 4,486
Kilocycle Club of Ft Worth
K5LP (+KA5ZCV) 1146-B- 15- 4,462
Goz's Gang
K2SA 1143-B- 12- 4,460
Saginaw Valley ARA
K8DAC (+N8HMF) 1330-B- 23- 4,426
Capeway Radio Club
K1BU 1286-B- 22- 4,408
Joliet ARS
W9OFR 1146-B- 27- 4,394
Chattanooga ARC
W4AM 1804-B- 52- 4,380
San Mateo RC
W6LMN (+KB6KZW) 1196-B- 37- 4,368
Eastern Michigan ARC
K8EPV (+KA8UKO) 1136-B- 22- 4,246
Rochester ARC
WØMXW 2218-C- 33- 4,177
Bryan ARC
N5TC (+KA5EPT) 986-B- 20- 4,100
Davenport RAC
WØSXR 1241-B- 35- 4,074
Ampex Employee's ARC
K6QEZ 1042-B- 12- 3,952
Northfield Emergency Amateur Team
N1CC (+K1RKT) 1070-B- 20- 3,942
Carthage ARS
NØHG 934-B- 19- 3,934
Enfield Radio Amateur's Group
N1SR (+KA1OOA) 1138-B- 18- 3,890
Great Bay RA
WB1CAG (+KA1MMC) 1173-B- 25- 3,840
East Bay ARC
W6CUS (+KB6MSV) 1014-B- 40- 3,814
Montgomery ARC
N4AU 1041-B- 25- 3,754
Calgary ARA
VE6NQ 957-B- 35- 3,720
Oakland Co ARS
W8TNO (+KA8ZIM) 1143-B- 30- 3,706
Kansas City ARC
KØOKI (+KAØWGI) 1122-B- 30- 3,680
Argonne ARC
W9OVE 1007-B- 25- 3,668
Sioux Empire ARC
WØZWY (+KA8RKW) 1038-B- 25- 3,660
Sunset Empire ARC
W7BU (+KA7WRY) 1120-B- 24- 3,622
Ephrata Area Repeater
W3AD 1123-B- 18- 3,568
Billerica ARS
W1HL 1004-B- 20- 3,564
Club de Radio Sherham
VE2FT 945-B- 15- 3,546
Escondido ARS
N6WB 1007-B- 25- 3,526
SLURP
KC8PR 980-B- 10- 3,502
Allen Co ARTS
W9INX (+N9BAC) 1236-B- 35- 3,406
Yuba Sutter ARC
WA8AGD (+WA8ISR) 876-B- 16- 3,380
Mc Henry Co Wireless Assn
KB9K (+KA9VNV) 1102-B- 15- 3,348

Highland ARA
NF8G (+N8FSQ) 899-B- 20- 3,330
Eagles
AK8A 1133-B- 10- 3,320
Albany ARA
K2CT 1146-B- 43- 3,288
Huntington Co ARS
W9EI 1195-B- 16- 3,250
Virginia ARA
W4FEG 1104-B- 30- 3,218
Metuchen ARC
K2YNT 1090-B- 30- 3,214
Findlay RC
W8FT (+KA8CXR) 847-B- 23- 3,204
Hazleton ARC
W3SJI 878-B- 25- 3,170
Fairfield ARA
NK8T 928-B- 30- 3,166
Rappahannock Valley RC
K4TS (+KL7GLK) 933-B- 15- 3,160
Orange Co ARC
W6ZE 951-B- 18- 3,132
Campbell Co ARC
W7HNI (+WD8ENC) 924-B- 13- 3,070
Portland ARC
W7KYC (+N7FTE) 763-B- 17- 3,060
Green Co Chp Ten-Ten Int'l Net
N5FER 716-B- 15- 3,012
Calumet AR Enthusiasts
KE9I 965-B- 10- 3,000
Lake Area RK
KE8DX 1044-B- 18- 2,958
Hazel Park ARC
W8JXU (+KA8YYO) 1086-B- 20- 2,956
North Hills ARC
W3XX (+KA3OUL) 897-B- 43- 2,938
Monsanto ARA
W8DYY 784-B- 55- 2,920
Teays ARC
KO8D 864-B- 25- 2,912
Ocean State ARG
W1XJ (+N1EAJ) 725-B- 14- 2,906
Marshall RC
WØBMJ (+KAØUJJ) 1150-B- 30- 2,868
Great South Bay ARC
W2DUK (+N2FIM) 800-B- 30- 2,858
Holland ARC
K8DAA 879-B- 25- 2,826
Brightleaf ARC
W4AMC 1009-B- 25- 2,818
Coastside ARC
WA6TOW 1128-B- 6- 2,816
Tritown RAC
W9VT 770-B- 32- 2,750
Lancaster and Fairfield Co ARC
K9QIK 939-B- 15- 2,744
Mississippi Coast ARA
W5CH 827-B- 30- 2,730
Port City ARC
W1WQM 723-B- 24- 2,708
Fond Du Lac ARC
K9NC 777-B- 6- 2,638
Twin City RC
W7LA 800-B- 12- 2,622
3M ARC
WØMR 755-B- 12- 2,610
Amateur Radio Caravan Club
W5HD 637-B- 30- 2,604
Ft Myers Area ARC
W4LX 639-B- 61- 2,594
Valley Forge Mtn ED Gang
N3KZ 745-B- 18- 2,590
Wichita ARS
NW5E (+KA5WVX) 679-B- 32- 2,588
Midway ARC
W9KY 853-B- 65- 2,576
JAARS
K6DLG (+N6HAR) 684-B- 20- 2,550
Muskegon Area AR Council
W8ZHO 965-B- 35- 2,540
Arrow Comm
KT8K (+KA8ZLR) 709-B- 30- 2,534
Fremont Co (Wyoming) ARC
K7MM 521-B- 7- 2,530
Granite State ARA
K1RD (+KA1NXT) 650-B- 16- 2,530
Pensacola Field Day
AA4W 589-B- 6- 2,520
Lincoln ARC
KAØVYA 959-B- 5- 2,512
Echo Repeater Assn
K9BTB (+KA9TNU) 710-B- 40- 2,500
GLERC ARC
WA4QPL 696-B- 16- 2,498
Tri-County ARC
W9MQB 718-B- 12- 2,480
Austin ARC
W5KA (+WB5SUR) 637-B- 50- 2,452
Sterling Park ARC
AA4MQ 763-B- 12- 2,432
Albany Co ARES/RACES
WA2GYY 688-B- 10- 2,430
Mt Vernon ARC
K8EEN 634-B- 9- 2,430
Lincoln Trail ARC
W4BEJ 819-B- 35- 2,422
Silver Creek ARA
WD8PNF 628-B- 22- 2,422
JPL ARC
W6VIO (+WA6VQI) 565-B- 47- 2,390
Jayhawk ARS
WØLB (+KAØWRO) 656-B- 12- 2,382
San Lorenzo Valley RC
N6RZ (+N6NLT) 1651-C- 16- 2,376
Mine Creek ARA
KCØOB (+KAØWNI) 821-B- 19- 2,374
Inland Empire ARC
WA6ZEF (+KB6MUB) 829-B- 35- 2,374

Steel City ARC
W3KWH (+KA3OYI) 762-B- 25- 2,352
Cumberland Valley ARC
W3ACH 568-B- 10- 2,302
Umpqua Valley ARC
KI7M (+KA7VBZ) 625-B- 12- 2,294
Parker Co RC
WD5F 572-B- 15- 2,266
Mahaska ARC
KDØBQ (+KAØWWV) 818-B- 12- 2,264
Everglades ARC
W4SVI (+N4MRB) 561-B- 17- 2,254
Clinton ARC
WØCS (+N8HCY) 555-B- 6- 2,250
Valley RC of Eugene
W7PXL 718-B- 11- 2,254
Lower Columbia ARA
W7DG 483-B- 23- 2,208
Bay Area ARC
WB8ICU 569-B- 10- 2,184
Edmond ARS
KV5X 562-B- 35- 2,156
Adams Co ARS
WB3FRG 716-B- 12- 2,152
IBM ARC
N4TL 515-B- 20- 2,150
Intercity ARC
W8WE 514-B- 30- 2,146
NCG
NØDJS 559-B- 20- 2,118
Macon ARC
W4BKM 676-B- 35- 2,112
Lake Region ARC
KØOIK 794-B- 26- 2,108
Midstate ARC
N9AZD 585-B- 21- 2,106
Grand Island ARS
WØCUO (+KA8TDN) 682-B- 15- 2,068
Larkfield ARC
WA2PNU 683-B-120- 2,078
Casper ARC
W7VNJ 601-B- 35- 2,074
Milwaukee RAC
W9RH (+KB4QXV) 580-B- 30- 2,034
Tri-County ARC
NA4T 437-B- 25- 1,994
Moreno Valley ARA
WR6G 608-B- 15- 1,988
Tri-Cities ARC
W7VPA (+KA7ZBO) 552-B- 15- 1,980
SPARC
K5ABA (+KA5ZSC) 688-B- 12- 1,980
Old Pueblo RC
W7GV (+N7HOR) 598-B- 14- 1,958
Auburn ARA
KS2J 556-B- 16- 1,954
Alamogodo ARC/AF-Navy MARS FD Group
WF5S 432-B- 15- 1,934
Top ARC
K5IS 738-B- 12- 1,932
PART of Westford
AB1A 516-B- 11- 1,920
Hamilton Co ARA
KØKWO 706-B- 14- 1,912
NCG
W4OLB (+KB4IRV) 585-B- 5- 1,910
South Bay ARC
N6HEK 560-B- 10- 1,862
Westark AR Council
WE5L 727-B- 17- 1,854
Maple Ridge ARC
VE7CMR 607-B- 12- 1,854
Pawnee ARC
AFØN 505-B- 25- 1,838
Three Missileers
N8UJ 486-B- 14- 1,820
Portland AWA
W1KVI 1143-C- 20- 1,817
Pioneer ARC
WØRCH (+KA8UKY) 459-B- 10- 1,808
Omik Electronic Assn
W3CEV (+KA8KTE) 404-B- 19- 1,784
Spring Hill ARC
N4US 355-B- 37- 1,730
North Hills Radio Club
K6IS 514-B- 15- 1,728
Suffolk Co RC
W2DQ 614-C- 20- 1,722
Johnston ARS
AK4H 495-B- 18- 1,710
Jamestown ARC
WØFX 430-B- 22- 1,652
Sierra ARA
NM5Y 625-B- 15- 1,650
Quabog Valley Repeater Assn
NC1Z 452-B- 18- 1,644
Wichita ARC
WØSOE (+KA8VTG) 404-B- 30- 1,624
Mid-Atlantic ARC
W3SA (+KA3PGJ) 394-B- 14- 1,624
Grass Valley Group
WT6P 366-B- 8- 1,600
Oswegatchie Valley ARC
NR2S 337-B- 11- 1,576
Queen City Emergency Net
W8VVL 383-B- 12- 1,574
Mich-a-Con ARC
N8LT 540-B- 10- 1,552
Jay's Generator Memorial RC
K4SWJ 444-B- 5- 1,544
Tri-Boro RC
W2BMW 413-B- 5- 1,542
Grant Co ARC
W9EBN (+KA9JUB) 466-B- 15- 1,536
Chesapeake Bay RA
KB3K 455-B- 15- 1,532

Cambridge ARA
W8VP 786-C- 5- 1,530
Centralia Wireless Assn
WD9FTR 547-B- 20- 1,526
Owatonna Steele Co ARC
K8HNY 447-B- 5- 1,526
Champaign Logan ARC
W8EBG 455-B- 40- 1,510
Southern Alberta ARC
VE6CAM 340-B- 19- 1,492
Coastal Carolina CCCC
KB4MYE (+KA4SFF) 502-B- 10- 1,492
Evergreen AR Service
NK7V (+KA7VJU) 398-B- 8- 1,482
Henry Co ARC
K8TII 681-B- 25- 1,462
Downey ARC
W6TOI 408-B- 19- 1,462
Highlands Co ARC
WG4M 396-B- 14- 1,444
Ebonaire ARS
NF2N 497-B- 17- 1,436
Chehalis Valley ARS
WA7UHD 330-B- 15- 1,426
Kendall ARS
KF5BT 369-B- 11- 1,416
Sudbury ARC
VE1BLZ 260-B- 17- 1,414
Anchorage ARC
KL7AA 292-B- 45- 1,396
Cascade RC
W7EK 454-B- 8- 1,396
Fulton Co ARC
K8BXQ 326-B- 4- 1,374
Hualapai ARC
K7GG 322-B- 6- 1,364
Mesabi Wireless ARC
K8MK 286-B- 12- 1,362
Brazos Valley ARC
WA5G (+N5GZW) 358-B- 15- 1,362
Dauphin ARC
VE4NUF 318-B- 30- 1,340
Pico Rams
K9IYP 399-B- 17- 1,328
Adams Co ARS
WB3FRG 716-C- 12- 1,326
Northwest Ohio ARC
WB8ULC 415-B- 16- 1,310
Cumberland ARC
K3IEC 504-B- 11- 1,308
Abbotsford Emergency ARC
VE7ECC 885-C- 5- 1,304
NCG
N3BAO 289-B- 3- 1,298
Hernando Co ARA
K4RX (+KB4BEX) 241-B- 50- 1,284
Plano ARK
NN5T 313-B- 37- 1,264
Lambton Co ARC
VE3IG 312-B- 24- 1,240
Humboldt ARC
N8AFT (+KB8KRS) 268-B- 11- 1,234
Cranford ARS
WB2CLW 309-B- 6- 1,224
South Side ARC
N8EWP 417-B- 8- 1,218
Scoland ARA
K0AAR 358-B- 19- 1,216
The Toppers
WA8AIL 421-B- 4- 1,214
Blue Valley ARC
WA8HOU 298-B- 25- 1,214
North Peninsula Electronics Club
W6PMK 246-B- 10- 1,210
Logan Co ARC
KA8RFK 346-B- 15- 1,202
Hartford Co ARA
W1NEM (+KA1LHJ) 364-B- 15- 1,188
El Dorado ARC
W6AJJ 355-B- 7- 1,162
NCG
WB8GXT 315-B- 9- 1,162
Healing Springs Mtn VHF Society
W4PAR 307-B- 20- 1,120
Chesco ARA
K3BKG 409-B- 8- 1,118
Placentia Radio Watch
WB6DCC 401-B- 10- 1,102
Mid-Willamette ARC
KA7KOI (+KA7YMA) 247-B- 12- 1,098
Highlands AWG
AK4U 326-B- 11- 1,088
Klamath Basin ARA
W7VW 228-B- 10- 1,082
Datapoint ARC
K5CB 274-B- 7- 1,056
Lodi ARC
K6URI 256-B- 14- 1,050
Petaluma DX & Experimenter Society
WB6EGE (+KA6OPN) 222-B- 10- 1,026
High Plains ARC
W0GGP 342-B- 10- 984
Apple City RC
W7TD (+KA7WFI) 256-B- 7- 968
Tri Lakes ARC
N8GW 241-B- 5- 920
Wood Co (Ohio) ARC
K8TIH (+KA8YUT) 202-B- 19- 852
Rep of The Rio Grande ARC
K5KYD 215-B- 12- 842
Prince Georges Wireless Assn
K3CEZ 135-B- 10- 832
Mancorad
W9DK 106-B- 9- 812
CHARRO
W5KR (+WP4BZN) 148-B- 6- 802
Chesapeake AR Service
KI4EZ (+N4NWA) 188-B- 23- 802
Orange Underwear FD Group
KA1OU (+WB2FSK) 128-B- 7- 794
Boeing Employees ARS
WA0TAH 245-B- 23- 790
Dape Co AR
W4NVU 233-B- 26- 778
UAMARC
WE6M 279-B- 12- 734
Kodak Park ARC
WB2WXQ 206-B- 6- 714
Tooele Co ARS
AG7A 121-B- 8- 670
Palm Beach Sheriff's ARC
KI4WH 84-B- 8- 668
Honeywell ARC
WA8NLP 163-B- 20- 660
Calveras ARS
KI6AZ 85-B- 18- 656
Clear Creek ARS
W0NPO (+KA0YAB) 66-C- 35- 648
Wythe ARC
K4OXN 320-B- 12- 640
Bishop ARC
WE6Y 136-B- 5- 572
NCG
K3KW (+KA3NWM) 91-B- 8- 570
Kings Co RA
W2XY 437-C- 25- 461
National Trail ARC
K9UXZ 181-C- 15- 301

3A Commercial

The West Side RC
VE3JJ 1248-B- 7- 3,508
RA of Western New York
W2PE 745-B- 16- 2,434
Chehaw ARS
NA4J 680-B- 16- 1,858
Mohawk ARC
NA1P (+KA1GCN) 465-B- 10- 1,308
Rappahannock ARA
AA4GL (+N4KBP) 454-B- 18- 1,284
Egyptian RC
W9AIU 357-B- 19- 1,142
Lawton-Ft Sill ARS
W5KS 378-B- 22- 902
Zero Beaters ARC
WA8FYA 285-B- 12- 896
Orrville ARS
KD8EU 310-B- 35- 872
Cape May Co ARC
AE2Y 184-B- 11- 612
DeForest ARC
WA8VVC 249-B- 18- 518
Madison West HS ARC
N9FFU 108-B- 7- 324

4A Battery

Foothills ARC
W3LWW 838-A- 18- 5,490
Mason-Dixon ARC
K8HS 822-A- 23- 5,265
Roanoke Valley ARC
W4CA 1311-B- 30- 4,232
Hendricks Co Ham Club
N9SF 1482-B- 20- 4,230
Central Oregon RAC
KE7DU 614-A- 10- 4,010
Gateway QRP Society
N9TW 304-A- 4- 2,980
Eagle Rock ARC
KX7C 323-A- 10- 2,870
NCG
WA6YBN 294-B- 5- 1,152
3 Generations
W6SGJ 224-B- 7- 994

4A

Cherryville RA
K2NJ (+KA2OEE) 4075-B- 32- 13,342
Kettle Moraine Radio Amateurs
N9KS (+KA9USV) 3092-B- 40- 9,920
Northwest ARC
W9LM 2737-B- 28- 9,260
Scottsdale ARC
K7TR 2711-B- 60- 8,808
Ft Wayne RC
W9TE 3103-B- 15- 8,700
OH-KY-IN ARS
K8SCH (+KB4TEE) 3029-B- 35- 8,650
ECARA
K1MUJ (+KA1MCY) 2217-B- 27- 8,634
Splitrock ARA
K2RF (+KB2AMH) 2452-B-100- 8,524
Hamfesters RC
W9AA (+KA9URF) 2679-B- 36- 7,954
Hughes Aircraft Co/HESEA ARC
K8ZT (+KB8MIV) 2165-B- 30- 7,230
Delaware Lehigh ARC
W3CK (+KA3OEG) 2301-B- 22- 7,068
Pilgrim AWA
K1BL (+KA1KDH) 2468-B- 25- 6,928
Ozaukee RC
KA9CAN (+KA9QLP) 2009-B- 18- 6,886
Wayne AR Technical Society
WD8LLD 1974-B- 8- 6,616
Reservoir ARA
K8QYL (+KA8ZGE) 2244-B- 25- 6,372
Two Rivers ARC
W3UST 1846-B- 32- 6,156
Nittany ARC
W3YA 1773-B- 25- 6,120
Double Cheese No Onion
W8MRE 1737-B- 13- 5,980
Pentagon ARC
K4AF (+N2FOE) 1655-B- 20- 5,916
Westchester ECA
WB2ZII (+KB2APX) 1586-B- 25- 5,782
Palomar ARC
W6NWG 2097-B- 47- 5,770
Sturdy Mmi Hosp & Foxboro Co ARCs
K1ZZJ 1896-B- 29- 5,704
Niagra Peninsula ARC
VE3VM 1505-B- 20- 5,634
Livingston ARK
KW8G (+N8GWV) 1556-B- 25- 5,546
Natchaug ARA
W1TR (+KA1NCO) 1811-B- 20- 5,176
West Allis RAC
W9FK 1699-B- 17- 5,040
Riverside Co ARA
W6TJ (+N6JPO) 1703-B- 40- 5,006
Fox River RL
W9CEQ (+KA9ORS) 1504-B- 50- 4,964
Beaches ARS
W4DU (+KB4SRJ) 1283-B- 30- 4,684
Van Wert ARC
W8FY (+KA8NSG) 1527-B- 23- 4,440
TARA
KI3D 1699-B- 25- 4,398
Poway ARS
K6CD 1331-B- 30- 4,388
Greater Lawrence AR Fellowship
W1FW 1116-B- 30- 4,190
Southern Michigan ARS
W8DF 1327-B- 25- 4,068
MTARA
NA1V (+KA1MDA) 1073-B- 10- 4,062
Ocean Monmouth ARC
KC2Q 1080-B- 15- 3,998
Stamford ARA
K1GF (+N1DXT) 1299-B- 75- 3,982
Fredericton ARC
VE1ND 1039-B- 12- 3,904
Kalamazoo Co RACES/Kalamazoo RC
W8VY (+KA8ZUL) 1097-B- 30- 3,828
EGARC
ND9W 1341-B- 13- 3,768
Lake Monroe ARS
NE4I 1135-B- 30- 3,750
Ottawa ARC
VE3RC 1078-B- 45- 3,720
Arizona ARC
W7IO 1136-B- 25- 3,692
Corpus Christi ARC
W5MS 1025-B- 37- 3,586
NCG
NB9B 1102-B- 6- 3,406
Naperville ESDA
N9RF 839-B- 13- 3,336
Mt Vernon ARC
N4GHI (+KB4EDU) 848-B- 30- 3,274
Kokomo ARC
W9XX 768-B- 15- 3,198
West Branch ARA
W3AVK (+KA3KXT) 837-B- 37- 3,196
Aurora RA
W8SM (+KA8RTG) 959-B- 42- 3,176
Adams Co ARC
K9UR 841-B- 15- 3,168
Orange Park ARC
NU4Y (+KA4AOS) 649-B- 30- 3,088
Shiawassee ARA
W8QQQ 1029-B- 24- 3,074
York ARC
W3EDU 910-B- 24- 3,050
Nutley ARS
W2GLQ (+KA2ZJO) 925-B- 20- 3,016
Brantford ARC
VE3BA 938-B- 25- 3,010
Rio Hondo ARC
W6GNS (+KB6MIR) 1056-B- 45- 2,924
Golden Empire ARS
W6RHC (+KB6COH) 749-B- 30- 2,850
Tri-County RA
W2LI 965-B- 23- 2,826
CFB Gagetown ARC
VE1JO 767-B- 20- 2,822
Gainesville ARS
NF4O 996-B- 17- 2,804
Framingham ARA
W1FY (+KA1NOI) 680-B- 30- 2,750
Whitman ARC
WA1NPO (+KA1MUW) 591-B- 25- 2,744
Tahoe ARA
NR7A 886-B-100- 2,706
Rome RC
W2OFQ (+KB2AKW) 692-B- 20- 2,688
San Gabriel Valley RC
W6QFK 621-B- 42- 2,634
Okaw Valley ARC
W9KXQ 865-B- 15- 2,618
Hope Valley ARA
KC1G 702-B-120- 2,608
Middle TN ARS
W4UOT (+KB4SCP) 745-B- 20- 2,602
Southern Sierra ARS
K6RL 567-B- 12- 2,542
Simi Settlers ARC
WM6P (+KB6IXA) 573-B- 22- 2,518
Iroquois-Ford ARS
WB9TAH (+KA9UAE) 701-B- 16- 2,508
Raritan Bay Radio Amateurs
K2GE (+KA2FNZ) 508-B- 14- 2,422
Willmar Area EAR
W0SW 775-B- 12- 2,364
Pecklomew Valley ARC
W3GOS 607-B- 10- 2,318
Midland ARC
W8KEA (+KA8ZLQ) 753-B- 24- 2,304
Seneca RC
W8ID 582-B- 9- 2,276
South Central Indiana ARC
N9BUC 667-B- 15- 2,250
Muscatine ARC
KE0Y 750-B- 17- 2,226
South Bay ARS & ARES
K6QHQ 468-B- 16- 2,224
Parma RC
K8VZW (+WD8MHL) 575-B- 12- 2,134
Catalpa ARS & Oak Park ARC
W8AG 696-B- 25- 2,106
Spokane Radio Amateurs
W7NBR 671-B- 18- 2,078
Fullerton RC
W6ULI 668-B- 26- 2,074
Pasadena RC
W6KA 922-B- 18- 2,032
Smoky Mountain ARC
W4OLB (+KB4IRV) 585-B- 12- 2,010
Butler Co ARA
W3UDX (+KA3NSQ) 444-B- 32- 1,938
Rantoul ARA
W9ZK 611-B- 14- 1,922
Kessler AR Activity
K5TYP (+KA5ZJU) 564-B- 13- 1,894
Shoreline ARC
W1BCG 439-B- 50- 1,772
Mankato Area RC
W0WCL 421-B- 18- 1,702
Jersey Shore ARS
W2DOR 434-B- 25- 1,654
Catalina RC
KC7S 414-B- 10- 1,600
Oklahoma Weather Information Net
KD5VQ 488-B- 8- 1,576
Sacramento ARC
W6AK 418-B- 16- 1,572
Geraldton ARC
VE3NHZ 373-B- 6- 1,554
Barrie ARC
VE3GCB 400-B- 25- 1,472
Durango ARC
KD8DI (+KA0NKA) 218-B- 12- 1,460
Lawrence Co ARA
NA3S 409-B- 20- 1,392
Island Co ARC
W7PN 264-B- 10- 1,380
Mid Michigan ARC
WD8DVB 388-B- 10- 1,336
Dalton ARC
WI4L (+KB4MOK) 394-B- 18- 1,326
SCCARA
W6UU (+KA6ABG) 328-B- 5- 1,294
Genesee Co RC
W8ACW (+N8HMD) 330-B- 35- 1,294
Orange Co ARC
N2AWI (+KB2AUQ) 381-B- 10- 1,292
Lower Yakima Valley ARC
W7FHI (+N7HNA) 323-B- 9- 1,260
Wayne Co ARS
K4CYP 250-B- 10- 1,248
Alexandria RC
W4HFH 248-B- 25- 1,214
Barry ARA
KJ8T 223-B- 8- 1,132
ARA Portneuf
VE2CSP 233-B- 15- 1,036
NCG
VE7DSY 236-B- 5- 916
Key City ARC
WA5B 91-B- 25- 700

4A Commercial

Porter Co ARC
N9RD 1458-B- 45- 3,960
Kingston ARC
VE3KAR 708-B- 15- 1,748
Valley ARA
N1RA 780-B- 4- 1,718
Somerset Co ARC
KB3VH 412-B- 12- 1,084
TARCOM
W2FWG 201-B- 17- 712
Greene Co Radio
WS8JR 343-B- 10- 686

5A Battery

Lincoln Co ARC
K7PQ (+KA7WFW) 941-B- 12- 3,366
Field Day's Finest
N9DD 418-B- 6- 1,632

5A

Western ARA
N6ME (+N6MKL) 3135-B- 45- 10,096
United RAC of San Pedro
K6AA (+WB6ONP) 3124-B- 35- 10,016
Huntsville ARC
K4BFT (+KB4KKG) 2661-B- 28- 9,200
Birmingham ARC
W4CUE (+N4KYO) 2449-B-225- 8,280
Lake Co ARA
K8BL 2593-B- 15- 8,036
South Pickering ARC
VE3SPC 2455-B- 25- 7,964
Garden State ARA
W2GSA 2298-B- 45- 7,286
South Florida DX Assn
W4WJ 2063-B- 20- 7,194
TRW ARC
W6TRW (+KB6LSE) 2123-B- 32- 6,870
Wheaton Community Radio Amateurs
W9CCU (+N9FSK) 1689-B- 43- 6,816
Carver/Scott ARES and HTCSCARS
KG0N 1716-B- 25- 6,450
RCA Astro ARC
W2DU (+KB2ADQ) 1826-B- 30- 6,312
London ARC
VE3LON 1907-B- 23- 6,108
Old Barney ARC
N2OO (+WB2JPY) 1677-B- 50- 6,016
NCG
KZ3H 1787-B- 9- 5,980
Twin Cities RC
W0BIJ 1792-B- 50- 5,478
Schenectady ARA
K2AE (+KA2LEP) 1626-B- 48- 5,476
Mid-South ARA/Tri-State DX Assn
W4EM (+KB4LQL) 1460-B-125- 5,298
Mt Diablo ARC
W6CX (+KA6MCS) 1604-B- 7- 4,874
Delaware Valley RA
W2ZQ (+N2FWP) 1536-B- 25- 4,768
Burlington Co RC
K2KED (+WA2SXD) 1342-B- 41- 4,720
Grumman ARC
WA2LQO 1267-B- 46- 4,682
Chicago Suburban RA
K9BY 1473-B- 60- 4,506
RA of Erie
W3GV (+KA3PMW) 1084-B- 12- 4,422
Tioga Co ARCs
K2QR 1253-B- 15- 4,418
Portage ARC
N8MC (+KA8ZOZ) 1177-B- 20- 4,386
HRAC
W3UU 1131-B- 35- 4,026
Greater Toledo ARA
K8ALB 1044-B- 14- 3,952
Panhandle ARC
W5WX 1059-B- 23- 3,894
Monongalia Wireless Assn
K8WV 1121-B- 25- 3,878
North AR ARS
K5LG (+KA5VDK) 1156-B- 5- 3,874
Cuyahoga Falls ARC
W8VPV 1029-B- 30- 3,782
Armadillo Gang
K5UDU (+KA5JVD) 1208-B- 35- 3,606
SHBP & M
W3PIQ (+KA3NUL) 952-B- 42- 3,550
Du Page ARC
W9DUP (+KA9VKK) 1052-B- 25- 3,528
Morris RC
W2OYH 921-B- 19- 3,406
Rockford ARA
W9AXD (+KA9UUH) 958-B- 25- 3,368
Central MA ARA
W1BIM 828-B- 42- 3,310
QRA Quannapowitt RC
W1EKT 838-B- 28- 3,274
Scarborough ARC
VE3WE 1049-B- 30- 3,268
LIMARC
W2VL 1620-C- 53- 3,246
Sangamon Valley RC
N9EM 967-B- 30- 3,190
Middlesex ARS
W1EDH (+WB1ARF) 956-B- 12- 3,150
Silverton ARC
KD7X 911-B- 15- 3,144
Delaware ARC
W3SL 836-B- 15- 3,114
Southern Berkshire ARC
W1BAA (+KA1ODC) 947-B- 15- 3,076
Clark Co ARES/Independ RA
W8VZE (+KA8TGQ) 992-B- 25- 3,038
Chicago ARC
W9CAF 893-B- 25- 3,036
Michiana ARC
W9AB 928-B- 15- 2,878
Chemung Co ARES
W2ZJ 468-B- 24- 2,592
Antietam RA
W3CWC 853-B- 10- 2,550
EPA FD Contesters
AK3V 1177-C- 18- 2,345
Kern Co-Central Valley ARC
W6LIE (+KB6CRY) 713-B- 40- 2,312
West Palm Beach ARC
W4HAW (+KB4SCV) 576-B- 25- 2,156
GD/PRA RC
WB6KQY 714-B- 15- 2,012
GDHC
WB6KQY 740-B- 5- 1,980
Warren Co RACES
N0CS 554-B- 25- 1,952
Beloit ARC
K9EP 804-B- 8- 1,922
Madison Co ARC
W9VCF (+KA9VHK) 595-B- 15- 1,870
Panorainaland ARC
W7JTR 447-B- 11- 1,670
WACRC
AD3T 380-B- 15- 1,632
Jefferson Barracks ARC
K0ZFK 296-B- 23- 1,102
Genois ARC
K9HGX 173-B- 5- 1,014

5A Commercial

Alliance ARC
W8ZZS 551-B- 12- 1,684

6A

Cary ARC
N4NC 3144-B- 28- 10,086
NBS Brass
K3AA 2998-B- 38- 9,896
Penn Wireless Assn
W3SK (+KA3NTZ) 2813-B- 40- 9,344
L'Anse Creuse ARC
K8RO (+KA8VSN) 2705-B- 50- 9,244
Northrop and Palos Verdes ARCs
W6CN (+KB6MKU) 2933-B- 51- 8,436
Hoodview ARC
WB7QIW (+KA7YFY) 2535-B- 48- 7,566

Bolingbrook ARS
AF9M (+KA9VAC) 1775-B- 90- 6,258
Warminster ARC
K3KT (+KA3JEF) 1673-B- 35- 6,246
Discrete Components of 955
K3WJV (+WA3BZT) 1609-B- 12- 5,510
Tulsa ARC
W5OK 1528-B-150- 5,158
Triple States RA Club
K8AN (+KA8VAU) 1198-B- 95- 4,608
Peoria Area ARC
W9UVI (+N9FAM) 1253-B- 25- 4,100
Warren ARA
W8VTD (+N8GZE) 1192-B- 28- 4,058
Wilson ARC
AA4DO 982-B- 32- 3,924
ARALB
W6RO 1167-B- 32- 3,710
Central NH ARC
N1LF (+KA1JVB) 1060-B- 24- 3,564
Indian Hills RC
W8ICS 925-B- 24- 3,190
709 ARC
W8BOO 1124-B- 20- 3,142
Gabilan ARC
W6RAG (+KB6KJO) 893-B- 30- 2,846
Houston Echo Society
WA5GZX (+KA5DAT) 836-B- 20- 2,708
Pueblo Ham Club
KR8K 762-B- 20- 2,224
Indiana Co ARC
W3BMD 375-B- 63- 1,752
Metropolitan ARC
K8NOW 471-B- 10- 1,746
Sierra Foothills ARC
KB6KOS 441-B- 16- 1,744
Rock Creek ARA
W3RCN 437-B- 21- 1,606
Mobile Sixers RC
W3AWA 452-B- 14- 1,516

7A

Mike and Key ARC
K7LED 2970-B- 38- 9,542
RF Hill ARC
W3AI 2198-B- 25- 7,544
Bergen ARA
K2ZO (+K62AWD) 1804-B- 30- 6,244
Twin City ARC
K9CW (+KA9QZO) 1707-B- 23- 6,020
Murgas ARC
K3YTL (+KA3OZA) 2118-B- 46- 5,980
Mountain ARC
W3YMW (+WB3KOZ) 1207-B- 25- 4,254
North Coast ARC
KB8A (+KA8ZRH) 1173-B- 38- 4,204
SCATS
WB6LRU (+KB6IDR) 1313-B- 42- 4,012
Toledo Mobile RA
W8HHF 1302-B- 18- 3,916
Empire RC
N8AY 701-B- 7- 2,550
SELECT
W5GAD 549-B- 26- 2,290
Adrian ARC
W8TQE 650-B- 68- 2,232
Black Hawk ARG
K59Q 737-B- 15- 2,192
Amador Co ARC
N6KD 536-B- 40- 2,020
Baldwin Hills ARC
NY6L 462-B- 22- 1,724
Walla Walla Valley ARC
W7DP 618-B- 22- 1,534

8A Battery

Alameda Co RC
N6WG (+N6NFB) 847-A- 25- 6,805

8A

Crystal RC
W2DMC 2863-B- 28- 9,092
Radio Club of Tacoma
W7DK (+KA7MMW) 2393-B- 32- 8,584
Sonoma Co Radio Amateurs
W6LFJ (+N6KZS) 1280-B- 40- 5,276
Mahoning Valley ARA
W5QLY 1456-B- 26- 4,870
Vienna Wireless Society
K4HTA (+KD4QJY) 1222-B- 50- 4,430
Peninsula Radio Operators Society
KY3S 1138-B- 18- 4,316
West Coast ARC
WI6C 933-B- 45- 3,526
Turlock ARC
W6BXN 759-B- 35- 3,434
Susquehanna Valley ARC
NB3H (+KA3RKP) 983-B- 16- 3,084
South Waterloo ARC
VE3SWA 842-B- 16- 2,858

9A

Four Lakes ARC
W9JZ (+KA9TNQ) 2375-B- 38- 7,778
TAARA
AC3J 1434-B- 80- 5,330
San Antonio RC
W5SC 1474-B- 35- 5,228
Eastern Ontario ARC
VE3SAU 618-B- 20- 2,684

10A

Gloucester Co ARC
W2MMD 2554-B- 50- 8,504
Antelope Valley ARC
K6OX 1525-B- 21- 5,572

11A

Silver Springs RC
K4GSO (+N4NWN) 795-B- 33- 3,780
Cumberland Co ARS
N3CWD (+KA3PIN) 940-B- 16- 3,082

12A Battery

Conejo Valley ARC
K6CAB (+KB6MJH) 2063-A- 30- 14,760

12A

Woodbridge Wireless
W4IY 3739-B- 17- 12,146

13A Battery

Nortown ARC
VE3NAR 1755-A- 24- 13,720

15A

Nashua Area RC
N1NH (+KA1OKQ) 3694-B-100- 11,704

19A

South Jersey Radio Assn
K2AA (+KA2YKN) 4320-B- 65- 13,178

23A

Ocala RA
NT4B 2407-B- 40- 9,038
Englewood ARA
K2ND (+WA2FYI) 28-B- 6- 2,656

One or Two Person Portable

1B-1 opr Battery

WB8IBM (KW8N, opr) 735-A- 1- 8,870
K3WW 534-A- 1- 4,850
K3ONW 417-A- 1- 4,370
N8XX 273-A- 1- 3,325
N2RI 237-A- 1- 2,645
K2JT 245-A- 1- 2,565
WB2MBM/3 272-A- 1- 2,475
W2CRS 324-A- 1- 2,475
KC3M 604-B- 1- 2,470
NJ7M 216-A- 1- 2,460
KM8X 237-A- 1- 2,360
WA5VQK 228-A- 1- 2,240
WA2HZR 201-A- 1- 2,210
NM7N 167-A- 1- 1,770
KA2HMJ 145-A- 1- 1,750
WB7APW 161-A- 1- 1,710
NY5T 163-A- 1- 1,630
KA9FOT/4 139-A- 1- 1,590
WA2DFI/7 114-A- 1- 1,440
N6KR 133-A- 1- 1,430
N9BDL 106-A- 1- 1,360
VE3HIE 108-A- 1- 1,280
KB8IH 109-A- 1- 1,190
K4RDU 100-A- 1- 1,100
W6SQN 84-A- 1- 1,040
WB9SAU 453-B- 1- 1,018
KH6CP/W1 55-A- 1- 945
KU7K 200-B- 1- 900
KC4AF 117-A- 1- 900
W9FN 79-A- 1- 890
WD4DJJ 187-B- 1- 886
WA8HND 113-B- 1- 852
WA2VJL 53-B- 1- 576
KA2SJG 84-B- 1- 576
WB2DLA 31-A- 1- 510
KA0KKV 39-A- 1- 490
N3ANW 74-A- 1- 475
KO7V 19-A- 1- 390
WB5BYK/6 57-A- 1- 385
K0CVF 129-B- 1- 360
NU4B 25-A- 1- 350
WR6I 43-A- 1- 330
KA3PMW 1-A- 1- 110
N6EIK 11-A- 1- 110
KA3CDB 6-B- 1- 12

1B-1 opr

WZ4F/9 1140-B- 1- 3,642
W4NW/8 670-B- 1- 2,780
N2AWT 611-B- 1- 2,644
W2SV 957-B- 1- 2,428
K5ER 618-B- 1- 1,822
WA8ANL 458-B- 1- 1,774
WA6GDS 416-B- 1- 1,426
K2TB 328-B- 1- 1,312
KE8AZ 524-B- 1- 1,248
K3ITT 245-B- 1- 980
N1DBK 207-B- 1- 928
K6MA/4 183-B- 1- 676
WB8REI 182-B- 1- 564
N9EWT 86-B- 1- 480
N0GEJ 67-B- 1- 414
K0GPD 92-B- 1- 384
KH6IQD 135-B- 1- 370
K0CWW 109-B- 1- 318
W4DGH 63-A- 1- 315
KA8LXS 27-B- 1- 208
KO9KS 42-B- 1- 184
WA8NSY 18-B- 1- 172
KI2Y 4-B- 1- 116

1B-1 opr Commercial

WA4NXN 189-B- 1- 378
KB4HGV/7 131-B- 1- 262
WB6VIC 101-B- 1- 202

1B-2 oprs Battery

WA9IRV (+KB8N) 500-A- 2- 5,400
AA5C (+KD5PJI) 378-A- 2- 4,180
NT7E (+KG6ME) 350-A- 2- 3,500
NR8J (+W8KEA) 331-A- 2- 3,295
W9VV (+K9DQU) 271-A- 2- 3,010
KD8FW (+KC8FJ) 337-A- 2- 2,980
N8HLE (+W1FB) 284-A- 2- 2,940
WB8ERJ (+N8GWY) 348-A- 2- 2,870
KK7C (+WB7BIV) 236-A- 2- 2,660
WA8FSF/7 (+WB6JJE) 640-B- 2- 2,568
WB0RXF (+WA8ZPT) 285-A- 2- 2,430
K8BP (+opr) 1058-B- 2- 2,418
KY5D (+WB4ODX) 230-A- 2- 2,350
KA8HIB (+WA8VBW) 316-A- 2- 2,025
KA2NYB (+KA3MZQ) 187-A- 2- 1,970
KW4M (+KX4R) 178-A- 2- 1,780
K7BFL (+KE7PG) 192-A- 2- 1,575
K8HD 277-A- 2- 1,485
K4EFD (+KJ4VH) 251-A- 2- 1,455
KH6IJS (+KH6NO) 122-A- 2- 1,320
N9AX (+KG9Z) 180-A- 2- 1,310
AA4CO (+KB4EFF) 106-A- 2- 1,190
KT7G (+KG7D) 259-B- 2- 1,126
W7LG (+KA7RCL) 110-A- 2- 1,110
WE5R (+K4KJP) 57-A- 2- 870
N7HTF (+WB7VLV) 135-A- 2- 845
NR8A (+NO8G) 102-A- 2- 840
VE2XU/3 (+VE3XS) 218-B- 2- 536
NG0S (+N0GVT) 214-B- 2- 528
N4KEZ (+WB4NBI) 51-A- 2- 510
KD9KW (+WB9KZQ) 228-B- 2- 500
N9EX (+KA9NZI) 20-A- 2- 400
KC4UX (+KA5B) 83-B- 2- 266
KG6VI (+N6CAB) 58-B- 2- 242

1B-2 oprs

N4BP (+N4UM) 1751-B- 2- 5,716
W6TK (+WD8AUB) 1023-B- 2- 4,686
N9NE (+K9DFB) 856-B- 2- 3,782
N7AZ (+WB7SRC) 958-B- 2- 3,480
W1XX (+W1NJM) 868-B- 2- 3,248
N8AAU (+AC8P) 647-B- 2- 2,888
W1WP (+AD1O) 611-B- 2- 2,588
KI3S (+KN3I) 543-B- 2- 2,012
K4LDR (+WB4ABY) 418-B- 2- 1,790
W8YHE (+WA8DCJ) 654-B- 2- 1,786
K2OC (+K9SO) 448-B- 2- 1,774
NC7B (+ND7A) 517-B- 2- 1,614
WA3VPL (+WA3YSW) 358-B- 2- 1,408
KQ2G (+KA2WWU) 267-B- 2- 1,328
VE2QST 268-B- 2- 1,238
WA2EKK (+KA2CKR) 426-B- 2- 952
W8GQN 180-B- 2- 920
W9XU (+WA9FDX) 322-B- 2- 854
K7THW (+KA7QAH) 121-B- 2- 784
WA2LWT (+WA2QIC) 283-B- 2- 766
N8BRQ (+KA8WOI) 389-C- 2- 658
VO1AA 157-B- 2- 600
KA1MWD (+KA1NSV) 183-B- 2- 594
WA8QBC (+KA8AYC) 50-B- 2- 130
KB5BD (+N5BNI) 59-B- 2- 118

