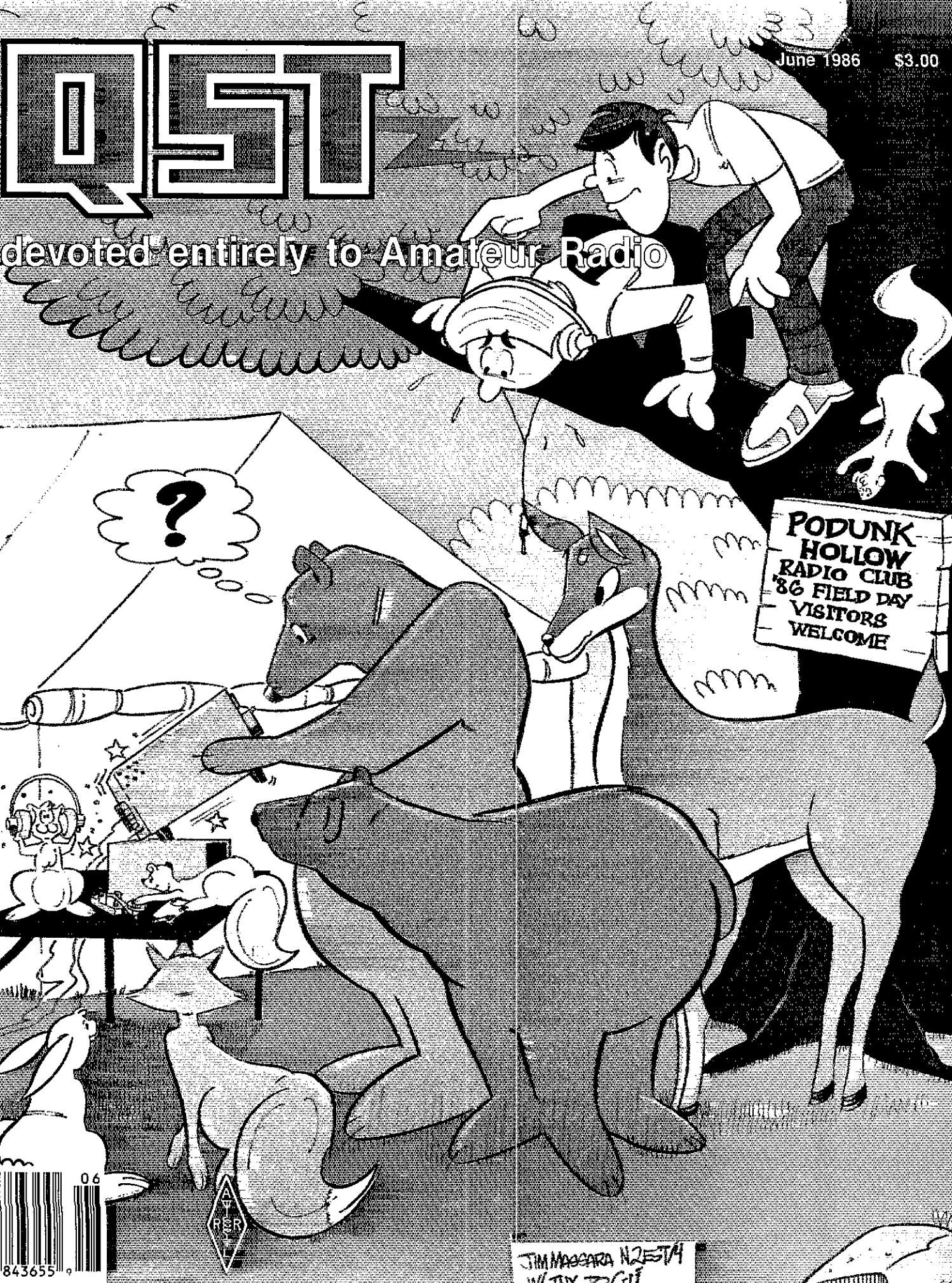
QST

devoted entirely to Amateur Radio

June 1986 $3.00



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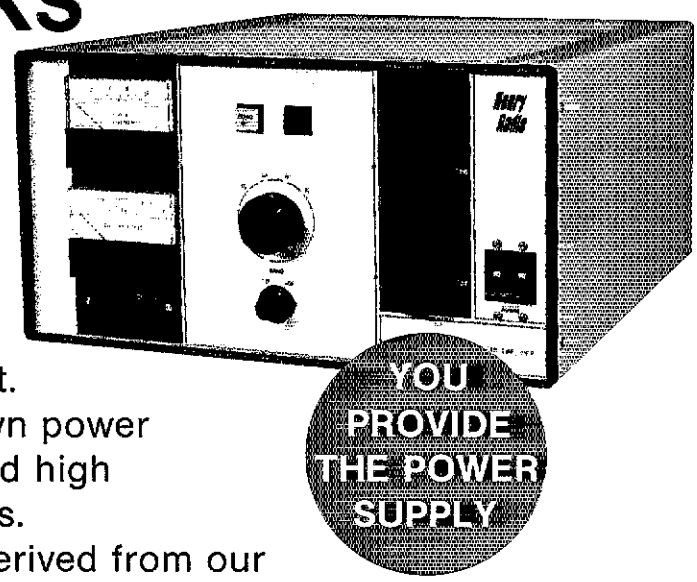
HENRY REPORT #4

NEW!!

...RF DECKS WITHOUT POWER SUPPLY



A long time need has been met.
Thousands of Amateurs own power supply components, but need high quality state-of-the-art RF modules.
Here are six new models derived from our current amplifier line that will fill that need.

- **2K Classic "X" RF - *3.5 to 30 MHz**
- **3K Classic Mk II "X" RF - *3.5 to 30 MHz**
- **2002A RF - 144-148 MHz**
- **2004A RF - 420-440 MHz**
- **3002A RF - 144-148 MHz**
- **3004A RF - 420-440 MHz**

*10 meter band deleted in U.S.

You can now have the bands you need at the price you can afford. We provide the RF deck! You provide the power supply. Let us send you a brochure providing complete technical information.

Of course, all our present model complete amplifiers are still available. This new group of RF modules simply strengthens and expands what was already the best and broadest line of Amateur power amplifiers.

Henry amateur amplifiers are available from Henry Radio and select dealers throughout the U.S. and are being exported to amateurs all over the world. In addition to our broad line of commercial FCC type accepted amplifiers we offer 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 • ROBOT • TEMPO • VIBROPLEX • YAESU

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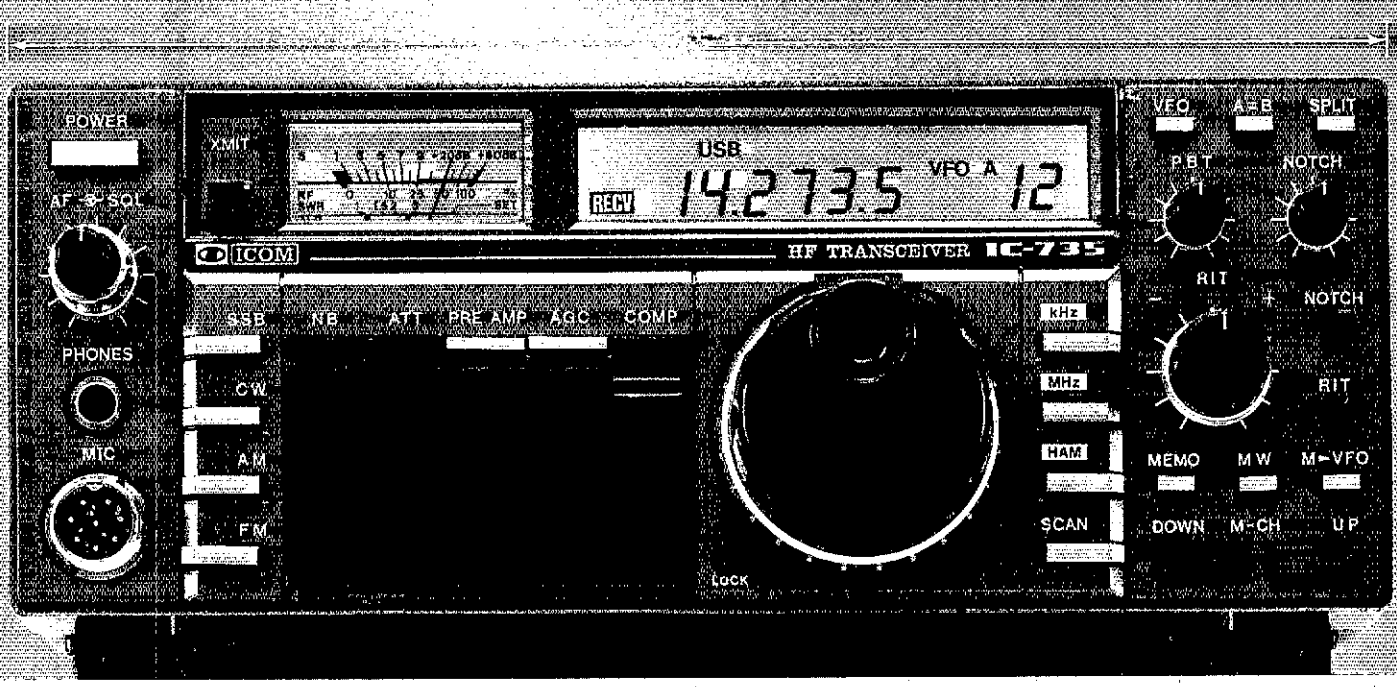
NEW! ICOM HF Transceiver IC-735



Ultra Compact

The new ICOM IC-735 is what you've been asking for...the most compact and advanced full-featured HF transceiver with general coverage receiver on the market. Measuring only 3.7 inches high by 9.5 inches wide by 9 inches deep, the IC-735 is well suited for mobile, marine or base station operation.

Superior Performance

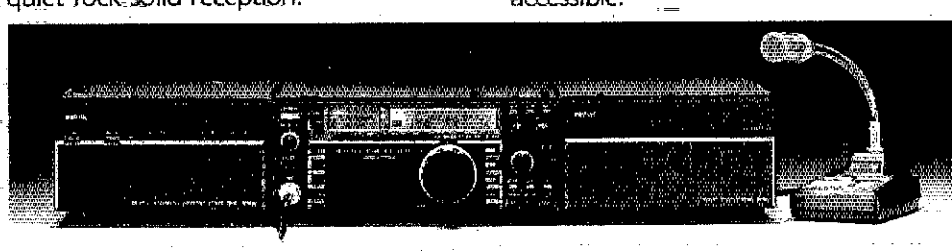
It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet rock-solid reception.

Simplified Front Panel

The large LCD readout and conveniently located controls enable easy operation, even in the mobile environment. Controls which require rare adjustment are placed behind a hatch cover on the front panel of the radio. VOX controls, mic gain and other seldom used controls are kept out of sight, but are immediately accessible.

More Standard Features

Dollar-for-dollar the IC-735 includes more standard features...FM built-in, an HM-12 scanning mic, FM, CW, LSB, USB, AM transmit and receive, 12 tunable memories and lithium memory backup, program scan, memory scan, switchable AGC, automatic SSB selection by band, RF speech processor, 12V operation, continuously adjustable output power up to 100 watts, 100% duty cycle and a deep tunable notch.



Options. A new line of accessories is available, including the AT-150 electronic, automatic antenna tuner and the switching PS-55 power supply. The IC-735 is also compatible with most of ICOM's existing line of HF accessories.

See the IC-735 at your authorized ICOM dealer. For superior performance and innovative features at the right price, look at the ultra compact IC-735.

ICOM

First in Communications

ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

June 1986 Volume LXX Number 6

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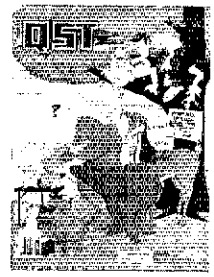

OUR COVER

Some call it lunacy, some call it their favorite operating event. FD '86 is June 28-29 and, as our artist's conception shows, there's fun galore awaiting those who take part. All you need to know about FD appears in May *QST*, pp 40-43 and 79, and in this issue, p 9 (also see p 53). *(cover art by Jim Massara, N2EST/4)*

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TOO GOOD TO BE TRUE?

PAKRATT™ Model PK-64

shown with enhanced
HFM-64 option installed

★ MORSE ★ BAUDOT ★ ASCII ★ AMTOR ★ PACKET ★

FIRST FIVE MODE DATA CONTROLLER

The Pakratt model PK-64 by AEA is the world's first computer interface that offers Morse, Baudot, ASCII, AMTOR *and* Packet all in one box (hardware *and* software included) at a price many competitors charge for Packet alone (from $219.95 Amateur net). Do not let the low price fool you; coming from any other company but AEA it WOULD be too good to be true. The PK-64 works with virtually any voice transceiver. The Pakratt is the easiest of any to hook up and have operating in just a few minutes.