1B-2 oprs Commercial

K5EIS 120-B- 2- 240

2B-2 oprs Battery

N3AE (+WA2SOC) 714-A- 2- 5,480
KA1CV (+WA1MBK) 482-A- 2- 4,655
WI6M (+WB6NKJ) 290-A- 2- 2,990
NA2J (+NA2K) 736-B- 2- 2,712
WB6CIA (+WB6VRN) 697-B- 2- 2,264
WB8TEI (+WB8JAY) 320-B- 2- 1,176
KA1ITX (+N1CRE) 69-A- 2- 1,120
W7ER (+W7TZZ) 238-B- 2- 988
N6MBY (+WB6UER) 111-A- 2- 870
N9ACA (+K9IQH) 119-B- 2- 556

2B-2 oprs

N6SU 1349-B- 2- 4,308
K8GIV (+K8BOI) 955-B- 2- 3,548
KB8CV (+N8GDV) 1134-B- 2- 2,548
WB6PFJ (+WB8LRV) 640-B- 2- 2,294
KE8BG (+WA9TXB) 584-B- 2- 2,242
WA4KDO (+WA4DBY) 436-B- 2- 1,226
KN7N (+KE7FS) 316-B- 2- 1,022
N4JRH (+N4KRR) 267-B- 2- 936
W4WAB 141-B- 2- 536
KC3UF (+KA3ONP) 125-B- 2- 452

2B-2 oprs Commercial

KF4AU/6 (+N4EQS) 283-B- 2- 766

Mobile Stations

1C

W8JI 732-B- 5- 2,552
WN6K 513-B- 2- 2,052
K8XC (+N8GXG) 186-A- 2- 1,860
NN5O 781-B- 4- 1,562
W8HD 517-B- 1- 1,308
W5AW 373-B- 3- 1,170
KM5S 429-B- 1- 858
WB4GHZ 339-B- 3- 734
W8VSK 166-B- 1- 664
WF8E 318-B- 7- 636
WI5Z 264-B- 2- 528
N5GFX 51-A- 1- 510
KF8K 179-B- 1- 358
KA5TJO 88-B- 3- 336
NA8R 142-B- 1- 284
KH6CF 53-B- 1- 212
N3DXJ 20-A- 1- 100
K2KQJ 10-A- 1- 100
N7GRN 13-A- 2- 95
N6MNA 23-B- 1- 64
WB7UJY/6 26-B- 1- 56
N6IGI 22-B- 1- 44
KR8L 9-B- 2- 36
WA4YRN 11-B- 1- 22

2C

KC9TR 293-B- 2- 818

Home Station Commercial Power

1D

KR8B 1500-B- 3- 4,870
K5NW 1083-B- 1- 3,256
NI9M 926-B- 4- 2,944
KF4CQ 569-B- 3- 2,276
K9ZO 1805-C- 1- 2,137
K4OAQ 511-B- 1- 2,044
W8UCE 1001-C- 4- 2,002
KA4NOO 850-B- 4- 1,700
WA3WAW 351-B- 1- 1,404
VE2GIW 333-B- 2- 1,332
K8YFM 621-B- 2- 1,242
WA8RXI 307-B- 1- 1,176
WB3RBF 492-B- 1- 1,140
N8FMR 276-B- 1- 1,104
N8FTJ 551-B- 1- 1,102
KS7T 723-C- 1- 1,079
AA4SR 441-B- 2- 1,024
NW4G 248-B- 1- 984
WB8OVV 281-B- 1- 964
K1DW 300-B- 2- 948
K3SS/1 230-B- 2- 920
KE8CS 448-B- 3- 900
W4WKQ 290-B- 1- 824
W8FL 298-B- 1- 786
K8GDF 230-B- 1- 778
N4ION 381-B- 4- 762
N4NER 751-C- 1- 751
W1SOX 178-B- 1- 712
KB4OP 345-B- 2- 690
W2KTF 141-B- 1- 582
K3LUE 275-B- 1- 550
NJ9Q 207-B- 1- 480
WA9ZES 116-B- 1- 464
K5SS 118-B- 1- 438
WB8ULZ/9 108-B- 1- 436
VE7IQ 107-B- 1- 428
W3HGM 102-B- 1- 408
KD5UJ 367-C- 1- 398
K8DI/2 178-C- 1- 356
KD2SU 175-B- 1- 350
VE6BKP 86-B- 1- 344
KD2OA 160-B- 3- 320
N4MPQ 77-B- 1- 308
KQ9Z 150-B- 1- 300
KA3LNA 73-B- 1- 292
KA1LDD 145-B- 1- 290
VE3SSN 141-B- 3- 282
K8EVC 139-B- 1- 278
W1OC 135-B- 2- 270
KA7YXC 135-B- 1- 270
WB7EMO 132-B- 1- 264
WA8WAU 121-B- 1- 242
KA1DSQ 114-B- 1- 228
WB6AKF 114-B- 1- 228
KB9PA 108-B- 1- 216
K6CSL 58-B- 1- 214
W6EIG 106-B- 1- 212
WK5Z 205-C- 6- 205
W5NR 102-C- 1- 204
W9REC 79-B- 1- 198
KC9EJ 48-B- 1- 192
NC1N 81-B- 1- 190
N5DWN 46-B- 1- 184
WA2VUU/3 47-B- 1- 180
WB5VXK 86-B- 1- 174
KA7VJI 43-B- 1- 172
VE7FB 81-B- 1- 168
VE7AOK 41-B- 1- 164
VE2CWR 160-C- 1- 160
KB4XE 66-B- 1- 156
WA6GFR 69-B- 1- 138
K9JA 8-B- 1- 132
KC3LM 59-B- 1- 128
W7TVL 62-B- 1- 124
KA1BFV 62-B- 1- 124
KC3SV 61-B- 1- 122
N7COU 118-C- 2- 118
W6SX 29-B- 1- 116
W2TI 59-C- 1- 116
W6PFE 56-B- 1- 112
KA3GXP 26-B- 1- 104
AA6EE 25-B- 1- 100
AB1U 49-B- 1- 100
W9UIX 50-B- 1- 100
K1II 40-B- 1- 92
K9SA 21-B- 1- 84
WA1PLK 41-B- 1- 82
WA8TUS 20-B- 1- 80
KA2YHY 18-B- 1- 72
WA2EHV/1 18-B- 1- 72
W0KAV 33-B- 1- 66
KA8LRR 32-B- 1- 64
N5ZR 20-B- 1- 62
KA8P 31-B- 1- 62
N4GPY 29-B- 1- 60
WA9GYG 54-C- 1- 54
W1LQA 53-C- 1- 53
K8HF 12-B- 0- 48
WB8KOE 14-B- 1- 40
W1YO 11-B- 1- 22
K9BAD 10-B- 1- 20
WA3VIL 8-B- 1- 16
W7PSS 3-B- 1- 6
W4RUE 6-C- 1- 6
N4MNU 1-B- 1- 4
KA1CNX 1-B- 1- 4

2D

AG8U 1093-B- 4- 2,946
W1NHS 973-B- 2- 2,818
WD4AHZ 519-B- 2- 1,802
W3ZH 542-B- 5- 1,548
NN7D 503-B- 8- 1,170
KI0S 456-B- 14- 1,138
KW1J 273-B- 4- 644
W9YCR 167-B- 6- 334
KA9PCV 91-B- 4- 208

3D

KB8N 520-B- 3- 1,520

4D

K8CCV 418-B- 10- 1,080

Home Station Emergency Power

1E

W4XD 285-A- 1- 2,650
NM7M 292-A- 1- 2,620
W1HN 607-B- 1- 2,428
W8UY 228-A- 2- 2,280
W5ORM 217-A- 1- 2,170
K9MWM 1004-B- 2- 2,114
VE7RCN 1050-B- 7- 2,112
W2WOE 525-B- 1- 2,100
KO1K 232-A- 3- 2,015
N4BOS 832-B- 4- 1,676
K8LL 1454-C- 15- 1,596
K7FC 161-A- 1- 1,535
KT1Y 254-A- 2- 1,270
K8TK 1205-C- 5- 1,238
W7YS 120-A- 1- 1,200
WB8SRM 583-B- 1- 1,182
W9ZI 290-B- 2- 1,160
N6CUS 576-B- 2- 1,152
W5STI 547-B- 3- 1,142
N8NF 779-C- 1- 1,063
WA3RGH 531-B- 2- 1,062
N9DHX 143-A- 1- 885
KD0EC 314-B- 1- 878
KD8VT 349-B- 2- 842
WD9EGW 84-A- 1- 840
K5SOR 83-A- 1- 830
K1TR 194-B- 1- 764
KA8VTF 74-A- 1- 740
WA3KEY 178-B- 1- 716
WN5TEN 157-B- 1- 628
KB6EAI 288-B- 1- 620
W7JBN 203-B- 5- 620
K1BTD 58-A- 1- 580
W1KN 135-B- 1- 540
K1TW 150-B- 2- 484
N5AE 47-A- 1- 450
ND0V 165-B- 1- 428
VE3OAT 206-B- 2- 410
W7DFO 74-A- 1- 410
KI4UX 172-B- 1- 364
NA7T 164-B- 2- 328
WB2CHO/6 154-B- 1- 308
W8TWJ 76-B- 1- 284
W1EQO 68-B- 3- 228
W1BGM 48-B- 1- 192
WA3FYZ 90-B- 1- 180
W6PRI 85-B- 1- 170
KD4ZO 81-B- 1- 162
K2HNW 6-A- 1- 160
VE2CWI 50-B- 1- 150
KA9PGD 60-B- 1- 148
KS6Q 24-A- 1- 120
W2GJ 10-A- 1- 100
WA3FYZ 49-B- 1- 98
W8JF 13-A- 1- 80
KJ4NJ 36-B- 1- 72

2E

AA4S 2174-B- 5- 7,258
WBAA/9 2061-B- 6- 7,152
AB8M 511-A- 10- 4,330
W4NT 1425-B- 8- 3,312
AA4BQ 924-B- 2- 2,796
K5QBM 945-B- 20- 2,344
W5ES 371-B- 50- 842
K9YHB 231-B- 6- 454

3E

W1FM 1117-B- 11- 3,966
VE7FG 1048-B- 14- 3,080
W5PWG 1089-B- 7- 2,972
KB8OT 958-B- 14- 1,916
KD6SA 485-B- 8- 1,072

4E

KE7C 1258-B- 4- 3,512
K3MJW 729-B- 15- 2,210

CHECKLOGS

AE1X, N1AA, W3ARK, W3EXP, KB4GY, N4XM, WP4N, KX6BU, WF6B, KE7LL, N7RK, W7ZA, W8VUV, N8DMV, VE3SMH

Rules, ARRL 10-Meter Contest

The rules for this year's 10-Meter Contest are the same as last year's. Keep in mind that a phone QSO is worth two points, and each CW contact is worth four points. A bonus is provided for each Novice/Technician contact; such contacts are worth eight points each.

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.

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 13-14, 1986). Forty-eight-hour period; all stations operate no more than 36 hours. Starts 0000 UTC Saturday; ends 2400 UTC Sunday. 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 through 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). (B) DX (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). Novice and Technician stations sign /N or /T.

5) **Scoring:**

(A) QSO Points: Count two points for each complete two-way phone QSO. Count four points for each complete two-way CW QSO. Count eight points for QSOs with US Novice or Technician stations (28.1 to 28.2 MHz only)— signing /N or /T. (Higher-class licensees: Remember that your power limit in this segment is 200-W output!)

(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).

(C) Final Score: Multiply QSO points by the sum of states/VE call areas/DXCC countries/ITU regions. Example: WB5VZL works 2539 stations, including 1633 phone QSOs, 896 non-Novice CW QSOs, 10 Novices, for a total of 6930 QSO points. He worked 49 states, 10 Canadian call areas, 53 DXCC countries and a maritime mobile station in Region 2 for a total multiplier of 113. Final score = 6930 (QSO points) × 113 (multiplier) = 783,090 points.

6) **Miscellaneous:**

(A) Call signs and exchange information must be received by each station for a complete QSO.

(B) No cross-mode contacts; CW QSOs must be made below 28.3 MHz.

(C) Mixed-mode single operator and all 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.

7) **Reporting:**

(A) Official forms are recommended (available from ARRL HQ for an SASE or two 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-check sheets (dupe sheets).

(C) Postmark your entry by January 14, 1987.

8) **Awards:** A certificate will be awarded to the highest-scoring single-operator station (in each category) from each ARRL Section and DXCC country. Top multioperator entries in each ARRL Division and each continent will receive certificates. Additional certificates will be awarded as participation warrants.

9) **Conditions 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 1986 *QST* for complete details.

Rules, ARRL 160-Meter Contest

This year's "Top Band" contest has some changes in the band plan (see Rule 6). As was the case last year, DX stations will send signal reports only.

Official entry forms are available from ARRL HQ for an SASE. If you want enough log sheets for more than 300 QSOs, please include two units of First Class postage. Good hunting!

Rules

1) **Object:** For amateurs worldwide to exchange QSO 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 5 until 1600 UTC December 7. 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 74) 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) **Adherence to Band Plan:** Participants are reminded that the segment 1.830 to 1.850 should be used for intercontinental QSOs only, in conformance with the ARRL band plan.

7) **Reporting:**

(A) Official forms are recommended (available from 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 7, 1987.

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) **Conditions 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 1986 *QST* for complete details.

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

NOVEMBER

1-2

ARRL November Sweepstakes, CW, Oct *QST*, p 90.

International Police Association Contest, Oct *QST*, p 93.

5

West Coast Qualifying Run, 10-35 WPM, at 0500Z Nov 6 (9 PM PST Nov 5). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 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.

8-9

European DX Contest, RTTY, Oct *QST*, p 93.

9

W1AW Qualifying Run, 10-35 WPM, at 0300Z Nov 10 (10 PM EST Nov 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Nov 5 listing for more details.

15-16

ARRL November Sweepstakes, phone, Oct *QST*, p 90.

Oceania CW QRP Contest, Oct *QST*, p 94.

AOEC 160-Meter DX Contest, Oct *QST*, p 94.

22-23

ARRL International EME Competition, Part 2, Sep *QST*, p 100.

24

W1AW Qualifying Run, 10-35 WPM, at 2100Z (4 PM EST). See Nov 9 listing for more details.

29-30

CQ World Wide DX Contest, CW, Oct *QST*, p 93.

DECEMBER

2

West Coast Qualifying Run, 10-35 WPM, at 0500Z Dec 3 (9 PM PST Dec 2). See Nov 5 listing for details.

5-7

ARRL 160-Meter Contest, this issue, p 81.

TOPS Activity Contest, sponsored by TOPS International, from 1800Z Dec 6 until 1800Z Dec 7. CW only, 80 meters. Single-op stations must take one 7-hour break, multiop stations may operate the entire 24 hours. Classes are single operator, multioperator 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 3-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.

8

W1AW Qualifying Run, 10-35 WPM, at 0300Z Dec 9 (10 PM EST Dec 8). See Nov 9 listing for details.

13-14

ARRL 10-Meter Contest, this issue, p 81.

28

Canada Contest

30

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 informa
tion 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, ARRL, 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; 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.

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

North Mississippi: The Tri-Lakes RC will operate special-event stations **Nov 6-9**, 0100Z-0400Z, from 12 counties to commemorate the 150th birthday of the 12 counties ceded to the US by the Chickasaw Indian Nation. Suggested frequencies: phone—3.8625 7.256 14.287; CW—3.725 7.125 14.125. Also, local 2-m repeaters, packet and satellite will be available for contacts. For certificate, send log info to W5NCB, 1306 S Lamar, Oxford, MS 38655.

Mt Clemens, Michigan: The L'Anse Creuse ARC will celebrate the flight of hot-air balloons by operating a special-event station from the basket of one, **Nov 8**, 1200Z-1500Z and 2000Z-2230Z. Suggested frequencies: 7.263 147.420. **Nov 15** will be an alternate-weather date. For certificate, send QSL and 9- × 12-in SASE to A. C. Koch, KA8JJN, 23682 Kim Dr, Mt Clemens, MI 48043.

Southington, Connecticut: The Southington ARA will operate W1ECV **Nov 8-9** to commemorate the Apple Harvest Festival. Suggested frequencies: 14.250 21.400 28.600. For certificate, send QSL and 9- × 12-in SASE (39 cents) to PO Box 284, Southington, CT 06489.

Hines, Illinois: The Hamfesters RC will operate K9FWN from 1500Z **Nov 9** until 0300Z **Nov 10** 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 and 9- × 12-in SASE (39 cents) to Hamfesters RC, c/o Robert K. "Pappy" Wade Memorial Ham Shack, Hines VA Hospital, Hines, IL 60141.

Newington, Connecticut: The Armored Forces AR Net will operate from 1200Z **Nov 9** until 2400Z **Nov 11** to commemorate Veterans Day. Suggested frequencies: phone—7.283 3.925; CW—7.060. Also, look for operation on all bands 10-80 meters. For certificate, contact any net member and send no. 10 SASE to Peter Kohanski, WB1DWR, 16 Berkley Cir, Newington, CT 06111.

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-Events Stations: To get your QSL or certificate from any of the special-event stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a self-addressed, stamped envelope. If sending for a certificate, use a 9- × 12-in envelope if you want an unfolded certificate, or a no. 10 envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your SASE to the address listed, or to the address given on the air by the station you QSO. Be patient. Special-event stations will often print their cards and/or certificates after the operation is over so they will know how many to order.

Section News

Administered by Steven Ewald, WA4CMS

The ARRL Field Organization Forum

CANADA

ALBERTA: SM, Bill Gillespie, VE6ABC—A/SM; VE6AMM. SEC: VE6XC. OO: VE6TY. STM/DEC: VE6ABC. Calgary and Red Deer amateurs provide communications for Triathalon in Red Deer. Glacier/Waterton Hamfest a great success and in great weather. Record attendance and good fun by all. Northern Alberta Radio Club provided communications for Triathalon event for the second year. Again a successful event. Band conditions and NM holidays slow down some traffic reporting. ATN figures next month. Traffic: APSN QNI 1162, QTC 43, Informal 74. Personal totals: VE6CHK 92, VE6CPE 19, VE6ABC 9.

BRITISH COLUMBIA: SM, Ernie Savage, VE7FB (on Holidays)—Public Service Net 3729 kHz, 0130 daily. NM Ford, VE7DDF. BCEN 3650 kHz, daily at 0200 Z. NM Ferdi, VE7EJU. QNI 910, QTC 231. Special thanks to Rob, VE7FSP for his two years of regular NCS on Tuesdays. Rob has other committments at the moment and will not be able to NCS for a while. And a welcome to our newest NCS Angela, VE7ANG. BCN report for August: Total QNI 4324, Average 139. Traffic: VE7BNI 420, CDF 151, EJU 76, EJW 65, XA 47, CCJ 45, ANG 32, FME 31, BZI 16, FSP 13, DJ 13, AVC 9, EIR 8.

MANITOBA: SM, Jack Adams, VE4AJE—Summer is becoming history for 1986 propagation has been trying at times during the summer. Many electrical storms with a number of stations been hit by lightening. Although one can disconnect, it is difficult to remove antennas. Remember a good ground system is essential to help prevent the lightening strikes. Net Reports: MEPN 31 sessions, 940 QNI, 23 QTC. MMN 31 sessions, 807 QNI, 34 QTC. MTN 15 sessions, 93 QNI, 13 QTC. WRIN 6 sessions, 354 QNI, 1 QTC. Individual traffic: VE4AJE 172, 4RO 44, 4TE 34, 4NUF 32.

MARITIME-NEWFOUNDLAND: ASM, Aaron D. Solomon, VE1OC—*Old Timer's Mini-Fest*, Sackville, N.B. Aug. 16-17. Great time had by those who attended. *Flea Market*, Moncton, N.B. Sept. 20th. More on this next report. *Certificates of Merit* awarded to 41 Amateurs who participated in Beaverbank, N.S. EMO Search for missing boy. VE1AQY has new ATH at Sackville, N.S. (Ham-land). *Visitors*-W1BGU, W7ZV, VE3GK, VE3WW, K1BH.

ONTARIO: SM, Larry Thiverge, VE3GT—SM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. Special events station VE3CNE was active again this year on all modes and bands from the Canadian National Exhibition in Toronto. 175 amateurs from 18 Clubs participated. There were thousands of visitors which helped generate some 376 pieces of formal traffic. VE3FAS VE3POJ VE3OOS VE3FXQ handled packet traffic while VE3GNW provided packet support for outbound traffic to the other nets such as the IATN and EAND. The executives for the station were VE3FXQ VE3OOS VE3ORN VE3KCE VE3CLT. Ex-VE4AKO from years ago is back on the air from Smiths Falls as VE3PRA using a TS-530S and a tri band beam. Congratulations to VE3FN on being reelected to another two year term as CRRL's Ontario Director. The OLN held their picnic at the Major Mac Park on Hwy 400. Those in attendance were NM VE3DOK VE3EOD VE3FAS VE3LNN VE3NIV VE3NLN VE3POJ. VE3DCX set up a one day display of amateur radio at the Tweed Fair. Toronto ARES members VE3LNN VE3MCN VE3KA VE3BUU VE3IOT VE3EES VE3EOD VE3HSF VE3IEL VE3NSG VE3ORN were on call in case of need during the recent Molson Grand Prix. Everything went well at the race and they were not required. VE3WM vacationed in VE2 land for two weeks. My thanks to VE3CYR who looked after the paper work while I took a months sabbatical from traffic activities. The following are your NTS nets operating within the Seciton:

Net	*Freq (MHz)*	*Time/Day*	*Mgr*
OQND*	3667	2100/Dly	VE3GSQ
OLN	7.68/.06	2330/Dly	VE3DQK
OPN*	3770	0000/Dly	VE3BUO
OQN*	3667	0000/Dly	VE2EDO
KTN	7.96/.36	0200/Tue/Thur/Sat	VE2EDO
OQN*	3667	0300/Dly	VE2EDO

*Denotes Section Net, all times shown are UTC. I encourage you to participate often and help generate some traffic—it's a fine public service activity. Traffic: VE3FAS 863, VE3ONE 756, VE3GSQ 511, VE3CYR 283, VE3GNW 256, VE3DCX 231, VE3DPO 87, VE3AJN 75, VE3ORN 64, VE3WV 58, VE3AWE 41, VE3BUO 38, VE3EAM 37, VE3GOL 37, VE3BAJ 34, VE3WM 23, VE3KCZ 17, VE3MCO 10, VE3GT 3. (July) VE3GNW 124, VE3GOL 29, VE3AWE 42, VE3BAJ 36.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. TC: VE2ED. NM: VE2EDO. Code and theory classes have started and a good attendance is reported by clubs. VE2EVX is the proud owner of a new TB-440S/AT and a complete new station, after losing all his gear by lightning. VE2EC qui est membre de ARRL depuis 50 ans, a recu un (lapel pin). Felicitations Charles. Plusieurs amateur handicapes visuel ainsi que leur guides se sont rendu a St-Simon a l'occasion de la 8e epluchette de ble d'inde annuelle par VE2BP et VE2WH. Avec regret, J'ai a vous annoncer le deces de VE2DHR. Traffic: VE2EDO 76, VE2JN 76, VE2BP 53, VE2WH 46, VE2EC 4.

SASKATCHEWAN: SM, W.C. Munday, VE5WM—SEC: VE5CU. EC: VE5AQ, VE5FF, VE5HG, VE5ACI, VE5WM. STM: VE5HG. NM: VE5EE (ARG-2 meter), VE5AEM (MJARC-2 meter), VE5HG (SARC-2 meter) VE5EX (PWXN), VE5HG (SK Phone Net), Vacant (SK CW Tfc Net) TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. August Net Reports: ARG-2 Meter: 30 session 619 QNI; MJARC-2 Meter: 29 sessions 292 QNI; PWXN: 31 session 688 QNI; SATN: 11 sessions 24 QNI. Traffic: VE5KZ 27, VE5UX 5. The month of August saw many public-service events around the Province involving Amateur Radio. I would appreciate hearing from hams in any area who participate in public service displays. Ham classes will be starting up, and best wishes are extended to those involved.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: KA3IXV. SEC: K3PFW. EC: KC3JM, KC3TI, KA3LNK. PIO: WB3DPJ. SGL: AF3R. PSHR: K3JL. Very glad to announce the appointment of KA3IXV to the position of STM also net manager of DTN. He is taking over the positions left vacant by the passing of W3DKX. Please give Jim your cooperation. Our thanks to the PRO'S and the Nanticoke ARC for holding exams at the Delaware Hamfest. Attended meetings of the Nanticoke ARC and also First State ARC where the trophy for field day was presented, both were very nice meetings. DTN Stations 297 traffic 23 in 23 sessions. DEPN Stations 57 traffic 17 in 5 sessions. SEN Stations 45 traffic 4 in 4 sessions. Traffic: W3EKO 57, W3QQ 37, WA3WIY 31, WB3DUG 25, K3JL 17, N3AXH 14, W3FEG 10, KA3IXV 10, KC3JM 8, KC3TI 7, W3PVO 7.

EASTERN PENNSYLVANIA: SM, Kay Craigie, KC3LM—ASM: WA3PZO, K3ZFD. ACC: KA3A. OOC: N3CWD. SEC: WA3PZO. STM: KB3UD. PIO: W3AMQ. TC: W3FAF. With our freedom to communicate, to experiment, to challenge ourselves, and to help our community, just being part of the Amateur family is reason enough to celebrate Thanksgiving! Our monthly wahoo goes to EPA's Official Bulletin Stations: W3PYF, W3AVJ, K3EBZ, WA3PZO, W3VA, W3TI, KO3B, W3CL, WA3ENE, and KC3LM (who?). Any ARRL member who does regular on-air bulletins (any mode) and has at least a Tech ticket can be an OBS. Contact KC3LM to apply. 73 to KA3CJR, a 1986 F.A.R. Scholarship winner. Oops! The correct Phil-Mont information phone number is (215) 448-1139. Add KC3B and N3CZB to the list of currently active Official Observers. Following guidelines of the Amateur Auxiliary, C-CARS has formed a Local Interference Committee serving Cumberland, Perry, Dauphin, and York Counties. Aiming for "no fault" solutions, LIC's help resolve Amateur-to- Amateur interference prob lems. In ARES, KB3YS is now DEC in Dist. 10. Thanks to the others who expressed interest in this position. Dist. 5 DEC N3BFL and his EC's send thanks and 73 to all their ARES volunteers, who've responded to 15 emergencies in the last 4 years. Happy 10th anniversary to Mid-Atlantic ARC and 30th to the Pack Rats! Del-Lehigh ARC's newsletter staff now uses KB3UD PBBS to transfer copy from writers to editors. WA3USG's first issue of the York area SPARK TRANSMITTER packed in the info. Delaware Co. ARA's WA3DNM and KA3JCR, R.F. Hill's WB3AIG, and Mid-Atlantic's KA3IME and KC3LM gave Novice classes this fall. Harrisburg RAC's W3IS and N3CP, York's WA2ORG, and WB2GSO in the Hanover/Gettysburg area offered classes for Novice and beyond. When your club elects new officers, kindly notify your ACC and SM and please add SEC WA3PZO to your club newsletter list. Does your club have an RFI committee? Contact TC W3FAF for advice on starting one, so you'll be ready when neighbors bring home their cheap-o Christmas VCR's. W3FAF researched and commented on the revised (and much improved!) Montgomery Co. model antenna ordinance released in August. STM KB3UD continues to work towards orderly packet traffic handling in EPA in cooperation with neighboring Sections. N3COY now assists KB3UD in preparing monthly statistics for the Public Service column. Section nets, July (QNI/QTC/Sessions): EPA 425/147/62, EPAEPTN 530/129/31, PTTN 246/55/31. Local nets, July: D3ARES 60/2/4, D5ESN 139/9/7, D6ESN 91/27/10, D8ARES 58/0/4, MARC/ARES 62/10/4, MARCTN 174/36/13, STARNET 219/48/31. Traffic, July: N3AZW 363, N3COY 220, W3IPX 154, KA3DLY 95, N3CD 90, KA3IME 79, KB3FW 55, W4UQ 54, KU3R 47, W3AQN 32, AA3B 30, K3TX 29, WA3CKA 26, W3JKX 26, N3DRM 26, N3EFW 25, W3FAF 13, W3DP 10, W3ADE 10, K3EBZ 10, W3TWV 9, N3ERE 5.

MARYLAND-DC: SM, John Barolet, KJ3E— Good news! KW3X has accepted appointment as the MDC State Government Liaison (SGL). And WA2WDT has been appointed Official Relay (ORS) and Official Emergency (OES) Station. Welcome aboard both. The big traffic months are upon us! The nets need your help, especially the CW nets. And you will be welcomed upon check in. If you are a little rusty and worried about your speed check into MSN, the excellent MDC traffic training net which operates at about ten wpm (3717 KHz at 0030Z every day). Ten wpm a piece of cake, you say? MDD, the twice-daily section net on 3643 KHz will be happy to work with you at any speed. And you know something? The very best phone traffic handlers send traffic as they were trained to do so on a CW net, a minimum of talk and perfect format. If you absolutely insist you are not going into any CW net (what a shame) generate some traffic for practice on your local 2-meter ARES or club net. Then send the most daring person to one of the section nets (MEPN, MDD, MSN) with the traffic. During a recent multiple packet radio exchange of messages between W3IWI, #1 packet radio honcho in MDC, and KJ3E, a minor-league "antique operator" (CW), I was reminded again how much fun ham radio can be and how many opportunities licensees have to communicate and experiment. I'm operating VHF packet, HF SSB and CW on the nets, and 2-meter FM voice; those modes consume all the time I have available for operating. If you are stuck on one band, sometimes on one band and frequency, you are missing lots of fun. Move into one of the Novice bands for an hour or two and remember your struggling, but fun, beginning. WA2WDT has been awarded an ARRL CERTIFICATE OF MERIT for his dedicated work in editing and and publishing the AMATEUR RADIO RESOURCE MANUAL. W3VVN, MDC Technical Coordinator, reports business: so far ARRL has sent the MDC TC/ATC group three technical problems with more are on the way. Do you have a technical problem? This group is here to help, so give them a chance. Communicate with W3VVN for a starter. The Baltimore ARC hes a super new meeting room in Children's Hospital with all kinds of peripherals available, primarily because BARC earned a good reputation as a useful organization for public service radio communications. Other clubs heed! Demonstrate such usefulness and move up to better meeting quarters and public acceptance. Laurel ARC is considering the pros and cons of establishing a 220Mhz repeater; that is the direction to go since 144Mhz is saturated. WB3JRW is the newest MEPN member to show up on packet ready to handle formal traffic. MDD Brass: W3FA/120, KJ3E/105; KX3U NC8'ed an extra MDD session in support of the Night Tango exercises. NETS: Net/Manager QND/OTC/QNI: MDD//W3FA 63/218/561, MEPN/N3EGF 31/112/682, MSN/KC3Y 31,47/374, WRPON/WB3BFK 21/12/186, FREDCARES/K3RXK 4/9/72, MDCPON/W3OYY 4/2/54, BCN/KA3OFS 5/1/40, WC2MN/KC3DW 4/0/81, TS2MN/W3DFW 4/0/117. PSHR: KK3F 154, W3FA 106, W3YVQ 102, KJ3E 93, N3EGF 93, K3RXK 88, KC3Y 72, WA3GYW 64. Traffic: KK3F 1056, KJ3E 180, N3EGF 125, W3FA 104, KC3Y 97, K3NNI 94, N3DE 68, K3RXK 47, KC3AV 43, KT3T 43, W3YVQ 37, W3DQI 28, N3RO 23, WA2WDT 22, WA3GYW 21, NA3Q 21, KX3U 21, KC3DW 20, W3LDD 20, KA3IID 18, WB3BFK 13, W3ZNW 8, KA3T 3, W3FZV 2, KA3JJN1.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QU. STM: WB2UVB. ACC: K2IXE. TC: KA2RAF. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATCs: N2BQT, K2JF and KA2RJA. Hard to believe that the holiday season will be starting at the end of this month, isn't it? Why not send holiday greetings through our National Traffic System? A good way to start would be to give the local net in your area a listen. For those of you in the Toms River area, listen to 146.31/.91 every evening at 7:30 PM local time for the JSARS Traffic Net. Over in the Trenton area the Robbinsvile repeater, 147.675/.075 at 10:30 PM every nite carries the Mercer County Net. Down in the sourthern part of our section we have the South Jersey VHF Net every evening at 10:30 PM on the Vineland repeater, 146.055/.655. If you are new to Amateur Radio and are restricted to the Novice bands, by all means check into the New Jersey Slow Net which meets every evening on 3735 kHz at 6:30 PM. Sound interesting? For more details about this fascinating part of our hobby, please contact your STM, WB2UVB at 15 E. Camden Av., Moorestown 08057. Until next month 73. Traffic: W2IML 84, N2FKA 70, NG2T 33, WA2HEB 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. BM: W2GLH. OOC: W2AET. PIO: WA2PUU. SEC: KB2KW. STM: W2ZOJ. TC: K2QR. SGL: WB3DUF. DEC: WA2AIV WB3CUF KB2KW NN2H WB2NAO. Appointments: (ORS) N2DC WA2HSB; (OES) W2AET K2DTQ KY2F W7GUN W2GJ NN2H WB2NAO W2PHQ W2PPS WA2TCZ W2TFL K2UNY; (EC) KD2AJ Clinton, KY2F Oswego, KA2OOA Chautauqua, WA2OEP Lewis, WA2VAM Cortland; (DEC) WB3CUF Mohawk District. THANKS KZ2R for past services as EC Orleans County. OBS SKEDS KA2UBD at 1915 Sundays on 28/88 and at 1845 Wednesdays on 34/94 in Oneida County. Regret loss of Bruce Mackey, KD2CY, to the Silent Keys. Public Service Honor Roll: N3DPF KA2DQA N2EVG WA2FJJ VE2FMQ W2FR W2GJ NN2H WB2IDS WB2IKL W2MTA KU2N WB2NLU WB2OWO ND2S KA2SJG KA2UBD KD2UV (former KA2UBX) NE2W K2YAI W2ZOJ. August BPL to WB2IDS and WB2OWO. Empire State Games support again excellent, thanks to efforts of many, including coordinator WB2IDS and PIO/consultant WA2PUU.

NYSEMO 3993	093-005-05	NYSR 3530	039-004-05
NYS/M* 3677	334-197-31	Blue 93/33	405-052-31
WDN/M* 04/64	299-090-31	JCARC 10/70	484-010-30
MFN 3925	173-047/31	OARCN 25/85	
NYPON* 3913	632-395-31	NYTN 3720	113-033-30
NYSPTEN 3925	585-062-31	BRVSN0 55/655	449-012-31
ESS 3590	367-087-31	CNYTN 90/30	
Q Net 31/91	278-001-30	MVTN 21500	013-040-09
OCTEN/3* /94	620-086-31	OCTEN/L* /68	276-058-31
STAR* 13/73	199-048-30	VHF THIN /64	035-000-04
WDN/E* 57/17	404-163-31	WDN/L* 04/64	446-146-31
NYS/E* 3677	430-290-31	NYS/L* 3677	407-297-31

*NTS Net. Other Nets reporting: CVARCSEN, LCARES. CONGRATS KA2KLM KA2KMT KA3CJR on again receiving Foundation for Amateur Radio Scholarships in 1986. VE teams continue to perform very well in WNY—announced schedules have been received by W2MTA for Auburn, Binghamton, Buffalo, Chenango County, Elmira, Ogdensburg, Rochester, Rome, Syracuse, and Tompkins County; if there are others, please let me know via club newsletters or by postcard. Traffic Handlers Picnic at K2KIR Verona QTH attended by about sixty from 1st, 2nd, 3rd, 4th, 8th and VE3 call areas. Club Officers: Otsego County ARA WB2PEF KA2QBQ KD2AO. Another phone for Call letter plates, (518) 474-8780. Rochester ARA, Special Service Club, administers VUCC and WAS awards in WNY; contact K2MP, by mail or call (716) 621-6692, Awards Chairman for RARA. COMMS: Oswego County boat parade—KY2F; Ginna drill—KA2SCJ. THANKS to 24 clubs sending newsletters. AFFILIATED CLUBS: Nine of fifty clubs have not filed Annual Reports . . . has yours? Eight other clubs have been dropped from affiliation. Take a look at affiliation . . . if your club is not, it is missing many helpful features. Traffic: WB2IDS 554, WB2OWO 467, WA2HSB 378, WA2FJJ 297, KA2UBD 297, N3DPF 296, WB2IKL 225, KD2UV 222, VE2FMQ 213, KU2N 185, W2MTA 178, ND2S 170, NE2W 164, WB2QIX 158, N2ABA 140, W2FR 128, WA2JPB 118, NN2H 108, W2ZOJ 105, K2YAI 80, N2EVG 64, KA2DQA 59, W2HYM 59, WB2IJH 55, W2GJ 53, N2EIA 46, WB2NLU 46, N2EAW 43, AF2K 37, WB3CUF 34, KA2SJG 29, KA2DBD 28, WB2KCT 25, W2PPS 18, N3DPE 18, WA2OEP 6, K2IUT 4, K2VR 2, WB2NAO 1.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—SEC: WA3UFN. ASM & STM: WN3VAW. PIO: KC3TO. OO Coor: KJ3Q. SGL: ? TC: K3LR. BM: KR3P. ACC: AK3J.

Net	QNI	QTC	Sess	kHz	T/D	Man.
WPACW	270	143	31	3965	7:00 P	WA3UNX
WPAPTN	415	100	31	3983	6:00	WA3HLN
KFN	173	53	21	3958	1:00 P	N3EMD
PFN	168	144	31	3958	5:00 P	WA3THT
WPA2MTN	346	94	31	146.28/88	8:00 P	KA3BGC
NWPA2MTN	560	39	31	144.53/145.13	10:00 P	KC3NY

A new Slow Speed Net is being planned for 3730 kHz at 6:30 PM Monday thru Friday all amateurs wishing to learn traffic net procedures and increase their code speed are invited to check in. Net controls will meet all speeds that the operators can handle. When you read this, summer will be over and more time can be given to operating and this would be a good time to spend some time listening to the various traffic nets and how they operate. If you learn the procedures which are not too difficult, it is a pleasure to spend several hours a month at this phase of our hobby. Also, you are doing a much needed service for the public, and it is also a good training for emergencies and disasters. We also need operators to sign up with ARES and Races. If you sign, you will receive an I. D. and a certain amount of coverage. When you read this, I hope the weather is still good and no heavy snows will foul up your travels. I will be at home most of the time and will answer any calls if possible. Sometimes we have to go higher to get some answers, but it at all possible we'll get them. Traffic: W3EGK 350, KQ3T 331, W3OKN 155, N3EMD 138, N3AES 114, WN3VAW 96, W3NGO 88, N3FM 72, WA3UNX 67, K3SMB 59, W3RUL 57, W3CZW 54, WA3DBW 50, W3KMZ 38, KQ3M 37, WB3CIS 34, KA3ETC 21, W3KUN 20, KC3JQ 16, WA3QNT 15, N3EKJ 11, WB3GUK 9, K3LTV 9, W3SN 7, W3TTN 6, WB3CLW 3.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: OOC: W9TT. BM: K9EUI. SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: AA9D. Welcome aboard to new Chicago Traffic Net NM Sandy, KA9QXI, who responded

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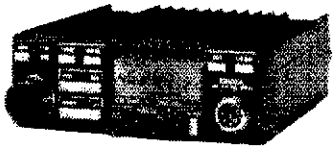

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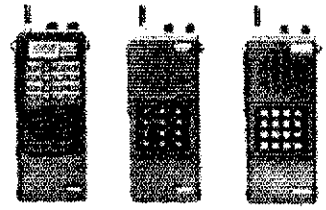

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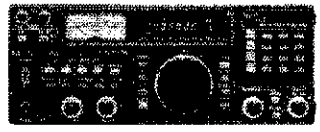

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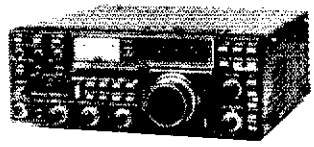

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Bob, K7RDH
East of Hwy. 17

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(619) 560-4900
Tom, Mgr. KM6K
Hwy. 163 & Claremont Mesa Blvd.

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to WB8RFBs call for assistance. Sandy has been active on CTN since the early days of the net, and is active on PACKET as well as the traffic net. As always, thanks to the many clubs who send me their newsletters each month... it really helps me keep up with what is going on throughout the state. Don Evisizof, KA9QWC is the newsletter editor for the Ft. Wayne IN Radio club and is interested in swapping newsletters on a monthly basis with any interested clubs in Illinois. To start swapping, write Don at RR#1 Box 206, Larwill, IN 46764. Most Chicago area amateurs are familiar with the BEAR (Broadcast Employees Amateur Repeater) Information Service which transmits Amateur Radio News each Wednesday at 8PM on 145.15, 223.74 and 444.375 in Chicago, 147.675 and 224.80 in Kenosha WI, 145.45 in Crown Point IN, and 444.75 in Gary IN. For those of us who live a little farther out, BEAR Info Service Producer Hap Holly points out that there is a BEAR Info Highlights line at 312/289-0145 which carries the main points of the weekly reports. As most of you know, for the last year and a half I have been wearing two distinctly different hats... that of SM of course, but also that of Illinois repeater coordinator for 10, 6 and 2 statewide, and 220 and 440 downstate. The initial hope was that in a year I could straighten out the database, keep up with ongoing coordinations, and work toward the formation of an organization to support repeater coordination in Illinois, and then bow out. Unfortunately the first two goals kept me from getting anything done about the third. This month I have received some information which may lead to getting some help on the coordination activity, and also some pledges of support for help in getting some type of coordinating council off the ground. If you are interested in being a part of such a council for repeater coordination in Illinois, please contact WD9EBQ or W9QBH. Traffic: KJ9L 326, NC9T 316, KA9FEZ 314, W9HLX 265, W9LWH 158, W9EHS 128, W9NXG 125, W9HOT 108, WB8RFB 105, W9KR 88, K9CNP 69, KZ9I 47, WD9DZU 42, KA9SHP 41, KD9K 36, N7DOY 25, WDØAHO 25, K9WMP 24, WB9TVD 20, K9QEW 18, KD9TK 17, K9EHP 16, W9VEY/M 8, WA9RUM 7, W9IL 4.

INDIANA: SM, Ron Koczor, K9TUS—ASM: W9UMH. SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. SGL: WA9VOO. BM: KC9TA. PIO: K9DIY. OOC: KJ9G. SRC: N9WB. Net Managers: ITN KD9DU, QIN KJ9J, KCN KW9D, VHF W9PMT, IWN KA9ERC.