In Packet mode, the PK-64 offers virtually all the features of every other Packet controller on the market, plus many important features left out by others due to cost constraints. For example, we have included a hardware HDLC, true Data Carrier Detect (DCD), multiple connect with up to ten stations simultaneously and full implementation of version 2.0 of the AX.25 protocol.

Because the PK-64 was designed specifically for the Commodore 64 (or C-128 and SX-64) computer, we have been able to do many things not economically feasible with general RS-232 interface controllers. For example, the Pakratt includes true split screen operation with on-screen status indicators and an on-screen tuning indicator.

ENHANCED HFM-64 MODEM OPTION

The standard PK-64 will operate all modes with a phase-lock-loop (PLL) detector roughly equivalent to all popular packet modems in the marketplace (except we have included extra filtering). The enhanced HFM-64 modem option offers true independent dual channel filtering with A.M. detection (like the famous CP-100 Computer Patch™). The enhanced HFM-64 option also offers a hardware LED tuning indicator (like the CP-100) and a front panel variable threshold control for setting maximum sensitivity under various band conditions. We recommend the HFM-64 option for anyone keenly interested in weak-signal heavy-QRM HF operation. For anyone desiring to operate FM RTTY with the standard North American tone pair or CW receive, the HFM-64 is required. The HFM-64 is field installable with no soldering or test equipment required.

WORKS WITH THE POPULAR C-64 COMPUTER

AEA designed the PK-64 around the low-cost C-64 because of the special architecture features making it especially suited to Amateur Radio applications. The C-64 should not be viewed as a mainframe, but rather a very economical accessory to your data communications system. Many owners of expensive computers such as IBM, TANDY, APPLE, KAYPRO, ATARI, etc., are now buying the low cost C-64 and dedicating it to their operating position. They simply cannot find software for their machine that even approaches the power and user friendliness of the PK-64. Plus, think of the convenience of having only one controller and keyboard to go from one mode to another without having to redo cabling!

The PK-64 is so complete that all you need to do is wire up a microphone connector to the end of a cable (provided) and you are ready to go. There is no need to track down special terminal software, cabling or even a power supply. It all comes with the PK-64. So do not be the last on your block to own the most exciting new product in years. See the PK-64 at your favorite dealer or write for our specification sheet now.

Prices And Specifications Subject To Change Without Notice Or Obligation

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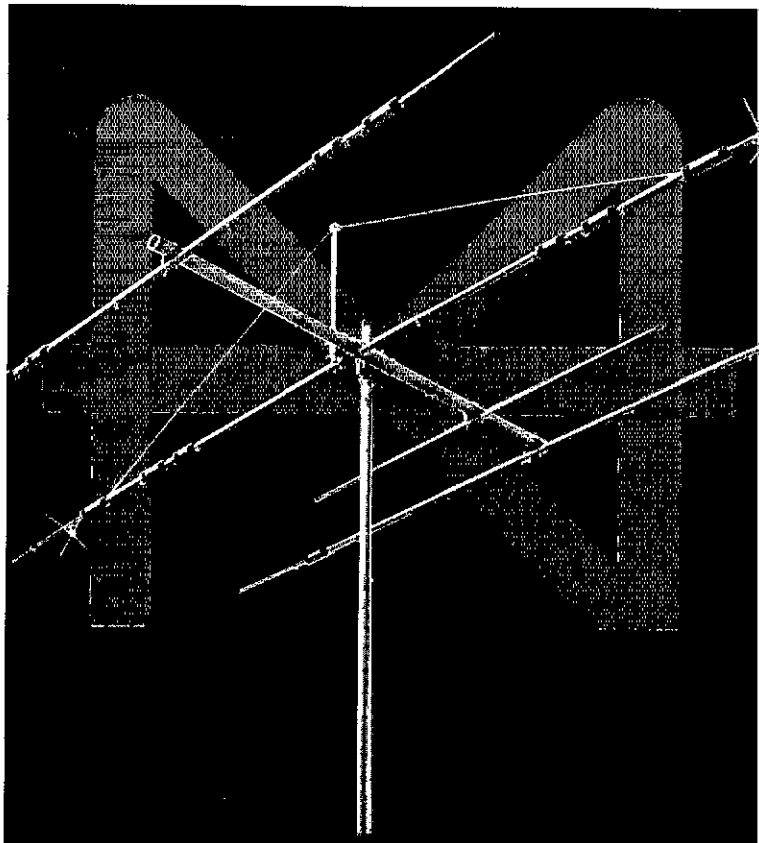


cushcraft
CORPORATION

A4, with wideband performance, easy installation, 4 band operation and moderate price will give you more enjoyment and satisfaction from your hobby. You'll like the 40 meter operating possibilities with the A744 add-on kit.

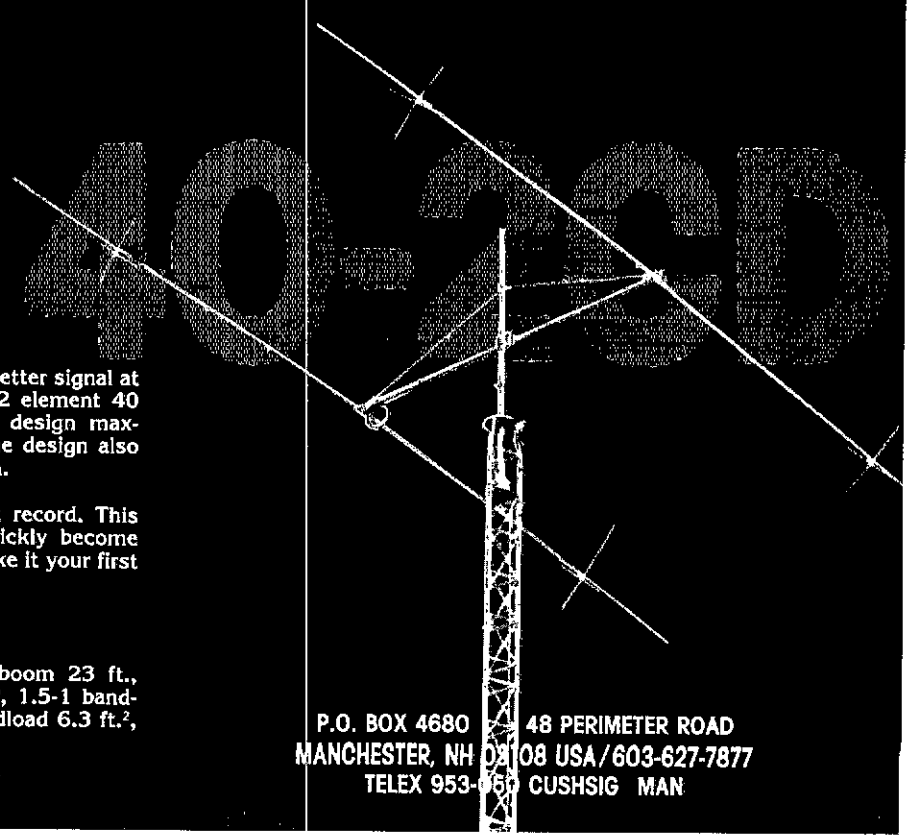
A4 is designed with you in mind because it has fewer parts to assemble, less weight and minimum wind load on your tower. With the 18 ft. boom, A4 gives excellent gain and front-to-back ratio. If your interest is rag chewing, DX-ing or contesting, A4 is the perfect 4 band beam for you.