Net	Freq	Time Daily UTC	QNI	QTC	QTR	Ses
ITN	3910	1330/2130/2300	3272	427	2528	93
QIN	3855	1430/0000/0300	838	302	1806	93
ICN	3705	2315	88	32	563	26
IWN	3910	1310	1561		354	31
IWN	VHF	Bloom/Kokomo	2029		513	62
Hoosier VHF Nets:			3512	314	4236	74

APPT: W9NPA, EC Blackford Cty; K9LMJ, EC Knox Cty; KA9QMI, ORS; K9ZBM, ORS. Silent Keys, W9YCF, KA9PSA, W9LZ. BPL: W9JUJ, Orig. 1; Rcvd, 392; Sent, 384; Dlvd, 2; Total, 799. IN 100% to D-9RN, tnx to W9JUJ and N9DWU. Special Service Club of the month is Fort Wayne RC. Contact is WD9HII, newsletter is HAMSPLATTER, published monthly. FWRC has 210 members, operates two repeaters on 2 meters and one on 440, mounts a first-rate Field Day effort each year, has an active club awards program and is Central Division's first SSC. The Amateur Auxiliary to FCC Field Operations Bureau is a formal recognition by FCC that the ARRL's OO program can form the basis for a self-monitoring body within the Amateur Radio Service. The AA/OO program lets local interference committees assist FCC in keeping our Service first-rate. If you need information, contact me or KJ9G, Indiana OOC. The Volunteer Resources Committee of the ARRL Board of Directors is studying the Special Service Club program. Intent is to determine its usefulness and see if improvements are warranted. As ACC, I made it a top priority to recruit SSCs. I believe this new ARRL program is vital to the health of ARRL because it recognizes the importance of clubs to the amateur community. If you agree, let the VRC members know. They are listed in the March 1986 QST. See you at the Fort Wayne Hamfest, Sunday, November 9. Make it a point to find me and say hello! Traffic: W9JUJ 779, W9JZV 220, KJ9J 212, KA9FFO 139, WA9YIF 95, WA9QCF 87, W9UMH 63, NJ9S 61, WD9DWD 60, WB9PFZ 58, K9WWJ 57, KD9ER 44, W9UEM 40, KW9D 34, K9KTB 33, WB9IHR 31, W9ZGC 31, WD9HII 28, W9QLW 25, W9PMT 25, KB9HH 25, N9HZ 20, N9DTG 20, WB9ZQE 19, AB9A 18, K9ZBM 15, W9BTZ 14, W9EI 10, WB9OZZ 10, KA9HNY 10, KA9QMI 10.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Thanks to KA9RII, NI9R, and N9EQP who promptly handled their assigned six test-emergency messages for the National Communications System's 1986 Operation Night Tango. Special appreciation goes to N9EBJ, KA9TXT, and KA9MWT for their help at the League booth in the Associated Public-Safety Communications Officers (APCO) National Conference held in Milwaukee; there were 132 hams that logged in during the three day exhibit, plus a steady stream of visitors that stopped by to chat. WB9ESM is the new Net Manager for WSBN, replacing temporary NM NØFKU. Colorful League field organization call-sign badges are available at a small cost, check with me for information, application blank, and approval. Do you like computers? Then listen to the informative Computer Net, 9 PM Thursdays on 146.91 with K9IZV in Milwaukee as NCS. Remember to indicate your club participation when submitting an entry in the ARRL Sweepstakes this month, make your log accordingly. November 15th, the Milwaukee Repeater Club will hold the 6.91 Friendly Fest open at 8 AM inside the spacious Eagle's Club, 24th and Wisconsin, Milwaukee, with free parking; talk-in on 146.91 and 146.52 MHz, and on-site exams start at 9 AM. See you at the ARRL table. Exams also November 15th at Waukesha County Technical Institute, send card to WD9JKZ. W9NW received special certificate for his training classes to help over 100 people become licensed Amateurs during the past 12 years. Tip of the month: No one grows old by living—only by losing interest in living. Traffic: WB9YPY 1215, KA9RIf 255, W9CXY 239, K9GDF 183, W9YCV 165, W9CBE 164, W9DND 131, N9BDL 112, WD9IID 111, WA9WYS 104, AG9G 89, W9UCL 89, N9BGE 83, KD9XE 77, WB9ICH 71, KA9KLZ 49, W9IHW 44, N9AUG 43, KA9BHL 42, K9AKG 41, K9UTQ 33, K9FHI 32, WB9JSW 28, WA9USD 28, N9FTN 24, NB9H 24, WD9DNQ 15, W9ODV 12, KY9P 12, KA9BHK 9, W9IEM 8, W9UW 8, WB9NRK 4. (July) AG9G 53, KY9P 11, WB9NRK 5.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. August would seem to be the peak month for Amateur Radio outdoor gatherings. The St Cloud Hamfest was held on Sunday the 10th at Lake George in St Cloud. The Arrowhead ARC Picnic was Saturday the 16th near Duluth with about 100 guests present. On Sunday the 17th, the annual Mille Lacs Lake Amateur Radio Comfest was held with KAØAJF and I hosting, and a great time was had by all. KCØT has announced the selection of Steve Heaton WBØMHK to be Affiliated Clubs Coordinator for Minnesota. He is from Mankato, holds an Extra Class license and has been a ham

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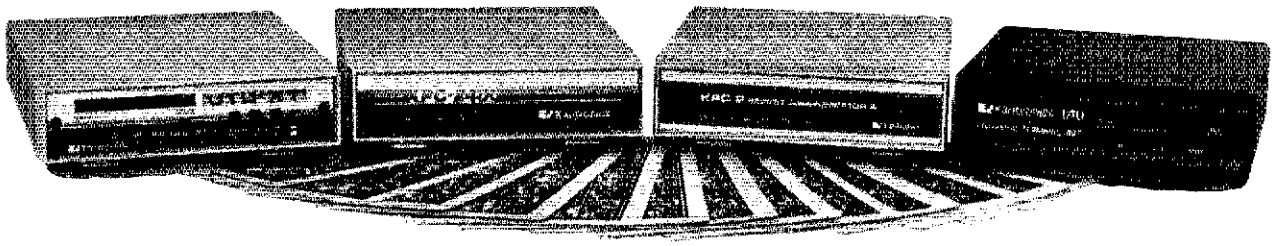

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for 12 years. He also serves as a VE and is a member of ARES/RACES, as well as the Mankato ARC. Bill Beaman KAØIYS has resigned as Vice-Pres of the St Paul RC and has moved to Arizona. NET NEWS: After a quiet summer, MSN/RTTY and MNAMWXNT are ready to resume operating in September. Listen on 3929 for info on upcoming On-the-air discussions such as Net Managers meetings and ARRL Forums. Minnesota Amateur of the Month for Aug is Dave Blair WBØYUC of Bloomington. He is recognized particularly for his work in developing Skywarn in the Minneapolis-St Paul area. Courage Centers annual Handi-Ham Winter Hamfest will be held Sat Dec 8th at the Eagles Club in Faribault. For more info contact Don Franz WØFIT, 1114 Frank Ave, Albert Lea Minn 56007. Consult QST's Hamfest Calendar or listen on MSPN for info on upcoming Hamfests. Our best wishes go to Ken Sobieck, NØFXR, and Art Holmberg, WØFWC, who are recovering from recent illness. Our regrets to the families and friends of recent Silent Keys: Bob Miller, KØSNB, of Duluth, Lyle Larson, WØOTZ, and Walt Dickey, WØGUS, both formerly of St Paul. VE Exams are to be held Dec 13th, sponsored by the St Paul RC. For more info, contact Jay Bellows KØQBE at 612-222-7253. A salute goes to the folks at Courage Center in Golden Valley as their new facilities are near completion. They invite you to stop in and visit whenever you are in the Twin City Metro area and take a look at the new Ham Shack. More important is how they work with people to develope skills and self confidence. They are indeed worthy of our support. 73 de KDØCI.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/1	3685	6:30 P	332/74/31	KAØEPY
MSN/2	3685	10:00 P	243/55/31	NCØE
MSSN	3710	6:00 P	212/22/29	KAØODQ
MSPN/N	3929	12:00 P	457/123/31	WBØWNJ
MSPN/E	3929	5:30 P	814/110/31	WDØBGS
PICONET	3925	9:00 A		WDØBAC

MSN/RTTY and MNAMWXNT did not operate in August. MINN EMERGENCY FREQ: 3929 BULLETINS: 3685 3929. MN/MSO: 3620. Traffic: WBØWNJ 420, WAØTFC 325, KAØEPY 194, KT9I 117, KAØODQ 51, NØCLS 48, KDØCI 43, W9DM 43, WØKYG 35, KAØAJF 29, WDØBGS 29, WDØGUF 29, KDØNH 26, KAØBFP 18, KCØT 15, NIØX 15, NØFOO 14, KØOGI 14, KAØARP 13, NØEWA 11, WBØFMI 11, KTØR 6. (June) KAØEPY 170. (July) KAØARP 24, NIØX 18.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—STM: NØABE. SEC: KAØKPY. Packet Radio Activity is Picking up in Rapid City-Lake Area Radio Klub at Watertown reported 909 phone contacts and 135 CW contacts on Field Day, KAØSWL, reports monitoring the Aberdeen 2 meter repeater during a tornado alert and Elmer reports the Spotter group did an excellent job. Contact W7PSX at Victor Montanna for information on a project to provide communications via phone patch net to veterans in VA Hospitals. The Sioux Empire Radio Club at Sioux Falls is working on a project to obtain a WX Radar for their Ham Station at the NWS office. They have installed a new repeater now in operation. Traffic: KØERM 63, NØABE 9, WAØVRE 24, WBØOMF 30, WØYMB 17, KØZBJ 55, KAØKPY 22, KØUEH 5, WØHOJ 3, KAØAIE 85, WØMZI 37.

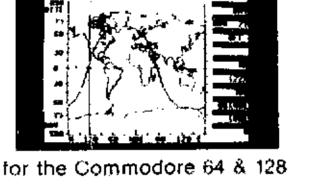
DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9QK. ACC: NI5D. SGL: W5LCI. TC: W5FD. BM: W5HYW. Repeater Coordinator: WB5FDP. HOGNET (Packet Radio Assn) information can be obtained form Chuck Webb, KA5BML. K5GK and W5LCI recently lost antennas and tower in windstorm. Several Ark stations report excellent satellite operation on the new FO-12 satellite. Contact KB5KJ or WB5IGF for additional info. Several DX cards are awaiting Ark hams at the Fifth District QSL Bureau, Box 44246, Oklahoma City, OK 73144. Please keep an SASE on file there if you are expecting cards. Hams are needed to handle traffic into the state from Region 5 nets. Please help if possible at 10 AM on 7280 and 3:30 PM on 7290. CW nets are at 7:45 PM and 9:30 PM on 3650. The Arkansas CW Net (OZK) is at 7 PM on 3591. Traffic: W5QFU 135, W9QK 106, W5UAU 37, W5RIT 20, WB5IGF 18, N5BPU 16, W5RXU 10, KA5DFT 6, WA5PNT 2.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: N5ADF. ACC: K5DPG. SGL: KD5SL. OCC: KE5KQ. TC: N5JM. An Official Bulletin Station is the "town crier" of amateur radio. The OBS transmits official ARRL and local bulletins of interest to radio amateurs via local and section nets, on-the-air bulletin board systems, and othe information outlets. Getting the word to all amateurs on current events in Amateur Radio is one of the most important jobs in the La. Section organization. If you would like to participate in an activity where you can spread the word; would like to be designated as an Official Bulletin Station; hold a technician or higher-class license; and are a full ARRL member you can be designated and placed on the mailing list upon your request. Bob Schmidt, W5GHP, the Louisiana Traffic Net Manager for many years, has requested a replacement with the intent to remain active on a less rigorous schedule. Bob has given amateur radio a great amount of time and energy. He was also the La. Section Communications Manager, Delta Division Vice Director, active in the GNO ARC, helped sponsor the La. World's Fair ham station and display, and active in many of the state hamfests. Many thanks from all of us for your many contributions in the volunteer leadership roles.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. PIO: KA5VBE. OOC: W5VMC. VHF COORD: N5DWU. BM: AJØX. TC: WB5SXK. VARC did fine job in providing communications for the annual MS River boat race. KA5YHB supporting new tower and beam. Had to have it to work with the new rig. Packet still drawing in new stations. Latest being N5DSK. Excercise Night Tango was a great success this session in Ms. Thanks to KB5W, N5AMK on HF and WA5DDV, WB5SXK on Packet. The turn around time for the HF traffic was under three hours. The line operating techniques also had 100% correct copy. HARC active again providing communications for ball games in Jackson. The Holiday Season is upon us now. Don't let that be your next excuse to not get involved in your Club's activities. Use the time wisely to plan organize and support projects to further enhance your area projects. DRN5 (WB5YDD) Sess 62, ATC 674. MTN (K5OAF) Sess 31, QNI 149, QTC 43. MSBN (WJ5P) Sess 31, QNI 1966, QTC 61. MMN (WJ5L) Sess 31, QNI 501, QTC 5. GCSB (W5JHS) Sess 31, QNI 967, QTC 20. MLEN (WD5O) Sess 5, QNI 105, QTC 0. Traffic: N5AMK 335, KB5W 280, K5OAF 232, W5WZ 42, KW5T 16.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OO/AA: W9FZW. PIO: N7EJI. SEC: WA4BZO. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. The reports of very active examining programs are still in the top news position. However there are some bad reports comming out relative of disappointed hams or potential hams that have a certificate of completion that they earned from a given VE group and they go to another location to try again to earn the coveted ticket or earn a higher class license. The fact that the new VE group is certified from a different VEC had not been considered. What the bottom line is that these certificates of



completion are not accepted from different VECs. The certificate must be used with the same certified examining teams. It seems that the packet program is still running full steam and the number of authorities are still saying that their way is the only one. I suggest that you do much study on the matter, and then you just have to get your feet wet to really begin to see a bit of daylight about the mode of communications. The one thing that will be soon evident is the generally accepted area of operation. It is getting crowded already. Don't give up and stay in there. Some OOs are known to be a bit over zealous with their reports in this area also. This is about the time for all your XYLs to start (you hope) to hint about what you would like the man with the long white beard to have under the Christmas tree for you. That is if you have been "GOOD", HI. That goes both ways if you are the ham in the family and you are the XYL. By the way, I guess all noted the easy way I added an extra day into the month of September last report. Tain't that easy just a typo, thanks K4ON. Would like to suggest that all take a little time and effort to seek out an older person that doesn't have a close local family member and see if they would not like to send a message to friend or relative some distance away as the Christmas season will be around soom. It will make them feel better, and IT WILL make you feel good also. Traffic for the period for the section is as follows: LF Sessions-78, QNI-3857, QTC-105; VHF Sessions-51, QNI-738, QTC-491; CW Sessions-46, QNI-217, QTC-74. CW net Honor Roll KB4MSB, WA4CNW and NG4J. Hope all the NCSs are getting their reports in on time. We need them. Individual station activity is as follows: KJ4JE 218 (also BPL), W9FZW 164, WA4FMR 119, W4WXH 109, K4WWQ 85, W4DDK 70, NN4S 41, W4PFP 22, W4TYU 20, KE4LS 18, W4TYV 14, KA5KDB 13, W4PSN 10, N4KQX 10, WA4HKU 7, KB4UQ 5. Thanks to all these people.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—Things are looking up on D9RN and 9RN. We still have a long way to go. Let's not slack off. We still need reps to help carry the load. Thanks to those who have been checking into Late D9RN. We still need a lot of help on 9RN. Any good CW operators out there? Know some nets have been missing from Section News. Hope to do better in the future. Thanks to KA4BCM for gathering the net reports and sending them in.

NET	SESS	QNI	QTC	MGR
MKPN	31	1175	162	KA4SAA
KTN	31	794	63	KA4GBZ
KNTN	41	213	60	KB4OZ
KYNE	21	44	8	WB4ZDU
KY4NL	29	118	46	KZ8Q
KYPON		16		WA4AVV
3ARES	4	34	0	KA4BCM
11ARES	5	22	2	KB4OZ
NKARC	4	64	4	KA4RKS
TSTMN	31	532	58	KZ8Q

Traffic: K4VHF 124, W4WQV 74, KI4QH 47, KA4BCM 30, KA4MTX 16, WA4AVV 12, KA4GBZ 10, WD4CQF 6.

MICHIGAN: SM, James R. Seeley, WB8MTD—The big news is about Mark Schreiner,NK8Q of Frankfort, whose nomination for the 1986 Hiram Percy Maxim Award I reported a few columns back. Mark is the winner! I am pleased for him. Along with the Saginaw Valley ARA, which group asked me to place him in nomination, we can all share in the pride and pleasure of this achievement. Silent Keys, with deep regret: K8OQB, Al Nelson, and W8WQP, Don Dancer. Al was the long-time EC for Kalamazoo County. He will be replaced in this post by Doug Burke, WB8CFV. New General Manager for QMN, chosen at the Traffic Handler's Picnic on Sept. 7, is WD8KQC, who was air manager for the slow net. He succeeds WB8SIW, our newly appointed STM. The picnic was not as well attended as some in years past, but a good—if chilly—time was had by all who were there. W8SCW and W8YIQ will continue as air managers for the fast and late sessions (1830 and 2200 local time), with WD8UOU taking over the slow net (1800). this might be a good time to list other net times and frequencies for local reference. QMN is on 3663, times as just noted. MMN, 1730, 2000, 3722. MACS, 1100, 3953 (1300 Sundays). MITN 1900, 3953. UPN, 1700, 2722 (+1230 Saturdays). WSSBN, 1900, 3935. GLETN, 2100, 3932. MI HF emergency frequency is 3932. Speaking of nets, ho-hum, they did it again: UPN now has 34 month is a row of record-breaking QNI. Is it ever going to end? Let's hope not. Stay tuned! North Ottawa ARC is to be congratulated on a very fine first-ever Special Event operation from aboard the USCGC Mackinaw, July 31—Aug 2 in celebration of Coast Guard Week. More than 240 contacts were logged, including one with a USSR station. Many request are coming in for their special certificate—even a couple of SWLS were heard from. FB, gang! August net summary (QNI, TFc, sessions): MITN, 581 232 30; MACS, 493 155 30; QMN, 639 142 62; UPN, 1118 71 36; GLETN, 557 38, 28; VHF activity 1332 21 158; BPL for KB8GT (first time!) for 139 orig. + del. Traffic: KB8GT 409, KA8CPS 262, W8QHB 187, WD8KQC106, WB8YDZ 105, WB8SIW 85, N8AHA 82, NJ8R 81, K8GXV 64, NJ8S 59, K8OCP 58, WD8MJB 55, WA8DHB 53, KA8PWM 48, N8CNY 47, K6HAP 42, N8EXS 39, NT8G WD8RHU 38, K8UPE 37, WD8OUO 35, W8SCW W8YIQ 32, K8EQO 19, W8EOI 16, W8VIZ 15, WB8SYA 14, W8IHX WB8WJV 13, K8ZJU 11, KA8LAR 9, WA8MVH 8, W8URM 6, WB8ITT KI8Q 3, N8FGL 2.

OHIO: Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. ACC: KJ3O. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

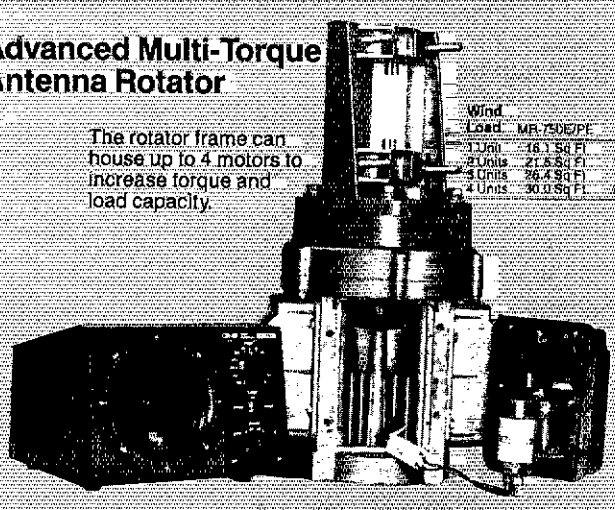
NET	QNI	QTC	Sess.	Time (Local)	Freq.	MGR
BN(E)	254	171	30	1845	3.577	N8EVC
BN(L)	223	147	31	2200	3.577	K8TVG
BNR	172	111	31	1800	3.605	W8EK
BSSN	511	276	58	0945,1900	3.873	K8OZ
ONN	215	94	29	1825	3.708	WD8KBW
OSN	352	133	31	1810	3.577	N8AEH
OSSBN	2209	856	93	1030,1615, &1845	3.9725	WB8JGW
OSSN	183	156	31	0645 M-F	3.577	KA8GJV
				0800 S-Sn	3.577	KA8GJV
O6MN	77	15	13	2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

VE sessions in November: Columbus 11/8; Mansfield 11/22; Canton 11/29; Elyria 11/30. Contact me for more information at the address of telephone number given on page 8 of this *QST*. On August 10, the Second Annual ARRL Ohio Section Conference and Picnic was held in Columbus on a rainy summer day. Those active amateurs present discussed traffic handling issues, the use of packet radio, and the Miamisburg train (chemical spill) disaster. At that meeting, a commendation plaque from the Ohio Section was presented to District 3 ARES (W8ILC DEC) for their planning and preparation prior to the disaster, and their exemplary performance during the event. Congratulations! The Verdons (Chuck KA8PWP and Mary KA8TLM) of Toledo have pulled up stakes and moved to California, where Chuck has accepted a job with Army MARS! Their efforts with the Toledo Hamfest and the Lucas County ARES will be missed! WB8GGR has resigned as EC of Rich-

Superior Ham Accessories

Advanced Multi-Torque Antenna Rotator

The rotator frame can house up to 4 motors to increase torque and load capacity.



Wind Load	MR-750E/PE	MR-300E
1 Unit	18.1 Sq Ft	5.92 Sq Ft
2 Units	21.5 Sq Ft	11.84 Sq Ft
3 Units	26.4 Sq Ft	17.75 Sq Ft
4 Units	30.0 Sq Ft	23.67 Sq Ft

Each motor is equipped with a Super Wedge and Clutch brake system (Slip clutch type) that works independently from the main frame gear train and protects the rotator mechanism from excessive torque.

Low voltage (24VAC) motors . . . Low-cost 6-wire control cable . . . can be installed on the same base as a TELEX unit.

Specifications

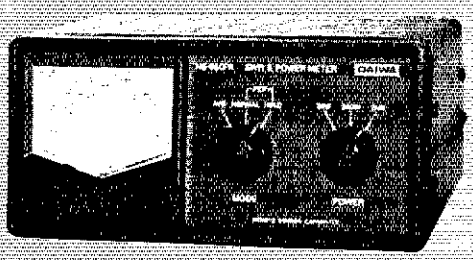
■ **Rotator Unit**

		MR-750E/PE	MR-300E
Rotation time	60 Hz	58 seconds (60 Hz input)	33 seconds (60 Hz input)
	50 Hz	70 seconds (50 Hz input)	39 seconds (50 Hz input)
Output torque Brake power	1 motor	610 lbs/inch 5,200 lbs/inch	220 lbs/inch 1,700 lbs/inch
	2 motor	1,200 lbs/inch 9,600 lbs/inch	440 lbs/inch 3,500 lbs/inch
	3 motor	1,800 lbs/inch 13,900 lbs/inch	650 lbs/inch 5,200 lbs/inch
	4 motor	2,400 lbs/inch 18,300 lbs/inch	870 lbs/inch 7,000 lbs/inch
Rotation angle		375 degrees	
Permissible mast size		1½ ~ 2½ inch (38 ~ 63 mm) < diameter >	
Control cable		6-wire cable 0.5sq—1.25sq (AWG16/18/20 etc.)	
Continuous running		5 minutes Max. permissible	
Dimensions		15.6" H x 8.43" W x 8.43" D (397 mm x 214 mm x 214 mm)	
Unit weight		16.5 lbs (7.5 kg) < with 1 motor unit fitted >	

■ **Controller Unit**

	CR-4 (for MR-750E/MR-300E)	CR-4P (for MR-750PE)
Power source	117 V AC (50/60 Hz)	
Power consumption	200 W (with 4 drive motors)	
Motor running voltage	24 V AC	
Dimensions	4.9" H x 7.1" W x 6.9" D (125 mm x 180 mm x 175 mm)	
Weight	9 lbs (4 kg)	
Operation	Manual	Manual/Pre-set

New Cross Needle SWR/Power Meters for All Bands



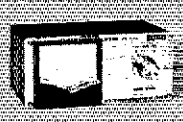
15° angle face for easy reading and operation

Model*	Freq. Range Int. Sensor	Forward Power	Tolerance Full Scale	Connectors
NS-660A	1.8-150 MHz	30/300 W/3 kW	± 10%	SO-239
NS-660PA	1.8-150 MHz	30/300 W/3 kW	± 10% Av Pwr ± 15% PEP	SO-239
NS-663A/N	140-525 MHz	30/300 W/3 kW	± 10%	SO-239/N Type
NS-668	900 MHz-1.3 GHz	1.5/15/60 W	± 10%	N Type

*Optional sensors adapt each meter for use on other bands.

External Sensors (For indoor/outdoor use)
Permit operation over range of 1.8 MHz through 1.3 GHz. Optional for use with NS-660 series meters.
U-66H, 1.8–150 MHz, Max 3 KW, SO-239 Connectors
U-66V, 140–525 MHz, Max 300W, SO-239 Connectors
U-66VN, 140–525 MHz, Max 300W, N Type Connectors
U-66SJ, 900 MHz–1.3 GHz, Max 60W, N Type Connectors
SC-20 50 ft. Cable with connectors for use with remote sensors

SWR & POWER CROSS NEEDLE METERS



CN-620B and CN-720B
Frequency Range: 1.8-150 MHz
Power: 3 Ranges (Forward, 20/200/2000 W) (Reflected, 4/40/400 W)

NS-448
900 MHz–1.3GHz
(Forward 5/20 W)
(Reflected 1.6/6.5 W)
Separate Sensor Type

	CN-520	CN-550
Frequency Range:	1.8-60 MHz	144-250 MHz
Power Range:	200/2000 W	20/200 W

	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W

Back Lit, with mobile bracket.

POWER AMPLIFIERS

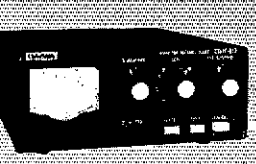
Band:	LA-2035R 144-148 MHz	LA-2065R 144-148 MHz	LA-4040R 430-450 MHz	LA-2155W 144-148 MHz
Input Power:	0.5-3 W	0.5-5 W	10 W	10-35 W
Max. Output Power:	30 W plus	60 W plus	35 W	30-150 W

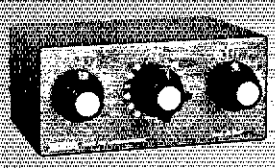
Pre-Amp (Gain) 15 dB

Model	Maximum I/ Continuous I	Output VDC
PS-30XM	31A/24A	1-15
PS-310M	31A/24A	3-14.6
PS-310MD*	31A/24A	13.8
PS-560MD**	56A/44A	13.8

*Sub-DC Outlets: 5.6A/5A, 3-14.6 VDC
**Sub-DC Outlets: 10.6A/1-15 VDC

POWER SUPPLIES





Frequency:	CNW-518	CNW-419	CL-880 (no metering)	CNW-919
Range:	3.5-30 MHz (8 bands)	1.8-30 MHz (17 bands)	1.8-30 MHz (17 bands)	140–150 MHz
Power Rating:	1 KW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW 10–250ohm
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10–250 ohm	

AUDIO FILTERS

AF-606K
Four stages of filtering . . . variable bandwidth over broad range . . . razor sharp CW reception . . . built-in speaker . . . PLL Tone Decoder circuitry.

COAXIAL SWITCHES

PAT. No. 59-000803

	CS-201	CS-201G	CS-401	CS-401G	CS-4
	2position	2position	4position	4position	4position
Frequency:	600 MHz	1.3 GHz	600 MHz	1.3GHz	1.3 GHz
Connectors:	SO-239	N type	SO-239	N type	BNC type
VSWR:	Below 1.1.2				
Insertion Loss:	Less than 0.2 dB				

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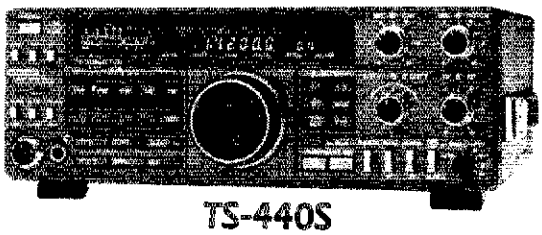
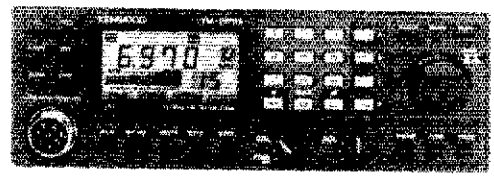
KENWOOD



TS-440S

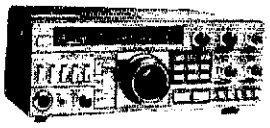
KENWOOD



TM-2530 TM-2550 TM2570

Call For Your Price

KENWOOD



TS-430S

Popular transceiver with general coverage receiver for fixed, mobile or portable use.

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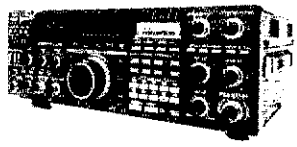

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The Popular TS-930S Still Available

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HANDHELD ACCESSORIES

HMC-1 Handset w/VOX
SMC-30 Speaker Mic
ST-2 Base Charger for TR2600
MS-1 Mobile Charger for TR2600
PB-26 NiCd Battery for TR2600
LH-3 Leather Case for TR2600
SC-9 Soft Case for TR2600
BT-3 Battery Case for TR2600
PB-21 NiCd Pack for TH-21/41
PB-21H 500 MAH NiCd Pack for TH-21/41
BT-2 Battery Case for TH-21/41
SC-8T Soft Case for TH-21AT/41AT
BC-6 Two-Pack Quick Charger
BC-2 Wall Charger for BP-21H
AJ-3 BNC Adapter for TH-21/41

KENWOOD

HANDHELDS

TR2600A TR3600A

TH21AT TH31AT TH41AT

Full line of accessories available.

PAKRATT™ Model PK-232

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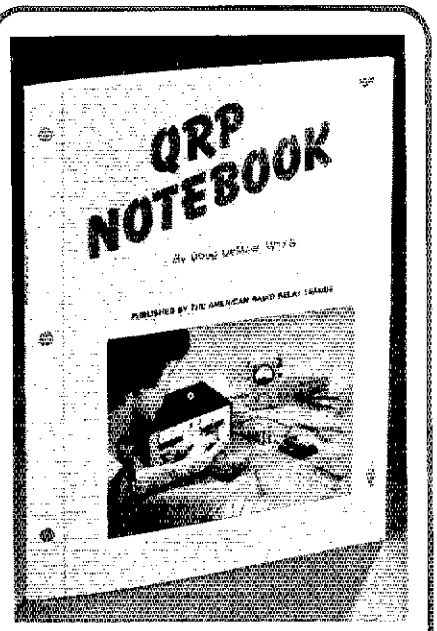

land County (Mansfield area) after 12 years of service. Thanks for the dedicated service, Bob! Bill Reese, WB8ZRN, will be working to fill Bob's shoes as EC. The Findlay RC has a new repeater (W8FT/R) on 449.15/444.15 MHz: should have good coverage of NW Ohio. The Canton ARC provided communications for the Football Hall of Fame Parade, with 4 frequencies used by over 60 operators. Columbiana County ARES provided assistance to DSA in testing the siren system with 17 operators. Julius, KD8XD, noted that many of the members of the Canton ARC could not or would not drive after dark, and so were missing evening club meetings. He is heading an effort to arrange carpools for those who would otherwise become inactive in club affairs: excellent idea! The Dayton ARA announced the recipients of it's four $1000 scholarships: N5FKG of Morgan City, LA; KA6JPD of Vallejo, CA; KA1IPP of Fairfield, ME; and WD8PWV of Bellbrook, OH. Congratulations to each of these fine young amateurs! DARA lists 20 new Novices in their latest newsletter; TSRAC lists 12. How about your club? Tom Chaney, N8DBL, lost a battle with cancer at age 40, and became a Silent Key. Tom was the treasurer of the Cleveland Hamfest Assn. and a member of the Western Reserve Radio Assn. and the North Coast ARC. Other Silent Keys: W8TPC, W8PTF. Athens County is on packet: KA8JXG, W8UKE, K8TUT, N8GHU, WB8OEB, WD8OXK, and W8VKD are active, and an Athens Regional Digipeater is operating on 145.01 MHz with the call WD8OXK-1 and an alias "ATH." It's running 80 watts to antennas at 1000 feet! As I enter my second two-year term as Ohio's Section Manager, I want to thank you all for your support and for your efforts in making Ohio a showplace of Amateur Radio public service and innovation. Let's keep it up! Traffic: W8TO 1170, KA8KHS 592, KE8BE 482, KV8Q 451, WD8KFN 413, WB8JGW 353, K8TVG 343, WD8MIO 249, K8OZ 226, K8JDI 216, K8ND 212, KC8UZ 184, W8BO 178, WB8MEK 168, N8EFB 150, W8FPA 149, WD8QXT 149, W8QZK 145, KA8GJV 143, W8SKP 126, WD8RIB 116, K8CMR 111, W8JMD 110, K8EF 109, KF8J 107, N8AKS 103, KD8FW 99, N8XX 97, N8AEH 88, N8HBI 85, WA8SSI 80, WD8JYE 78, N8EVC 75, WD8KBW 74, W8EK 72, WB8KWD 72, N8FWA 71, WD8IKC 65, KA8UYM 64, N8GEC 63, W8ZOL 60, WA8DYS 56, KA8CGF 55, WB8KWC 55, KC8YV 54, NF8B 50, NR8C 47, WA8FQW 42, NC8Q 42, KD8WJ 41, NE8X 37, KD8IC 36, KA8ILZ 36, KC8JV 34, KA8TNT 34, N8FBE 33, KJ3O 32, WA8HGH 31, KD8XL 30, WA8HED 29, WB8HHZ 29, W9SWM 27, WA8EYO 26, NK8B 24, K8EEN 24, WD8QZM 24, W8RG 24, N8FPH 22, KD8KU 22, K8LQM 22, WB8BWY 21, WD8MPV 21, W8LDU 19, N8CJS 19, K8DHD 19, KC8WH 19, NK8C 18, W8UQY 18, NQ8K 18, W8WE 16, N8AJU 15, K8CKY 15, WD8CTX 15, K8DXZ 14, KA8RIX 14, KC8D 13, WB8DMF 12, KZ8P 12, K8BXT 11, WB8RSM 11, W8BHL 10, WD8DKQ 10, N8GOB 10, KA8VET 10, WB8YFD 10, KD8WH 9, W8FUP 8, WB8MRL 8, W8MVE 8, N2NS 8, N8CW 7, KA8DRR 7, KA8OQF 7, K8VOY 7, WD8CKK 6, KA8LAY 6, KA8YXN 6, W8EMK 5, N8HIL 5, K8IOW 5, WD8CSP 4, N8GIO 4, W8LT 4, KA8SZH 4, WD8ATN 3, KA8MFG 3, N8HBF 2, KA8MFH 2, WB8GDM 1, N8GSM 1, K1LT 1, WD8NED 1, W8ZM 1, WD8NVY 0.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2MCO. SEC: AK2E. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ATC: WA2VGM.

NET	TIME/DAY	FREQ.	NET MANAGER
ESS	2300Z	3.590	W2WSS
CDN	2330Z	146.34/94	WB2ZCM
HVN	0030Z	144.535/135	KA2MYJ
NYPON	2200Z	3.913	WB2IDS
NYS/M	1500Z	3.677	WB2EAG
NYS/E/L	0000/0300Z	3.677	KU2N
SCRN	0100Z	147.735/135	KV2U
SDN	0230Z	147.66/06	K2ZVI

NET LISTINGS (QNI/QTC): AESN 46/1 ATEN 7/1 ESS 367/67 HVN 182/30 NYPON 632/395 NYSE 430/290 NYSL 407/297 NYSM 334/197 SDN 333/69. CLUB NEWS: Albany ARA provided communications for the Albany Tricentennial Bash. They report WA2YDG—Silent Key. They will have program on ATV for Oct. CCNR reports KA2NNI as Silent Key. Rip Van Winkle ARS is starting Novice course. Saratoga RACES had great day for its first Hamfest 6 Sep.—great Hamfest! WARA heard W2KN talk about his 50 years of hamming. WECA heard from the candidates for director and vice director and report two new hams KB2BMT and KB2BMU. Albany area amateurs helped with ARC Canoe Classic in August. If there is anyone who would like to try their hand at a staff position, please contact me ASAP. Open are ACC, PIO, OO Coord. August PSHR: KA2MYJ NQ2H W2PKY WB2VUK K2ZVI KC2TF. JUNE TFC: KA2TQW 17, N2FTR 1. JULY TFC: WB2MCO 58, KA2TQW 8, AGU. TRAFFIC: W2PKY 182, KC2TF 167, NQ2H 140, WB2VUK 94, KA2MYJ 75, K2ZVI 61, K2ZM 57, KA2TQW 9, N2FTR 8, WB2OHR 7.

NEW YORK CITY—LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. ASM/VE: W2NL. SEC: KA2RGI. OOC: NB2T. TCC/RFI: WA2YNH. STM: WA2ARC. PIO: W2IYA. The following are traffic nets in and around the section:

NLI*	3630 kHz	1900/2200	WB2EUF
NCVHF	6.745 rpt	1930 m-f	K2MT mgr
BAVHF	6.67 rpt	2000 m-f	k2YQK mgr
SCVHF	6.37 rpt	2030 m-f	W2GZD mgr
ESS	3590 kHz	1800	W2WSS mgr
NYS/M	3677 kHz	1600	WB2EAG mgr
NYS	3677 kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and check in whenever possible. I wish to thank W2JUP for his time and effort as TCC/RFI for the section, the pay wasn't the greatest but the help was appreciated. Larry Koenig, WA2YNH, has agreed to fill in for the rest of my term, all letters, threats, ransome notes and demands for money should be sent to 24 Suffolk Rd., S. Massapequa, NY 11758. By the time this column is published, it will be known that Woody, WB2IAP, will be the new Section Manager. His term of office will start 1 Jan. 1987. Please continue to send me the club newsletters, I will be still helping, writing the column and such. The demands of helping to raise 4 very active and growing children and working got to be a little too much, and I felt I was starting to hurt the section. I would also like to wish everyone, on behalf of the XYL and 4 jr. ops, a very happy Thanksgiving. LIMARC will continue to conduct examination sessions on the second saturday of the month at N.Y. Inst. of Technology, Rt. 25A, Old Westbury, in Salten Hall Rm2, applicants are reminded to bring 2 forms of I.D., original and a copy of their FCC license, check for $4.50, made payable to ARRL/VEC, 2 pens/pencils and a calculator for the math questions, for further info contact Woody Gerstner, WB2IAP, 42 Mohawk Ave. East Atlantic Beach NY 11561. WA2WKV has been appointed DEC for Nassau County. Larry Moreno K2IJL is the Good and Welfare Chairman for LIMARC. For those asking why they don't see anything about their clubs in the column, remember, I have a 2 month lead time on the column, information like new calls, new officers, equipment, coming back from a trip and things of interest to the section are what I need. Traffic: K2YQK 146, W2GKZ 54.

NORTHERN NEW JERSEY: SM, Robert R. Anderson,

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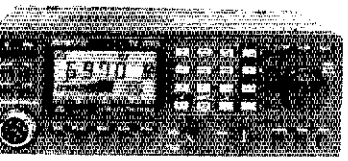

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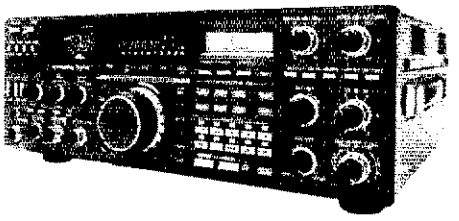

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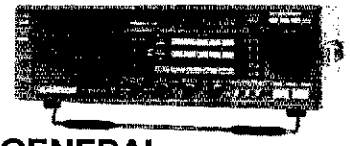

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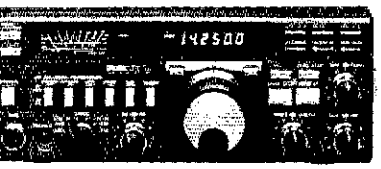

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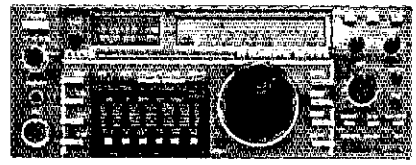

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K2BJG—ASM (VE liaison): N2XJ. ASM (FO info): N2BFG. SEC: N2FOZ. STM: KA2HNQ. OO/AAC: (Open). ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. I am pleased to announce the section leadership appointment of Fred Janicke, N2FOZ, as Section Emergency Coordinator. Contact Fred at 122 Bellview Ave Butler NJ 07405. Phone 838-6348, or via PBBS at WA2SNA-1. Other new appointments are: Bergen county ECs KA2FXS (Dumont) and WD5JPM (Hillsdale). Bergen county OESs K2IDH, KA2BTD, KA2FXS, KS2O, N2CS, N2EMX, N2DUW, W2IUJ, W2TML, and WD5JPM. In an effort to preserve and invigorate the traffic nets of New Jersey, a group of traffic handlers from areas throughout the state are in the process of forming a new organization to be called the "New Jersey Traffic Association, an independent organization of New Jersey traffic handlers, and an affiliate of the ARRL." The articles included in their proposed constitution are all designed to promote amateur radio third-party message handling, commonly known as Traffic Handling. This matter will be the major topic at the traffic handlers December Confab. For further information contact John P King, KA2F, 26 N Sunnycrest Dr, Little Silver NJ 07339, 842-9179. On another matter concerning NNJ traffic handling we need to recruit a "Packet Liaison Section Net Manager." This function is needed to ensure that NTS traffic is moved daily to and from our several PBBSs within NNJ. An experienced traffic handler who has acquired Packet capability would be best. Please contact our STM or me if you would be interested in taking on this much needed traffic handling function. Congratulations to the following who were newly licensed or upgraded during August sessions conducted by: NNJ VE Board, and Old Bridge RA: Novice: F Rumbauskas, D Sease, and W Symczyk. Technician: KA2BBQ, KB2ASW, KB2AQN, and KB2BCR. General: KB2AYK, and N2FVV. Advanced: KA2UVI, N2FZG, and KA2KGT. Extra: KD2TM, N2FPC, and N2GHF. August Data:

Net	Mgr.	Freq	Time	Sess	QNS	QNI	QSP
NJM	W2RRX	3695	1000	Dy	31	188	110
NJPN	W2CC	3950	1800	Dy	36	364	60
NJN/E	AG2R	3896	1900	Dy	23	127	96
NJN/L	AG2R	3707	2200	Dy	21	82	50
OSTTN	WB2QMP	147.12	2000	Dy	31	343	150
TCETN	KA2SPH	146.685	1930	Dy	31	13	13
NJVN	WB2ANK	146.49	2230	Dy	30	116	72
NJPTN	(PBBS)	145.01	WA2SNA-1 and WB2GWD-0				

NNJ Amateur Radio Public Info Line: 201-735-8550.
SAR/PSHR: N2XJ 259/105, N2DXP 76/64, K2VX 10/, W2CC 22/, WB2QMP 74/69.
Division Director/Vice Director elections are not over yet. If you have not cast your ballot do it now!

MIDWEST DIVISION

IOWA: SM, Rollin J. Sievers, WBØAVW—SEC: KDØBG. STM: KCØXL. OOC: WØVX. ACC: WBØQAM. BM: KØIIR. PIO: NCØW. TC: KØDAS. SGL: AKØQ. Note that WØVX, David Jaksa of Marion has accepted the position as OOC. He has all the qualifications, I am sure he will do a good job. Duane, WBØVLX, of Webster City won the top prize at the Ia. 75 meter picnic in Marshalltown. As always a great time and good friends. KØBRE, Buzz was awarded a certificate for his contributions to the Iowa 75 meter traffic net for the past year. Indications are that "Kerchunk" the Siouxland ARA monthly news letter may go on a quarterly basis because of the lack of input from club members. I know the feeling. Report from Headquarters show that there were 87 new novices and 45 upgrades in the past 60 days. More ECs are needed in the state, if your county does not have one and you are interested contact your DEC. You must be an ARRL member.

NET	QNI	QTC	Freq	Time	DAY	MGR
75 meter noon	1125	153	3970	1730	Dy	WBØJFF
75 meter eve	810	90	3970	2300	Dy	NØAEF
ITEN 4 sess	90	10	3970	2300	Sun	KDØBG
TLCN 62 sess	255	125	3560		Dy	WØYLS
W. Cen. ARES	279	3	147.69/09		M-TH-F	

Traffic: WBSS 147, WDØFWB 122, KØGP 102, KAØADF 95, W4JL 96, WBØJFF 71, WØYLS 55, KAØGSA 50, KCØXL 35, WBØAVW 33, KØBRE 29, KØKQJ 18, WØBW 6. ICN QNI 46 QTC 11 in 12 sessions. Happy Thanksgiving to all.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. Net Manager KSBN/KPN, WØFRC. Net Mgr QKS, ——. Ks RTTY Mgr, KAØCUF. District Emergency Coordinators are WØOAG, WBØYJT, and WØEB. STATE Govt Liaison is NØBLD. Tech. Coord is WBØNOM. Bulletin Mgr, KØJDD. ACC, KØBXF and Manager of QKS-SS is WØMYM. Packet Radio is coordinated for KS by WDØBRZ and the EX NET by WEØHDZ. Another unexpected Silent Key, Harold Brent, KØEU. We will all miss him on the nets. For those of you holding station appointments, be advised—DO NOT LET YOUR ARRL MEMBERSHIP EXPIRE. The League DOES automatically cancel all appointments of non members. Zone 5, Wyandotte County is now without an EC and Zone 6B is in the same category. Any one interested in filling the gaps should now speak up. Congratulations to the RICE COUNTY ARC, now an affiliated ARRL club. Net Reports for July are as follows: KSBN QNI 1009 QTC 124. KPN QNI 319 QTC 13. KWN QNI 762 QTC 623. KMWN QNI 621 QTC 588. CSTN QNI 2061 QTC 39. QKS QNI 188 QTC 38. QKS-SS QNI 35 QTC 9. Ks-RTTY QNI 12 QTC 2. Light reporting for this month. Guess the gardening, vacations and the unexpected are the reasons. July Traffic: WØFRC 301, WBQBK 283, NØGCC 194, KSØU 114, WØOYH 75, KØBXF 50, NBØZ 45, WAØHOZ 33, WØMYM 23, WØPB 12.

MISSOURI: SM, Benton Smith, KØPCK—If anyone needs to contact the Section SEC, K9OCU, Ken's telephone number is (314) 583-5975. Ken also has pager numbers of (314) 239-1223 and 583-1225. These numbers should be of interest to DECs and ECs. New officers for the Mark Twain Lake ARA are; Pres. KKØP, VP. WØRTY, Sec. KAØJQE and Treas. KD9VA. Appointed Assistant Division Directors in the Missouri Section are; WØZFN and NFØQ. On July 13 the Heart of America ARC provided communications for the Shawnee Mission Medical Center Triathlon. The operation was organized by KØUAA and members participating were; WØAIB, WAØVYS, WAØNXD, NØCLV, KSØN, KAØYJH, WBØBBC, KCØHV and KAØSYZ. On Aug. 2 a severe squall went through the Branson, MO. area disrupting long distance telephone service. Amateurs from the Southwest part of the state provided communications from the Branson and Marshfield area and to assist the telephone company to coordinate their repair crews. The amateur operation was under the direction of the local DEC, WDØFJX and other area amateurs assisting were; NØGW, W6VKY, NCØG, KAØOKE, WAØKNW, NØDST, KBØRS, NØDGI, and KAØUA. The repeaters of 147.15 and 146.64 were linked during the emergency. The Hannibal ARC operated a special event station at the Tom Sawyer Days. Approximately 1200 contacts were made. The CMRA provided communications for the Bicycle Race at the Show-Me Games on Aug. 2. Operators were; KAØKSL, WBØTEG, KA9HJP, NDØN, K4CHS and KØPCK. The Heart of America ARC is now

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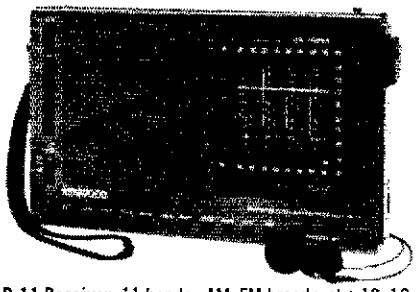

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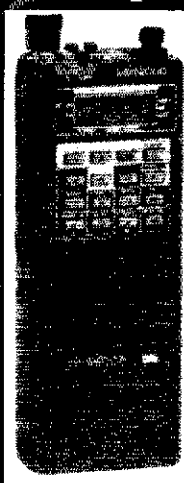

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conducting a net at 9:00 PM on Thursday on 34/94. Everyone is welcome to check in. Nets reporting:

NET	Ses	QNI	QTC	Day	Time PM	Freq MHz	Mgr
MON	62	349	186	Dly	7:00/9:45	3.585	KØSI
MOSSB	31	694	110	Dly	6:00	3.983	KØORB
MEOW	52	103	51	Dly	5:30	3.983	KØDSQ
HBN	21	279	30	Mon-Fri	12:05	3.880	KØDSQ
PHD	4	116	9	Mon	9:00	146.43	WAØKUH
HARES	4	69	7	Mon	7:00	146.88/.28	NØBPA
RRABN	29	395	4	Dly	8:00	146.39/.79	KAØLLN
SLAN	4	268	2	Mon	9:00	146.31/.91	KØWEX
ZAEN	4	72	2	Tue	8:00	147.84/.24	NCØE
MTTN	12	35	2	Mon-Sat	6:30	3.379	NØBKE
MCARES	3	27	1	Thu	8:30	146.52	WBØELJ
LOZBC	21	273	0	Mon-Sat	6:00 AM	1 146.13/.73	WØRTL
LOZFM	5	96	0	Fri	9:00	146.13/.73	WØRTL
CMEN	4	68	0	Wed	9:00	146.16/.76	KØPCK
ARESN	4	44	0	Thu	9:00	147.855/255	NØFQW
SARN	4	44	0	Tue	9:00	146.43/7.03	WØENW
SMARC	4	43	0	Wed	7:00	146.31/.91	WBØTNX
JCCCN	4	36	0	Wed	8:00	146.40/7.00	WBØDZX
TCN	4	33	0	Thu	9:00	147.09/.69	KAØLLO
MOFON	4	31	0	Wed	5:15	222.42/4.02	AIØO
LOZCW	5	5	0	Sat	9:00	3.707	WØRTL

Traffic: KØSI 266, KBØZL 107, WAØFYA 94, KØPCK 91, WAØYJX 86, AIØO 78, WØBMA 78, KØORB 66, NQØG 66, KCØAS 63, WØOUD 49, KØDSQ 39, NTØC 38, K9OCU 30, NDØN 28, KT5Y 23, WCØAAG 16, WBØCJB 20, NIØR 19, WAØKUH 9, WDØELL 7, NØSS 6.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn, WDØEGK. Packet Radio activity continues to grow in the Nebraska Section. New stations are showing up on packet everyday, and there are now many bulletin boards in operation for handling traffic and all types of messages. There are many articles and sources of information of how to join in on the fun of packet operation. Also there are many people willing to help the newcomer to become acquainted with the procedures and capabilities of packet. Your Section Manager's packet station is on the air 24 hours a day on 145.01 MHz and so is your Section Traffic Manager's packet station. This is an excellent way to get in contact or to at least leave a message. The traffic data collected by our STM WDØEGK is forwarded to your Section Manager via packet. This has been working very well for the past few months. Packet is another great tool for the Field Organization to have even better communications. The amateur television repeater in Omaha is very active. Currently the weekly Sunday evening nets of the Midlands ARES are being televised on the ATV system. The ATV enthusiasts have put together video tapes showing activities at the Ak-Sar- Ben Radio Club Field Day this past summer and also coverage of the bike ride across Nebraska where amateur radio provided communications. The Nebraska Section Field Organization still has openings for volunteers, including some at the section level. Please contact your Section manager for details. Traffic: KØDKM 150, KBØZL 107, WBØTED 65, KAØKPT 49, WAØBOK 23, WØKBS 21, NQØA 15, WBØGQM 12, KØTUH 6, KAØBCB 3, WDØBOX 2, KØTFT 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: NA1I. TC: W1HAD. PIO: KX1B. SGL: K1AH.

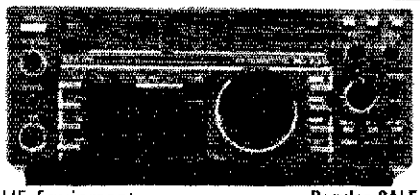
NET	FREQ	LOCAL TIME	QTC	QNI	NM
CN	3640	1900/2000	211	264	K1EIR
CPN	3965	1800 m-s	86	246	KA1BHT
NVTN	22/88	2130	31	114	N1BOW
WCN	78/18	2030	161	423	WB1GXZ
RTN	13/73	2100	68	272	KA1JAN

This is my final column as SM of Connecticut. The past two years have been quite an experience. Despite ill health, I was able to participate in some pretty exciting times in amateur radio. The public recognition we have received has been outstanding. Thanks to dedicated operators like our traffic handlers, especially those in charge of the nets, we have been ready and able to handle any situation that has come along. From events such as parades and bike-a-thons to disasters like Hurricane Diana or the Mexican earthquake, radio amateurs were there to supply emergency communications to those who needed them. The media took notice and the resulting publicity helped us. One thing we must remember—as much fun as our hobby is, it is based on public service. For the past two years, I have had the help of a dedicated staff. Without them, things would have been difficult, if not impossible. The times that I was unable to get involved, I could count on them to take over and do a terrific job. For the most part, their loyalty was unquestioned. The next column will be written by John Ronan, K3ZJJ, your new SM. I'm sure John will welcome your suggestions and input although since he has been part of my staff, I have noticed that he has no shortage of ideas and strategies of his own. Good luck John. We will be listening and watching with great interest. A special thanks to Mary, WB1GXZ, for her hard work. You established an outstanding record, Mary. Thanks also to all of you who have supported me. It was of great help and comfort to me in good times and bad. It has been a terrific experience, one that I will always remember. Now that I am in good health, I look forward to less paperwork and more hamming. 73s. Traffic: WB1GXZ 337, N1EDD 162, KA1GWE 132, KA1KTH 69, KB1ZC 66, N1BOW 63, KA1BHT 51, W1WP 47, WB4FDT 42, W1BDN 35, KY1F 33, W1YOL 26, K1AQE 25, WA1NLD 21, WB1ESJ 13, W1CUH 6, W1QV 5.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: K9HI. SGL: K3HI. OO/AA: KA1KF. SEC: KB1PA. PIO: K1HLZ. BM: KB1AF. STM: KW1U. TC: KA1IU. ACC: KA1KCU.

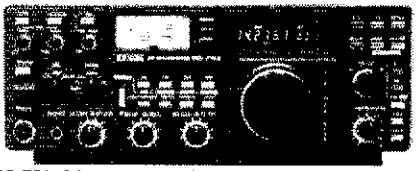
NET	MGR	FREQ	TIME(LOC)/DY	QTC	QNI	
EMRI	N1AJJ	3658	1900/2200	DY	246	357
EMRIPN	N1BGW	3880	1730	DY	142	180
EM2MN	KA1AMR	145.23	2000	DY	138	299
NEEPN	K1BZD	3945	0830	SN	14	66
HHTN	NG1A	04/64	2230	DY	145	533
EMRISS	N1CVE	3715	1600/2030	DY	76	171
CITN	KB1AF	745/045	1930	DY	131	324

Welcome aboard to new Affiliated Club Coordinator KA1KCU and to new Bulletin Manager KB1AF! Sturdy Memorial Hospital ARC reports that KA1OLS is new Civil Defense Deputy Director. OES AE1X is working on new filter design programs for his computer, while N1EGN of Chatham is learning the fine points of packet BBS operation. State Government Liaison K3HI is still anxious to hear from any of you who are having (or have in the past had) difficulties caused by restrictive covenants or ordinances. Tell your tales of woe to Shawn O'Donnell, 8 Delaware Place Apt 2, Brighton, Ma. 02135. FCC Auxiliary Coordinator KA1KF is still looking for people to assist with Amateur-to-Amateur interference problems. If you're interested, be sure to contact him ASAP. Congrats to high scorers on Public Service Honor Roll: KW1U, WA1FCD & NG1A. Traffic: KW1U 615, WA1FCD 384, KN1K 364, N1BGW 285, WA1TBY 253 KB1AF 250, W1CE 176, N1BHH 167, NG1A 113, N1CVE 107 W1ZHC 98, N1AJJ 97, KA1AMR 97, KA1EID 88 K1ABQ 85, K1GRP 81, K1SEC 68, N1DDC 46, KA1LIH 40, KA1AE 23, WA1FNM 23, K1LCQ 22, W1DMH 20, K1BZD 20, WA1SNH 15, KA1KCU 7, KA1LIK 6, KA1EDY 6. Total traffic for the month-3554! Have you expressed your opinions to your Section Manager and Division



HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	999.00	849.95
PS-55 External power supply	199.00	179.95
AT-150 Automatic antenna tuner	445.00	359.95
FL-32 500 Hz CW filter	66.50	
EX-243 Electronic keyer unit	56.00	
UT-30 Tone encoder	17.50	

IC-745 9-band xcvr w/.1-30 MHz rcvr	1049.00	899.95
PS-35 Internal power supply	199.00	179.95
EX-241 Marker unit	22.50	
EX-242 FM unit	44.00	
EX-243 Electronic keyer unit	56.00	
FL-45 500 Hz CW filter (1st IF)	66.50	
FL-54 270 Hz CW filter (1st IF)	53.00	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-44A SSB filter (2nd IF)	178.00	159.95



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	999.00
IC-751A 9-band xcvr/.1-30 MHz rcvr	1649.00	1399
PS-35 Internal power supply	199.00	179.95
FL-32 500 Hz CW filter (1st IF)	66.50	
FL-63 250 Hz CW filter (1st IF)	54.50	
FL-52A 500 Hz CW filter (2nd IF)	108.00	99.95
FL-53A 250 Hz CW filter (2nd IF)	108.00	99.95
FL-33 AM filter	35.25	
FL-70 2.8 kHz wide SSB filter	52.00	
RC-10 External frequency controller	39.25	

Other Accessories:	Regular	SALE
IC-2K1 160-15m solid state amp w/ps	1999.00	1699
PS-15 20A external power supply	169.00	154.95
PS-30 Systems p/s w/cord, 6-pin plug	299.00	269.95
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
MB Mobile mount, 735/745/751A	24.50	
SP-3 External speaker	61.00	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	63.00	
PP-1 Speaker/patch	159.25	149.95
SM-6 Desk microphone	44.95	
SM-8 Desk mic - two cables, Scan	78.50	
SM-10 Compressor/graph EQ, 8 pin mic	136.25	124.95
AT-100 100W 8-band auto. antenna tuner	445.00	389.95
AT-500 500W 9-band auto. antenna tuner	559.00	489.95
OPC-118 Adapts AT-100/500 to IC-735	16.00	
AH-2 8-band tuner w/mount & whip	625.00	549.95
AH-2A Antenna tuner system, only	495.00	429.95
OPC-137 Adapts AH-2/2A to IC-751/745	16.00	

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Other Accessories - continued:	Regular	SALE
GC-4 World Clock (Closeout)	99.95	59.95
GC-5 World clock	91.95	

6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	549.00	489.95
BP-10 Internal Nicad battery pack	89.00	
BP-15 AC charger	14.00	
EX-248 FM unit	55.50	
LC-10 Leather case	39.50	

VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	799.00	699.95
EX-106 FM option	140.00	126.95
BC-10A Memory back-up	9.50	
IC-271A 25W 2m FM/SSB/CW	859.00	759.95
AG-20 Internal preamplifier	64.00	
IC-271H 100W 2m FM/SSB/CW	1099.00	969.95
AG-25 Mast mounted preamplifier	95.00	
IC-471A 25W 430-450 SSB/CW/FM xcvr	979.00	869.95
AG-1 Mast mounted preamplifier	99.50	
IC-471H 75W 430-450 SSB/CW/FM	1399.00	1169
AG-35 Mast mounted preamplifier	95.00	

Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	115.00	104.95
PS-35 Internal power supply for (H)	199.00	179.95
SM-6 Desk microphone	44.95	
EX-310 Voice synthesizer	46.00	
TS-32 CommSpec 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, TTP mic	639.00	569.95
IC-490A 10W 430-440 SSB/FM/CW	699.00	599.95

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, UP/DN mic	429.00	379.95
IC-28H 45W 2m FM, UP/DN mic	459.00	399.95
IC-48A 25W 440-450 FM	459.00	399.95
HM-14 TTP microphone	55.50	
UT-28 Digital code squelch	37.50	
UT-29 Tone squelch decoder	43.00	
HM-16 Speaker/microphone	34.00	
IC-3200A 25W 2m/440 FM w/TTP	599.00	499.95
UT-23 Voice synthesizer	34.99	
AH-32 2m/440 Dual Band antenna	37.00	
AHB-32 Trunk-lip mount	34.00	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
RP-3010 440 MHz, 10W FM, xtal cont.	1229.00	1099
IC-120 1W 1.2 GHz FM Mobile	579.00	499.95
ML-12 1.2 GHz 10W amplifier	379.00	339.95
IC-1271A 10W 1.2 GHz SSB/CW Base	1229.00	1079
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 1.2 GHz, 10W FM, 99 ch. synth	1479.00	1299

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Hand-held Transceivers		
Deluxe models	**Regular**	**SALE**
IC-02AT for 2m	399.00	339.95
IC-04AT for 440 MHz	449.00	389.95
Standard models	**Regular**	**SALE**
IC-2A for 2m	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-12AT 1W 1.2GHz FM HT/batt/cgr/TTP	459.00	399.95
A-2 5W PEP synth. aircraft HT	569.00	

Accessories for Deluxe models	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	74.95
BC-16U Wall charger for BP7/BP8	20.25
LC-11 Vinyl case for DIx using BP-3	20.50
LC-14 Vinyl case for DIx using BP-7/8	20.50
LC-02AT Leather case for DIx models w/BP-7/8	54.50

Accessories for both models	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	18.00
FA-2 Extra 2m flexible antenna	11.50
CP-1 Cig. lighter plug/cord for BP3 or DIx	13.00
CP-10 Battery separation cable w/clip	22.50
DC-1 DC operation pak for standard models	23.25
EX-390 Bottom slide cap	5.50
MB-16D Mobile mtg. bkt for all HTs	21.99
LC-2AT Leather case for standard models	54.50
RB-1 Vinyl waterproof radio bag	31.50
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 100 kHz-30 MHz, 117V AC	$949.00	799.95
RC-11 Infrared remote controller	67.25	
FL-32 500 Hz CW filter	66.50	
FL-63 250 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 25 MHz-2 gHz scanning rcvr	1099.00	969.95
RC-12 Infrared remote controller	67.25	
EX-310 Voice synthesizer	46.00	
AH-7000 Radiating antenna	89.95	

(9)

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Director lately? You should-Your lone voice can indeed be heard!

MAINE: SM, Cliff Laverty, W1RWG—ASM: Bill Mann, W1KX. SEC: KA8UVQ. STM: AK1W. ACC: KA1FKS. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. In recognition of her club activity and interest in club coordination, I have appointed Lynda Hawke, KA1FKS, to serve as Affiliated Club Coordinator. A new club in the Rockland area was officially organized July 31 as Pen Bay ARC. At its "annual" meeting, Pres KA1HEH, VP K1ALX, Tech VP WA1ZDA, Scy N1DOY, Treas N1DEI were elected. They have installed a repeater, 147.060, on Hatchet Mt. They have applied for ARRL Affiliation. The Augusta Emergency Amateur Radio Unit conducted their ARRL affiliated hamfest Sept. 6 very successfully with 525 attendees. Please turn in your traffic reports. PSHR: WB1CBP 92, W1RWG 60. AEN reports 78 checkins in 4 sessions. W1JTH reports appointment of new Official Bulletin Stn, W1VEH, for packet bulletin board. The recently formed Harpswell Amateur Radio Unit covers Harpswell, Orrs Island, Great Island, and Cundy's Harbor from Bailey Island in their emergency program reports Bud Lawrie, W2OLV/1. "Hat" Souther, ND1A, has been appointed Net Manager of Pine Tree Net. Hat has been old faithful on CW traffic activities. Traffic: WB1CBP 112, W1ISO 95, AK1W 94, N1BJW 59, W1KX 46, W1RWG 40, N1BIR 35, ND1A 29, W1BMX 28, W1JTH 17, WA1YNZ 8, N1BME 6, W1OTQ 3.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—OO: N1NH. PIO: WA2MBQ. The summer months are, for many clubs, a period of light activity. Some groups don't have meetings during the summer months but pick up again in September. But Ham radio keeps on rolling here in the NH section! N1CIR reports that the Kearsarge club played a major role in the Hospital Day activities in N. London. This is the annual town fund raiser for the hospital. The club operated a message booth and handled about 40 messages for visitors in addition to demonstrating RTTY. The station was staffed by WB5DLV, W1GUX and KA1BBO. The club was also asked to provide communications support for the parade. The following area Hams participated: N1CIR and N1DRE (husband and wife team), WB5DLV, W1GUX, KA1MYU, and KB1DL. Good PR during the "quiet" summer. On the publishing scene, Paul, KG6LC has just presented AMSAT with a new, high powered sat tracking program for the C128. He was assisted by WA1OMM in preparing the data. The program will be available to AMSAT members. Great article on Ham radio by W1EMN in the latest AARP bulletin. Sam's focus is on encouraging retirees to get active in Ham radio. Good article, Sam! In August, we had 100% rep on 1RN and 5 tfc handlers making PSHR: K6UXO, KA1HPO/T, N1CPX, KA1LMR, and N1AKS. So, if you thought things were quiet this summer, look again. We still receive calls every week from people who want to get into the hobby. I will continue to refer them to the nearest club for help in getting licensed. Don't miss this opportunity to strengthen the hobby and your club. If you don't have enough people to start a formal class, try setting up a one-on-one with a club member to help them through the training. Traffic: GSFM 201, NHN 163, GSPN 134, NSOVTP 40, N1CPX 431, W1PEX 267, KK1E 155, W1QYY 152, W1TN 132, K1PQV 121, KA1LMR 117, N1NH 112, W1GUX 99, W1FYR 89, WA1YZN 84, KI1M 83, K6UXO 76, W1ALE 62, KA1LBW 59, N1AKS 49, NE1J 47, KA1GOZ 36, K1TOY 28, N1ALM 25, WB1GXM 18, KB1XI 18, KV1S 17, KA1HPO 16, K1ACL 15, N1DQA 8, K1OIQ 8, W1LQG 6. (Jul) KA1LBW 23, W1LQG 10.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Tnx to the Operators that worked with the Narragansett Bay Wheelmen bicycle 100 mile ride. Your time was deeply appreciated. Also tnx to the operators that worked with the United Nations UNICEF "Earth Run" from New York to Boston Mass. The N.C.R.C. has been officially renewed as a Special Service Club again congrats all the members. I hope everyone enjoyed the Boxboro Convention and found some good deals on equip. Many nice eyeball QSO also. Good Luck to all in the Sweep Stakes Contest coming up. Tnx to N1BED for the great job he did with the All Club All R.I. opr. Special Event Station that was set up at the State Capitol. Traffic: W1EOF 227, KA1KML 215, EMRIPM 142, KA1JXH 141, WA1CRY 48. 73s CUL.

VERMONT: SM, Frank I. Suitor, W1CTM—ASM: KD1R. STM: AE1T. SEC: W1KRV. BARC Hamfest held Aug. 9-10 at Essex Jct. Fairgrounds with a record attendance of over 900. Key events included: ARRL visitors—Division Director Tom Frenaye (K1KI) and Quebec SM Harold Moreau (VE2BP); Packet demo by Ben (K1AUE); ATV demo by Ed (N1QG); RC model A/C demo coordinated by Jim (K1VII); VE exams held by Mitch (WB2JSJ) and his VT/NY/QUE super team. 10 upgrades; Army Guard A/C control tower comm systems demo; and just a super good time meeting old and making new friends. Being the 1st time at a new QTH was a challenge, and will result in making the 1987 fest even better. BARC wishes to thank all attendees for ur support. Congrats to the following upgrades/new hams: Extras WA1JVV, K1ADQ, NF1C, W1HJX, WA1HSG; Advanced N1EBZ, N1EEV, K1WML, KB1YU; Generals N1DPE, KA1OQV, N1DZP, N1EET, WA1JOG, KA1KAQ, KA1OEJ, N3AGX; Techs KA1GGH, KA1NIS, KA1OSF, KA1NOQ, KA1NOO; Novice KA1LHC. Again on Aug 8th, the ARES team was active in helping the NWS at the Burlington Airport confirm/warn of severe wx in VT/NY/QUE. WB1FWR did his usual outstanding job as net control. A complete ham station is being set up at VT Office of Emergency Mgmt in Waterbury. CVARC will provide RACES ops during disaster operations. W1ZW is now on packet. Next VE exams are scheduled 12/6 in Windsor (CVFMRA-WB1GXM) and 12/13 in Burlington (BARC-WB2JSJ). Congrats to KA1DLK on his ARES organizing in the Bennington area. If interested in helping statewide, contact Joe (W1KRV) who is the new SEC. Joe is a ham of great experience and I am very glad to have him on the team. BARC welcomes its new poet KA1NWG! The Twin State RC recently welcomed a new member JA1OMV—How's that for DX recruiting! VTN says welcome back from vacation to N1DHT, VT Kidney Bike-A-Thon communications provided by BARC—another example of ham public service. Traffic: KT1Q 683, WA2SPL 656, N1DHT 115, AE1T 106, WA1JVV 93, W3QQ 37, W1KRV 16, K2KBT 12. August Net Reports: VTN 31/195/207. VSBN 22/238/39, CAR 26/651/44, GMN 26/348/34, VTPHN 5/75/8, VTRFDN 1/3/0, TSN 4/47/8. Happy Thanksgiving to all.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—PIO/ACC: K1BE. SEC/SGL: WB1HIH. OO/RFI: N1CM. TC: KA1JJM. STM: W1UD. Recent additions to the 220 repeater roster are 223.30/224.90 at the 146.70 site and 223.28/224.98 in E. Longmeadow. Provin Mt. members sponsor both. Antennas and equipment for the new 902 MHz band were recent subject of HCRA program given by W1JR. AND HCRA giving another license class this fall, followed by a VEC exam in December. A very thorough report of the activities of 146.91 and NOBARC was submitted to the State. Activities ran the gamut of parade assistance, search for lost persons and aircraft, Gloria, earthquake traffic, Yankee Rowe drill, etc. W1KK has picked up the Net Manager reins of Western Mass Net. Former NM, K1PUG, has done yeoman duty holding in since his relocation to CT. Thanks Hank and Art. PSHR: N1DMU 114, WB1HIH 91. Traffic: KA1T 225, W1UD 148, N1DMU 115, W1KK 57, WB1HIH 36, WA1OPN 9, W1ZPB 3.

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10 Channel • 25 Watt Transceiver • Priority

The *Regency* RH250B is a ten-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to ten frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH250 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH600B** is available for $454.95. A UHF 15 watt version of this radio called the **RU150B** is also available and covers 450-482 MHz. but the cost is $449.95.

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List price $199.95/**CE price $114.95/SPECIAL**

10-Band, 10 Channel • Handheld scanner

Bands: 29.7-54, 136-174, 406-512 MHz.

The Uniden Bearcat 50XL is an economical, hand-held scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order part # **BP50** which is a rechargeable battery pack for $14.95, a plug-in wall charger, part # **AD100** for $14.95, a carrying case part # **VC001** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

Regency RH250

NEW! Scanner Frequency Listings

The new Fox scanner frequency directories will help you find all the action your scanner can listen to. These new listings include police, fire, ambulances & rescue squads, local government, private police agencies, hospitals, emergency medical channels, news media, forestry radio service, railroads, weather stations, radio common carriers, AT&T mobile telephone, utility companies, general mobile radio service, marine radio service, taxi cab companies, tow truck companies, trucking companies, business repeaters, business radio (simplex) federal government, funeral directors, veterinarians, buses, aircraft, space satellites, amateur radio, broadcasters and more. Fox frequency listings feature call letter cross reference as well as alphabetical listing by licensee name, police codes and signals. All Fox directories are $14.95 each plus $3.00 shipping. State of Alaska–**RL021-1**; State of Arizona–**RL025-1**; Baltimore, MD/Washington, DC–**RL024-1**; Buffalo, NY/Erie, PA–**RL009-2**; Chicago, IL–**RL014-1**; Cincinnati/Dayton, OH–**RL006-2**; Cleveland, OH–**RL017-1**; Columbus, OH–**RL003-2**; Dallas/Ft. Worth, TX–**RL013-1**; Denver/Colorado Springs, CO–**RL027-1**; Detroit, MI/Windsor, ON–**RL008-3**; Fort Wayne, IN/Lima, OH–**RL001-1**; Hawaii/Guam–**RL015-1**; Houston, TX–**RL023-1**; Indianapolis, IN–**RL022-1**; Kansas City, MO/KS–**RL011-2**; Long Island, NY–**RL026-1**; Los Angeles, CA–**RL016-1**; Louisville/Lexington, KY–**RL007-1**; Milwaukee, WI/Waukegan, IL–**RL021-1**; Minneapolis/St. Paul, MN–**RL010-2**; Nevada/E. Central CA–**RL028-1**; Oklahoma City/Lawton, OK–**RL005-2**; Orlando/Daytona Beach, FL–**RL012-1**; Pittsburgh, PA/Wheeling, WV–**RL029-1**; Rochester/Syracuse, NY–**RL020-1**; San Diego, CA–**RL018-1**; Tampa/St. Petersburg, FL–**RL004-2**; Toledo, OH–**RL002-3**. New editions are being added monthly. For an area not shown above call Fox at 800-543-7892. In Ohio call 800-621-2513.

NEW! Regency® HX1500-GA

List price $369.95/**CE price $239.95**

11-Band, 55 Channel • Handheld/Portable Search • Lockout • Priority • Bank Select Sidelit liquid crystal display • EAROM Memory Direct Channel Access Feature • Scan delay

Bands: 29-54, 118-136, 144-174, 406-420, 440-512 MHz.

The new handheld *Regency* HX1500 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 55 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Includes belt clip, flexible antenna and earphone. Operates on 8 1.2 Volt rechargeable Ni-cad batteries (not included). Be sure to order batteries and battery charger from accessory list in this ad.

Bearcat® 100XL-GA

List price $349.95/**CE price $203.95/SPECIAL**

9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC

Frequency range: 30-50, 118-174, 406-512 MHz.

The world's first no-crystal handheld scanner now has a LCD channel display with backlight for low light use and aircraft band coverage at the same low price. Size is 1⅜" x 7½" x 2⅛". The *Bearcat* 100XL has wide frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the AM aircraft band, the 2-meter and 70 cm. amateur bands, *plus* military and federal government frequencies. Wow...what a scanner!

Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

Bearcat® 210XW-GA

List price $339.95/**CE price $209.95/SPECIAL**

8-Band, 20 Channel • No-crystal scanner Automatic Weather • Search/Scan • AC/DC

Frequency range: 30-50, 136-174, 406-512 MHz.

The new Bearcat 210XW is an advanced third generation scanner with great performance at a low CE price.

NEW! Bearcat® 145XL-GA

List price $179.95/**CE price $102.95/SPECIAL**

10 Band, 16 channel • AC/DC • Instant Weather

Frequency range: 29-54, 136-174, 420-512 MHz.

The *Bearcat* 145XL makes a great first scanner. Its low cost and high performance lets you hear all the action with the touch of a key. Order your scanner from CE today.

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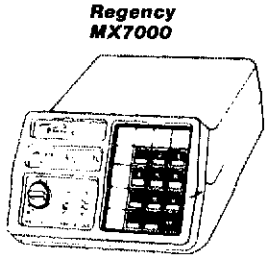

Regency MX7000

Regency HX1500

NEW! Bearcat® 800XLT-GA

List price $499.95/**CE price $317.95**

12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC

Bands: 29-54, 118-174, 406-512, 806-912 MHz.

The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½"

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NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., NL7C—SEC: KL7JIM. STM: KL7T. ACC: AL7AC. TC: AL7L. NM: KL7GID, KL7AF, KL7JKW. DEC: AL7AC, KL7WM, KL7JFT. The Motley Net (nightly on 3.933 MHz at 0500Z) picnic was very successful drawing 138 hams and their families. All attending had a very enjoyable time. The Anchorage Club enjoyed a visit by KH6BZF, and a propagation report presented by him. It seems we just finished the last Iditarod, but planning has started on the 1987 Iditarod. AL7FS, KL7JIM, and WB7SFO are handling the planning chores for amateur communications in the Iditarod. Traffic: KL7GID 104.

IDAHO: SM, Lem Allen, W7JMH—CLUB NEWS: Magic Valley Chapter has a monthly first Saturday breakfast at Depot Grill in Twin Falls—all hams welcome. ARRL MATTERS: Don't forget to vote for NW Director when you receive your ballot. Try to arrange your local Simulated Emergency Test exercise this year to coincide with the tests of the other groups. This makes for a more comprehensive exercise. PEOPLE & THINGS: VE exams were held in Boise on Sept 6. Congrats to WA7YIH, new Extra; KA7UUH, KA7ZEB, KA7ZFX, new Technicians; Donald Peterson, new Novice. NET REPORTS:

Net	FQ—Time	SES	QNI	QTC
FARM	3937 LSB 8P Da	31	2282	33
ID CD	3990 LSB 810A M-F	21	673	21
IMN	3635 CW 9P Da	31	346	71
NW TN	146.38/98 FM 730P Da	31	671	31

GENERAL: Remember that during emergencies, communications is also needed to and from schools, churches, and lodges where large numbers of people could sleep and be fed, not just the ground zero site of the cause of the emergency. Traffic: N7BHL 185, W7GHT 177, KE7MO 42, W7JMH 42.

MONTANA: SM, Les Belyea, N7AIK—The Yellowstone ARC will publish a 1987 Montana Callbook. It will be available this month (November) for the cost of $4.00 plus .50 cents mailing. Clubs wishing to sell the Montana Callbook to their members or others may do so by buying them in quantities of 20 or more for $3.50 each which will include shipping. Contact N7ATT in Billings. The Treasure State chapter of the QCWA, also, RACOM members had their fall meeting in Lewistown in October. Up-grades reported: to Extra- N7HVB, to Adv.- WB7WVE, N7GXW, WB7SIE, to Gen.- KA7SJW (age 83) WOW! Plan on checking into the Montana Section net each Sunday morning at 9:30, freq of 3920 kHz, as it is an excellent source of information, ARRL activities, specific happenings and technical assistance. PSHR: WB7WVD, KF7R.

NET	SESS	QNI	QTC	MGR
IMN	31	346	71	WA7GQO
MTN	31	1641	131	KF7R
MSN	5	49	1	K0PP

Traffic: KF7R 83, WB7WVD 41, N7AIK 28.

WASHINGTON: SM, Brad Wells, KR7L—ASM/ACC: KC7PH. SEC: N7DRT, STM: KD7ME. OOC: N7IL. TC: W7BUN. I am sorry to report that Gene Sprague, KD7G, has resigned as SM due to poor health and impending eye surgery. He is now on road to recovery, and we can look forward to his continued involvement in section affairs. If you wish to contact me with news or questions, I monitor 145.31 (Bremerton), 147.00 (WWDXC) and 146.52 simplex. For specific information on clubs, emergency communications, traffic handling, the Official Observer program, and technical problems, contact one of the Section Officials listed above. They check into the WARTS net on 3970 at 6:00 PM local time. Many thanks to the stations who participated in this year's Simulated Emergency Test. Public Service operating activities are a cornerstone of Amateur Radio. It is also lots of fun. To learn where the action is, check into one of the following nets:

Clark Cnty ARES	147.24	Tuesday	7:00 PM
King Cnty ARES	145.33	Sunday	8:00 PM
Kitsap Cnty ARES	145.31	Sunday	7:30 PM
Kitsap Cnty ARES	3987	Sunday	7:00 PM
Pierce Cnty ARES	147.38	Tuesday	7:00 PM
Snohomish Cnty ARES	147.18	Sunday	7:00 PM
Snohomish Cnty ARES	146.78	Monday	8:00 PM
Spokane Cnty ARES	147.30	Tuesday	8:00 PM
Whatcom Cnty ARES	145.23	Monday	8:00 PM
" " "	147.16	Sunday	7:30 PM
" " "	148.46	Sunday	8:00 PM
" " "	3965	Monday	7:30 PM
Wash. Emergency Net	3987	Monday	6:30 PM
Wash. Information Net	3987	Daily	9:30 AM

Any other ARES groups that would like to be listed in this column, contact me or N7DRT. Clubs: the Mike and Key ARC meets monthly on the 3rd Saturday at 10 AM at the Good Neighbor Center, 305 S. 43rd Street, Renton; the North Seattle Amateur Radio Club meets the 3rd Tuesday at First Interstate Bank, 30th Ave. NE and NE 125th Street (Lake City). Contact Mike, W7WHT, at 282-1438 for meeting time. Remember that this is your column for news and views of Washington Section. Keep us informed of your activities and meetings. Thanks to the following stations who reported handling traffic during August: K7AJT, N7AM, W7APS, K7CLL, N6EQZ, KD7G, W7GB, N7GGJ, K7GXZ, W7IEU, W7IGC, KR7L, W7LBK, W7LG, KD7ME, K7SUX, KA7VEE, WB7WOW.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—Asst SMs: W6ZF, N6DHN. EC: W6LKE. STM K6APW reports that he is now a VE, and has also been packet-connecting with KK1A & N6EEG. Jim is looking for a "few more good men" on the Section Nets. Can you help? W6CHU from Los Angeles reports that his brother W6DUZ, formerly of Fairfield, has become a Silent Key. HARC is getting their ARES clothing, new home for K6EAG/R, and emergency power concerns all in order now. EBARC is moving forward with plans to incorporate. Their "BLOWN FUSE" editor, KG6HF, is retiring at year's end. They mourn the passing of member WB6QGJ. MDARC is also looking for a new editor for their award- winning "THE CARRIER." (Being a newsletter editor is hard work, but a most important job in any club. Don't miss a chance to serve YOUR club by not giving it a try!) LARK's newsletter is now featuring FB fotos and a new columnar format. They recently published a comprehensive survey to determine member's wants/needs. NBARA is sponsoring a "Show the Flag on 10" net, 28.600 at 1930 local time on Thursdays. BARC had an excellent article on their participation in a recent emergency drill appear in the "BENICIA HERALD." Traffic: W6VOM 164, WB6DOB 138, K6APW 91. (Jul) WB6DOB 140, W6VOM 122, K6APW 86. (Really late Jun) K6APW 124!

NEVADA: SM, Joe Lambert, W8IXD—WB5PTO & W8IXD gave a Packet demo to the Boulder City Commodore Computer Club in an effort to get young people already interested in computers, involved in Ham radio. Combining the two technologies with packet radio provides an excellent opportunity for the non-technical person to have a fun-filled introduction to digital communications. The demo received excellent P.R. in local newspaper. Good News: Ely and Reno have 2-meter communication via Lewis Mtn. SNARS had 60% pass rate on 8/23 exams. Thanks VEC team: K7HRW, K7AZ, K7VV, KY7N, W6JBB, WB7EIY. Contact K7HRW for next test date. K7HRW is setting up ham classes in Reno and is looking for instructors. If you can help, contact Curly, K7HRW. Be sure to attend Nevada's own HAM- WEST November 7-8.

PACIFIC: SM, Army Curtis, AH6P—Aloha and hafa adai to all of the Pacific. Lots of new upgrades thanks to the VE program. On Kauai, NH6FJ, NH6EP, WH6BKJ. and WH6AON moved up, while on Maui NH6EV, WH6BJG, KA7MSH, AH6GQ, AH6GJ, WH6BFT, and WH6BCP succeeded. In addition, Linda, daughter of AH6GQ, passed her novice. Congrats to all! Incidently, is AH6GQ the first YL in Hawaii on packet? Public service events were well supported on both Kauai and Maui, while on the Big Island, many BIARC members turned out two weekends in a row for a very successful fund raiser. Ask a member what we did. It certainly was different! Hope I saw you in San Diego. Traffic: KH6S 49, KH6H 21.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG. ACC & TC: W6RFF. DEC North: KF6KJ. DEC Sierra: KA6GHI. SECTION NET: First Sunday each Month, 8 PM, on 146.085, input up, Yuba/Sutter repeater WD6AXM/R. Net Control—W6IEW or W6RFF. This month is CLUB month in this report. First, WELCOME and CONGRATULATIONS on ARRL affiliation to the Hangtown ARC of Placerville and the Siskiyou Repeater Association of Fort Jones. Contacts for the new affiliates are their Secretaries, Betsy Sheridan, N6NGA for Hangtown and Ruth Hinkle, W6LXL for Siskiyou. I had an enjoyable trip visiting clubs this month and for each club the meeting was somehow unique. The main purpose of the trip was to present a Charter of Affiliation to the Trinity County ARC who recently became a League affiliate. Fortunately, club meeting dates worked out so that I could also visit the Yuba/Sutter ARC in Yuba City on the way up north and the Golden Empire ARS in Chico before returning. The Yuba/Sutter Club was, for the first time on a regular meeting night, enjoying a social get together at a pizza parlor. The Golden Empire ARS was celebrating its 50th birthday meeting. They were organized in August 1939. Congratulations to their President, Walt, KE6EP who upgraded to Extra Class the next day. Sorry, Reva, NT6E, that I spelled your name wrong in the March report. Traffic: N6CVF 364, WB6CLD 272, WD6BZQ 257, N6LUY 245, WA6WJZ 220, K6SRF 163, KI6GW 83, W6RFF 53, WA6ZUD 16, WD6EEZ 12, WB6SRQ 10, KB6COH 2, WA6ERZ 2.