MODEL A4 10, 15, 20 METERS

MODEL A744 40 METER ADD ON KIT

SPECIFICATIONS SWR 1.2-1 bandwidth 500 + KHz, boom 18 ft., longest element 32 ft., wind area 5.5 ft.², turn radius 18.4 ft., weight 37 lbs. Excellent gain.

MORE CONTACTS, MORE SATISFACTION WITH *CUSHCRAFT BEAMS*



More contacts, less interference and a better signal at the receiving end are yours with this 2 element 40 meter Skywalker Yagi. The computer design maximizes gain and reduces side lobes. The design also gives low SWR with excellent bandwidth.

Holder of the North American contact record. This compact two element antenna has quickly become "the most wanted" 40 meter beam. Make it your first choice.

MODEL 40-2CD 40 METERS

SPECIFICATIONS boom 23 ft., longest element 42 ft., beamwidth 70°, 1.5-1 bandwidth 180 KHz, turn radius 24 ft., windload 6.3 ft.², weight 40.7 lbs. Excellent gain.

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Here Now! 220 MHz

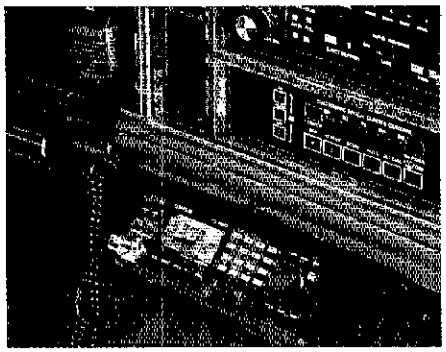
220: Kenwood Style!

TM-3530A

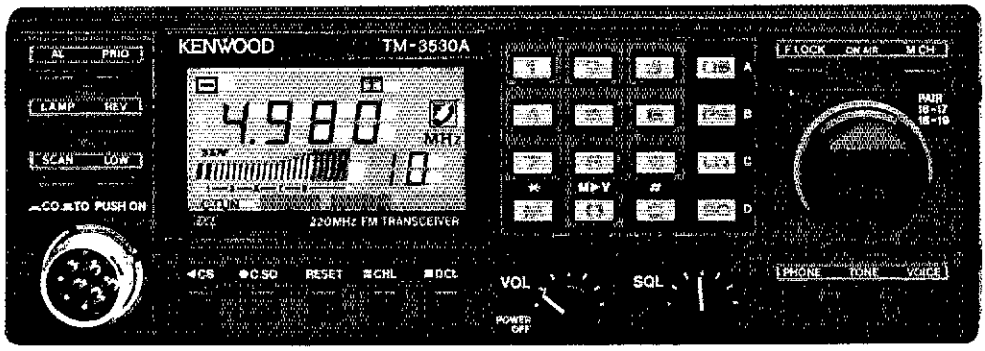
The first comprehensive 220 MHz FM transceiver

TM-3530A—25 watts of 220 MHz FM—Kenwood style! Features include built-in 7-digit telephone number memory, auto dialer, direct frequency entry and big LCD. All this makes the TM-3530A the most sophisticated rig on 220 MHz!

- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 seven-digit telephone numbers)
- Frequency range 220-225 MHz
- Automatic repeater offset selection—**a Kenwood exclusive!**
- Direct keyboard entry of frequency
- 23-channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Optional front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz**
- Frequency lock switch
- Digital Channel Link (DCL) option
- **Unique** offset microphone connector—relieves stress on microphone cord



- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- **New** 5-way adjustable mounting system
- High performance GaAs FET front end receiver
- HI/LOW power switch (adjustable LOW power)



TM-3530A optional accessories:

- **PS-430** DC power supply
- **TU-7** 38-tone CTCSS encoder
- **MU-1** DCL modem unit
- **VS-1** voice synthesizer
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MB-10** extra mobile bracket
- **CD-10** call sign display
- **MC-60A/MC-80/MC-85** desk mics.
- **MC-48** extra DTMF mic. with UP/DOWN switch
- **MC-42S** UP/DOWN mic.
- **MC-55** (8 pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200B** SWR/power meter
- **SW-100** compact SWR/power meter

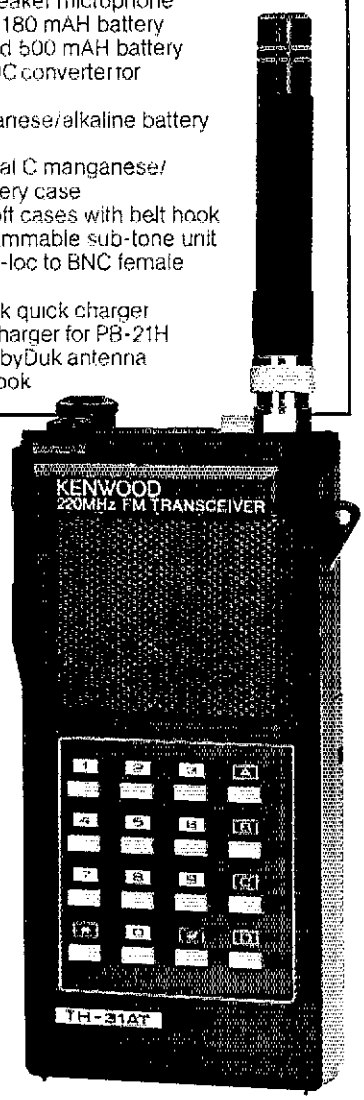
TH-31AT/31A

Kenwood's advanced technology brings you a new standard in pocket/handheld transceivers!