SAN FRANCISCO: SM, Bob Smith, NA6T—VOMARC participated in the JACK LONDON FESTIVAL with a special events station in operation, did you work them? Can you name the people—two renewals stapled together, and someone else gets WW6E? Thats a got-u from the FCC! Glad to see the Good turn out at the SCRA Fleamarket and Hamfest. I know our Div. Director, KB6ZV, now knows who can have the most fun! Various clubs are offering Club Jackets for sale at a very resonable price, what a great way to tell the public who you are, An Amateur Radio Operator, during various Public Service Events. Don't delay, get yours now. SFRC BBQ was a great success, tnx to its host, Ron, WA6POB. DNARC has a new meeting place—The Clubroom in the Old High School Building, also try the 7.18+ rptr in the Cresent City area. Packet is alive and well in CC city, WA6ZDQ es K6HY are the first two, who's next? Can you beat this— FWRA is having trouble with MA BELL also—two xmitters spaced 600 khz apart have been QRM'ing the .61 rptr in G-Ville es they are 10 MHz away from it!! Did you pay your bill Rich? SHARC's picnic was a big success at Benbow Lake State Park, 67 people, warm skys, good food, and a live outdoor concert provided by CR. But the crowd stealer was the 10' boa constrictor owned by Bill, N6NWX. Now I've heard of alligator repeaters, but what is a boa constrictor repeater? Traffic: N6FWG 85, W6PW 46, KK1A 298.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WC6U. STM: N8AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K8YK. N6IWD has retired and moved to Alturas. A new Emergency Coordinator is needed for Mono County. All appointees are reminded that a monthly report is required as a part of an appointment. Congrats to W6MRP on 50 years as an ARRL member. K6QPE is Extra. KB6ANA is Advanced. KB6JHU, KB6JDT, and KA6VQG are General. KB6ANL is Tech. KB6NAK, KB6NKB, and KB6NMF are Novices. KB6JHA is N6NUO. W6MND has a TS 940. WD6GVS has an IC 27A. W6YEP has an IC 751A. KB6JQK and KI6FM have TS 430s. Traffic: N8AWH 181, N6MCY 22, WA6YAB 14, W6DPD 6.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—SEC: WA6OCV. TC: WA6PWW. STM: N6JLJ. PIO: WB6NLA. ASM: N6JQJ & NS6S. ACC: W6MKM. BM: (vacant) OOCORD: (vacant). Congratulations to our new Section Emergency Coordinator, Susan Tracy WA6OCV. Susan did a superb job first as Santa Cruz EC and then Santa Cruz County DEC . . . the Foothills ARS had a very enjoyable picnic at the QTH of N6BC . . . the Gabilan ARC heard a talk by Jack Clark of CDF at their meeting . . . EMARC heard a talk by Ken Cutlers WA6TWX on SETI (Search for Extra Terrestrial Intelligence) Ken is one of the lucky few who work on SETI in a professional capacity at NASA/Ames . . . the Lockheed ARC heard from Pete Olinger, LMSC's company emergency coordinator . . . John, K6OZV conducted a novice code class, sponsored by the Lockheed ARC. Of the 8 members who completed the class, 6 passed the novice exam and 2 passed the tech! Congratulations to all! . . . by the by, K6OZV has helped a total of 44 novices get their licenses! OO reports: K6AYB Traffic: W6YBV 133, NR7E 90, KA6SXW 47, W6PRI 18, KB6IWG 15, N6JLJ 9.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. SGL: KE4ML. Enjoyed seeing everyone at Shelby hamfest. NTS meeting most enjoyable. Thanks to STM K4NLK and staff. Upcoming hamfests: Concord Nov 2. Greensboro Nov 22/23. Congrats to WB8CBU who made Extra all upgrades at hamfest. New appointments: KU4W EC Hoke Co. Late note on License Plate Bill—HB 952: Take time to write your Senator a letter and thank them for supporting the bill. New DMV Form MVR- 35 (Revised 8-86) MUST BE SUBMITTED for new plate. EVERYONE MUST COMPLETE NEW FORM. ATC WD4OQL reports that the most often asked technical questions are on antennas and feed systems. K1PLR has moved back to CT. Thanks for FB job as Section OOC Harry. Are you an amateur radio instructor? Are you registered with ARRL? NO? Then register now to receive helpful aids. Several 100 are needed in section. We have almost 10,000 amateurs in section. This is the teaching season so let's help everyone to become a ham. It's OUR turn to be ELMERs. Now is the time to organize public displays on Amateur Radio and set up Traffic booths at shopping malls for Christmas season. VEs be aware of changes in exam question pools. FCC deregulation now gives the VEC responsibility for question pools and distribution of same. With 27 VECs nationwide and NO uniformity, this will weaken integrity of Amateur Radio and exams. The League is READY NOW to help all VECs in this

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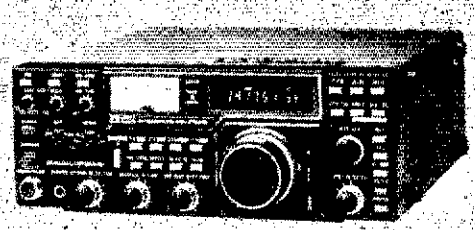

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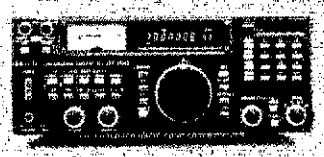

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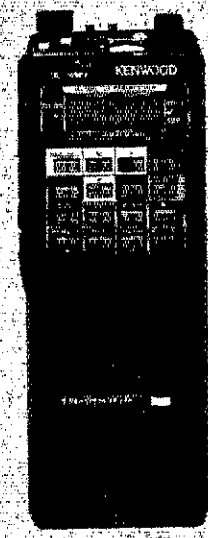

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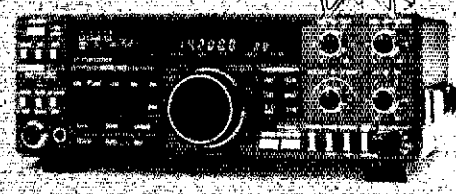

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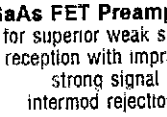

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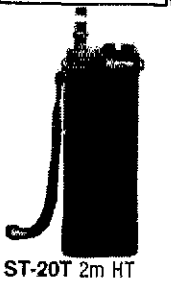

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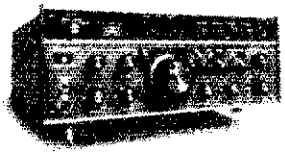

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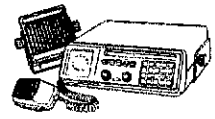

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matter. If you have any thoughts or ideas let HQ know. Let's thank our Maker for your wonderful hobby. HAPPY THANKSGIVING TO ALL from Section Staff. HF Net Schedules: NCMN 3927 7:45 AM; CSN 3715 6 PM; NCEN 3923 6:30 PM; CN 3573 7/10 PM. Traffic: NJ4L 354, K4NLK 314, WB4HRR 181, KA4TLC 144, AA4MP 142, AK1E 91, K4JHF 88, KI4YV 83, WD4HTE 81, WB4WII 76, KA4YMY 61, AA4UO 59, K4IWW 57, WA4MNR 50, N4JRE 48, N4MQU 48, WA4BFT 46, WB4N 43, K4SWN 43, N4NOY 40, N4LST 39, NE4J 32, K3HXC 30, NT4K 28, WD4EQK 26, WD4MRD 25, W4EHF 22, WB4CYN 18, N4LUO 18, N4NTO 17, N4MMM 16, KU4W 16, N4CJJ 14, N4JEO 10, K8SKX 10, N4LUB 9, WD4RMQ 2.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ— I have processed several applications for ARRL appointee callsign badges since authorization of the engravers. If you wish to purchase a badge, I must sign your application before it is mailed to the engraver of your choice. Be sure to follow details found in October QST and Field Forum. If you have noticed, stations reporting traffic has steadily declined since first of the year. I must assume that the same amount of traffic is being passed for the count has not declined on the nets. COME ON GANG! It only takes about three minutes to count your traffic, originate and pass a message to me at month end. TAKE THE TIME! APRIL-AUG Nets: SCSSB 2572/262, SCNT 552/116, Blue Ridge 8296/335, Greater Pee Dee 3054/374, York 2551/417, Oconee 1853/114, Anderson 900/41, Lancaster 735/80, Carolina State Line 267/13. Traffic: K4ZN 210, W4ANK 127, W4FMZ 105, KB4BZA 88, WO1KT 83, KA4LRM 82, WB4UDK 53, K4ZB 27, WD4HLZ 17.

VIRGINIA: SM, Claude Feigley, W3ATC—STM: KB4WT. SEC: N4EXQ. ACC: NT4S. OOC: W4HU. BM: AB4U. TC: WB4MAE. For a listing of the section NTS nets see last month's QST. N4KSO reports that the Russell county class resulted in 4 new novices. WA4LJI reports the 10th annual Rockbridge Community Festival generated 136 pieces of traffic with WD4RIE as Chief Op. Glad to report WA4NTP back in harness after a trip to the hospital. Tnx to the Rappahannock Radio Club for sending their fine newsletter. N4EXQ, section SEC, is busy bringing DEC, EC and OES records up-to-date. Full cooperation from all appointees is appreciated. It was nice meeting you at Virginia Beach Convention. The Traffic/ARES forum was well attended and K4JST and WA4CCK presented a well received Packet demonstration. It looks like many attendees were impressed and bought a TNC so there are many new stns on in the Tidewater area. WD4RIE, DEC for the Blue Ridge District, reports of ARES activity with his group amassing 114 hours of community service. The Sterling Park club has made a donation of a group of ARRL publications to their local library. Lots of "OO" activity with OOs W4HU, W8IRT, K4JDJ and KB4WT submitting notices of FCC infractions. The first issue of the revitalized Virginia Ham is history and the second issue should be in your mailbox shortly. N4EXQ announces that N4KSO becomes DEC for the Southwest Virginia district, N4IIC EC for Hampton and the separation of the Eastern Shore District from First Colony with WA4TVS as DEC for Eastern Shore. Other new appointees are; AA4GL as OES, KJ4MF, N4FNT, WD4OCW, WB4ZNB and K4MTX as ORS. WB4KSG has been appointed as Net Manager for the VNL. Future VE exam schedule; Nov. 1, Hampton contact N4IIC, Nov. 8, Manassas contact Hal Robinson, Dec. 6, Portsmouth contact WB4BAB. It would be appreciated if those planning exams for 1987 would send me their schedules. ARRL Hdqs has approved several engravers to produce the League appointee badges if you are interested in obtaining one of these badges contact the SM for details. Traffic is starting to perk up. This month's traffic count was 4498 with 39 stns reporting. Again N4GHI leads the pack followed by N4EXQ. Do you have any suggestions for improvement in the section's operation, if so, let the SM know. Traffic: N4GHI 604, N4EXQ 576, AA4AT 353, W3ATQ 348, WB4PNY 270, K4JST 239, KB4WT 236, WA4CCK 190, K4MTX 177, WD4FTK 176, WA4LJI 152, W4JLS 141, KB4NGO 117, WD4OCW 99, AA4GL 98, WB4EDB 87, K4MLC 60, WB4KSG 59, N4KSO 51, WB3ANC 50, WD4MIS 50, NT4S 48, K4VWK 45, NN4I 40, WB4KIT 38, N8ANQ 34, KA4IUM 23, K4JM 23, K4BGZ 22, N3RC 19, KB4PW 17, K4GR 16, WA4TVS 9, WB4ZNB 8, K4AXF 7, N4FNT 6, K4JUM 5, W4YE 5, KC3HN 0.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. ACC: WA8CTO, SGL: K8BS. TC: K8CG. RPT COORD: WB8GDY. Memorandum of agreement documents with local Governments will be sent to us as soon as available. Chas area hams assisted with this year. For info on testing in Chas, contact AC8K.

net	Freq	Time	QNI	QTC	Sess	NM
WVFN	3865	6:00	716	128	31	W8YP
WVMD	7235	11:45	615	30	31	W8FZP
WVN	3567	7:00	208	67	30	KZ8Q
WVRN	2640	6:30	148	30	31	KBLG
WVNN	3730	5:30	166	45	28	WD8LDY
Hill Billy	4290	Noon Su	135	12	5	W8YP

Traffic: W8YP 381, KA8WNQ 176, WD8LDY 164, W8FZP 118, KD8G 105, N8GJO 100, KE8FI 69, KA8TJK 57, K8TFP 46, K8KT 36, K8UQY 34, K8QEW 30, WD8EBH 19, N8CG 17, KA8OGF 17, KA8ZGY 6.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—ASM: W0RSG, KA0MQA. SEC: WB0FQB. STM: N0DZA. OO: W0ACH. ACC: WB0DUV. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KA0CZW. Welcome to the newest affiliated club in the section, SKI Country ARC. The International PGA Golf Tournament held at Castle Pines in Parker, utilized approximately 35 amateurs to handle Net Control for the five-day tournament. Although many other cities have used amateurs this was a first for the Denver area. Thanks to ACC WB0DUV for her organization of this event using ARES and many area club members as Net Control operators...a job well done. Congrats to KA0CZW for organizing communications for the EAA Fly In held at Greeley. There are several VE tests now being held on a regular schedule of monthly testing. Mile Hi VE Team—Contact W0IJR; Boulder VE Team—Contact N0BWS; Littleton VE Team—Contact W0NT; PPRAA Colo Springs— Contact N0LA, and ARA Ham Radio School—Contact WA7WDJ. From the Section Team ...Happy Thanksgiving, 73, KQ0J. NETS: Col: 26 sess, QNI 695, QTC 30-69 inf. CWN: QTC 96. QNI 72, 24 sess. CWXN: QNI 2395. QTC 2797, 31 sess. HNN: QNI 1544, QTC 72-296 inf. 31 sess. NCTN: QNI 315, QTC 116, 32 sess. SCTN: No totals. Traffic: N0BQP 1872, WA8HJZ 1735, W0ACH 576, K0RXK 569, K0JAN 383, WB0FFV 132, WA0OYI 118, KB0Z 90, N0DZA 71, WD0BSZ 40, W5HRS 28, KE0BI 14.

NEW MEXICO: SM, Joe T. Knight, W4PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 105 msgs with 172 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 58 msgs with 1236 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 115 msgs with 897 stations in. Yucca 2-mtr Net 01/81 handled 13 msgs with 421 checkins. Caravan Club 2-mtr Net

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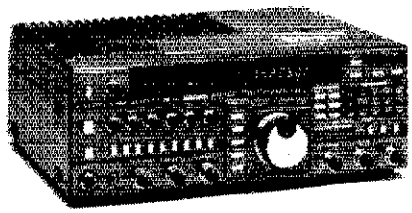
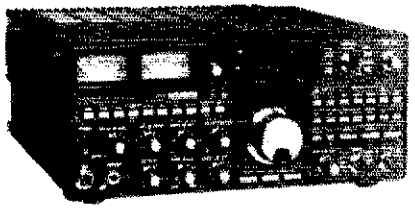
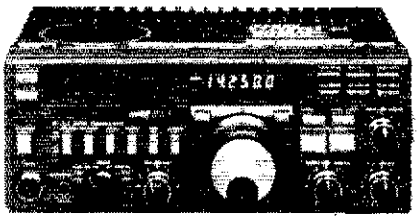


HF Equipment	LIST
FT-767GX 160-10m xcvr/.1-29.99 MHz Rcvr	$1895.00
6M/767 6m module	179.95
2M/767 2m module	179.95
430/767 430-440 module	219.95
440/767 440-450 module	219.95
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	2859.00
KY-ONE Keyer unit	50.00
DC-ONE DC cable	15.00



FT-980 9-band CAT Xcvr/SW Rcvr	$1795.00
SP-980 Speaker with audio filter	99.95
SP-980P Speaker/patch	99.95
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
E-980 Interface cable; FT-980/757AT	46.50
XF-8.9HC 600 Hz CW filter (1st IF)	50.00
XF455.8MCN 300 Hz CW filter (2nd IF)	59.95
KY-ONE Keyer unit	50.00
FIF-65 Computer interface; Apple IIe	69.95
FIF-80 Interface; NEC PC-8001	119.00
FIF-232C for VIC-20/TI/most RS-232	79.95
FRB-1 External relay box	20.00
GC-980 General coverage kit	14.95



FT-757GX 9-band Xcvr/SW Rcvr/mic	$995.00
FP-757HD Heavy duty supply with fan	249.00
FP-757GX Compact power supply	235.00
FP-700 Power supply	209.95
FRB-757 External relay box	10.95
FC-757AT Automatic ant. tuner w/memory	359.00
FAS-1-4R Remote antenna selector	79.95
MMB-20 Mobile mount	25.95
FIF-65A Interface; Apple IIe	59.95
FIF-232C for VIC-20/TI/most RS-232	79.95
GX Turbo/F01 Software; Apple II	59.95
GX Turbo/C01 Software; C64/128	89.95
GX Turbo/V01 Software; VIC-20	89.95

FT-757GX accessories - cont.	LIST
FTV-700 Transverter w/no module	175.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
Misc. accessories	LIST
SP-102 Speaker with audio filter	$ 99.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	89.95
MH-1B8 Mobile microphone	24.95
YS-60 1.8-60 MHz 2kw PEP wattmeter	84.95
YS-500 140-520 MHz 200w wattmeter	69.95
YH-55 Lo-Z headphones	21.95
YH-77 Lightweight headphones	21.95
FF-501DX Low pass filter	34.95

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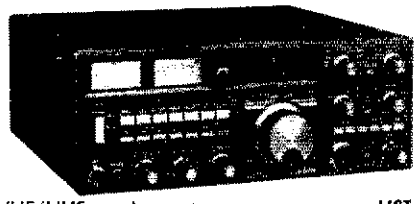

VHF/UHF equipment	LIST
FT-726R VHF/UHF Xcvr w/2m, TTP mic	$1095.00
HF/726 10-12-15m unit	289.95
6M/726 6m unit	269.95
430/726 430-440 MHz unit (OSCAR)	329.95
440/726 440-450 MHz unit (FM band)	329.95
SU-726 Satellite duplex module	129.95
XF-455MC 600 Hz CW filter	69.95
DC-726 DC cable for FT-726R	10.05
FTE-36 Tone board for FT-726R	58.00
AD-2 50w 2m/440 duplexer	34.95

FT-270RH 45w 2m FM Xcvr w/TTP mic	439.95
FT-2700RH 25w 2m/440 FM w/TTP mic	599.95
FTS-8 Encoder/decoder	44.95
FVS-1 Voice synthesizer	31.95
AD-2 50w 2m/440 duplexer	34.95
FT-770RH 25w 440 FM xcvr w/TTP mic	479.95

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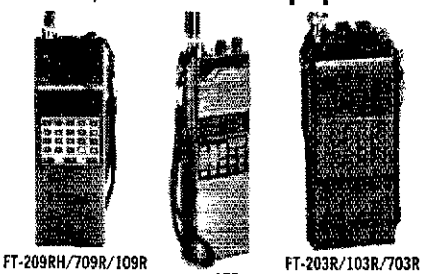

FT-209RH/709R/109R FT-727R FT-203R/103R/703R

Handhelds	LIST
FT-209RH 5w 2m FM HT/TTP/batt/cgr	$359.95
FT-727R 5w 2m/440 HT/TTP/batt/cgr	479.95
FT-109R 220 FM HT/TTP/batt/cgr	TBA
FT-709R 4w 440 FM HT/TTP/batt/cgr	359.95
FT-727R 5w 2m/440 FM HT/TTP/batt/cgr	479.95

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FT-203R/TTP 2.5w 2m FM HT/batt/cgr/TTP
FT-103R/TTP 2.5w 220 FM HT/batt/cgr/TTP
FT-703R/TTP 2.5w 440 FM HT/batt/cgr/TTP
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Acc. for 09-series/03-series/FT-727R	LIST
FBA-5 Alkaline battery holder	12.95
FNB-3 425ma 10.8v batt (comes w/03 series)	49.95
FNB-4 500ma 12v batt (comes w/09-series)	59.95
FTS-6 Encoder/decoder; 09-series	49.95
FTS-7 Encoder/decoder; 03-series	49.00
LCC-6 Leather case w/top cover; 09-series	39.95
MH-12A2B Speaker/microphone	39.95
NC-9B Wall charger for FNB-3	9.95
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	9.95
MMB-21 Mobile bracket	14.95
PA-3 Mobile adapter and charger	39.95
TA-2 2m 19" telescoping whip ant	11.95
WB-3 Waterproof baggie for HTs	29.95
YH-2 VOX headset	26.95

FRG-9600 FRG-8800

Receivers	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$599.95
FRA-7700 Indoor active receive antenna	59.95
FRT-7700 Antenna tuner	64.95
FRV-8800 118-174 MHz VHF converter	119.95
FIF-232C Interface; VIC-20/TI/RS-232	79.95
FF-5 500 KHz low-pass filter for VLF	20.00
DC-8800 DC kit	3.50
FM-W/8800 FM-wide kit	20.00
FRG-9600 60-905 MHz receiver	679.95
VU-9600 NTSC video unit	25.00
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66/06 handled 51 msgs with 205 checkins. SCAT 2-mtr Net 66/06 handled 4 msgs with 570 checkins. 2nd Annual Alamogordo Hamfest was certainly successful. Congrats to AG0X and W5HD as our new Director and V. Director. So very sorry to report the passing of WA5OHI and W5HVR. As WA5OHI always said, "Have a good day and a better tomorrow." Traffic: ND5T 659, W5DAD 38.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, NS7K. STM: John Sampson, W7OCX. Ray, K7HLR, has resigned as TWN/E Mgr. The CW traffic people will miss your experience and leadership, Ray. KN7U is settled in the Phoenix area for school, but finds time to be on HF occasionally. I travelled to Denver for a meeting with the RM Div Dir, as did the other SMs in the Div. We hashed over problems ranging from antenna ordinances to frequency coordination to novice enhancement. Contact me with your questions or comments. 73 de NA7G. Traffic: WA7MEL 119, WA7KHE 114, NS7K 57, K7MG, NA7G 16, W7OCX 10.

WYOMING: SM, Dick Wunder, WA7WFC—Asst. Section Mgr: Steve Cochrane, KA7AWS, Section Emergency Coord.: Jim Anderson, W7TVK. The Great Plains Amateur Repeater Association, 146.28/.88 rptr. on Laramie Peak, held their annual workday and campout Aug. 2nd & 3rd at Friend Park on the west side of Laramie Peak. I have been moving again this month, and now am in the new house on 2 1/2 acres for antennas. I hope to be back on the air with my normal station by the first of October, and it will be nice to be settled again. Thanks for bearing with me & my mobile signal this past summer. KC7AR reports the Wyoming Cowboy Net held 21 sessions with 715 QNI & 25 QTC. Albany Co. RACES Net 23 QNI. Traffic: NN7H 251, W7HLA 90.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. "act" SEC: WA4RNP. Here are the new officers of the Tuscaloosa Club: President W4QAT, Pat; Vice President KB4QDB, Bill; and Secretary/Treasurer AA4QV, Warren. The Alabama Traffic Net "M" has chosen WB4TVY, R.T. as Member of the Year. K4HJX, Jim is a new OO/A Aux for the section. I have a Silent Key to report: WA4RMP, Will Hardy of Tennessee (formally of Huntsville). He will be missed. Due to personal and job committments, WA4FAT, Bill, had to resign as "B" net mgr. I thank him for the good job he has done. WD4NYL, Mark, has taken up the slack for the time being. The Simulated Emergency Test was a success with a lot of activity on the bands. It has come to my attention that we need more participation on the CW traffic nets so lets dust off the old keys and keyers and start checking in. Traffic: CAND reports 641 messages in 31 sessions with DRN5 represented by WA4JDH, W4CKS, and NW4X. DRN5 reports 674 messages in 62 sessions with AL represented by WA4JDH, W4CKS, W4WJF, and NW4X. AEND reports 60 messages in 30 sessions with AEND and ATNM rep by WA4JDH, W4CKS, WD4NYL, KJ4MG, and N4DCS. Brass Pounders League, WA4JDH. Public Service Honor Roll, WA4JDH, W4CKS, and WA4RNP. Totals: WA4JDH 878, W4CKS 151, WD4NYL 69, WA4RNP 40, K4AOZ 36, W4WJF 29, WB4TVY 8.

GEORGIA: SM, Eddy Kosobucki, K4JNL—Following is a list of the GA section staff who have dedicated themselves to help u and ur club or group. Feel free to call on them if u need info or have a problem.

Section Emergency Coordinator	NC4E
Section Traffic Manager	WB4WQL
Affiliated Club Coordinator	WA4ABY
Bulletin Manager	K4VHC
Official Observer Coordinator	NA4I
Public Information Coordinator	WB4DEB
State Government Liaison	W4BTZ
Technical Coordinator	WD4PAH

I want to thank Jack, W4PIM, Curt, K4UDR, & Jack, WA4PNY, for their service to the section. For various reasons, they decided not to be reappointed. The 1986 Hamfest season comes to a close on Nov 1 & 2 at Lawrenceville with the combination Hamfest-Computer Show. This has turned out to be a well attended one, so don't miss it. While we're on the subject of HAMFESTS *now is the time* for ur club or group who is planning one in 1987 to send me a post-card so that we can get u the necessary forms for an ARRL sanctioned HAMFEST. This is vy important as they have to be approved by the ARRL Board of Directors. Please don't wait but *do it now*. BGMRC at Newnan agn did a FB job with the annual Power Cross Roads affair. Columbus ARC furnished communications for Habitat for Humanity & the Triathalon sponsored by the Kidney Foundation. The major section Tfc Nets are as follows:

Georgia Cracker Net	7 AM dy & 8 AM Sun 3995.
Georgia Net	1 PM dy 3987.5.
Ga SSB	Net 7:30 PM dy 3975.
Ga State Net	(CW) 7 & 10 PM dy 3593.

PLEASE take out a little time & check into one of these fine nets. After a while u won't miss one. Traffic: W4PIM 188, AA4JV 107, W4WXA 80, K4MOG 68, WJ4WO 60, KA4HHE 40, KF4FG 36, WB4DVZ 35, N4MWR 34, K4NM 27, W4HON 25, W9NXC 20, KI4IG 15, K4BAI 13, WB4SPB 8, W4OHH 8.

NORTHERN FLORIDA: SM, Roy Mackey, N4ADI—ACC: WD4RIQ. BM: KB4LB. STM: WB4GHU. SGL: KC4N. TC: N4KF. SEC: WD4PUP. PIO: WD4PUO. OOC: K4JJE. The ACC position has been filled by "Giff" from Ocala, and we are happy to welcome him to our LO group. He will be the person to assist Clubs to become affiliated with ARRL and later to help the clubs to qualify for SSC status. He will do this by letters and by visiting selected club meetings in the Section. This column is being prepared at the Melbourne Hamfest and we just spent a lot of time discussing the problems faced by many of the Traffic Nets in getting messages relayed and in having poor propagation conditions on 40 and 75. We are calling for more stations to check-in so that better relays may be made with more stations available. NMs are looking for new NCSs and Liaison Stations to RN5D and D4RN. If you will listen and respond when a NCS asks for help, it will keep the NTS functioning as it should. We are looking for more stations who are qualified to become Official Observer Stations. You must pass a special test to be appointed so contact K4JJE in Panama City for more information. Looks as though we are in a recruiting mood these days, and that is the turth. The Amateur Radio game is coached by, run by, and is done by volunteers, so why not become part of an active, helpful group that is working to make your hobby grow and be a source of pride when someghint you have done is successful. Call me or write me to get active! Traffic: WX4H 523, N4PL 455, N4EDH 302, KB9LT 270, KC4VK 204, KD4KK 163, AA4HT 130, KB4LB 120, WA4EYU 120, WF4Y 118, KB4MHH 99, W4ILE 98, N4GMU 89, WC4D 86, WD4IUI 78, W4MGO 71, NS4C 69, AA4FG 50, WA4OXT 50, WA4SXW 47, N4JAQ 42, KB4FIY 41, W4KIX 38, N4ADI 37, KI4CQ 26. NQ4P 24, KA4KAH 23, N4JHI 22, N2AOX 17, WB4FJY 17, W4DTV 17, WD4HBP 16, KF4GY 12, WD4HUZ 11, W8IM 11, N4DY 11, WB4AWG 10, N4BQE 8, KJ4VT 4, KJ4HS 3.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OOC: W4TAH. ACC: WA4NBE. Welcome to W4TAH, who is the newly appointed Official Observer Coordinator. Many thanks to W4SS, the Section Emergency Coordinator who has been filling in as temporary OOC until a permanent appointment was made. Congrats are also due WD4KBW, our Bulletin Manager, who is now manager of the Florida Medium Speed Net. Thanks to AA4HT in the Northern Florida section for a job well done as FMSN manager this past year. I am sorry to report that Walt, KF4U of Winter Park, is now a Silent Key. KF4U was in the Northern Florida section and was active on Gator Net, QFN and SVTN. Congrats to the Tri-County ARS upon their appointment as an affiliated club. The Indian River ARC reports that WA4MMD has been elected president, W1TLZ, vice president, W4YWA, secretary, N4AKA, treasurer and KA4FFA Director. At the July 25th meeting of the IRARC, AA4MI presented Bill Eppley, W4SDB, with a 50 year ARRL plaque and pin. WB5YDD, manager of DRN5 reports 674 messages were handled during August. He also reported that WD4IUI, WF4X and W4TAH were Florida reps. Incidently, W5TNT is manager of RN5 and the following are Florida reps to the evening cycle of RN5 (Monday through Sunday): KA4FZI, WF4Y, W4KIX, K4IA, K4ZK, KB9LT and WA4PFK. KA4FZI has been subbing for WB4GHU Mondays while he is temporarily off the air. WD4HHH, manager of FAST net for the past several years, has asked to be relieved as of October 1. Many thanks, Delbert, for many years of service—it is much appreciated. KF4RL, manager of SEFTN, not only keeps the usual net records, but also keeps a record of each station who handles traffic. Since SEFTN is a local two meter net there is considerable emphasis placed on stations learning how to handle traffic. A small number of messages must be handled plus the submission of a Station Activity Report over a period of time in order to qualify for a net certificate. KF4RL even reminds those who have handled a piece of traffic to send their SAR if it appears they have forgotten! The Melbourne Hamfest was terrific as usual—many good meetings and an excellent job done by WA4NBE as program chairman. The Traffic Handlers Breakfast was so well attended that it overflowed into two dining areas. WA4EIC taped a session of QFNS, The All Florida Slow CW Net one evening and then at selected places during the tape he stated exactly what was sent and then gave an explanation of what was happening. WA4EIC will furnish a copy to anyone sending him a blank 60 minute tape. His address is good in the callbook. 73 de WA4PFK. Traffic: W3CUL 2851, W3VR 932, W4NFK 302, WA4PFK 282, K4EUK 250, K4ZK 245, KA4GUS 143, KA4NXF 128, K4SCL 128, AA4BN 114, WB4WYG 114, W4DL 102, KA4FZI 97, K4IA 84, WA4RUE 81, N4ET 60, KF4RL 60, KJ4WJ 54, WD4KBW 48, KB4MON 48, KA4YHS 45, K4JI 41, KI4ZW 37, W3TLV 32, WB4GCK 30, WA4EIC 29, W4TAH 28, KA4SIH 27, KF4JA 26, KB4LKT 25, WA9VND 24, K4BLM 19, K4FQU 19, W4MPV 17, WA4NBE 17, KY0T 17, WD4CHO 16, WD4NXK 16, W4ESH 15, N4MML 15, K4IRT 12, AA4CH 11, KB4KAW 9, KA4KXV 9, K4OVC 8, KA9AKY 7, KY3Y 6, KA4KDD 5, KB4LPL 5, N4NHX 5, NX5Q 5, KD4GR 5, WK4F 4, W3IJR 4, N4NHO 4, AA4MI 4, N0ABC 4, KA4GDU 4, WD4AEP 3, W4DWN 3, WD4MCC 2, W4TKQ 1, KB4EWO 1.

WEST INDIES: SM, Alberto L. Valdejuli, WP4CSG—Things are still slow in the Section, with the beaches at their prime, warm weather, as usual, we still have the "summer bug." The hurricane season is about to end, and as of this writing, all has been quiet, thank God. Although slow, we are moving towards creating and activating ARES groups in the V.I.s. My heartiest thanks and congratulations to Lou Bean (KV4JC) who has shown quite some interest in getting things organized there. I hope all of you help Lou in accomplishing the monumental task of getting the emergency programs going. Any help you give Lou will be more than welcome. Sorry to notify that Jaime Wilson, KP4ABK, our STM has resigned due to leaving the Island. In his stead has been appointed Tony Purcell, KP4IG, who we know will keep up the high standards previously maintained by Jaime. We are sorry to see Jaime leave, but we understand, and hope for him the best of luck. We also thank Jaime for a job very well done, and we feel sure that he will be quite active in the VA-MD area once he gets there. NETS: WINE (VP2VI NM) Sessions 28, QTC 1, QNI 70. WINS (KP4DJ NM) Sessions 31, QND 310 mins, QTC 28, QNI 149; NCS: KP4DJ 25; KP4IG 4; NP4WM 2. Traffic: KP4DJ 43.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF-STM: W7EP. NMs: K6LL, KA7HEV, WB7CAG. Congratulations to JARL and the JA hams who were responsible for the very successful launch of JAS-1 on 12 August. The bird is now called "FUJI", or FO-12. This satellite is performing admirably with signals coming in like "gangbusters." Many stations contacted during first week after launch using ten watts transmitter power on the uplink. 100 watts EIRP seems enuf to do it. Use QRP and enjoy! KA7MUI received a commendation from the Air Force for his role in handling some very sensitive communications during a recent aircraft crash. W7DRR renewed his OBS appointment, and is now putting our ARRL bulletins on Navajo Mountain RPTR. on 146.36/96 serving the Page area. Good work, Joe. Since the S.W. Divn is hosting the 1986 ARRL National Convention, the next S.W. Divn ARRL Convention will be sponsored by the Scottsdale ARC October 9-11, 1987. It will be at the Ramada Safari Resort in Scottsdale, and the home of Barry Goldwater, K7UGA. For advance info contact chairman Jim Cushing, KD7RW at 602-867-7002. Glen Canyon Wireless Assoc putting out a VY FB newsletter, "Line of Sight." Thanks for sending it. Ariz. Repeater Association did another FB job this year on 4th of July serving coffee, punch and iced tea to motorists that passed through the Sunset Point rest area on I-17 during the holiday weekend. They also handled traffic for stranded motorists. (Tnx, "Squelch Tail.") Old Pueblo Radio Club did another FB job this year of putting on the "O.K. Corral Gunfight," at Tombstone as a special event. W7GV worked many stations on several bands from the actual location of the OK Corral and will issue certificates. This time next month your SM and XYL will be on a cruise ship going down thru the Panama Canal. Will prevail on Bob W7EP to put your Section News report together as well as his usual FB job of reporting the traffic action. 73, Jim.

	SESS	QNI	QTC	MGR
ATEN	31	748	134	KA7HEV
Cactus HF	31	485	69	WB7CAG
Cactus VHF	31	281	87	WB7CAG
SW TFC Net	31	172	105	K6LL
(July)	31	177	162	K6LL

Traffic: KA7MUL 217, NS7C 195, W7AMM 182, W7EP 135, K6LL 130. WB7CAG 91, KA7HEV 64, W7OIF 42, N7ETP 39, W7GAQ 22, K7POF 6, K7JKM 2.

LOS ANGELES: SM, Bob Poole, AJ6F—As I write this column, I am anxious to depart in the morning for San Diego and attend the National ARRL convention. I am looking forward to a fantastic time. Preparations are underway for the Angeles Crest 100 mile marathon. Nineteen checkpoints and numerous other communications functions will be attended to by area amateurs; more on this next month. The revised Emergency

communications plan is now available to Downey Amateur Radio Club members; contact Dave, WB6ZGF, for a copy. The W6QFK (San Gabriel) club reminds us that the November 7-8 Hamvention is certainly worth considering. I'll see the SGVARC folks there! News of the affiliation of the Westside ARC hit here a few days ago; the presentation of the certificate is always a pleasant chore. Congratulations to W. A. "Spud" Monahan, K6KH on his retirement; visitors from as far away as New Hampshire (KX1W) attended the gala party. I regret to have been out of town that day. Properly so, the SCDXC has instituted an annual award for DX activity. Entitled the W6AM Memorial DX Activity Award, the rules for the SCDXC monthly activity award apply except that a one-year cumulative score will be considered. Contact the SCDXC for details. One highlight of the National convention is bound to be the meeting of the Southern California Digital Communications Council; the SCDCC will explore the new horizons of packet and the digital world. A sad duty of LAX and ORG ARES volunteers was to man the Red Cross shelters for emergency communications after the recent mid-air collision over Cerritos; this little city is situated exactly on the border of the two sections and the performance of the hams in this crisis demonstrated the cooperation between the two sections admirably. Condolences to the families and friends of those lost in this terrible tragedy. ASM, K6IYK, needs your input to the growing packet directory he is maintaining; contact Jim for details. Jim also has produced a handy "Command Reference Summary" for TNC2 commands. I'm sure it's free for the downloading! T-Hunters are asked to contact N6JSX for information on the newly-formed Society of T-Hunters. Kuby can be reached at (818) 964-1188. The Los Angeles Area Council of Radio Clubs in conjunction with the U.S. Coast Guard Auxiliary conducted a booth at the mammoth Los Angeles County Fair; literally thousands of passers-by were given the opportunity to glimpse an insight of ham radio. N6GXZ placed a lot of time and effort into this becoming a reality. W6LS continues to solicit used ham radio oriented magazines to be used to raise funds; donations of used magazines and arrangements for purchase of them should be directed to W6LS, the Lockheed Employees Recreation Club ARC. Well here it is again; the monthly tabulations of the W6FNO/R public service activity. Totals are: 170 vehicular, 10 fire and 2 medical for a total of 182 reported. Elsewhere, the FNO group supported the Riverside Mountain Rescue Unit during a search for five lost teenagers. The kids were found and all was secure. Band conditions still poor, but we are still moving the summer traffic. Not too many County Fairs so far this year so traffic is down this month. Ted, K6UYK, spent some time in Oregon this month visiting relatives. N6LHE doing great job as liason to scn 2 and vhf, thanks Len. Traffic: W6INH 276, WB6VPY 184, N6LHE 129, K6CL 10.

ORANGE: SM, Joe Brown, W6UBQ—Orange Co. ASM: Ralph, WB6JBI. Riverside Co. ASM: Bob, W6LKN. San Bernardino Co. ASM: Tony WB6QHB. The Orange County ARES Re-organization project is moving right along under the direction of Corky, N6HQI, DEC for that county. Two EC appointments have been made. Tom Luddon, KB6CTT, will head area 4# El Toro, Laguna Hills, Mission Viejo, Trubuco Canyon. For info call (714) 768-9266. Mary Pagel, KA6IGG will work with the Public Schools and Amateur Radio Support Groups. If Mary is half as active as her boy Karl, this and the Archie Comic Book Program will really be moving. The San Diego National convention was fantastic congratulations and thanks to Walt Hicks, W6UZL, and the Convention Staff. The Section Manager Meeting chaired by Art, W6INI, SM of the San Diego Section, was extremely productive. The ARRL HQ people got an ear-full from the West Coast. Rick Palm, K1CE was very helpful with our Field Organization problems. The ANZA Valley Radio Club, Anza, CA and the INLAND EMPIRE ARC, Ontario, CA received affiliation with ARRL at the Executive Committee. Welcome aboard! Philip Bettencourt, KB6FRW has resigned from the Affiliated Club Coordinator position. He has held the program together for the last year. Applications are now being accepted and solicited. The job entails club presentations and program activities. In the Riverside Co Area the LIC chairperson is requesting clubs to nominate members to become OOs, at least two per club. This Volunteer monitoring is essential for solving between the ear problems and turkey control. From the Buena Park ARC, there is a CW practice session every month before the club meeting. For serious practice any club officer will arrange to help. Getting back to basics, sounds like fun. The San Gabriel Valley ARC newsletter listing club "ELMERS" and their specialty, very valuable info for new hams. Scandle sheet editors take note. BPL WF6O. PSHR WF6O, WB6QBZ WA6QCA. The National Traffic System needs liaison stations, net control stations, traffic handlers digital comm capabilities, but most of all it needs involvement and traffic originators. Try it. You might like it.

NET	FREQ	SEC	QNI	TFC	NM	TIME
SCN/1	3598	22	218	192	WF6O	1830
SCN/2	3598	30	159	55	WF6O	2015
SCN/V	146.645	31	379	259	WA6QCA	2100

Traffic: WF6O 631, WB6QBZ 111, K6ZCE 106, KA6HJK 94, N6GOT 94, K6DD 76, WA6QCA 72, W6CPB 21, ADØA 18.

SAN DIEGO: SM, Arthur R. Smith, W6INI—TC: N6NR. STM: N6GW. SEC: W6INI. PIO: KG6LF. The 1986 ARRL National Convention is now history. Early returns indicate over 5000 registered plus several hundred youths admitted free for the Youth Forum featuring Tony England, WØORE. On-the-air eavesdropping indicates an outstanding convention thanks to the leadership of Walt, W6UZL. Thanks also go to all the volunteers who made the plan work. Probably a first for a national convention was the presence of Pablo Mooser, XE1SR, President of Mexico's LMRE (ARRL counterpart). A giant step forward for international relations. (See 97.1e of FCC regs.) Recent upgrades: to Extra WU6U (N5AGY); to Advanced N6ARS, D6CWM, KI6GI (KB6JXQ), N6GZX (KA6UGH), N6KVO (KB6DQP), N6KVP (KB6DQQ), N6LTE, N6MUA (KB6JWU), N6NGE (KB6JXM), N6NKM (KB6KWP), WB6QVH, KB9ZZ (WD9DAE). Attn ORS. Don't forget that a monthly report ot STM N6GW is required, even if negative. NCTN met 30 times, handled 43 msgs. ARES CW 5 sessions, 20 ck-ins. Traffic: KU6D 66, N4KRA 55, N6GW 31, WA6IIK 3.

SANTA BARBARA: SM, Byron Looney, K6FI—Good News! The situation which I described in this column of September, QST and in the SBAR Section Newsletter has been greatly modified by AB 3298 which has been signed into law by the Governor. Unregistered persons impressed into performing service as Disaster Service Workers are now entitled to the same workers' compensation benefits as registered DSWs. Furthermore, DSWs are no longer treated as second class citizens in determining those benefits. Our thanks to Assemblyman Bader. I still urge you to sign up with the Office of Emergency Services in your county. W6KFV, ATC in Thousand Oaks, recently did an excellent job of clearing a very sticky RFI problem for K6TAR. FCC in Long Beach asked John to help and he delivered. Great work, John! Traffic: N6HYM 26.

ICOM

VHF Mobiles: Going First Class

Two meter and 70cm FM mobile activities are an extremely popular pursuit among today's radio amateurs, and there are some good reasons for that situation. Modern VHF and UHF transceivers boast a dazzling array of operating features, yet they're small enough to fit in the confined space of any auto's interior. Reduced size and unobtrusive VHF and UHF antennas are also easy to assemble and install on modern "bumperless" autos. Modern amateur communications couldn't be easier or more enjoyable!

VHF and UHF band propagation is basically line of sight, however group and club supported repeaters placed atop mountains and tall buildings throughout our great land extend that coverage in an almost overlapping manner. Indeed, it's quite natural for one to travel from coast to coast while chatting with other amateurs via their area's FM repeaters. Many of those repeaters also include local autopatch telephoning capabilities which can be accessed via a transceiver's DTMF keypad.

Meanwhile, the nature of FM's "interference free copy" encourages friendly conversation type QSOs rather than mere exchanges of names and signal levels. It's a grand way to experience the true pleasures of amateur radio communications, and ICOM wants to help you join these activities in high style. We offer five exciting transceivers to fit your personal preferences: The IC-28A, IC-28H, IC-27A, IC-27H and the IC-3200A. Each of these new generation units include all of the flexibilities and luxuries modern technology has to offer, yet each is very easy to understand and operate anywhere or anytime.

ICOM's new IC-28H (45 watts output) or IC-28A (25 watts output) two meter transceivers are ideal traveling companions for the open road. The unit's wide frequency coverage of 138 to 174MHz includes MARS and CAP operations, plus it receives continuously available NOAA weather broadcasts in the popular 162.550MHz range. If you enjoy space age SWLing, you can even listen for Russian space missions reported active in the 143MHz range.

Scanning of the IC-28A/H's 21 memories can be accomplished via its main dial or microphone buttons, or selected memories can be scanned while in the memory scan mode. You can activate or cancel their automatic scanning from the microphone for ultimately convenient mobiling.

The IC-28A/H includes a large LCD readout which can be viewed from any angle, plus an automatic dimmer that reduces its backlight during night use. All popular PL tones are built-in and any "odd repeater split" can be programmed into the IC-28A/H. It's a "do anything unit", yet it's super easy to operate. If your auto's cramped for space, the IC-28A is only 5.25 inches deep. Thinking about Packet? The IC-28A and IC-28H boasts exceptionally fast switching times, and performs like a Packateer's dream.

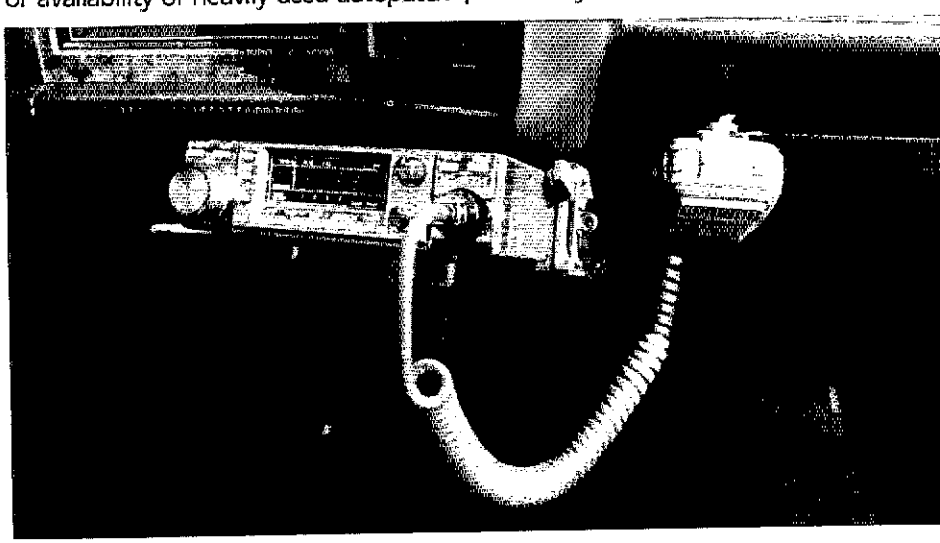
ICOM's ever popular IC-27H (45 watts output) and IC-27A (25 watts output) transceivers concentrate a glamorous array of operating capabilities into a thin package covering the 140 to 150MHz range. This unit's dual VFOs and nine memories can be tuned via its main dial or microphone buttons as desired. Programmable or full band scanning is available, along with two tuning rates.

Band or memories can be automatically scanned for busy or open channels (convenient for checking active repeaters or availability of heavily used autopatch systems). Scan speed and pausing times are also selectable. A special priority function lets you spot check any VFO or memory channel, all popular PL tones are included, a DTMF keypad is built into the mic, and an optional UT-16 voice synthesizer will announce the unit's operating frequency. This transceiver has everything!

Both two meter and 70cm amateur bands are thriving with FM activity, and ICOM's Dual Band IC-3200A lets you enjoy all of their action in the easiest and most comfortable manner possible. Using only 14 front panel controls, this super compact unit covers 140 to 150MHz plus 440 to 450MHz with any repeater split and popular PL tone readily available and programmable into its ten memories.

Its dual VFOs and memories can be fully or partially scanned from the front panel's button or steptuned from the mic. That mic, incidentally, is ideal for autopatching without "dashboard fumbles". Finally, the IC-3200A's built-in duplexer provides dual band operation using a single coax line. When teamed with ICOM's AH-32 dual band antenna and AHB-32 padded trunk lid mount it's a double winning setup!

Want to enjoy VHF/UHF activity in top style? Think ICOM! ICOM's customers say its transceivers are simply the best, and those opinions ring louder each day!



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- **Compact Size**
- **Simple to Operate**
- **Large LCD Readout**
- **25 Watt IC-28A**
- **45 Watt IC-28H**
- **Packet Compatible**
- **21 Memory Channels**

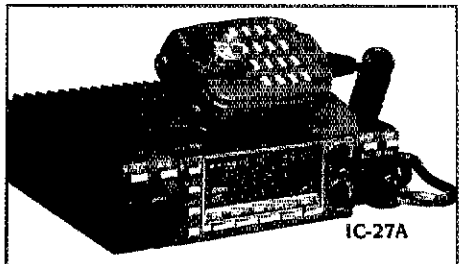
The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

45 Watts. The IC-28H provides a full 45 watts of powerful output. The **IC-28A** 25-watt version is also available. Both units have a selectable low power.

Large LCD readout. A wide-view LCD readout can be easily read even in bright sunlight. An automatic dimmer circuit reduces the brightness for evening operation.

Wideband Coverage. The IC-28H performs from 138–174MHz (specifications guaranteed from 144.00–148MHz) and includes weather channels. Ideal for MARS and CAP operation.

Compact Size. The IC-28H measures only 2 inches high by 5½ inches wide by 7¼ inches deep (IC-28A is 5¼ inches deep). Great for mobile installations where space is limited.



The IC-27H 45 watt and IC-27A 25 watt ultra compact 2-meter mobiles continue to be available.

21 Memory Channels. Store 21 frequencies into memory, or lock out certain memory channels. All memories are backed up with a lithium battery.

Scanning. Scan the entire band or the memory channels from the provided HM-12 mic.

Easy to Operate. With only 11 front panel controls, the IC-28H is simple to operate.

Available Options. IC-HM14 DTMF mic, PS-45 13.8V 8A power supply, UT-29 tone squelch unit, SP-10 external speaker, IC-HM16 speaker mic and HS-15/HS-15SB flexible boom mic and PTT switchbox.

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New Design
100% Duty Cycle Transmitter
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12 Volt Operation

The new IC-751A top-of-the-line base station transceiver is designed the ham operator who demands high rformance. Whether contesting or Y'ing for pleasure, the 100 watt 751A incorporates the best features the IC-751, plus brings you to the efront with the following most-asked additions.

More CW Control. For the CW thusiast, the new IC-751A includes an ctronic keyer unit, QSK rated at up 40WPM, standard FL-32A 9MHz/ 0Hz CW filter and CW sidetone to monitor your code in RX or TX modes... great for practice!

All Amateur Band Coverage. Plus general coverage reception from 100kHz to 30MHz. May be easily modified for MARS operation.

Improved Smooth Tuning. The IC-751A features a newly designed tuning knob for velvet smooth tuning.

Added LED Annunciator. For easily identifying if you're using the tuning speed, dial, or band switching functions.

32 Memories. Mode and frequency may be stored in any of 32 memories...all the memory capability that you'll ever need.

More Stable. Even in the receive mode, the IC-751A has a sophisticated thermal sensor to monitor the internal temperature. The sensor automatically activates the cooling fan which gives maximum stability ...critical for contesting.

Newly Designed Features. The IC-751A boasts a number of newly designed features for better performance ...new 9MHz notch filter to drastically reduce QRM, new AGC system, new compressor for better audio and a new AF gain control system to improve control of the CW sidetone volume.

Options Available. Options for the IC-751A include the IC-PS30 external AC system power supply, IC-PS35 internal AC power supply, IC-AT500 antenna tuner, IC-EX309 microprocessor interface connector, SM-8 or SM-10 desk mics, IC-2KL linear amplifier, RC-10 remote controller, SP-7 or SP-3 speakers, IC-EX310 voice synthesizer and GC-5 world clock.

Optional Filters. FL-52A CW 455kHz at 500Hz, FL-53A CW-N 455kHz at 250Hz, FL-63A CW-N 9.0106MHz at 250Hz, FL-33 AM 9.010MHz at 6000Hz, and CR-64 high stability 30.72MHz crystal filter.

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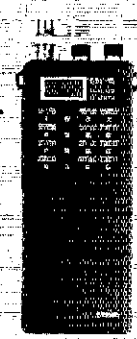

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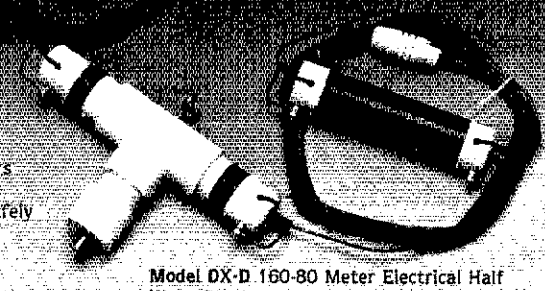

Model DX-D shown

- Ideal for condos, patios and attics.
- No-trap design. Unlike trap antennas, there are no capacitors to break down under high RF voltages, and a tuner may be safely used for multi-band operation if desired.
- Direct 50 ohm feed. Tuners usually not required when operating in resonant bands.
- Full power operation.
- Uses "ISO-RES" inductors.
- Stainless steel hardware.
- Fully assembled.

Model DX-A 160-80-40 Meter Quarter Wave Twin Sloper —
- The premier low frequency DX antenna.
- Combines the tremendous DX firepower of the quarter wave sloper with the wide bandwidth of the half wave dipole.
- One leg is 67', the other 55'. Installs like an inverted-V. Ground return through tower or down-lead ..... **$49.95 each**

Model DX-D 160-80 Meter Electrical Half Wave Dipole —
- Also operates on 160 through 10 meters with a wide range tuner and either coax or balanced feed.
- Only 66' overall length ..... **$89.95 each**

Model DX-80 80 Meter Electrical Half Wave Dipole —
- Also operates on 80 through 10 meters with a wide range tuner and either coax or balanced feed.
- Only 38' overall length ..... **$69.95 each**

Available from your local Alpha Delta Dealer or direct. Add $4.00 shipping and handling (USA only). Exports quoted.

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SURROUND YOURSELF WITH THE BEST!

Reliable. ICOM's extensive line of reliable, field-proven handhelds and interchangeable accessories give you the most options for handheld communications. 2-meter, 220MHz, 440MHz or 1.2GHz...ICOM has your frequency covered.

2-Meters. For 2-meter coverage, ICOM offers the IC-02AT and IC-2AT handhelds. The versatile IC-02AT covers 140.000–151.995MHz, the IC-2AT 141.500–149.995MHz...both include frequencies for MARS and CAP operation. The IC-02AT features an LCD readout, 32 PL tones standard, DTMF, direct keyboard entry, three watts output, (optional 5 watts output with IC-BP7 battery pack), 10 memories and three scanning functions. The IC-2AT, the most rugged handheld on the market, has 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.

220MHz. To get away from the crowd, ICOM has the IC-3AT 220.000–224.990MHz handheld with 1.5 watts output, thumbwheel selection and a DTMF pad.

440MHz. For 440MHz operation, ICOM has two handhelds available, the versatile IC-04AT and the IC-4AT. The IC-04AT and IC-4AT offer full coverage from 440.000–449.995MHz. The IC-04AT includes an LCD readout, 32 PL tones standard, DTMF direct keyboard entry, three watts output, (optional 5 watts output with IC-BP7 battery pack), 10 memories and three scanning systems. The IC-4AT has a DTMF pad, thumbwheel selection and 1.5 watts output.

1.2GHz. ICOM announces the IC-12AT 1260.000–1299.990MHz handheld, the first 1.2GHz handheld available. The IC-12AT features 10 memories, an LCD readout, DTMF direct keyboard entry, two scanning systems and one watt output.

Accessories. A variety of interchangeable accessories are available, including the IC-BP8 800mAH long-life battery pack, HS-10 boom headset, CP1 cigarette lighter plug and cord, HM9 speaker mic (for IC-02AT, IC-04AT and IC-12AT), leather cases, and an assortment of battery pack chargers.

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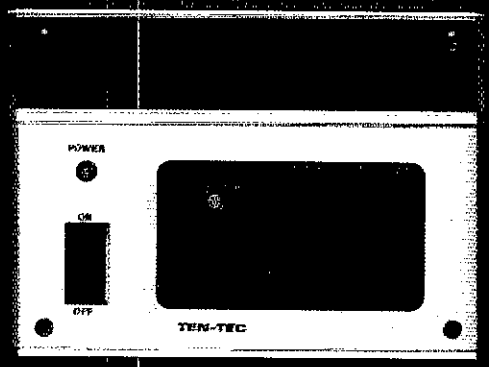


MODEL 260 POWER SUPPLY

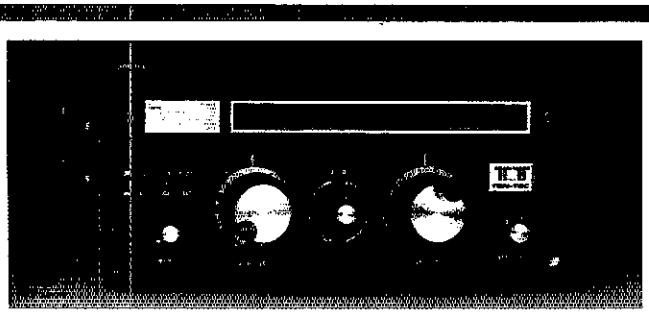
MODEL 561 CORSAIR II

CORSAIR II HF TRANSCEIVER, Model 561 . . . $1345
Receiver performance that only a permeability tuned oscillator can deliver . . . superb signal to noise ratio, outstanding adjacent signal rejection. Three, frequency tuning rates using dual range offset tuning. QSK with a changeover time of 30 ms or less for superior CW or AMTOR operation. Twelve position band switch for operation on all nine HF bands, from 1.8 to 30 Mhz, plus 40 Khz overshoot on band edges.

RECEIVER
Sensitivity: 0.25 µV for 10 dB S/N ratio.
Selectivity: 16 pole crystal ladder filter. 2.4 kHz bandwidth. 1.6:1 shape factor at 6/60 dB. Three position, mode independent, switch selects standard 2.4 kHz, optional 1.8 kHz, 500 Hz or 200 Hz filters.
Notch filter: Greater than 50 dB notch, adjustable from 200 Hz to 3.5 kHz.
Audio Bandpass filter: 8 pole, active filter centered at 750 Hz variable from filtered to flat response.
Passband tuning (PBT): Tunes 2nd IF frequency 3 kHz.
Noise Blanker: Switchable on/off with adjustable threshold and blanking
Offset tuning: Dual range, tune RX, TX or TRX.
PLUS: Built-in antenna pre-amp, spot button, selectable AGC fast, slow and off and much more.

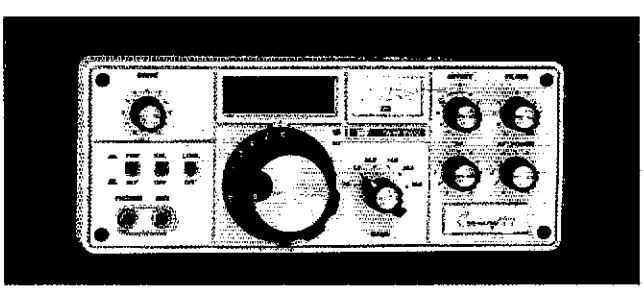
TRANSMITTER
RF Output: Broadband, solid state, self tuning with 85-100 watts, all bands.
Built-in Iambic keyer. Speed adjustable 8-50 WPM with 40 character programmable memory.
Multi-meter: Reads Ic, Power out, SWR, speech processing level.
Built-in speech processor, with level control, standard.
Variable ALC, adjust power output continuously from 100% to 25% and retain full ALC action.
PLUS: Rear panel connectors for station control, AFSK, QSK, phone patch, auxiliary antenna, PTT, standard CW key, and more.
POWER REQUIRED: 13.8 VDC, Base or mobile at 20 A.
Size: HWD 5.25" x 15.25" x 15".

REMOTE VFO, Model 263 . . . $219
Uses the same PTO design as the CORSAIR. Adds complete TX/RX



2KW ANTENNA TUNER, Model 229A . . . $299
Designed to match your 50 ohm, un-balanced coaxial, transmitter output to virtually any, balanced or un-balanced antenna. General coverage from 1.8 to 30 MHz. Handles all the power the law allows.

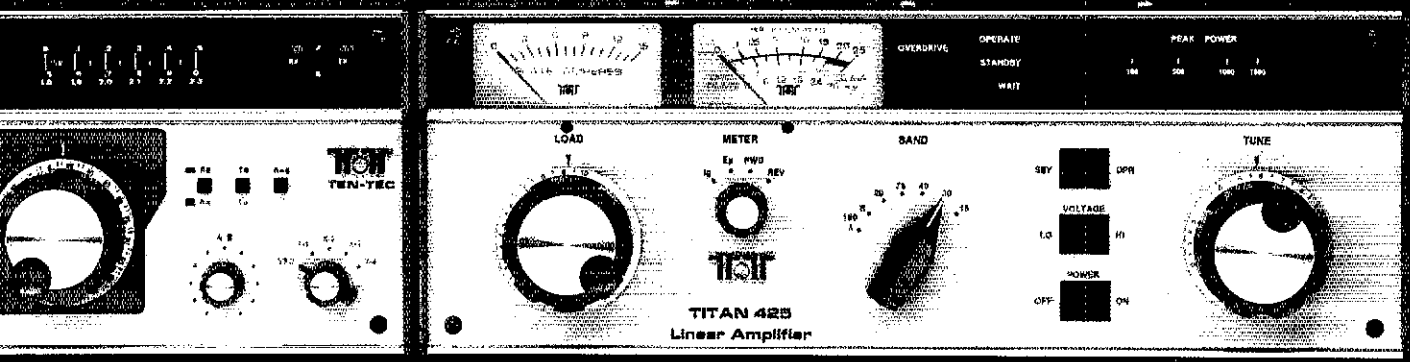
- Reversible "L" network circuit for best match and bandwidth, at either hi or lo, antenna impedance.
- Avoids false load indication.
- Ceramic insulators and coil forms throughout. Silver plated switch contacts and roller inductor coil.
- Built-in SWR bridge.
- Built-in balun.
- System by-pass switch.
- 4 Position antenna select switch.
- Attractive Ten-Tec Corsair styling.
- Also available in kit-form, Model 4229 . . . $219.



CENTURY/22, CW Transceiver, Model 579 . . . $389
Put the fun back into hamming. This is a top notch, 50 watt, CW transceiver. Features found in only the best rigs are included. Full break-in QSK, excellent RX selectivity on CW (also tunes LSB/USB) and 100% solid state circuitry. Broadband "no tune" RF amp. Operates 80, 40, 30, 20, 15 and the lower 500 KHz of 10 meters. Power required, 12 to 14 VDC at 6A. Size HWD 4" x 10" x 10.5". Weight 6 lbs. Great for portable, mobile or base station operation.
POWER SUPPLY for Century/22. Model 979 115VAC . . . $98,
979E 230VAC . . . $110

THE ULTIMATE HF MOBILE ANTENNA SYSTEM
. . . From $28.00 - $40.00 per band.
HF mobile is a world of compromise! Give yourself a chance. Choose the finest, environmentally protected, antenna system. Loaded to the best height for radiation efficiency, and to clear most overhead obstacles. Upper SS whip is vertically adjustable for "no tears" tuning. Lowest wind resistance too, less whipping and de-tuning. Standard ⅜" x 24 base fitting screws into all standard mounts. Typical height 78" or less.

Our outstanding SSB performance equals our CW and DIGITAL reputation!



MODEL 263G REMOTE VFO — MODEL 425 TITAN

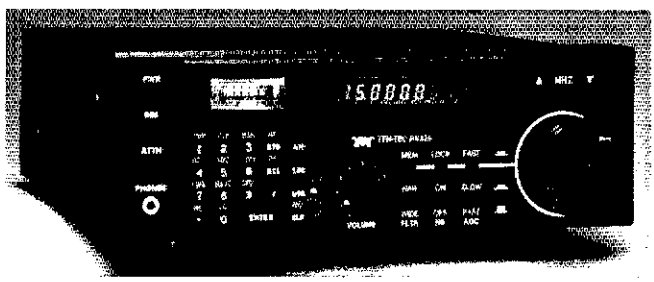
frequency control. Front panel switch selects, CORSAIR transceive, 263 transceive, CORSAIR TX/263 RX, 263 TX/CORSAIR RX. You can also listen to both frequencies simultaneously. A balance control is provided for priority adjustment. Also makes provision for Xtal control. Connects to CORSAIR with cables provided. Size is HWD 5.25″ x 7.5″ x 12″.

MATCHING SPEAKER/POWER SUPPLY Model 260 . . . $199
A highly regulated and filtered, 20 amp. supply. Includes protective circuit breaker and primary power fuse. Can use either 115 or 230 VAC, 50/60 Hz. Size is HWD 5.25″ x 7.5″ x 12″.

TITAN HF LINEAR AMPLIFIER . . . $2685
"BOOM BOX" EXTRAORDINAIRE! Remoted power supply makes possible, this compact, desk top linear amplifier. Puts out a solid 1500 watts SSB and CW, 1000 watts continuous power on RTTY, AMTOR or SSTV. Lightning fast QSK for "break-in" CW and super AMTOR performance.

RF DECK
Drive power: 80 watts typical.
Four LED status indicators, including "overdrive" warning.
Hi/Lo plate voltage switch.
Metering: Full time plate current meter. Multi-meter, selectable for plate voltage, grid current, power out or reflected power.
Vernier drive, tune and load controls.
Peak power indicator: Ultra quick 10 element LED bar-graph display.
Amplifier tubes: Two Eimac® 3CX800A7, ceramic, external anode, air cooled triodes in grounded grid circuit. Plate dissipation, 1600 watts.
Frequency coverage: 160, 80, 40, 20 and 15 meter bands plus 18 and 24 MHz standard, 10 meter kit supplied upon proof of authority to transmit.
Size and weight: HWD 5.25″ x 15.25″ x 15″. 17 lbs.

POWER SUPPLY (Supplied with TITAN)
Primary power: 220-250 VAC @ 20 amps, maximum.
Conservatively designed for cool operation under full load using a Ten-Tec, tape wound, Hypersil® transformer.
Hi/Lo blower speed switch.
Size and weight: HWD 8.25″ x 13.4″ x 10.25″. 45 lbs.
UPS shippable.



NEW! Model RX-325 General Coverage RCVR...$699

Fully synthesized, the RX-325 is the latest from Ten-Tec. General coverage from 300 KHz to 30 MHz. Operates on 12 to 14 VDC or with 120 VAC adapter, supplied. You will hear it all, mobile or base. Look at these features:

- Keyboard entry or tuning knob frequency control.
- 25 Memories.
- AM, LSB (cs), or USB (CW).
- S-Meter with SINPO scale.
- Built-in quartz digital clock with timer feature.
- Noise Blanker.
- RF Preamp built-in.
- Programmable band or memory scan.
- Dual ceramic I-F filters.
- Hi and Lo impedance antenna terminals.

PLUS . . . switchable AGC, built-in speaker, 2 Watts audio power, epoxy-glass circuit boards throughout. Striking, high-tech appearance, finished in black. Size (HWD) 3.75″ x 9.5″ x 7″. Weight 5 lbs. 5 oz.

The term of the TEN-TEC WARRANTY IS ONE YEAR...as always!

...America's Best Kept Secret!

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WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Net activities for August: CAN-D QTC 641 in 31 sessions. North Texas stations participating were W5VMP, KD5RC, and KA5AZK. D-RN5 QTC 574 in 62 sessions, with K5UPN, KD5RC, KA5AZK, AE5I, and W5SFU QNI. TTN QNI 931 QTC 192 in 31 sessions. TEX CW QNI 661 QTC 426 in 62 sessions. D/FW QNI 588 QTC 174 in 31 sessions. TSN QNI 92 QTC 15 in 23 sessions. AE5I reports that an Amateur Radio exhibit at the West Texas Fair in Abilene went well. Due to many problems that could not be resolved by the telephone co., I have had my number changed. Please make a note of the new number, as the one on page 8 of each QST will be wrong for a couple of months. It is (214) 221-8873. I have a recorder on vox operation for your convenience in relaying station activity reports each month. Please be sure your report is in by the 5th of each month deadline. N5FW put on a super program at the NTHFA in Denton last month on the nuts and bolts of being a successful DX'er. Maybe Frank can be persuaded to repeat the program at Ham-Com '87! Hope to see you all at the Texoma Hamarama this year. PSHR for August: W5VMP K5MXQ K5EVI KA5SPT AE5I. Traffic: KD5RC 270, N5BT 263, W5TNT 261, KA5SPT 206, W5VMP 149, K5MXQ 148, WB4HML 121, W9OYL 90, KA5AZK 88, W5QU 67, AE5I 59, K5EVI 58, N5HEN 22.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG. SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. OIARC's annual hamfest in Ponca City is now history for another year. Kudos to the OIARC bunch for another fine event. Texoma Hamarama '88 will be kicked off this year in a unique fashion, by hosting its first annual golf tourney Oct. 24th, with main activities on the 25th and 26th at Lake Texoma Lodge, 15 miles west of Durant. This is the last big hamfest of the year in Okla., so be there. Wheatstraw ARC was presented their ARRL Charter of Affiliation at their annual watermelon feed Sept. 21st. Congrats to everyone in Wheatstraw for providing one of the most outstanding organizations in western Oklahoma for over 25 years. Congrats to KV5X on recent appointment as an Asst. Dir. of West Gulf Division. This will be my final installment of Section News since my term as SM expired Sept. 30th. I want to thank all who have supported me the last two years, particularly my section cabinet (callsigns above) who did all the work. I feel the OK Section is at the most advanced stage it has ever been and I am confident it will continue to shine under the capable leadership of our new SM, Bill Goswick, K5WG. All appointees please report to Bill henceforth. / 73 / Traffic: W5AS 256, WB5SRX 243, K5CXP 223, NQ5W 210, W5RB 123, NG5O 94, W5REC 90, WA5OUV 82, N5IKN 76, K5GBN 42, WD5IFB 40, NB5N 37, WB5OHK 30, K5CAY 26, W5VOR 25, W5VLW 25, WA5ZOO 22, KA5WGS 21, W5SUG 7, ND5S 6, NQ5Y 4; July(Late): KV5X 152, NG5O 57, KA5WGS 14.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—ASM: N5TC. STM: K5QEW. SEC: KA5KRI. TC: NZ5U. PIO: WA5UZB. OOC: WA2VJL. A trip through West Texas, New Mexico and Arizona introduced me to network repeaters. The Texas Connection covers West Texas like a blanket; the "ZIA" connection links New Mexico and Arizona and can go into Southern California. 'Twas a truly fantastic 2-meter experience! Special thanks to N5TC for filing the July Station Activity Report column. TC NZ5U reports nearly 100% of technical problems solved by his team. PIO WA5UZB having success with his program to have a PIA in each affiliated club, working toward 100%; he will welcome inquiries from unaffiliated clubs because all Amateur Radio news is wanted; put him on your bulletin mailing list. K5UPI, NCS (pres) of the South Texas Emergency Net reports everything was in readiness for arrival of Hurricane Bonnie, but services not required. Hill County ARC (Kerrville) provided radio communication for the VFW canoe race July 4; coordinator KF5FU had help from KC5ZT, W5CFK, KA5SZI, W5NTJ, W5FES, WD5ENH, WB5TCB. San Antonio ARC reports K5MOF received award for working all U.S. counties; W5TQS received the San Antonio Spirit award for service to his community. OBS W5KLV reports 9 bulletins, 24 satellite bulletins, 4 propagation forecasts, 5 DX bulletins, 1 CRRL bulletin given 137 readings on 9 nets. NZ5J in Seguin reports N5IJQ is now KF5MK, KA5DYB is Extra and KA5ZVD is new Novice, thanks to the VE program; K5RF is moving to the new West Texas Section. DRN5 Mgr WB5YDD reports 613 messages in 62 sessions; South Texas represented 98% by W5CTZ, NX5V, KD5KQ, N5DFO, AJ5K, W5KLV, WB5EPA, WB5FQU, WA5ZJY, WB5YDD. Bryan ARC reports WB5RVT upgraded to Technician, one previously unlicensed person qualified for General; club bulletin editor KA5OGA appointed PIA; N5BZI relayed highway accident information via 911 as received from KE5HE; W5DPP wants to know if a special signal should be devised for alerting repeater users to emergency communication needs; KD5PI, coordinator, with N5BZI, KA5RCT and N5ETD provided communication for July 4 fireworks display; club provided communication for Muscular Dystrophy Walkathon in late August. CAND Mgr W5KLV reports 641 messages in 31 sessions; DRN5 represented 100%; South Texas stations W5KLV, WB5YDD, WB5FQU, N5DFO, WB5EPA, KD5KQ, NX5V. Traffic: W5CTZ 327, AJ5K 309, WB5YDD 283, W5KLV 222, WD5GKH 121, WB5FQU 76, WB5EPA 66, AC5Z 49, K5HZR 39, WB5J 30, W5BGE 28, K5CVD 21, WA2VJL 20, K5QEW 11, WA5WCY 6. (Jul) WA5WCY 5.

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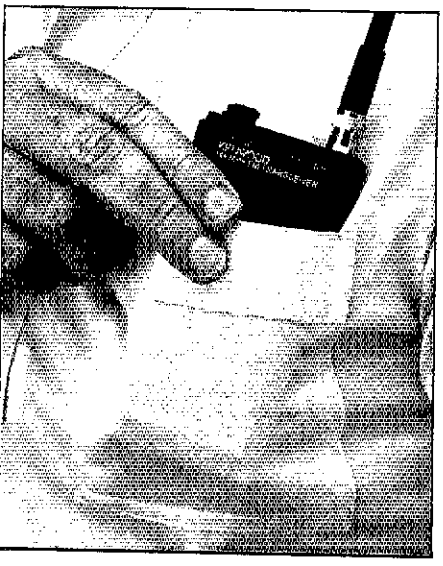
NOW BUILT-IN CTCSS!

By Popular Demand!

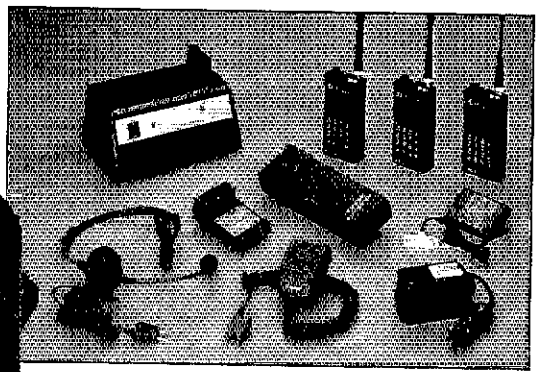
TH-21BT/31BT/41BT

The smallest HT™ is now even better! The new "BT-Series" gives you a plus—a built-in DIP switch programmable CTCSS encoder! Now you can access more than one "private line" over the air! The original TH-21A Series (The Smallest HT™) is still available from the VHF leader—Kenwood!

- **High or low power.** Choose 1 watt high—enough to "hit" most local repeaters; or a battery-saving 150 mW low.
- **Pocket portability!** Kenwood's TH-series HTs pack convenient, reliable performance in a package so small, it slips into your shirt pocket! It measures only 57 (2.24) W x 120 (4.72) H x 28 (1.1) D mm (inch) and weighs 260 g (.57 lb) **with PB-21.**
- **Expanded frequency coverage (TH-21BT/B).** Covers 141.000-150.995 MHz in 5 kHz steps, includes certain MARS and CAP frequencies.
  TH-31BT/B: 220.000-224.995 MHz in 5-kHz steps.
  TH-41BT/B: 440.000-449.995 MHz in 5-kHz steps.



- **Easy-to-operate, functional design.** Three digit thumbwheel frequency selection and top-mounted controls increase operating ease.
- **Repeater offset switch.**
  TH-21BT/B: ±600 kHz, simplex.
  TH-31BT/B: −1.6 MHz, reverse simplex.
  TH-41BT/B: ±5 MHz, simplex.
- **Standard accessories:** Rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery pack, wrist strap.
- **Quick change, locking battery case.** The rechargeable battery case snaps securely into place. Optional battery cases and adapters are available.
- **Rugged, high impact molded case.** The high impact case is scuff resistant, to retain its attractive styling, even with hard use.



Optional accessories:
- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **BC-2** wall charger for PB-21H
- **BC-6** 2-pack quick charger
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **BH-3** belt hook
- **AJ-3** thread-loc to BNC female adapter
- **RA-8A/9A/10A** StubbyDuk antenna
- **TU-6** sub-tone unit (TH-21AT/A only)

More information on the Smallest HT™ is available from Authorized Kenwood Dealers.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut Street
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TH-series transceivers shown with optional StubbyDuk antenna
Specifications and prices are subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.

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Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

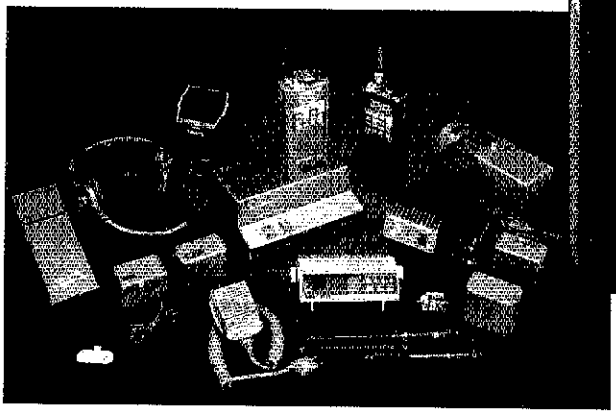
The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

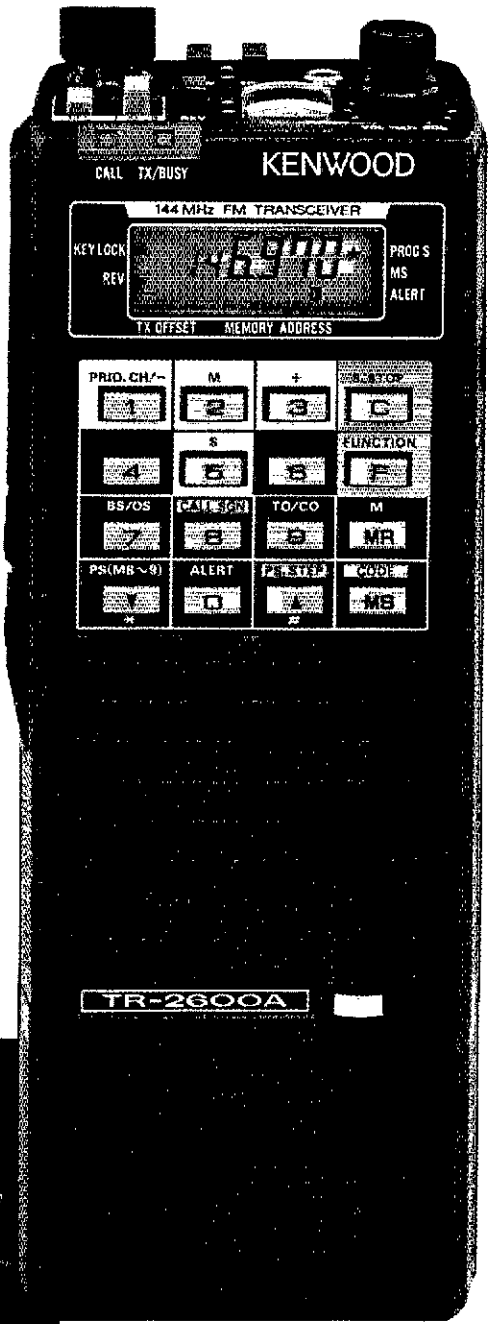
Optional accessories:

- TU-35B built in programmable sub-tone encoder
- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.

- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz. (TR-3600A covers 440-450 MHz.)
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.





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Compton, California 90220

TR-2600A shown. TR-3600A is available for 70 cm operation.

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

MADISON FALL HIT PICKS

242 New rigs and old favorites, plus the best essential accessories for the amateur.

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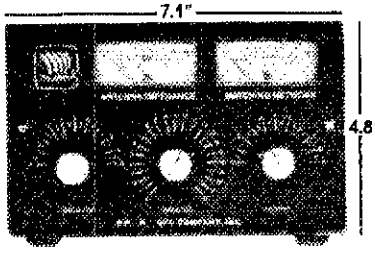
ALL ITEMS ARE GUARANTEED OR SALES PRICE REFUNDED

EQUIPMENT

Kenwood	Call for prices on all Kenwood
Kenwood TS940S Contester's delight	Call
Kenwood TS 440	Call for trade
Icom R7000 25-2000 MHz	949.00
Icom IC32A/A	519.00
Santec ST-20T Handi-Talkie	289.00
Icom IC735	879.00
Ten-Tec 2510 (Easy OSCAR)	489.00
KDK FM 240	279.00
Mirage Amps	15% OFF



NYE MB102 Tuner 189.00

ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC3/HC4/HC5	Stock
Heil BM10 Boom Mike headset	CALL
CSI Private Patch III	469.95
Triplett 3360 VOM (same as FLUKE 77)	69.00
Daiwa NS660A 30/300/3000 watts	135.00
Minco ELH 230D- Excellent buy	88.00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54.95
Ameco PT-2	84.95
New Tokyo HC-200A	115.00
Miller C5141 Low pass filter	14.50
B & K Test Equipment VOM, oscilliscopes generators, etc.	CALL
Tripp 20A/12VDC Supply (16A continuous)	39.00

BELDEN

9913 low loss, solid center, foil/braid shield	51c/ft
8214 RG8 Foam	45c/ft
8237 RG8	39c/ft
8267 RG213	55c/ft
9000 14 Ga stranded copper ant. wire	13c/ft
8448 8 conductor rotor cable	33c/ft
9405 Heavy duty 2-16 Ga 6-18 Ga	56c/ft
9258 RG8x	20c/ft
9269 RG 62A/U	16c/ft
8403 Mic Cable, 3 condctr & shield	45c/ft
100 feet 8214 w/ends installed	54.00
8669 7/16" tinned copper braid	1.00/ft

AMPHENOL

83-1SP-PL259 Silverplate	1.25
UG176 reducer RG8x	.30
83-1J Double Female UHF	2.00
82-61 N Male	3.00
82-97 N Female Bulkhead	3.00
82-63 Inline Female N	4.00
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31-212 BNC-RG59	1.50
31-216 UG201 A/U N Male-BNC Female	2.00
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34125 N Female UHF male	9.00
3128 BNC Female-PL259	3.00
Fox N-Male Connector (Fits 9913)	4.50

PACKET POWER

AEA PK-232	299.00
Kantronics KPC 2400	299.00
Kantronics 2400	139.00
Kantronics Packet II	199.00
MFJ 1270	125.00
AEA PM-1	149.00
New AEA UDC-232 Firmware, No modem. List 279.00	CALL

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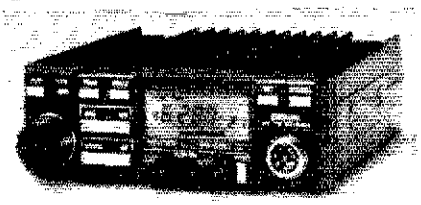

IC28A List 429	Your Cost 369.00

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Isopole 144 MHz	44.95
AOP-1 Complete Oscar Antenna	149.95
Butternut HF6V 80-10 vertical	125.00
HF2V, 80 & 40 vertical	119.00
HF4B	189.00
Hustler G7-144	119.95
Hustler 6BTV	139.00
Hand Rotator 12X, CD45-2	Call
KLM HF World Class Series Antennas	Call Don
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OTHER ANTENNAS

Diamond D-130 Discone 25-1300 MHz	79.00
Larsen Kulduck	17.00
Larsen 440 HW 1/2 wave Kulduck	25.00
Larsen 2M Vehicle telescope ant	25.00
Avanti AP151 3G on Glass Antenna	36.00
Antenex 2M 5/8 Mag Mount Comp	25.00
Avanti APH450-5G on glass	39.00
Orion 2M 1/2 wave Hanov Antenna	19.00
Van Gordon SLA 1 160-80-40 Sloper	34.00
Valor AB-5 Mobile	79.95
Stoner DA100 D Active Rx Antenna	190.00
DC Tenna Hitch 3/8-24 Thread Fits 3/4" trailer hitches	29.95

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Nye ESK-001 Keyer	58.00

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3-500Z	99.95
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GE 6JS6C	12.95
GE 8950	14.00
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Close out on rigs & accessories. All the time We may have what you're looking for	Call

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Kantronics UTIL-XT Fits any computer (even yours!)	119.00
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ETO/AL PH 77 Clean	3,800.00
ICOM IC 745	650.00
TenTec 505 Argonaut	195.00
YAESU FT 101E	395.00
YAESU FT 901 DM/CW	600.00

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Minimum order $10.00. Mastercard, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. All items full factory warranty plus Madison Warranty.

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10 watts	—	10A	10B	10C	10D	10E
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
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Super-compact mobile transceivers

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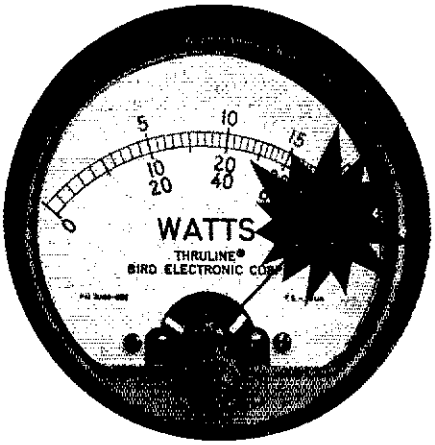
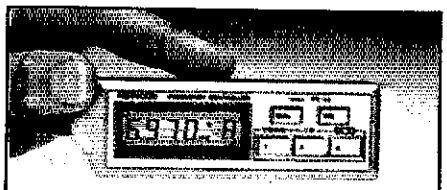
- 45 watt output, with HI/LO power switch (TM-401B has 25 watts output.)5 W low.
- Dual digital VFOs
  TM-201B covers 142-149 MHz, includes certain MARS and CAP frequencies
  TM-401B covers 440-450 MHz
- 5 memories plus "COM" channel, with lithium battery back-up



- Programmable, multi-function scanning
- High quality external speaker supplied
- Audible beeper confirms operation

Optional accessories:

- PS-430 power supply
- TU-3 or TU-3A two frequency tone encoder
- FC-10 frequency controller
- MC-55 (8-pin) mobile microphone
- SP-40 compact mobile speaker
- SP-50B deluxe mobile speaker
- SW-100A/B SWR/power meters
- SW-200A/B SWR/power meters
- SWT-1 2 m antenna tuner
- SWT-2 70 cm antenna tuner
- PG-2N extra DC cable
- PG-3B DC line noise filter
- MB-201 extra mobile bracket



Optional FC-10 frequency controller

Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel).

More information on the TM-201B/401B is available from authorized dealers.