- 1 watt high, 150 mW low
- Super compact and lightweight (about 8 oz. with PB-21!)
- Frequency range 220-224.995 MHz in 5-kHz steps
- Repeater offset:—1.6 MHz, reverse, simplex
- **Supplied accessories:** rubber flex antenna, earphone, wall charger, 180 mAH NiCd battery and wrist strap
- Quick change, locking battery case
- Rugged, high-impact case

TH-31AT/31A optional accessories:

- **HMC-1** headset with VOX
- **SMC-30** speaker microphone
- **PB-21** NiCd 180 mAH battery
- **PB-21H** NiCd 500 mAH battery
- **DC-21** DC-DC converter for mobile use
- **BT-2** manganese/alkaline battery case
- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases with belt hook
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
- **BC-6** 2-pack quick charger
- **BC-2** wall charger for PB-21H
- **RA-9A** StubbyDuk antenna
- **BH-3** belt hook



TH-31AT with DTMF pad shown. Optional RA-9A attached.

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Specifications and prices are subject to change without notice or obligation.

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Just arrived!

All-Mode Mobility!

TR-751A

Compact 2-m all mode transceiver

It's the "New Sound" on the 2 meter band—Kenwood's TR-751A! Automatic mode selection, versatile scanning functions, illuminated multi-function LCD and status lights all contribute to the rig's ease-of-operation. All this and more in a compact package for VHF stations on-the-go!

- Automatic mode selection, plus LSB

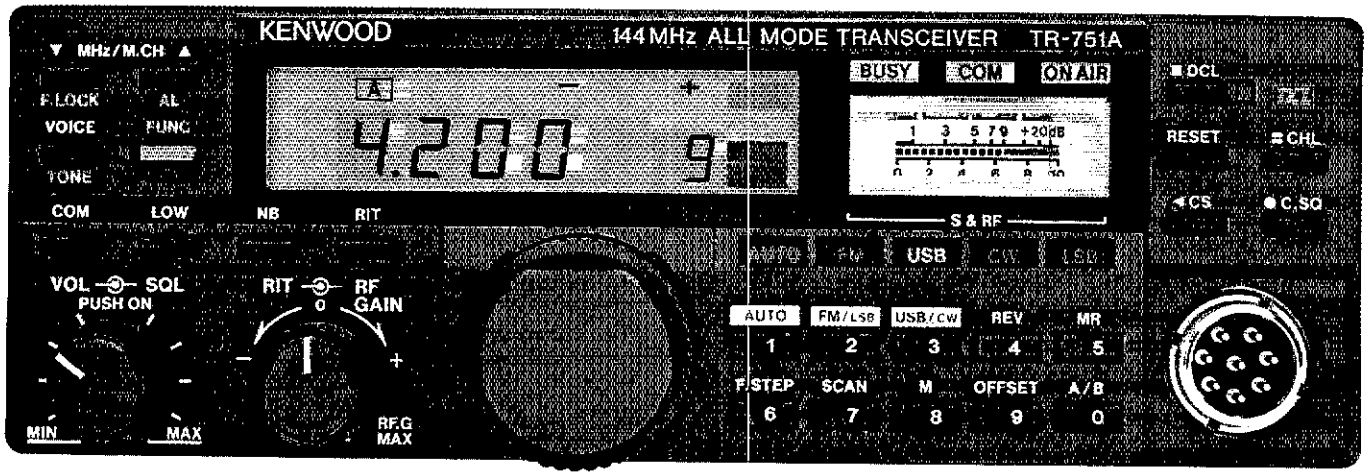
144.0 144.1 144.5 145.8 146.0 148.0 MHz

CW	USB	FM	USB	FM

- Optional front panel-selectable 38-tone CTCSS encoder
- Frequency range 142-149 MHz (modifiable to cover 141-151 MHz)
- High performance receiver with GaAs FET front end
- VS-1 voice synthesizer option
- 25 watts high/5 watts adjustable low
- Programmable scanning—memory, band, or mode scan with "COM" channel and priority alert
- 10 memory channels for frequency, mode, CTCSS tone, offset. Two channels for odd splits.
- All mode squelch, noise blanker, and RIT
- Easy-to-read analog S & RF meter
- Dual digital VFOs
- Semi break-in CW with side tone
- MC-48 16-key DTMF hand microphone included
- Frequency lock, offset, reverse switches
- Digital Channel Link (DCL) option

Optional accessories:

- **CD-10** call sign display
- **PS-430, PS-30** DC power supplies
- **SW-100A/B** SWR/power meter
- **SW-200A/B** SWR/power meter
- **SWT-1** 2-m antenna tuner
- **TU-7** 38-tone CTCSS encoder
- **MU-1** modem unit for DCL system
- **VS-1** voice synthesizer
- **MB-10** extra mobile mount
- **SP-40, SP-50** mobile speakers
- **PG-2K** extra DC cable
- **PG-3A** DC line noise filter
- **MC-60A, MC-80, MC-85** deluxe base station mics.
- **MC-42S** UP/DOWN mic.
- **MC-55** (8-pin) mobile mic.

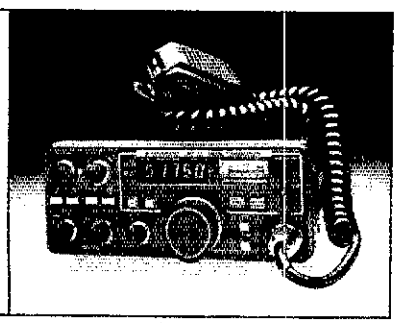


Actual size front panel

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz, in steps of 100-Hz, 1-kHz, 5-kHz, 25-kHz or 1-MHz.
- CW-FM Hi—10 W, Low—1 W. SSB 10 W.
- Automatic band/memory scan. Search of selected 10-kHz segments on SSB/CW.
- 6 memory channels.



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

*Executive Committee Member

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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 J0H 1Y0 (514-798-2173)
Saskatchewan — W. C. "Bill" Munday, VE5WM, 132 Shannon Rd, Regina S4S 5B1 (306-586-4963)

Atlantic Division

Delaware — Harold K. Low, WA3WIY, Rte 6, Box 66, Millsboro 19966 (302-945-2871)
Eastern Pennsylvania — James B. Post, KA3A, 15 Monarch Rd, Wilkes-Barre 18702 (717-825-3940)
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)
Western Pennsylvania — Otto Schuler, K3SMB, 3732 Colby St, Pittsburgh 15214 (412-231-6890)

Central Division

Illinois — David E. Lattan, WD9EBQ, RR 1, Box 234, Makanda 62958 (618-529-1578)
Indiana — Bruce Woodward, W9UMH, 6208 Bramshaw Rd, Indianapolis 46220 (317-251-5606)
Wisconsin — Richard R. Regent, K9GDF, 5003 South 26th St, Milwaukee 53221 (414-282-0312)