KENWOOD

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

TM-401B is similar to the TM-201B, but covers 440-450 MHz and is 25 watts.
Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories

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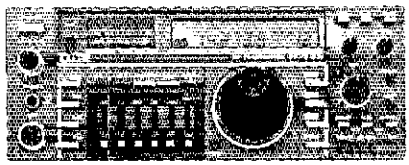
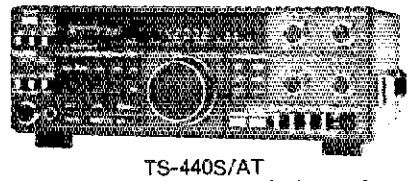


IC-735

HF Equipment	List	Juns
IC-735 Gen. Cvg Xcvr	999.00	Call $
IC-745 Gen. Cvg Xcvr	1049.00	Call $
IC-751A Gen. Cvg Xcvr	1649.00	Call $
Receivers		
IC-R7000 25-1300+MHz Rcvr	1099.00	Call $
IC-R71A 100kHz-30 MHz Rcvr	949.00	Call $
VHF		
IC-271A All Mode Base 25w	859.00	Call $
IC-271H All Mode Base100W	1099.00	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 $
UHF		
IC-471A All Mode Base 25W	979.00	Call $
IC-471H All Mode Base 75w	1339.00	Call $
IC-47A FM Mobile 25w	549.00	Call $
IC-4AT FM HT*	339.00	Call $
IC-04AT FM HT	449.00	Call $
IC-3200A FM 2m/70cm 25W	599.00	Call $
220MHZ		
IC-37A FM Mobile 25w	499.00	Call $
IC-3ATFM HT	339.00	Call $
Repeaters		
IC-RP3010 440 MHz	1229.00	Call $
IC-RP1210 1.2 GHz	1479.00	Call $



TS-440S/AT

HF Equipment	List	Juns
TS-940SAT Gen. Cvg Xcvr	2249.95	Call $
TS-940S Gen. Cvg Xcvr	2049.95	Call $
TS-930S/AT Gen. Cvg Xcvr	1849.95	Call $
TS-830S Xcvr	1099.95	Call $
TS-530SP Xcvr	899.95	Call $
TS-430S Gen. Cvg Xcvr	819.95	Call $
TS-440S/AT Gen. Cvg Xcvr	1199.95	Call $
TS-440S Gen. Cvg Xcvr	1049.95	Call $
Receivers		
R-1000 200kHz-30 MHz	519.95	Call $
R-2000 150kHz-30 MHz	649.95	Call $
TS-670 All Mode Quad 6M	799.95	Call $
VHF		
TS-711A All Mode Base 25w	899.95	Call $
TR-751A All Mode Mobile 25w	599.95	Call $
TM-201B FM Mobile 45w	369.95	Call $
TM-211A FM Mobile 25w	399.95	Call $
TM-2530A FM Mobile 25w	429.95	Call $
TM-2550A FM Mobile 45w	469.95	Call $
TM-2570A FM Mobile 70w	559.95	Call $
TH-21AT FM, HT	249.95	Call $
TR-2600A FM, HT	359.95	Call $
UHF		
TS-811A All Mode Base 25w	1049.95	Call $
TM-401B FM Mobile 25w	399.95	Call $
TM-411A FM Mobile 25w	449.95	Call $
TH-41AT FM, HT	259.95	Call $
TR-3600 FM HT	369.95	Call $
220MHZ		
TM-3530A FM 220MHz 25w	449.95	Call $
TH-31AT FM 220 MHz HT	259.95	Call $
TL-922A HF Amp	1499.95	Call $

FT 757GX

HF Equipment	List	Juns
FT-ONE Gen. Cvg Xcvr	2859.00	Call $
FT-757GX Gen. Cvg Xcvr	995.00	Call $
FT-767 4 Band New	1895.00	Call $
Receivers		
FRG-8800 150kHz-30 MHz	599.95	Call $
FRG-9600 60 - 905 MHz	679.95	Call $
VHF		
FT-270RH FM Mobile 45w	439.95	Call $
FT-203R/TT FM Handheld 3w	259.95	Call $
FT-209RH FM Handheld 5w	359.95	Call $
UHF		
FT-770RH FM Mobile 25w	479.95	Call $
FT-703R/TT FM Handheld 3w	299.95	Call $
FT-709RH FM HT 4w	359.95	Call $
VHF/UHF Full Duplex		
FT-726R All Mode Xcvr	1095.95	Call $
6m/726 6m Module	269.95	Call $
430/726 430-440MHz	329.95	Call $
440/726 440-450MHz	329.95	Call $
HF-726 10-15-20M	289.95	Call $
SU-726 Sate Duplex	129.95	Call $
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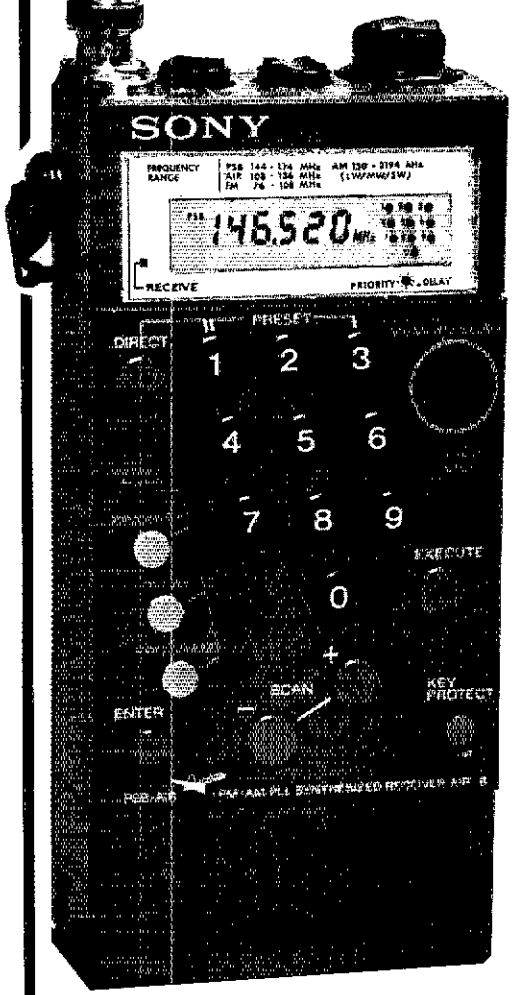
The SONY AIR-8 Is Here!

Hand-Held Programmable PLL Scanner/Receiver For AIR BAND-2M/PSB-FM-AM(LW-MW-SW)



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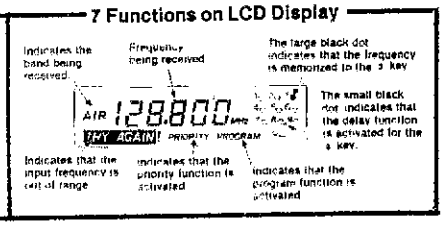
The Air-8 measures 3⅛" × 7⅛" × 2", and weighs just 21 oz. This is truly a sturdy little companion that will give you years of dependable performance wherever you go.

6 Frequency Bands

Band		Frequency range	Tuning interval
PSB		144 - 174 MHz	5 kHz
AIR		108 - 136 MHz	25 kHz
FM		76 - 108 MHz	50 kHz
AM	SW	1601 - 2194 kHz (1603 - 2194 kHz)	1 kHz
	MW	530 - 1600 kHz (531 - 1602 kHz)	10 kHz (9 kHz)
	LW	150 - 529 kHz (150 - 530 kHz)	1 kHz

7 Functions on LCD Display



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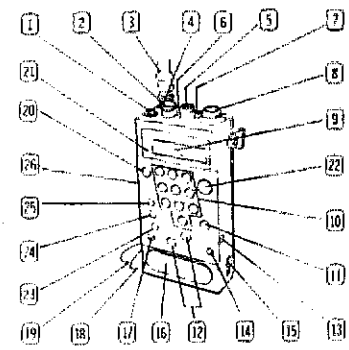

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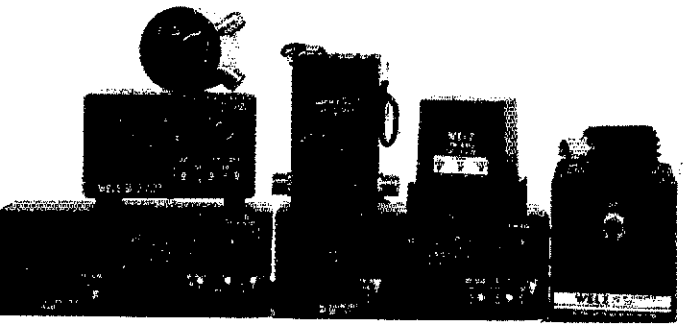

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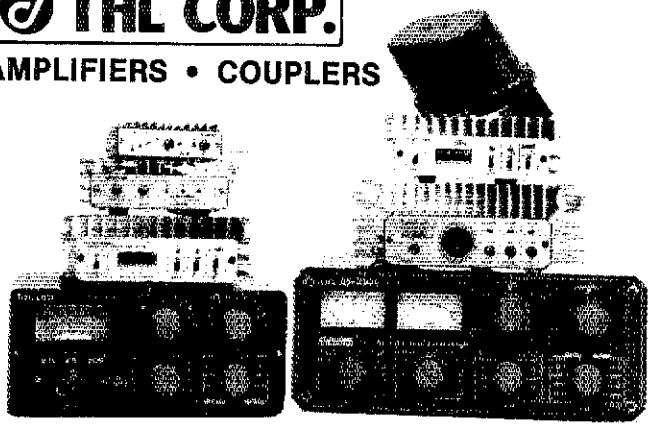

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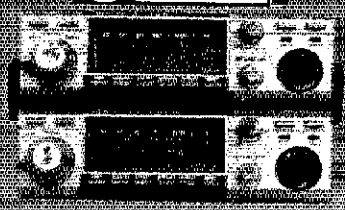

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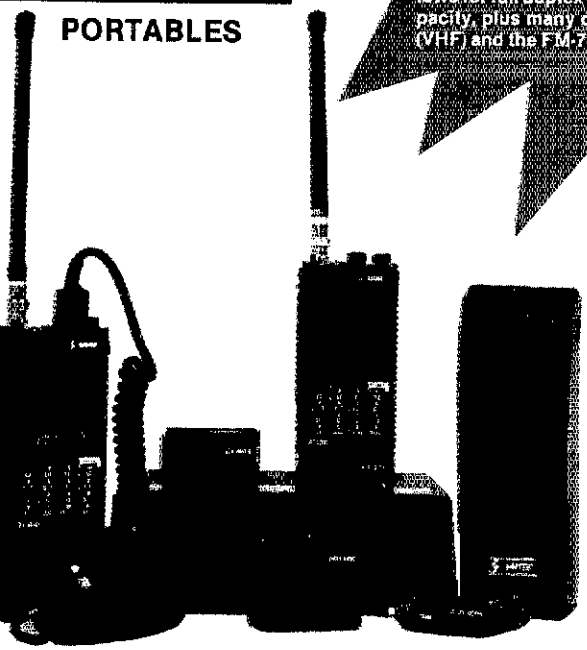

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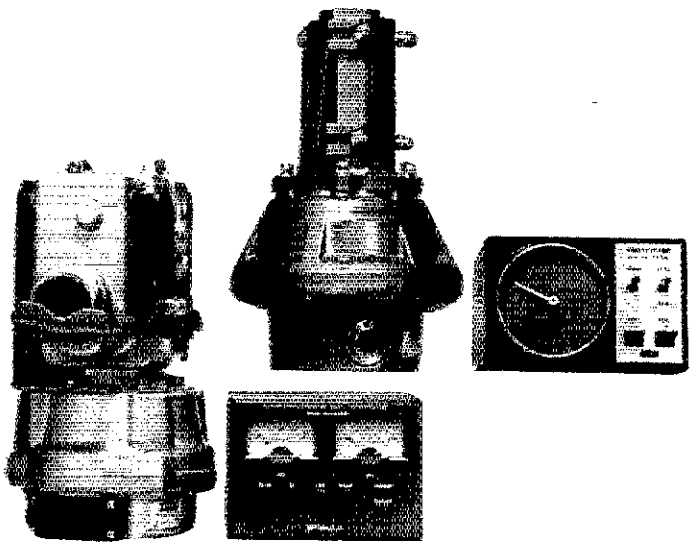

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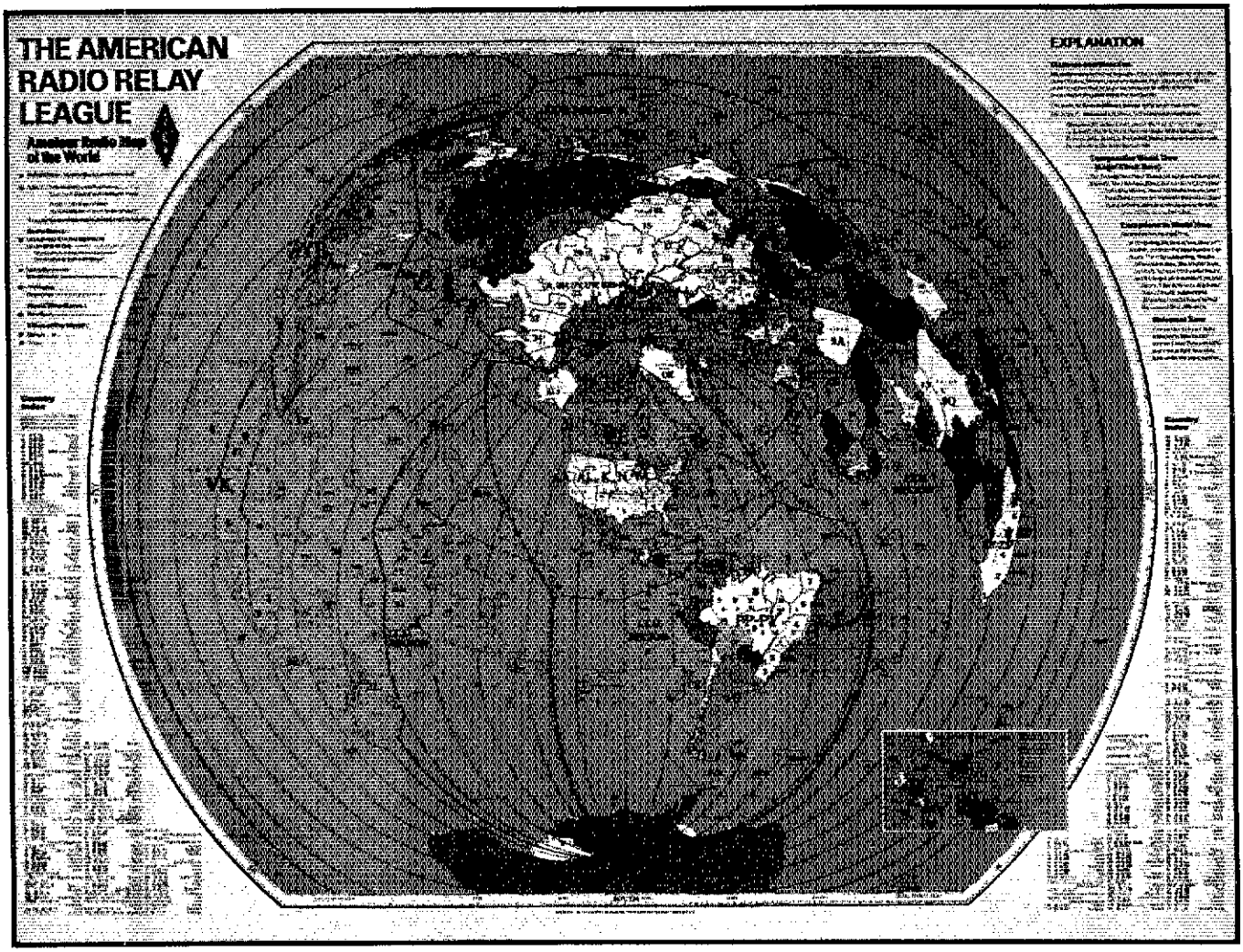

LATEST EDITION

DETAILED CARIBBEAN INSERT

The ARRL Amateur Radio Map of the World has been updated from the 1980 version by the League and Rand McNally. The colors are brighter and bolder, and we have added an enlarged and detailed insert of the Caribbean. The country index lists countries alphabetically by prefix and shows ITU and CQ Zones as well as continent. On the map itself you will find ITU Regions, time zones and great circle bearings centered on the United States as well as prefixes and call districts. The latest edition of ths popular Amateur Radio map will brighten any ham shack wall! Price is $8.00.

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Listen for Yaesu's FT-767GX everywhere you might hear it: HF, 6 meters, 2 meters and 70 cm.

You'll hear operators calling it the ideal HF/VHF/UHF base station for small ham shacks and apartments.

And they'll rave about its full-featured performance and highly attractive price.

You see, the FT-767GX continues the price/performance tradition of our popular FT-757GX. But with even more features.

When you're ready to expand beyond HF coverage, just plug in optional modules for 6-meter, 2-meter, and 70-cm operation.

As standard equipment, you get a built-in HF automatic antenna tuner, AC power supply, digital SWR meter, digital power output meter, electronic keyer, and CW filter.

And operation is smooth and intuitive with keyboard frequency entry. Dual VFOs that tune in 10-Hz steps. A digital display in 10-Hz steps. And ten memories that store mode, frequency, and CTCSS tone information.

The FT-767GX is ready to operate full duty cycle at full rated power output for up to 30 minutes. And it listens from 100 kHz to 30 MHz.

Plus your station is really complete with full CW break-in, our patented Audio Peak Filter for CW operation, a CW TX offset variable 500/600/700 Hz, IF shift, an IF notch filter, a Woodpecker noise blanker, a VFO tracking system for slaved A/B VFO tuning, and optional CTCSS unit for repeater operation. And that's just a partial list!

But the best way to discover its full-featured performance is to visit your Yaesu dealer today.

Yaesu's FT-767GX. The affordable way to be heard on HF, VHF and UHF.

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Our 30th Anniversary.

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Customer 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.

Ham-Ads

1) Advertising must pertain to products and services which are related to Amateur Radio.

2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8 1/2" × 11" sheet of paper.

4) Closing date for Ham-Ads is the 13th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received September 14 through October 13 will appear in December *QST*. If the 13th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in your advertising before your ad can appear. The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

The League reserves the right to decline or discontinue advertising for any reason

CLUBS/HAMFESTS

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, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. 1417 Stoneybrook, Mamaroneck, NY 10543.

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.

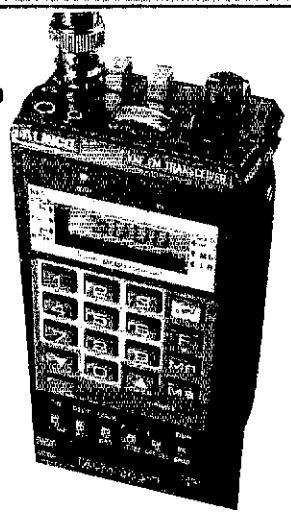
FIND OUT what else you can hear on your General Coverage Transceiver or Receiver. Join a shortwave radio listening club. Complete information on major North American clubs and sample newsletter $1. Association of North American Radio Clubs, P.O. Box 462, Northfield, MN 55057.

GEORGIA (LAWRENCEVILLE) - I-2: The Alford Memorial Radio Club of Stone Mountain is sponsoring Ham Radio and Computer Expo '86 at Gwinnett County Fairgrounds, 20 minutes north-east of Atlanta. Hours: 9AM - 5 PM Sat.; 9AM - 4 PM Sun. Admission $4 advance, $5 at door. Forums, awards, VEC license exams both days, free cook-out Sat. night. Many other activities for the entire family. Superb dealer facilty, giant undercover flea market. Discount hotel rooms. Free parking for 3500 cars, RV sites with full hookup available. Talk-in on 146.16/76, 449.25/4.25. Information: Alford Memorial ARC, P.O. Box 1282, Stone Mountain, GA 30086 or call N8LM at 404-925-7615.

THE FOXHUNTING Society of Illinois will sponsor the Greater Chicagoland Team Foxhunt #17 on November 29th, 1986. Amateur Radio clubs are welcome to participate. The event starts at the Cermak Plaza Shopping Center at the intersections of Harlem Ave. & Cermak (22nd. St.) in Berwyn IL. The hunt will start at 8PM on 146.16MHz. A travelling trophy is presented to the winning team. For full hunt rules & info write to Mike Brost WA9FTS, 5127 N. Monterey Ave., Norridge IL 60656 or call 312-457-0966.

ALINCO ELECTRONICS INC.

P.O. Box 20009 • Reno, Nev. 89515 Phone (702) 359-1414 • Telex 4993999 EGELECTR
44 Glen Carran Circle • Sparks, Nev. 89431



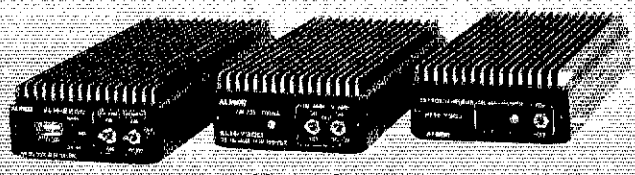
ALM-203T
List $345.00

2m FM Handheld Transceiver

- 2 Band HT
  Band A 140-150 MHz
  Band B 150-160 MHz (Receive Only)
- 10 Channel Memory
- Built-in Sub Audible Tones
- Battery Save Function
- 3 Watts Output Standard; 5 Watts with 12 V adapter
- Don't decide on a handheld until you have seen Alinco's newest!

ALR-206T List $358.00

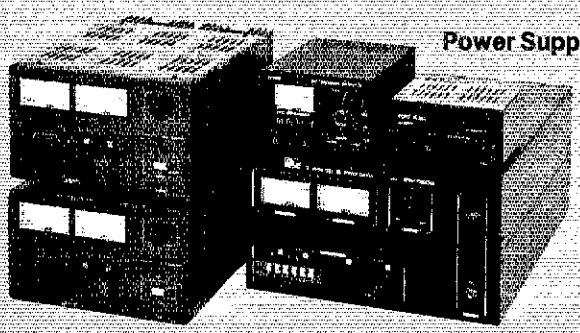
- 140-149.995 MHz Covers MARS and CAP
- Programmable Band Scan
- Programmable Non-Standard Repeater Offset
- Unique Control Knob
- Completely Programmable From Microphone
- 25 Watt High · 5 Watt Low
- Built in Lithium Back Up Battery
- Up/Down Control On Microphone
- 10 Channel Memory
- Built in Sub Audible Control
- Many Features, See Your Dealer



Linear Amps

List Prices From $69.95 to $156.00

- 2m, 1¼m and 70 cm micro linear amplifiers
- 3 watts in provide 30 to 50 watts out to convert your HT to a high power mobile radio
- Each amp includes a heavy duty heat sink, protection circuit and a low pass filter for a clean signal
- Some models available with a 15 db gain GaAsFET receive preamp, others with a 10 db gain FET receive preamp and one with an RF meter.



Power Supplies

Affordable performance is the final output of these workhorses. These high efficiency, high output, regulated supplies each comes with automatic current limit and shut down protection. Choose from 4.5 to 55 amps of output. List Prices From $69 to $333.

Memo:

WATCH ALINCO GROW!

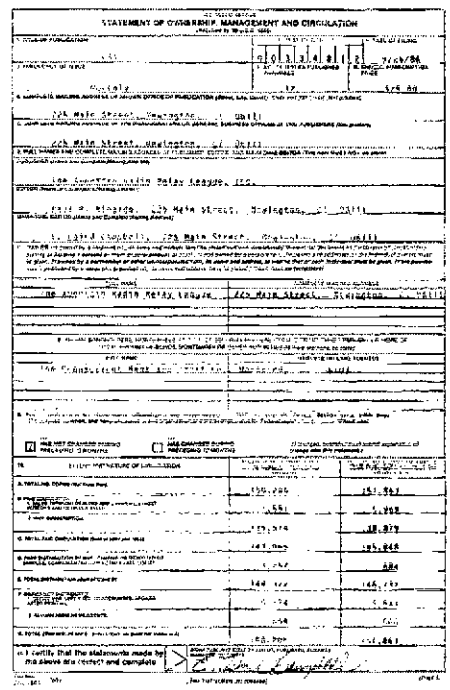
We will be introducing more new and exciting products in the very near future, NEW state of the art miniatures. 140-150MHz HT's, new miniature 440-450MHz HT's, new dual band mobile radio and new high power 2 meter and 70cm amplifiers.

Remember Alinco's unique warranty program. If you have a failure within 30 days, your dealer (up to his inspection) will give you a new unit, provided it has not been abused or modified.

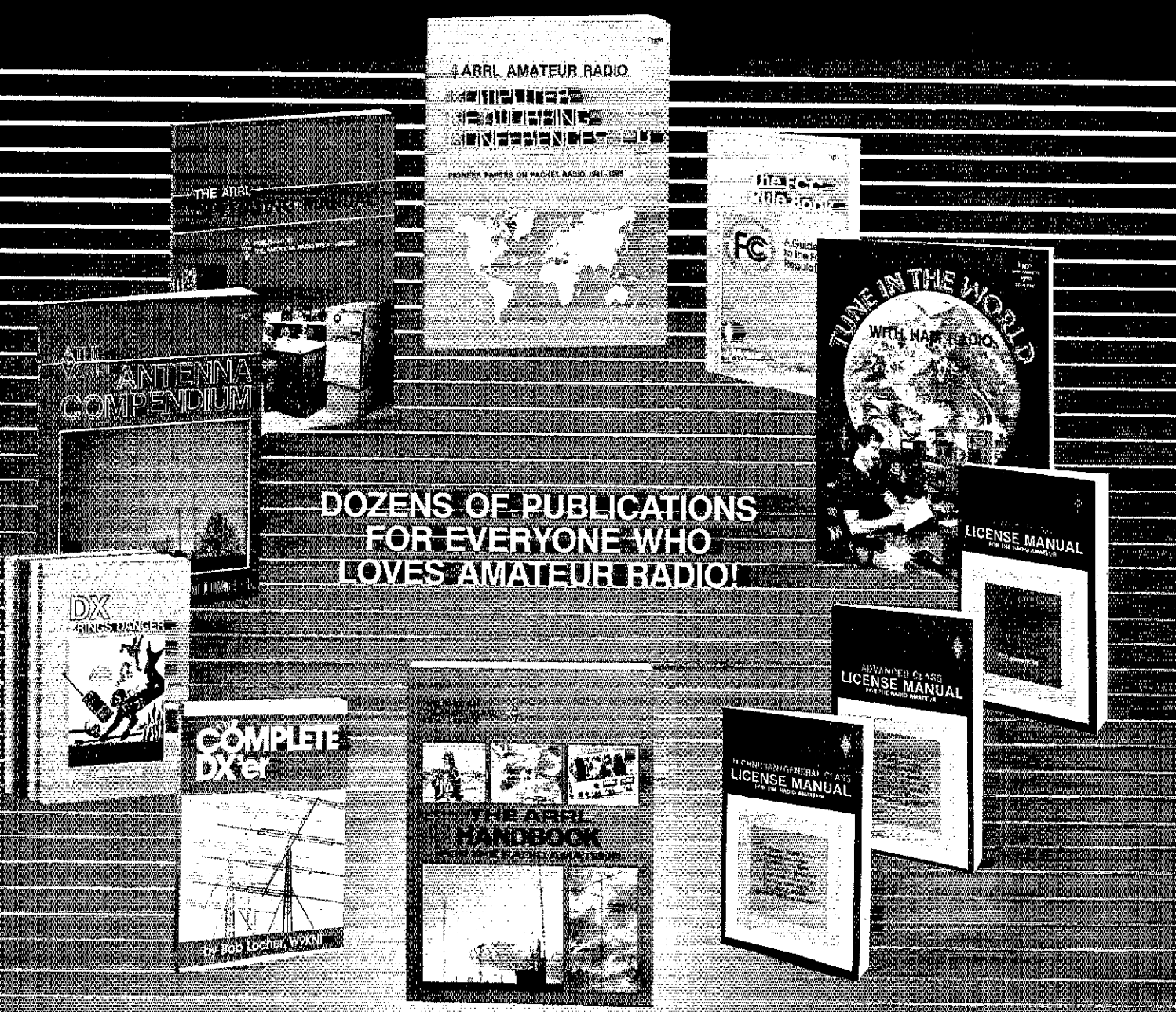
Thank you for your continued support.

Everett

Everett L. Gracey
President



The ARRL Bookshelf



DOZENS OF PUBLICATIONS FOR EVERYONE WHO LOVES AMATEUR RADIO!

MIDWINTER MADNESS - Midwinter Hamfest fun. See you in February. K0LTC.

QSL CARDS/RUBBER STAMPS/ENGRAVING

POST CARD QSL Kit - Converts Post Cards, Photos, to QSLs! Stamp brings circular. Labelcraft, P.O.Box 412, West Sand Lake, NY 12196.

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. Little Print Shop, Box 9848, Austin, TX 78766.

FREE samples—stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50 cents. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

QSLs-1)Famous KØAAB custom collection. 2)Railroad employees and railfan's specials. 3)Front report styles. 4)Multiple callsigns. 5)Ham business cards. State your sample wants. 39 cents self addressed business size envelope required. Marv Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

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.

QSLs - since 1956, free samples, Rusprint, Box 7575, Kansas City, MO 64116.

FREE, 100 QSLs with first order. Samples 50c. Gazebo Press, Rt. 4 Box 4148, LaPlata, MD 20646.

ENGRAVING: CALLSIGN/name badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

CADILLAC of QSLs--Completely different! Samples $1 (refundable). Mac's Shack, P.O. Box 43175, Seven Points, TX 75143.

PICTURE QSL cards of your shack, etc. from you photograph or black ink artwork. 500 $24; 1000 $36.50. Also unusual non-picture designs. Send stamp for illustrated literature. Generous sample pack $1; half pound of samples $2. Custom printed cards, send specifications for estimate. Raum's RD 2, Orchard Road, Coopersburg, PA 18036 (formerly of Philadelphia).

QSLs Quality and Fast Service for 26 Years. Include Call for Decal. Samples 50c. Ray, K7HLR, Box 331, Clearfield, UT 84015

BROWNIE QSLs since 1939. Catalog & Samples $1(refundable) with order) 3035 Lehigh Street, Allentown, PA 18103.

FIRST CLASS, Full Color QSL from your prints or slides. Confirming report and address printed on back, $199/2,500. Smith Printing, 20420 Calhaven Dr., Saugus, CA 91350. 805-251-7211.

QSL CARDS - Look good with top quality printing. Choose standard designs or fully customized cards. Better cards mean more returns to you. Free brochure, samples. Stamps appreciated. Chester QSL's, Dept. B, 310 Commercial, Emporia, KS 66801.

QSL samples - 25c Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

FREE QSL Card samples - quality cards at low prices, wide selection available. Send for free samples: KE7GY, INSTACOPY, Rt.1 Box1486, Roosevelt, UT 84066.

CUSTOM ENGRAVING: Complete line of plastic/metal call/name badges, License plate holders, gifts and ham accessories. SASE to: WA2YKY, 704 Dewitt Street Jacksonville, NC 28540.

CALL SIGNS as seen in Dayton, 14 Karat or Sterling Silver Tie Tack/Lapel Pin or necklace. Nice Christmas gift. For Details - Bashas 14 Karat, 202 Charlann Circle, Cherry Hill, NJ 08003.

QUALITY QSLS, Samples 50c. Olde Press, WB9MPP, Box 1252, Kankakee IL 60901.

UNDECIDED ABOUT whole QSLs to order? Look through those you have received and you can judge our quality. Our prices are reasonable and satisdaction guaranteed. Free Samples. QSLs By W4MPY, 705 Audubon Circle, Belvedere SC 29841.

QSL CARDS State and USA outlines, globe and call sign designs. Free Samples. Shell Printing, KD9KW, P.O. Box 50, Rockton IL 61072.

ANTIQUE-VINTAGE-CLASSIC

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 F802, 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 60642.

WANTED: Radio, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond Glendale, CA 91201. 818-242-8951.

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.

The 1987 Handbook has it all!

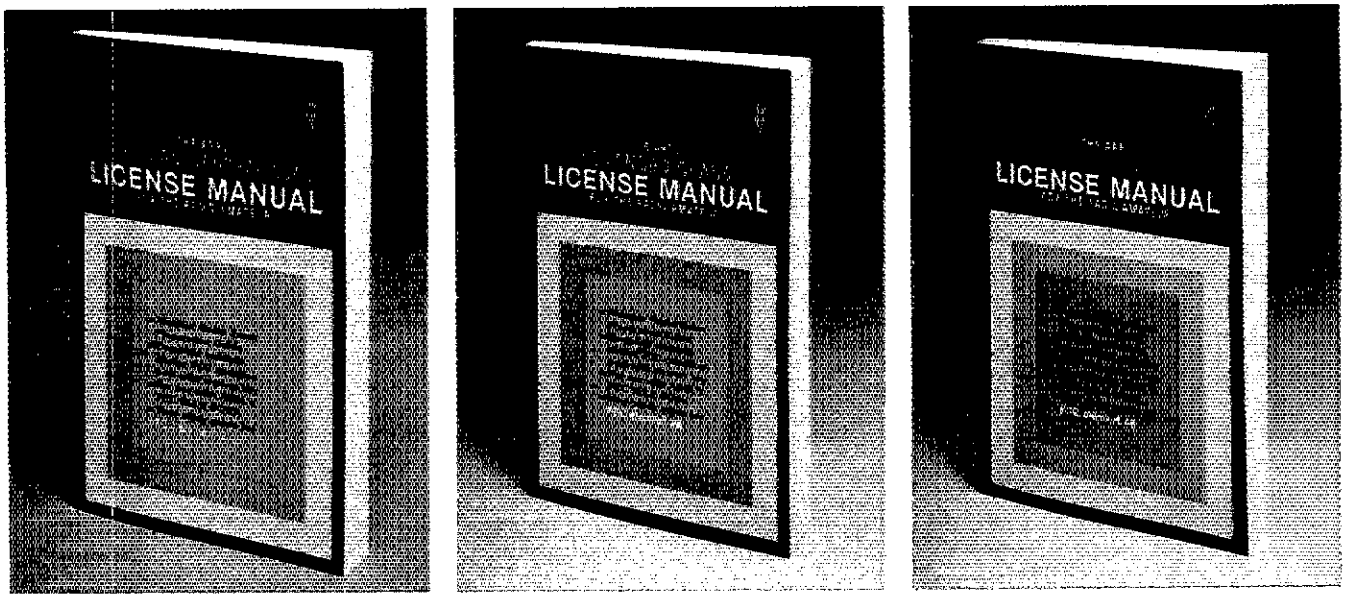
The 1987 ARRL Handbook for the Radio Amateur **is your source for the most up-to-date information on:**

- **Packet Radio and other forms of digital communication**
- **RF Circuits and design**
- **Power amplifiers**
- **Visual communication — ATV, SSTV, and FAX**
- **Propagation**
- **Operating**
- **Antennas and transmission lines**
- **Voice communication**
- **Space communication**

The 64th edition has 40 chapters and over 1200 pages. It's packed with practical construction projects and there are many with printed-circuit board etching patterns. Every year the *Handbook* is updated to reflect changes in the state-of-the-art. Whether you are a radio amateur, engineer or technician you'll find the latest edition a must addition to your technical library. There is no change in price from last year! Paperbound: $18 in the US, $19 elsewhere; cloth: $27 US, $29 elsewhere. Payment must be in US funds. Add $2.50 ($3.50 for UPS) shipping and handling.

WA6P operated this solar powered packet station during 1986 Field Day as part of the McDonnell Douglas Amateur Radio Club and Southern California Amateur Network entry. The photographer was WA6AUF.

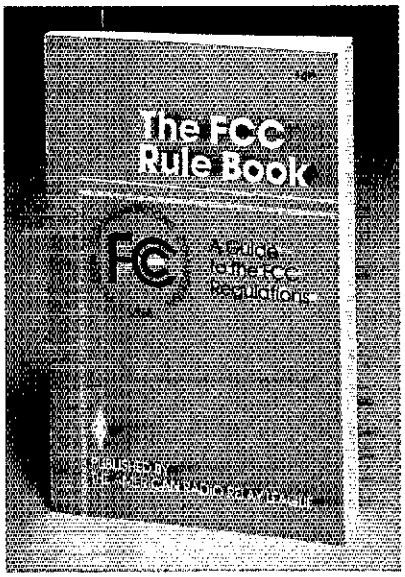
AVAILABLE IN NOVEMBER



PASSING POWER!

• NEW EXTRA CLASS LICENSE MANUAL!

The ARRL publications pictured on this page are just what you need in order to pass the various amateur exams. Beginning with **Tune in the World with Ham Radio** for the Novice and progressing through the new and critically acclaimed **ARRL License Manual Series** for the Technician through Extra Class; you will find passing each exam element a snap! There are accurate text explanations of the material covered along with the FCC question pools and answer keys. **The FCC Rule Book** is invaluable as a study guide for the regulatory material found on the exams and as a handy reference. *Every* amateur needs an up-to-date copy of **The FCC Rule Book!**



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Kit with book and cassette .. **#0232 $10**
Book only ..... **#0240 $ 7**

License Manual Series
Technician/General Class ..... **#0143 $ 5**
Advanced Class ..... **#016X $ 5**
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FCC Rule Book ..... **#0216 $ 4**

Code Proficiency
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C-60 Code Practice Cassettes
30 min. each at 5 and 7½ WPM* ..... **#1030 $ 5**
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*Same tapes included in *Code Kit*

Orders must include $2.50 shipping for book rate or $3.50 for UPS.

The American Radio Relay League, Inc.
225 Main Street
Newington, CT 06111

WANTED: *QST* VOLUME 1. W6ISQ, 82 Bellbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

EARLY ELECTRONIC and Mechanical Television Sets, parts, literature wanted for substantial cash. Finder's fee paid for successful leads. Arnold Chase, 9 Rushleigh Road, West Hartford, CT 06117 203-521-5208.

BUY, sell, collect and restore early tube equipment? Early receivers, tubes and telegraph gear? Join AWA which sponsors old time "meets," flea markets, museum and journal with free want ads. Annual dues only $8. Write: Bruce Kelley, W2ICE, Rte. 3, Holcomb, NY 14469.

TELEGRAPH BUGS,paddles, old keys wanted. Collector needs most models and variations of Martin, McElroy, Mefehan, Brown Bros., Dow-Key, Clark-Rotoplex, pre-1960 Vibroplex, etc. Historical data on same or donations of parts, damaged keys appreciated. Write: John Hensley, WJ5J, 5054 Holloway Avenue, Baton Rouge LA 70808.

WANTED: SPEEDX BUG. CONLY, 819 Henrietta, Sunnyvale, CA 94086

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

$100 for 6ACB or W6ACB QSL card prior to 1940. WØKU 303-371-6159.

WE MAY HAVE the tubes you need. (Thousands in stock). Send S.A.S.E for our list. Fala Electronics, PO Box 1376-1, Milwaukee, WI 53201.

WANTED - WESTERN Electric tubes, amps, consoles, drivers, horns, speakers, microphones, parts. Radio tubes (2A3, 45's, 50's, 199, 280, 210, 211, 845) old speakers, drivers, horns, from Jensen, Altec, Trusonic, JBL, University, Tannoy. David Yo, PO Box 832, Monterey Park, CA 91754. Tel: 818-576-2642.

R-390A RECEIVER: $195 checked; $115 repairable. Parts, tubes, sections. Info SASE. CPRC-26 six-meter transceiver (see HR, March 1985) $17.50 apiece, $32.50 pair (add $4.50/unit shipping). Baytronics, Box 591 Sandusky 44870. 419-627-046D.

R-390A RECEIVER: $195 checked; $115 reparable. Parts, tubes, sections. Info SASE. Baytronics, Box 591, Sandusky, OH 44870. 419-627-0460 evenings.

WANTED CROSLEY "Pup" K4NBN "No Bad News"

WANTED - BANDSPANNER Broomstick Antenna. Write or call K8LJM 313-792-2787.

WANTED: CRYSTAL SET parts: Variometers, Variocouplers, Condensers, Detectors, Catwhiskers, Dial Knobs, Tap Switches, Tap Points, Binding Posts, Headphones. MIDCO, 660 N Dixie Highway, Hollywood FL 33020

WANTED NEW in crates WWII Signal Corps and Navy airborne radio equipment. A.J. Link 619-722-6162.

WANTED WW2 JAPANESE military radios like Chi-Ichi in original condition also BC1000 Antenna AN130, RC291, AN131. Tajima, JA1DNQ/KD2HB, C/O Toshiba, 914-273-1750.

QST 1959 to date, complete. Ham Radio all to 1985, complete. Best offer. Robert Meyer, 2710 Main, Lafayette IN 47904. 417-448-6616.

COMPLETE COLLECTION CQ's in binders, except 1971 to 1975. Best offer takes all. Have *QST*s 1954 to Dec. 1982 at 35c each. WØMRN 1022 N. Rockhill, S. Louis MO 63119.

WANTED: E.H. Scott radios and McMurdo Silver radios i.e. Scott Radio Labs "Scott Special", Scott "World's Record" sets and others. McMurdo Silver 'Single Signal 5B' or Radio Professional Model 5D and others. Any and all literature or memorabilia. Finder's fee. I will arrange all shipping. Dennis Yanko, 410 N. Summit, Oconomowoc WI 53066. 414-965-3641 collect after 5:00 PM CST.

WANTED: National NCX-500 transceiver and matching AC-500 Power Supply or National NCX-1000 transceiver. 512-647-0748, K8WB, 5302 Charter Oak, San Antonio TX 78229.

FOR SALE: Waterman Model S-14-A Pocketscope; Superior Model 660 Signal Generator. Write or call W3EYF 301-265-1356.

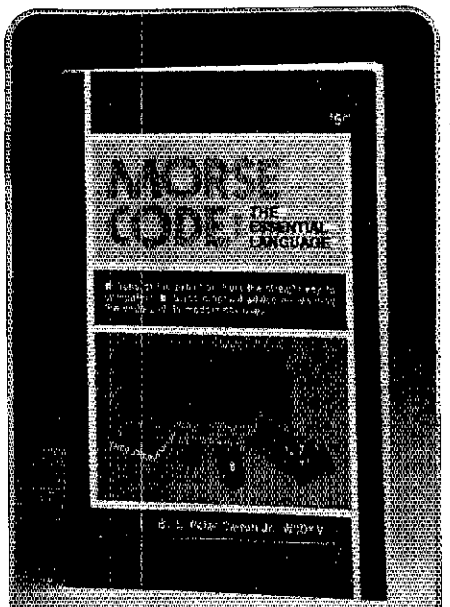
CLEAN OUT OLDIES: Collins KWS-1, nice shape complete $790. Johnson Viking One $125. Valiant II $124. Viking Mobile $150. SR-46 with VFO $58. NCX-3 $95. EICO 720 $58. WRL DuoBander $68. Hammarlund HQ-150 $125. HQ-110 $125. Knight T60 $50. Hallicrafters SX-43 $125. SX-110 $125. S-38 $45. Sky Courier $75. SR-160 $95. Henry KD2 Desk Top Linear 2000 Watts $485. Save by coming for pickup. Byu out more. N4LX, F.E. Coble, 251 Collier Avenue, Nashville, TN 37211. Phone 615-833-2724.

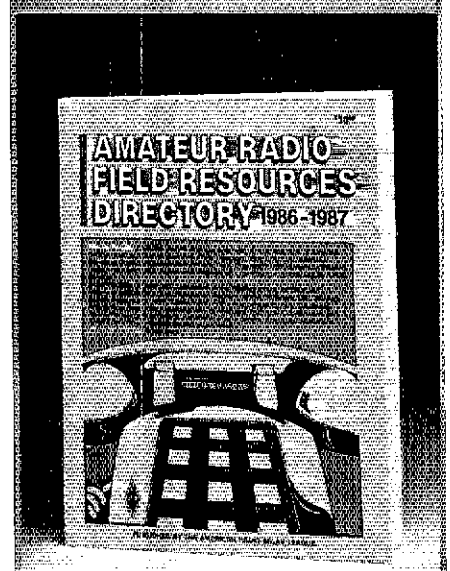
WANTED OLD *QST* Handbooks - looking for a 1943 Edition and a 1963 Edition. Send letter specify condition, soft or hard cover and asking price. Will answer all letters. John W. Heacock K3YCP, 2650 Bluffton Road, Buford GA 30518.

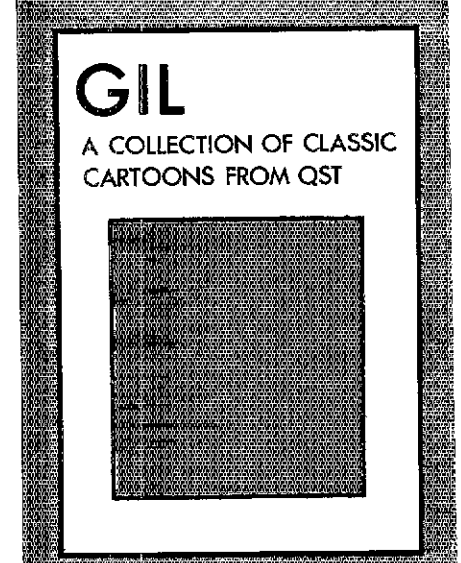
WANTED PLATE XFMR for Globe King 500-C and manuals for Heath AT-1, Hallicrafters SX-140 and HT-40, EICO 720 and Globe Scout 680- A. Neal, WA4TQJ, Route 4 Logan Road, Ozark AL 36360.

TELEGRAPH AND WIRELESS collector looking for each make and model of Bug made before 1935. Vibroplex, Martin, Boulter, Mecograph, etc. Also need spark keys, Detectors, loose couplers, Pre-WWII tubes and light bulbs, and pre-1900 landline (keys, sounders, pocket sets). Visitors welcome; 300+ items. K5RW, Neal McEwen, 1128 Midway, Richardson TX 75081. Tel.: 214-234-1653.

COLLINS R-388/51J-3 rcvr in good condition. Sell or swap for VHF gear or what?. Also need parts for same model. K2YAW, 516-585- 7448.