Dakota Division

Minnesota — George E. Frederickson, KCØT, RR #2—Box 352, South Haven 55382 (612-558-6312)
North Dakota — Mike Mankey, WBØTEE, 518 E. Columbia Dr, Bismarck 58501 (701-258-5114)
South Dakota — Roland Cory, WØYMB, 1010 7th St, W, Mobridge 57601 (605-845-2400)

Delta Division

Arkansas — Joel M. Harrison, Sr., WB5IGF, Star Rte 3—Box 306, Judsonia 72081 (501-729-3301)
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)
Tennessee — John C. Brown, NO4Q, PO Box 37, Eva 38333 (901-584-7531)

Great Lakes Division

Kentucky — Dale Bennett, WA4JTE, 320 Loy St, Columbia 42728 (502-384-2639)
Michigan — James R. Seeley, WB8MTD, 21615-29½ Mile Rd, Springport 49284 (517-857-2013)
Ohio — Jeffrey A. Maass, K8ND, 9256 Concord Rd, Powell 43065 (614-873-3234)

Hudson Division

Eastern New York — Paul S. Vydareny, WB2VUK, 259 N Washington, North Tarrytown 10591 (914-631-7424
NYC-Long Island — John H. Smale, K2IZ, 315 Kensington Ct, Copiague 11726 (516-226-4835)
Northern New Jersey — Robert R. Anderson, K2BJG, 69 Page Dr, Oakland 07436 (201-337-9644)

Midwest Division

Iowa — Rollin J. Sievers, WBØAVW, Rte 3-Box 62, Storm Lake 50588
Kansas — Robert M. Summers, KØBXF, 3045 North 72nd, Kansas City 66109 (913-299-1128)
Missouri — Benton C. Smith, KØPCK, 3301 Sinclair, Rte 3, Box 196-A, Columbia 65203 (314-443-5168)
Nebraska — Vern J. Wirka, WBØGQM, 3106 Vinton, Omaha 68105 (402-341-4572)

New England Division

Connecticut — Robert Koczur, K1WGO, 84 Whetstone Rd, Harwinton 06791 (203-485-0338)
Eastern Massachusetts — Luck Hurder, KY1T, PO Box LL, North Eastham 02651 (617-255-2029)
Maine — Clevis O. Laverty, W1RWG, 17 Fair St, Norway 04268 (207-743-2353)
New Hampshire — William Burden, WB1BRE, 11 Briand, Nashua 03063 (603-882-0021)
Rhode Island — John Vota, WB1FDY, 41 Brookside Ave, Centerdale 02911 (401-231-1934)
Vermont — Ralph T. Stetson, III, KD1R, PO Box 123, Milton 05468 (802-893-4856)
Western Massachusetts — R. Donald Haney, KA1T, RD 1—Box 237, Myrick La, Harvard 01451 (617-772-4126)

Northwestern Division

Alaska — James L. Moody, Jr., NL7C, PO Box 102841, Anchorage 99510 (907-694-4077)
Idaho — Lemuel H. Allen, W7JMH, 1800 S. Atlantic St, Boise 83705 (208-343-9153)
Montana — L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
Oregon — William R. Shrader, W7QMU, 2042 Jasmine Ave, Medford 97501 (503-773-8624)
Washington — Gene E. Sprague, KD7G, 10716 23rd Dr SE, Everett, WA 98204 (206-337-3459)

Pacific Division

East Bay — Bob Vallio, W6RGG, 18655 Sheffield Rd, Castro Valley, CA 94546 (415-537-6704)
Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — Army Curtis, AH6P, PO Box 4271, Hilo, HI 96720 (808-959-8985)
Sacramento Valley — Robert H. Watson, W6IEW, 10994 Clinton Bar Rd, Pine Grove, CA 95665 (209-223-01
San Francisco — Robert Odell Smith, NA6T, 320 Park St—PO Box 1425, Fort Bragg, CA 95437 (707-964-4931)
San Joaquin Valley — Charles P. McConnell, W6DPD, 1658 W Mesa Ave, Fresno, CA 93711 (209-431-2038)
Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

Roanoke Division

North Carolina — Rae Everhart, K4SWN, PO Box 41, Lexington 27293-0041 (704-249-8734)
South Carolina — James G. Walker, WD4HLZ, Rte 1, Box 5395, Marion 29571 (803-423-3645)
Virginia — Claude E. Feigley, W3ATQ, 135 The Main—RR #1, Williamsburg 23185 (804-253-0658
West Virginia — Karl S. Thompson, K8KT, 5303 Pioneer Dr, Charleston 25312 (304-776-4352)

Rocky Mountain Division

Colorado — William "Bill" Sheffield, KQ0J, 1444 Roslyn St, Denver 80220 (303-355-2488)
New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-458
Utah — James R. Brown, NA7G, 865 Manchester Rd, Kaysville 84037 (801-544-0056)
Wyoming — Richard G. Wunder, WA7WFC, Box 2807, Cheyenne 82003 (307-634-7385)

Southeastern Division

Alabama — Joseph E. Smith, Jr., WA4RNP, 1211 13th St, N, Bessemer 35020 (205-424-4866)
Georgia — Edmund J. Kosobucki, K4JNL, 5525 Perry Ave, Columbus 31909 (404-322-2856)
Northern Florida — Phillip O'Dwyer, WF4X, 543 Mooney Rd, NE, Fort Walton Beach 32548 (904-862-2353
Southern Florida — Richard D. Hill, WA4PFK, 3800 SW 11th St, Ft. Lauderdale 33312 (305-583-6932)
West Indies — Alberto L. Valldejuli, WP4CSG, V-11 19 St, Berwind Estates, Rio Piedras, PR 00924

Southwestern Division

Arizona — James E. Swafford, W7FF, 5906 W Miramar Dr, Tucson 85715 (602-298-7793)
Los Angeles — Eugene R. "Bob" Poole, AJ6F, 2059 Reynosa Dr, Torrance, CA 90501 (213-326-2801
Orange — Joe H. Brown, W6UBQ, 5444 La Sierra, Riverside, CA 92505 (714-687-8394)
San Diego — Arthur R. Smith, W6INI, 4515 Melisa Way, San Diego, CA 92117 (619-273-1120)
Santa Barbara — Byron W. Looney, K6FI, 6540 Buckley Dr, Cambria, CA 93428 (805-927-8733)

West Gulf Division

Northern Texas — Phil Clements, K5PC, 1313 Applegate La, Lewisville 75067 (214-221-2222)
Oklahoma — Dave Cox, NB5N, 1812 S Umbrella Ct, Broken Arrow 74012 (918-250-2285)
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.

All 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
(user name: ARRL)

"It Seems to Us . . ."

FIELD DAY!

Breathes there a ham with soul so dead,
Who never to himself hath said,
This is the year I go on FIELD DAY!
—with apologies to Sir Walter Scott

One of the great strengths we enjoy as radio amateurs is the tremendous diversity of interests and activities that are encompassed by our "radiocommunication service of self-training, intercommunication, and technical investigation." Even within a single local club, you'll find members engaged in a wide variety of radio-related pursuits. Mostly, all we ask of one another is that we stay out of each other's hair, and that we all pitch in when an issue comes up that affects us all: antenna ordinance problems, threats to our allocations, extraordinary situations (like the judicial error plaguing Jack Ravenscroft, VE3SR, that you'll read about later in this issue), and so on.

Occasionally there are opportunities to combine our talents. Traffic handlers have joined forces with packeteers to solve the problem of traffic-system overloads during natural disasters; repeater mavens and OSCAR buffs have gotten together to give VHF FM operators a taste of satellite communication through "gateways" connected to the local FM machine. Others crop up from time to time, often without warning.

But there's one event that's *guaranteed* to make use of *everyone's* abilities. It's been a fixture on the Amateur Radio calendar since 1933. It draws tens of thousands of participants every year. It's the reason you'll never see a hamfest scheduled on the fourth weekend of June. It's Field Day, and if you've never been a part of one you can't begin to imagine what you've missed!

What is Field Day? Ask a hundred hams, and you'll get at least as many answers. For some, it's a contest where everyone starts from scratch in building a temporary station, and the guys with the big antennas at home don't have a built-in advantage. For others, it's a time to get together with kindred spirits for a low-key radio campout. For still others it's the climax of the club's social year, where the guy who can't *look* at a radio without causing it to blow a fuse can be the "Most Valuable Ham" because he knows how to fix pancakes and eggs on a camp stove for Sunday breakfast.

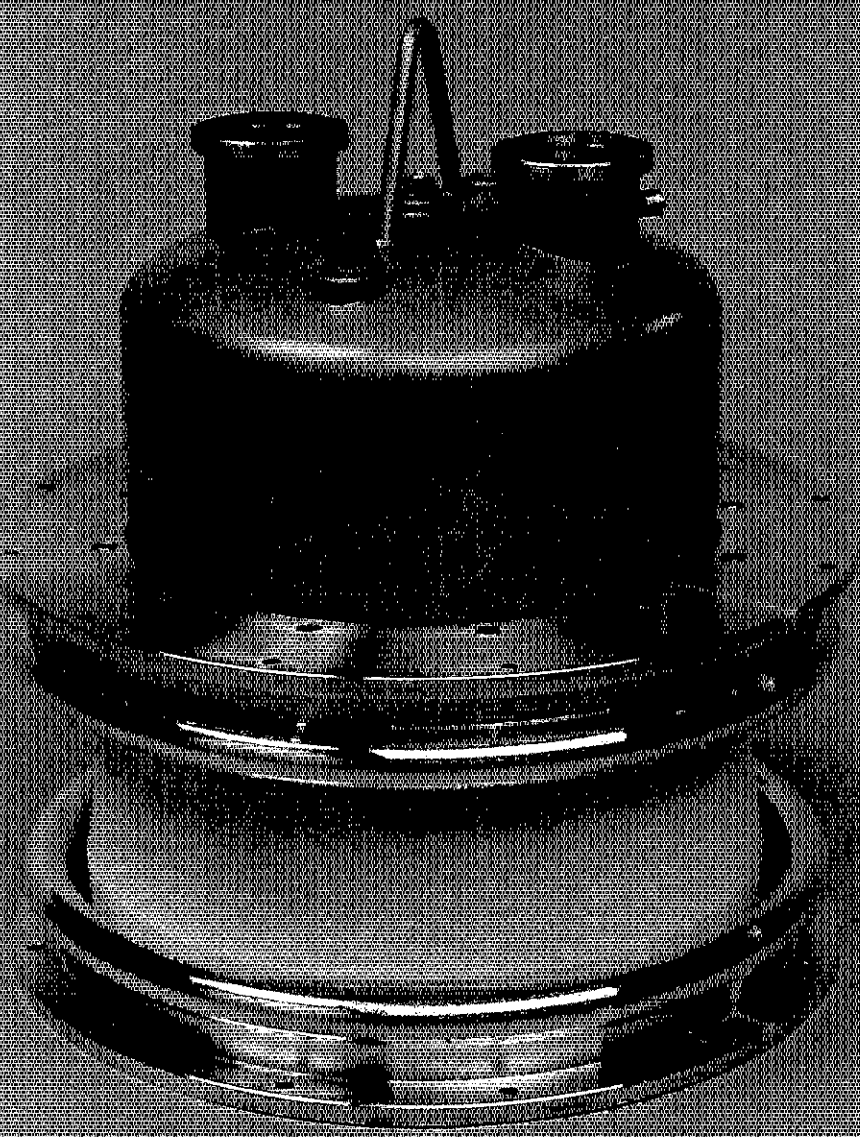
Field Day may be where you finally learn how to solder a PL-259 the right way, where you see packet-radio or satellite communications for the first time, or where your experimental solar panels earn the club enough bonus points to nose ahead of the competition in the next county. It may be where you get soaked to the skin when the first cloudburst of the summer hits while you're taking down the tent, or where you discover that VHF is good for more than line-of-sight distances. It may be where you make your first QSO as a Novice, under the watchful eye of your "Elmer," or where you first see someone operating CW who is actually having fun doing it!

On Field Day, everyone can contribute. The antenna expert can tailor some skywires to suit your particular site, and in the process perhaps take some of the black magic out of the aerial art for the rest of the group. The master of mechanical devices can keep the generator running—without which the radios wouldn't even make good boat anchors. The old-timer who says he's "just" a ragchewer can entice a lot of contacts out of the woodwork with a well-known voice and friendly manner.

If Field Day is the year's best opportunity for us to share our talents and experience with one another, it is equally a way to give the general public an inkling of why the radio mystique has so captured our imaginations. Remember those reporters who called for news from Mexico City, or who covered your attempts to contact the Space Shuttle? Call them up, and invite them out! Your site may not lend itself to public inspection, but if it does, take advantage of it—and if not, at least a few friends and family might enjoy something to do on a sunny summer day.

Whether you approach Field Day as a cutthroat competition or as a friendly outing, advance preparations will be the key to enjoyment. Last month's *QST* carried not only the Field Day rules, but a fine article by KØUAA as well, in which Mike shares the secrets of his own club's FD success. While June 28-29 isn't far away, there's still time to put together a memorable effort.

Gremlins come uninvited to even the best-prepared Field Day outing. May all yours be little ones!—*David Sumner, K1ZZ*



1.5 Megawatts at 50 MHz—And More! Delivered by EIMAC's 8973 Power Tetrode

The versatile super-power 8973 tetrode is designed for tough on-the-job results under difficult circumstances. For CW or long-pulse service in plasma heating and accelerator applications this rugged Varian EIMAC power tube fills your needs. Look at these demanding applications where the 8973 is operating *today*:

User	Application	Frequency (MHz)	Power Output	Pulse Length
JET	ICH*	25–50	1.5 MW	20 seconds
JT-60	ICH*	110–130	750 kW	7 seconds
JFT-2M	ICH*	10–40	1.5 MW	300 milliseconds
KFA-Textor	ICH*	24–50	1.5 MW	3 seconds

*ICH = Ion cyclotron heating

It takes a sturdy, reliable power tube to have on-the-job results like these and the 8973's doing it day after day.

And this is just the beginning! The X-2242, available early in 1988, will provide 2.5 megawatts at 30 MHz and 1.3 megawatts at 130 MHz. All of this, plus 1.4 megawatts anode dissipation rating. The X-2242 is the same size as the 8973. That's a lot of power in a small package!

For a data sheet and technical literature on the 8973, contact Varian EIMAC, 301 Industrial Way, San Carlos, CA 94070 or call (415) 592-1221. TWX 910-376-4983.

Eimac®

UP FRONT in QST

Brrrr! To celebrate this past New Year's Eve, Jeff Damm, WA7MLH, and some friends dug out this cave on the south side of Mount Hood, about 50 miles east of Portland, Oregon, and set up an amateur station. During the operation, he used a homebrewed 35-watt, 75-meter SSB rig powered by two sets of D-cell NiCds and a dipole erected in the trees above the snow cave. Jeff's greatest problem was feeding the frozen-stiff coax through a hole in the roof of the cave. His most memorable DX contact? ZL2BT.

VE3SR Ruling: A Major Setback; Jack Will Appeal Decision

"A flagrant miscarriage of justice" sums up initial amateur response to the court's decision in the Jack Ravenscroft, VE3SR, interference case. Ruling in favor of a neighbor who sued Jack for damages arising from alleged interference to their home-entertainment equipment, the judge ordered Jack to permanently cease transmitting radio signals from his property and to pay damages and court costs. The encouraging news is that Jack has decided to appeal the decision. More on this landmark case on page 66.

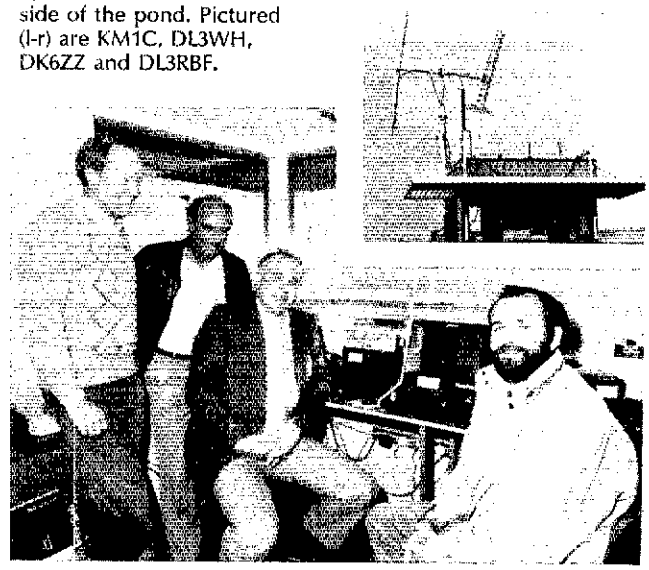
FCC Revisits Emergency-Communication Issue

A year ago, in a proposal designed to more clearly spell out the parameters for retransmitting Amateur Radio signals, the FCC changed the definition of amateur emergency communication. In response to an ARRL petition, the FCC has reinstated its original definition of emergency communications, effective May 4, 1986. See this month's Happenings for details.

Want a Two-Way with W1AW?

Because of the many hours devoted to code practice and bulletins, W1AW is not available for casual QSOs during the evening. However, there is usually a 30-minute "window" between 11:30 PM EDT and midnight when W1AW is available for contacts. A number of ARRL HQ nightowls are operating the station nearly every weekday during this half hour. Look for W1AW on 7040 kHz.

On a recent trip to West Germany to receive flight training from Lufthansa Airlines, Bill Pedersen, KM1C, had the good fortune to meet a fellow ham, DK6ZZ, a former Lufthansa captain and current president of the Lufthansa ARC. He also got a tour of the club's station, DLØDLH, at the Frankfurt am Main airport. In addition to working SSB and CW on HF, club members enjoy AMTOR and OSCAR satellite operation. Bill was so impressed with the club's AMTOR setup that he set up his own and anxiously looks forward to his first AMTOR QSO with DK6ZZ from this side of the pond. Pictured (l-r) are KM1C, DL3WH, DK6ZZ and DL3RBF.



A good location, a captive audience and a willingness to devote some time and effort are the main ingredients of a successful Amateur Radio demonstration. Members of the Council of Eastern Massachusetts Amateur Radio Clubs had all these and more when they sponsored an exhibit on the main floor of the Museum of Science in Boston the weekend of April 26-27. Some 8000 people had the opportunity to view Amateur Radio close-up and to participate in hands-on demonstrations at the exhibit, which covered all modes of radio communication, including packet radio and OSCAR. Here, members of the Council erect antennas on the Museum roof during a dry run about a month before the exhibit. *(KA1DTU photo)*

If you're a traffic handler, chances are you've handled some traffic originating from WD4IIO, the Clover Leaf ARC, in Brooksville, Florida. Over the past nine years, station members have passed thousands of messages to family and friends on behalf of the more than 2000 retirees living at the Clover Leaf Farms and Clover Leaf Forest communities. Founded in 1977, WD4IIO is 25 members strong and an ARRL Special Service Club. Pictured (l-r) are trustee and founder W4ILE on 2 meters, W4LYT on RTTY, WD4FNX on CW, Club President WD4FOB and VE3HVQ on packet radio. *(KB4JNB photo)*

DXers: Know Thy Contact

DXers who are interested in knowing more about the people and places behind their QSOs might want to check out the new *Britannica Atlas*. A good source of facts and figures from around the world, this publication has an added attraction: ARRL members can save $15 off the regular price. Check out the ad on page 122, this issue.