NEW! FROM ARRL

MORSE CODE: The Essential Language tells of the evolution from the straight key to computers. Using the code is a fun and exciting way to communicate, and author Pete Carron, W3DKV has incorporated his own enthusiasm into this book. The beginner will find practical advice on learning to receive and send. There are chapters on high speed operation, distress calls and what the future has in store for CW operation. An extensive history of the code is presented and the appendix lists abbreviations, the RST system, associations and organizations of CW operators and manufacturers of equipment. If the sight of a radio operator sending a message in code generates a certain intrigue that makes the mind wander to thoughts of mysterious signals in the night, ships in distress and faint transmissions from distant lands; then *MORSE CODE: The Essential Language* is must reading for you! 111 pages, copyright 1986 #0356 $5 plus postage and handling.*

The Amateur Radio Field Resources Directory for 1986-87 is now available. Its 514 pages are divided into three sections. The WHITE pages list those individuals who can help with almost any Amateur Radio-related question or problem. The BLUE pages include a 10-year **QST** cumulative index, ARRL organization and much more. The YELLOW pages contain advertisers. Copyright 1986 #0321 $10 plus postage and handling*.

GIL - A Collection of Classic Cartoons from QST Phillip "Gil" Gildersleeve, W1CJD contributed over 1500 cartoons and drawings to ARRL from the late twenties until he became a silent key in 1966. This book presents only a small portion of the "best of Gil." Most hams would love to have a "Jeeves" character to do the tough chores around the ham shack, and what radio club doesn't have characters similar to those portrayed on the famous field day covers? Gil was an avid radio amateur, and a member of *Who's who in American ART*. This book is a tribute to W1CJD, and we are sure that you will have as much fun reading and viewing Gil's work as we did in assembling the material. Approximately 110 pages, copyright 1986 #0364 $5 plus postage and handling.*

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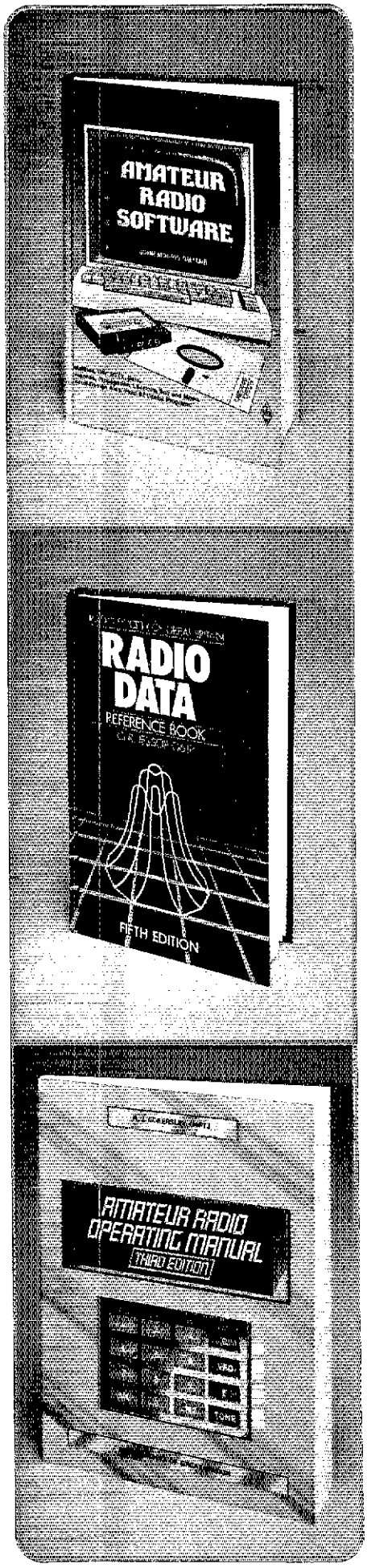

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AMATEUR RADIO SOFTWARE by John Morris, GM4ANB. Designed to be a sourcebook for the radio amateur program. Contains 86 programs written in BASIC and 6 in assembly language. The introductory chapter describes the differences between various versions 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 meteorological 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.

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. The latest edition just off the press. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. Third Edition. Copyright 1985, 204 pages. Softbound $10.00

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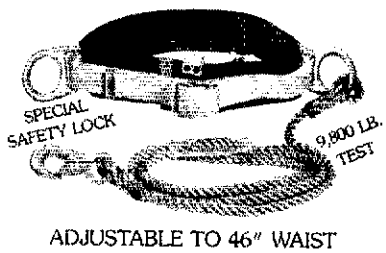

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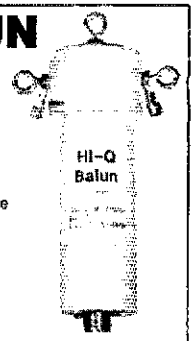

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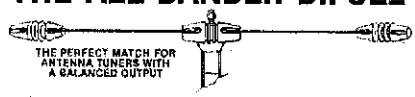

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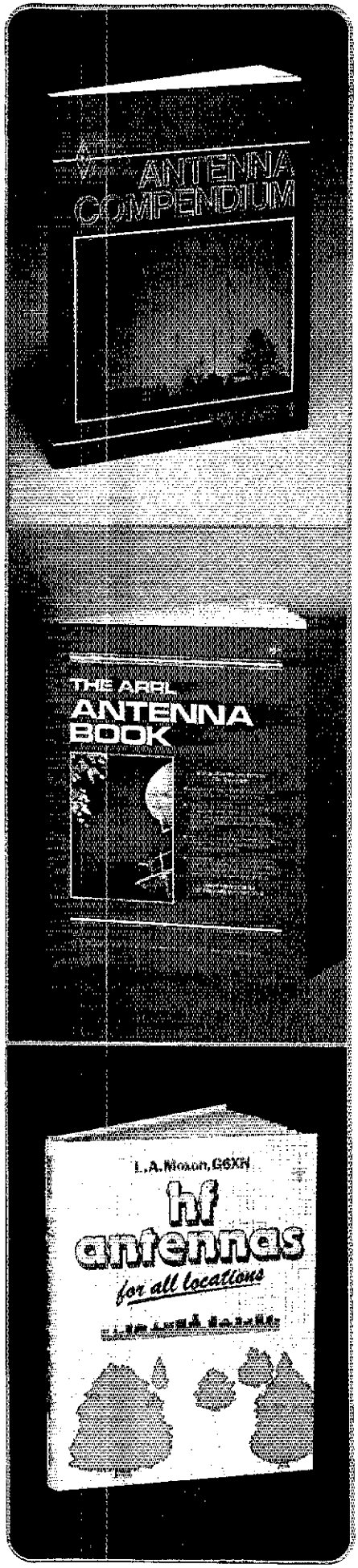

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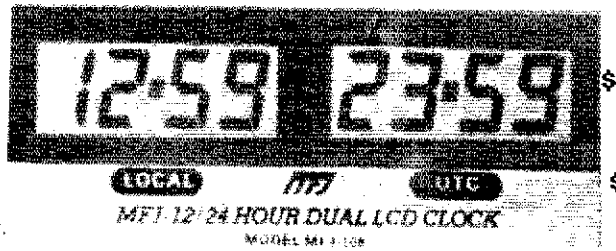

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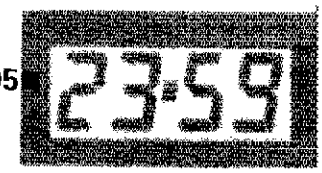

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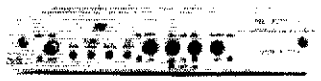

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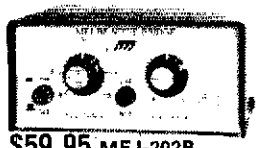

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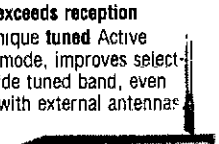

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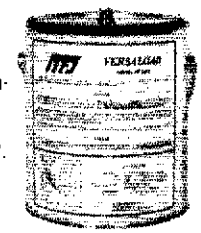

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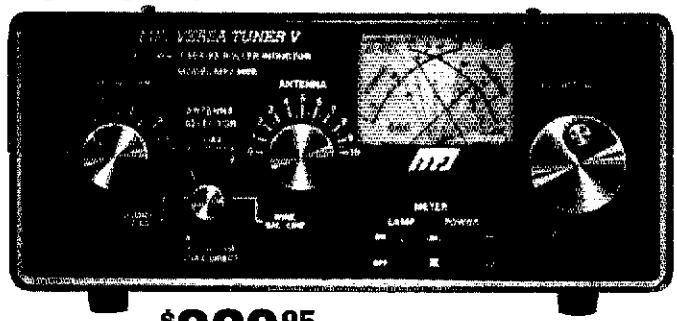
Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.



MFJ989B **$329.95**

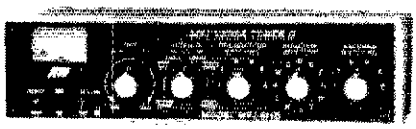
Lighted Cross-needle Meter reads SWR, forward and reflected power all in one glance. Has 300 and 3,000 watt ranges. Meter light requires 12 VDC.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**



MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 1.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962B **$229.95**

Run up to 1.5 kw 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 300 and 3,000 watt ranges. 6 position antenna switch handles 2 coax lines, wire and balanced lines. 4:1 balun. 250 pf, 6 kv variable capacitors. 12 position ceramic inductor switch. New smaller size matches new rigs: 10¾ × 4½ × 14⅞ inches. Flip stand for easy viewing. Requires 12V for light.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

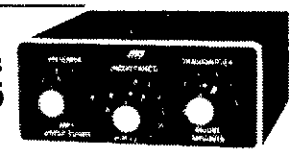
MFJ-1702. $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ-1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

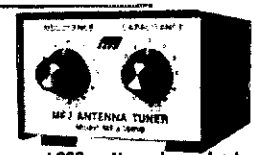
MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

MFJ's Random Wire TUNER

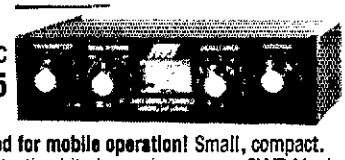
MFJ-16010 **$39.95**



MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. **No need to go outside and readjust your mobile whip.** Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for $5.00.

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Unlike machine specific TNC's you never have to worry about your 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 and an appropriate 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 widespred use.

You can also use the MFJ-1270 as an excellent but inexpensive digipeater. You can use 12 VDC for portable operation or 110 VAC for fixed station operation.

It features AX.25 Level 2 Version 2 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

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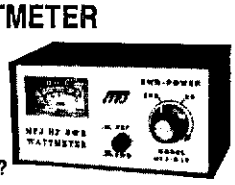
The MFJ-484B is RF proof, sends 8-50 WPM and measures just 8x2x6 inches. It uses 12 to 15 VDC or 110 VAC with MFJ-1312, $9.95.

HF SWR/WATTMETER

MFJ-816
$29.95



Want minimum SWR to maximize your antenna performance?

The MFJ-816 is our smallest -4½x2¼x3 inches-(and most affordable) SWR/Wattmeter that lets you read SWR, forward and reflected power (30/300 watt scales) from 1.8 to 30 MHz. Uses toroidal current pickup for uniform sensitivity.

CROSS-NEEDLE SWR/WATT METER

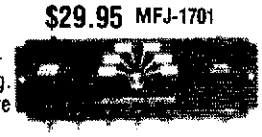
MFJ-815 $59.95

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. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702
$19.95

$29.95 MFJ-1701



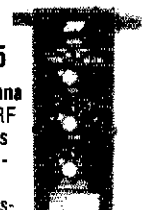
Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE

MFJ-206 $79.95



This new breakthru 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.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

MFJ's Best VERSA TUNER

MFJ-949C
$149.95

MFJ's best 300 watt tuner is now even better!

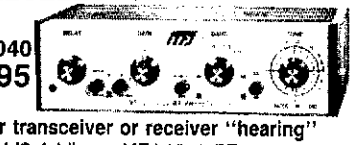
The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

RF PRESELECTOR

MFJ-1040
$99.95



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Continuing a 66 year tradition, there are three new Callbooks for 1987.

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The 1987 Callbook Supplement is a new idea in Callbook updates; it lists the activity in both the North American and International Callbooks. Published June 1, 1987, this Supplement will include all the new licenses, address changes, and call sign changes for the preceding 6 months.

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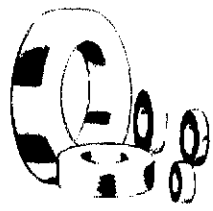

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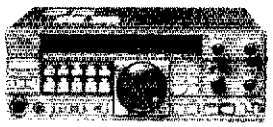

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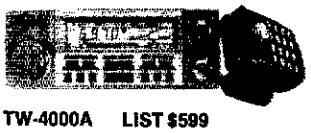

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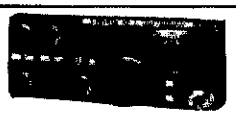

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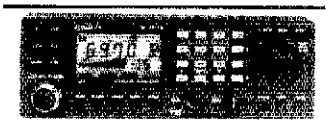

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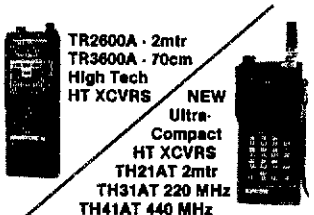

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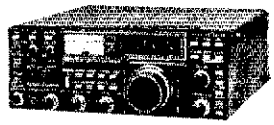

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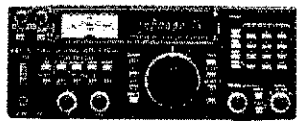

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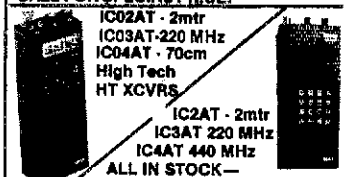

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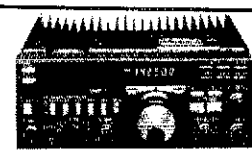

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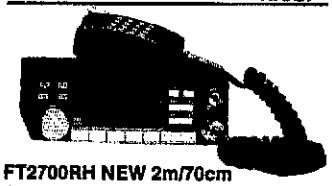

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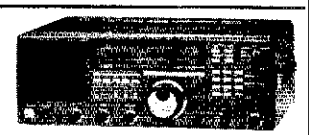

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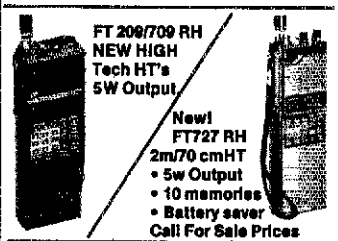

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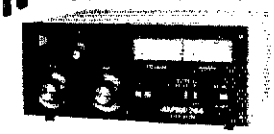

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BLEEDER RESISTORS: 200K Ohm, 50 Watt. 2/$11 or 3/$15. Shipped prepaid. Gary Paladino, 906 Hester Drive, Harrison AR 72601.

ROSS'S NEW SPECIALS (November only): Bird 4304 $249.90. ICOM IC- 735 $849.90, IC-701 $589.90, IC-120 $449.90, IC-751A $1379.90, Kenwood TS-940S w/AT $1,???.??, TR-9500 $529.90, TR-8400A $389.90, VFO-120 $139.90. Yaesu FT-270RH $339.90, FT-757GX $778.90, FRG-7700 $379.90, FT-727R $399.90, FT-767GX $1599.90, Over 7500 ham-related items, all major lines. Phine or send SASE for personal price quote. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays and Mondays. Ross Distributing Company, 78 South State, Preston ID 83263. 208-852-0830.

TOWER BUILDERS: For Sale: Victor oxy-acetylene welding torch outfit. Includes hoses, regulators, several welding tips of varying size and cutting tip. Like-new condition. $250 Contact Bruce Hale at ARRL Hq or call 666-1541 ext 279 8AM-4PM Eastern Time.

AZDEN PCS-2000 2M xcvr $189, Yaesu FT-101EX $529. Both mint. CD-33 Rotor, Good Cond. $50. N2EAB, 914-968-2729

KENWOOD TS 520, Digital Freq. Display, CW Filter, VFO520 external VFO, Desk Mike. $450. N3CKH, 716-442-4318

WANTED DRAKE MS-4 in mint condition. Also wanted FL-6000 and FL-500 filters for my R-4C. Gordon Moss, 1221 Formosa Ave., Los Angeles, CA 90046

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KENWOOD TS-520 with CW Filter $325, Hammarlund HQ-170 $70 works good, Heath DX-60B $55 works good. KA5ZCW, 3216 Greenwood Drive, Norman, OK 73072 405-360-2398

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HEATH SB-650 Frequency Display; Cushcraft A3 elements, both with manuals, VGC, $80 each. WB2WPM.

FOR SALE: Kenwood 2 meter TR7400 with built in scanner $160. Drake TR22C 2 meter mobile/port. with linear amp $160. Wilson 2-meter H/H with case and charger, immaculate $140. Complete Collins S line 75S3 receiver, 32S1 transmitter & power supply $300. Nick Swan, WB8ERN, 4839 Beaune Rd., Ludington, MI 49431, 616-843-2162

CONTRIBUTE USED GEAR to the ham clubs of ORT, an IRS approved nonprofit organization. Contact Mike Neidick, K2ENN, 145 E15 St. Apt 6A, NYC 10003 212-777-1332

WANTED: COMPLETE station or estate sale. Highest price paid and fast. Call or write: John Korona, 1117 Dewitt Terrace, Linden, NJ 07036 201-486-0039

WANTED: MINT Ten-Tec 405 amp., AC4 SWR, AC5 Tuner. NC0N, 219 South 35th, Parsons, KS 67357

FOR SALE: HW101 and HP23C, Excellent $230. HQ-145A Excellent $95. All $300. Firm. Hartzell, R.D. #2 Mifflinburg, PA 17844

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FOR SALE from the estate of Ted Stern K4YY. 54 Ft. complete Tristao tower, $550. Mosley TA-33 Beam $75. Ham M Rotor $75. HP606A Signal Generator $300. HP608A Signal Generator $300. Drake R4B Rcvr $140. Drake T4XB Txmtr with power supply & MS4 speaker $175. Super Pro 600 $100. E-TEK Freq. Readout $50. (2) Heath/HD-15/Patch $20 ea. CDR/AR22/Rotator with beam $35. (2__ Astatic/D104/Mike $35 ea. Heath/HM15/VSWRMet $20. (2) Central Elec/20A/SSBEx100 $35. Central Elec/458A/VFO $20. Clegg/FM27B/2M-FM $60. RadShak/DX-160 Recvr $50. Call or Write: H. Stern, 5360 NE 15th Ave., Ft. Lauderdale, FL 33334 phone 305-776-6819

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YAESU 101EE - mint condition $395. WB5OCL 703-498-0194 after 6 PM

WANTED: HEATHKIT power supply UT-1 or MP-1 for Cheyenne transmitter (MT-1). Also, green cabinet for SB-610/620/630. Kantronics interface for HAMSOFT. FOR SALE: 23 plate blocks (4 stamps per block * uncancelled) of US postage stamp issue #1260 (5c) "Amateur Radio". 75c each plus sase. Bendix (2M Railroad Radio) manual for 1R Series. $10 Danny Ruth KA3AQV, 2621 27th St SW, Allentown, PA 18103-7209.

SELL: HEATHKIT Umatic Memory Keyer; power cube, factory tuned. $75. N7AG, 2805 NE 35PL, Portland, OR 97212 503-287-5002.

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FOR SALE: CW/RTTY system, TI99/4A with MFJ 1224 Interface and Kantronics Hamsoft software. All cables, manuals and power supplies, $150: Robot 70A SSTV monitor, $50: Heathkit keyer HD10, $10: Electronic Research Corp. SL55 Audio Filter, $25: Write KB4SA 201 Suburban Drive, Kennesaw, GA 30144

MOTOROLA HT-200 2M FM 2 channel 2 antennas $75. Heath HW-121 mint condition/pwr supply CW crystal $225. Dan, KA9CAQ, P.O. Box 6349 Evansville, IN 47712

WANTED: MINT Ten-Tec 405 Amp. NCON 316-421-8468. 219 South 35th, Parsons, KS 67357

SALE: HEATH HW101, PS, CW and SSB Filters, $225, Win, WB2FJL, 126 Belmont Ave., N. Plainfield, NJ 07060, 201-757-2527.

SWAP: HW-100, custom matching ext. VFO, HP23A, for 220 MHz Synthesized Rig; Breda, c/o Jacklin Seed, Post Falls, ID 83854- 9499

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WANTED: 8877, new or used. Sell: YG455CN $65. Schaaf, 1-414-434- 2938.

FOR SALE: Heath HW-5400 solid state SSB/CW transceiver with all options, PS-5400 Power Supply, and HM-2140A SWR/Wattmeter. professionally assembled and aligned - mint condition $650. Mike Trager, Box 157, Port Jefferson, NY 11777 516-473-7337

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SELL: 2mter KW, pair 4CX250BS W/PS, $300; Yeasu FT301D, FP301D, CW Filter, $400; 7/8' foam hardline, 140',$150; 5000VCT, 2kW Transformer, $40; 160/80/40m Sloper, $25: All negotiable, AA4FQ 502-729-4454.

KENWOOD TS-520S mint, manual, original carton $350. Firm. K3LBM, Phila., PA 19149. 215-743-5685

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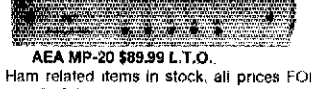

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KENWOOD 7950, 50W. Mobile 21 Memories. Excellent Condition. Original Carton, Manuals, ETC. will ship $195. T. Jones, 37 Orenda Springs, Saratoga Springs, NY 12866.

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DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Swan and all others. Six 1/2' digits. 5'wide by 1 1/4' metal cabinet. Send $1 for information. Receive a $25 discount. Includes comparisons of the simple "BCD" readouts found in new radios and our "Calculating Frequency Counter" readouts. Please be specific. Grand Systems, POB 337, Blaine, WA 98230

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SLEP MAIL-ORDER SPECIALS, Marconi TF-1066B/6 Signal generator 10MHz thru 470MHz, both AM/FM, plus deviation, crystal calibrated RF output, ideal for AM/FM, VHF/UHF, Stereo/TV repairs $550. Military OS-8C/U small portable 3' Oscilloscope, ideal for bench work or modulation/RTTY testing $59.50, HP606A Signal generator 50 kHz thru 65 MHz $375, military TS-403/U microwave signal generator 1.8 GHz thru 4.2 GHz $285, HP608C signal generator 10 MHz thru 480 MHz $345, all lab calibrated, satisfaction guaranteed, have quantity, Visa, M/C or Check, add shipping, phone Bill Slep 704-524-7519, Slep Electronics Highway 441, Otto, NC 28763

WANTED SKY BUDDY, Howard 430 also SkyRider receivers QST's and Handbooks in the 1900's Harvey Wells transmitters Hallicrafters HT6 Sell Johnson Viking II and VFO $150 Apache $100. K4UJZ Russ Olmsted, 608 West Thompson Lane, Murfreesboro, TN 37130, 615- 893-5344

SELL: KENWOOD TS-430S transceiver w/MC-425. %500 negotiable, KA8GGK, Sue, 1414 Woodland Dr., Durham, NC 27701. 919-286-5679 (w)919-682-9057(h)

SOFTWARE for the C-64. RF and DC formulas plus Beam Headings, Noon Meridian and Tower Stress Calc, Free data, RF Kit Co., Box 27127, Seattle, WA 98125

PRINTED CIRCUIT BOARDS -Low Quotes, High Quality, Quick Service. Single, Double sided, Multilayered Boards. Prototypes through Production Quantities. Design/Layout Capabilities. Board Assembly/Turnkey Facilities. Call or write for quotes and info. - TORCCC, 1131 Tower, Schaumburg, IL 60195, 312-490-1374

54 FT. ROHN HD crankup tower, Drake MN-2000 2 kW tuner Dick, WA9JFL, 1111 Parkview Rd., Galesburg, IL 61401, 309-344-2265

JOBS FOR HAMS

EXPERIENCED TOWER ERECTORS/climbers needed to install/maintain towers and antennas. You must relocate to the East Coast, but travel extensively. Military background in this field welcome. Contact: Ron Sowinski, ND9D, 22 Church Street, Mercersburg, PA 17236. 717-328-3947.

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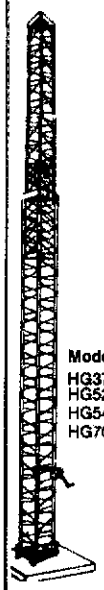
Index of Advertisers

ANTENNA/TOWER SALE!



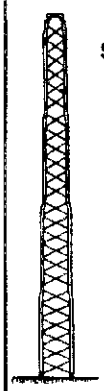
hy-gain
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



ROHN
Self Supporting Towers On SALE!
FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	226	$329
HBX48	48 ft	10 sq ft	303	$429
HBX56	56 ft	10 sq ft	385	$499
HDBX40	40 ft	18 sq ft	281	$399
HDBX48	48 ft	18 sq ft	363	$489

*Your Total Delivered Price Anywhere In Continental 48 States. Antenna Load Based on 70 MPH Wind.

ROHN
Guyed Tower Packages

- World Famous Rohn Quality and Dependability
- Rugged high wind survival-provides safe installation
- Multi purpose towers satisfy a wide range of needs
- Complete packages include: guy hardware, turnbuckles, guy assemblies, w/torq bars, concrete base, rotor plate and top section per manufacturers specs.

Packages shown below are rated for wind zone "B" (86 mph wind). Zone "C" (100 mph wind) design prices slightly higher. All tower packages shipped freight collect from our Plano, TX warehouse, in stock for prompt delivery.

	Model 25G	Model 45G	Model 55G
50'	$ 579	1079	1439
60'	639	1209	1609
70'	689	1329	1759
80'	849	1479	1929
90'	919	1749	2089
100'	989	1899	2259
110'	1189	2019	2639
120'	1259	2179	2819

US TOWER CORPORATION

These rugged crankup towers and masts now available from Texas Towers!

Check these features:
- All steel construction
- Hot dipped galvanized
- Totally self-supporting
- No guys needed

Coax arms, Thrustbearings Masts, Motor drives, Remote controls, Hinged bases, Rotor bases, & Raising fixtures also in stock.

CALL FOR SALE PRICES!

Model	Min. Ht.	Max. Ht.	Ant. load*	Sale price
MA40 mast	21'	40'	10 sq ft	$ 649
MA50 mast	22'	50'	10 sq ft	899
TX438	22'	38'	18 sq ft	829
TX456	22'	56'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2058
HDX566	22'	58'	30 sq ft	1878
HDX572	23'	72'	30 sq ft	3229

Note - US Towers Shipped Freight Collect From Visalia, CA Factory

**Note-towers rated at 50 mph to EIA specifications*

RG-213U
$.29/ft $279/1000 ft
Up to 600 ft via UPS
- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X
$.19/ft $179/1000 ft
- RG8X—95% Bare Copper Shield • Low Loss
- Non-contaminating Vinyl Jacket Foam Dielectric

9086
$.39/ft $379/1000 ft
- Same specs as Belden 9913
- Lower loss than RG8U
- 100% shielded-braid & foil

HARDLINE/HELIAX™
Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket	$.79/ft
½" LDF4-50 Andrew Heliax™	$1.79/ft
⅞" LDF5-50 Andrew Heliax™	$3.99/ft

select connectors below

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
9086	50	.4	64	1.7	3.1
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$25	$25	$25	$25
⅞" Heliax™	$49	$49	$49	$49

COAX CONNECTORS

Amphenol Silver PL259	$1.25
UG21B N Male	$2.95
9086/9913 N Male Connector	$4.95

ANTENNA WIRE & ACCESSORIES

Stranded Copper 14ga.	$.10/ft
16ga.	$.09/ft
¼ mile 18ga copper-clad steel wire	$30
Dog bone end insulator	$.79 ea.

Van Gordon

1:1 Balun	$11	Center Insulator	$6
Dipole Kits		D80 $31.95/D40	$28.95
Short Dipole Kits		SD80 $35.95/SD40	$33.95
All-band Dipole w/ladder line			$29.95
G5RV all band antenna			$49.95

ALPHA DELTA
DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander	$229
A4 4-el Tribander Beam	$299
A743 & A744, 30/40 mtr KIT for the A3 & A4 ea	$79
R3 20, 15, 10mtr Vertical	$275
AV5 80-10mtr Vertical	$109
D40 40mtr Dipole	$159
40-2CD 2-el 40 mtr Beam	$299
A50-5 5-el 6 mtr Beam	$85
215 WB NEW 15-el 2 mtr Beam	$85
230 WB NEW 30-el 2 mtr Beam	$229
4218 XL 18-el 2 mtr Beam	$105
3219 19-el 2 mtr Beam	$99
220B 17-el 220MHz Beam	$99
424B 24-el 432MHz Beam	$85
ARX2B 2 mtr Vertical	$39

hy-gain
Limited Quantities purchased at old prices. Call for current prices

CALL FOR SPECIAL PRICES!

- Discoverer 2-el 40-mtr Beam
- Discoverer 3-el Conversion Kit
- EXPLORER-14 SUPER-SPECIAL
- QK710 30/40 mtr. Add-On-Kit
- V2S 2-mtr Base Vertical
- V4S 440MHz Base Vertical
- TH5MK2S Broad Band 5-el Triband Beam
- TH7DXS 7-el Triband Beam
- TH3JRS 3-el Triband Beam
- 205BAS 5-el 20-mtr Beam
- 155BAS 5-el 15-mtr Beam
- 105BAS 5-el 10-mtr Beam
- 204BAS 4-el 20-mtr Beam
- 64BS 4-el 6-mtr Beam
- 12 AVQ 20-10 mtr vertical
- 14 AVQ 40-10 mtr vertical
- 18 AVT/WB 80-10mtr Vertical
- 18HTS 80-10 mtr Hy-Tower Vertical
- 23BS 3-el 2 mtr Beam
- 25BS 5-el 2 mtr Beam
- 28BS 8-el 2 mtr Beam
- 214BS 14-el 2-mtr Beam
- 2BDQ 80/40 mtr Trap Dipole
- 5BDQ 80-10 mtr Trap Dipole
- BN86 80-10 mtr KW Balun W/Coax Seal

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

HF6V 80-10m Vertical $129 Delivered
- Full Legal Power
- Q Tuning Circuits

HF2V 80-40m Vertical $129 Delivered
- Full Legal Power
- Automatic Band Switching

Accessories:

RMK II Roof Mtg. Kit	$49
STR II Stub-Tuned Radials	$29
TBR160 160m Coil Kit	$49
30m Add-on Kit	$29
20m Add-on Kit	$29
17/12m Add-on Kit	$27

HF6V HF2V

FREE UPS on ACCESSORIES when purchased w/antenna

HF4B "Butterfly" 20-10m Compact Beam $189. Delivered
- Unique Design Reduces Size
- No Lossy Traps
- Turns w/TV Rotor

MIRAGE/KLM

KT34A 4-el Broad Band Triband Beam	$399.95
KT34XA 6-el Broad Band Triband Beam	$589.95
2m-14C 14-el 2-mtr Satellite Antenna	$139.95
2m-16LBX NEW 16-el 2-mtr Beam	$169.95
2m-22C NEW 22-el 2-mtr Satellite Antenna	$179.95
432-30LBX NEW 30-el 432 MHz Antenna	$139.95
435-18C 435 MHz Satellite Antenna W/CS-2	$179.95
435-40CX 435 MHz Satellite Antenna W/CS-2	$209.95

ROTORS

Alliance HD73 (10.7 sq ft rating)	$119.95
Alliance U110 (3 sq ft rating)	$49
Telex CD 45II (8.5 sq ft rating)	$Call
Telex HAM 4 (15 sq ft rating)	$Call
Telex Tailtwister (20 sq ft rating)	$Call
Telex HDR300 Heavy Duty (25 sq ft rating)	$Call
Kenpro KR500 Heavy Duty Elevator Rotator	$189
Kenpro KR5400 AZ/EL Rotor Package	$319

ROTOR CABLE

Standard 8 cond cables $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

ROHN GUYED TOWER SECTIONS
10 FT. STACKED SECTIONS

20G	$39.50	45G	$112.50
25G	$49.50	55G	$149.50

ALL ACCESSORIES IN STOCK—CALL

ROHN FOLDOVER TOWERS

Model	Height	Ant. Load*	Price
FK2548	48 ft.	15.4 sq. ft.	$ 899.
FK2558	58 ft.	13.3 sq. ft.	$ 949.
FK2568	68 ft.	11.7 sq. ft.	$ 999.
FK4544	44 ft.	34.8 sq. ft.	$1199.
FK4554	54 ft.	29.1 sq. ft.	$1299.
FK4564	64 ft.	28.4 sq. ft.	$1399.

25G Double Guy Kit	$249.
45G Double Guy Kit	$269.

*Above antenna loads for 70 mph winds w/guys at hinge and apex. All foldover towers shipped freight prepaid in 48 states. Prices 10% higher west of Rockies.

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$.15/ft
1/4 EHS Guywire (6650 lb rating)	$.18/ft
5/16 EHS Guywire (11,200 lb rating)	$.28/ft
5/32 7 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2 × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$8.95
9902LD Cable End (for 6700 cable)	$9.95
Socketfast Potting Compound (does 6-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$69	$89
18 in Wall	$39	$69	$99	$129
25 in Wall	$69	$129	$189	$249

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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

TM2570 "ALL NEW"

- First 70 Watt FM Mobile
- First With Memory & Auto Dialer
- 23 Channel Memory
- Front Panel Programmable CTCSS

KENWOOD

TR2600 "SPECIAL"

- 2.5 W/300 MW 2 Meter HT
- LCD Readout
- 10 Memories
- Band And Memory Scan

TH-21AT "THE Smallest HT"

- Compact Pocket Size
- 1 Watt
- Optional 500mA Battery

YAESU

FT-757GX "CAT SYSTEM"

- All Mode Transceiver
- Dual VFO's
- Full Break-in CW
- 100% Duty Cycle

CALL FOR BEST PRICE!

YAESU

FT-767GX HF/VHF/UHF BASE STATION

- Add Optional 6m, 2m & 70cm Modules
- Dual VFO's
- Full CW Break-in
- Lots More Features

YAESU

FT23/73R

- Zinc-Aluminum Alloy Case
- 10 Memories
- 140-164 MHz, 440-450 MHz
- 600 MAh Standard Opt. 5w New "super handie"

YAESU

FT-727R "DUAL BAND HT"

- 5 Watts on Both 2m & 440 MHz
- 10 Memories
- Battery Saver
- Remote Computer Control Capability

ICOM

IC-735 "NEW"

Can you put a price tag on reliability? Now ICOM offers a ONE YEAR WARRANTY on its HF Transceivers & Receivers purchased after August 1, 1986.

ICOM

IC-751A "NEW"

- 100 KHz - 30 MHz
- FM Standard
- 32 Memories
- QSK (Nominal Speed 40 WPM)

ICOM

ICZ-38A

- Full 25W, 5W low
- 21 memories
- Subtones built in RX 215-230 MHz

CALL FOR BEST PRICE

ICOM

IC-μ2AT

- 140-163 MHz
- 10 Memories
- 1W, 1.5W optional
- 32 tones built-in

IC-03AT

- 220 to 224.995 MHz
- 2.5W, 5W Optional
- Built in subtone
- 10 Memories

Kantronics

KPC-2400

"ALL THE FEATURES OF KPC-2 PLUS 2400 BAUD"

- Easy Direct Interface to PC Compatibles or the VIC/C-64 Series
- AX .25 Version 2 Software
- Supports multiple connects
- Has both the KPC-2 modem for 300 Baud HF and 1200 Baud VHF work, and a new phase shift keying (PSK) modem for 2400 baud operation.

MFJ 1270

- TTI serial port
- Latest AX.25 version 2.0 software
- True Data Carrier detect for HF
- 16K Ram

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

ANTENNA SALE

HY-GAIN . . . ON SALE	KENPRO . KR400 $139.00
HUSTLER 25% off mobile	. . . . . . KR500 $179.00
CUSHCRAFT	. . . . . . KR5400 $299.00
KLM	ALINCO . . . AAZ-7 $89.00
BUTTERNUT	COLUMBIA CABLE
. . . . HF6V $118.00	. . . . RG-8X .15/ft.
. . . . HF2V $110.00	RG-8 Superflex .28/ft.
AEA . . . . . . 144 SR $42.00	. . . . . . 9913 Type .39/ft.
AVANTI . . . 151.3G $35.00	. . . . Rotor Cable .18/ft.
QUATRON	H.D. Rotor Cable .31/ft.
	1/4W mm $13.95

CALL FOR BEST PRICES

AEA

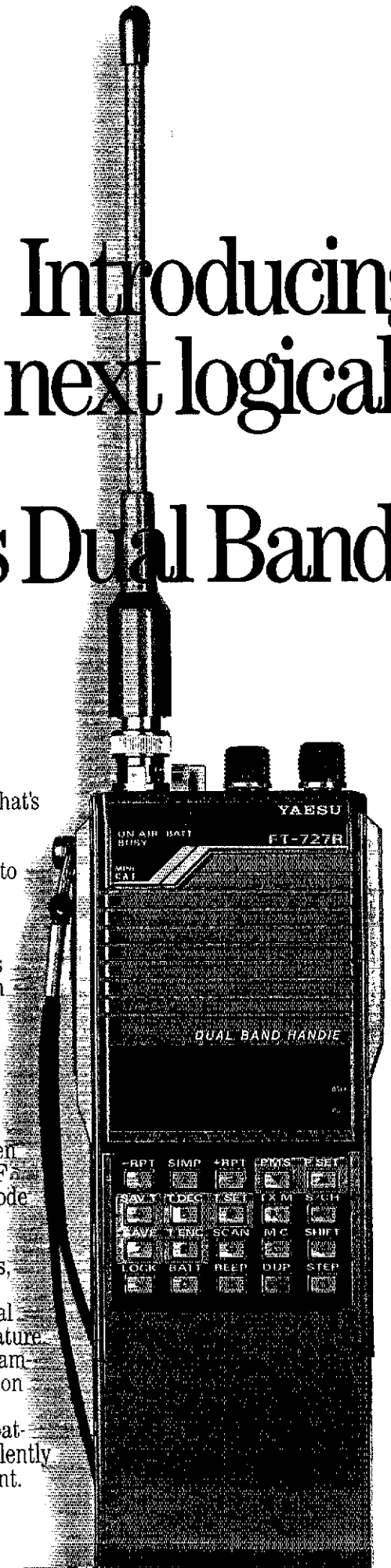
PK 232

- Make any RS-232 compatible computer or terminal a complete digital operating position.
- Morse, Baudot, ASCII, AMTOR, Packet
- Loaded with features.

• MOST ORDERS SHIPPED SAME DAY •

Introducing the next logical step.

Yaesu's Dual Band Handie.



Two affordable radios in one—that's exciting.

Yaesu's dual-band FT-727R packs our best HT know-how into one compact design. At a price that's in step with your ham budget.

Hit hard-to-reach repeaters with a powerful 5 watts on both 2 meters and 440 MHz.

Work the bands quickly and easily with a wealth of microprocessor-controlled commands:

Jump between the separate VHF and UHF VFO registers. Ten memories store any VHF or UHF frequency, and tone encode/decode information. (Four memories retain repeater shift data).

Scan the memory channels, the entire band, or a band segment. And return to any special frequency with the priority feature.

Use link repeaters by programming TX on one band and RX on another.

Conserve power with the battery saver. It lets you monitor silently while drawing negligible current.

And measure your battery level with the digital battery voltmeter. There's even a "Low Battery" LED.

Finally, your operation is rounded out with features like VOX capability. A one-touch repeater reverse switch. An LCD readout with illumination lamp. A high/low power switch. Remote computer control capability. An optional CTCSS module. And Yaesu's full line of optional accessories.

So step up your operating capability now with the logical choice in HT operation.

Yaesu's dual-band FT-727R.

YAESU

Our 30th Anniversary.

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Parts: (213) 404-4847

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(513) 874-3100

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KENWOOD

...pacesetter in Amateur radio

NEW!

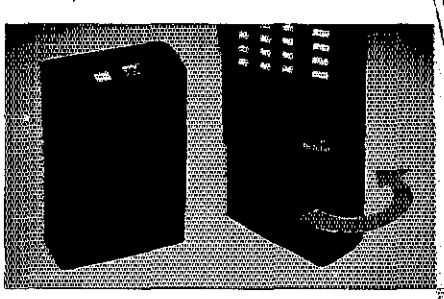
Ultimate Affordable HT!

TH-205AT

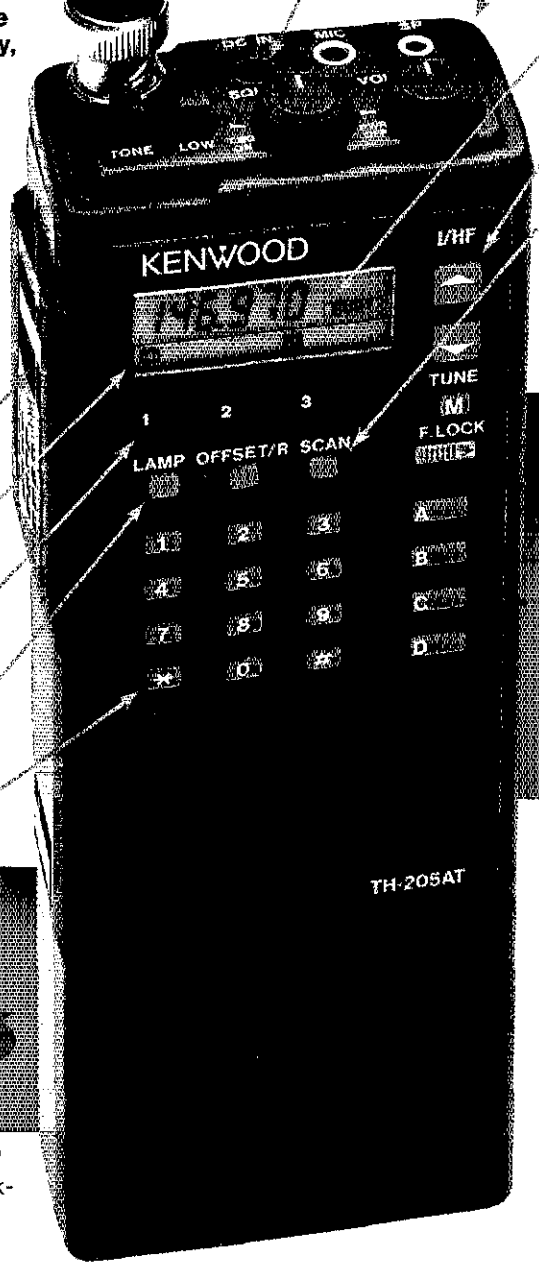
Affordable 5-watt hand-held transceiver. Ultimate Affordability!

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!

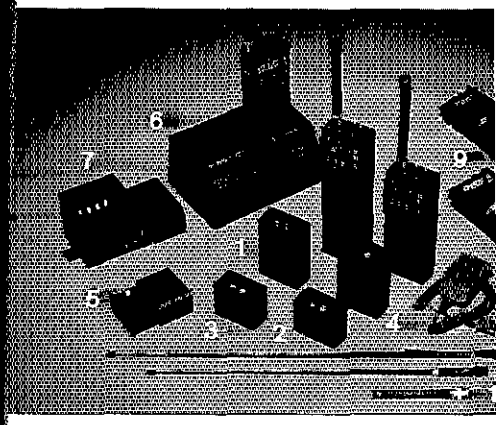
- Monitor switch—to check frequency when PL encode/decode switch is on.
- Extended frequency coverage for certain MARS and CAP operations.
- 3 memory channels store frequency and offset. And so easy to use! Simply press the memory channel number to recall your favorite channels!
- Night light, offset/reverse.
- 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. (300 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 key.
- 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 Battery charger for PB-1, 3 or 4. **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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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation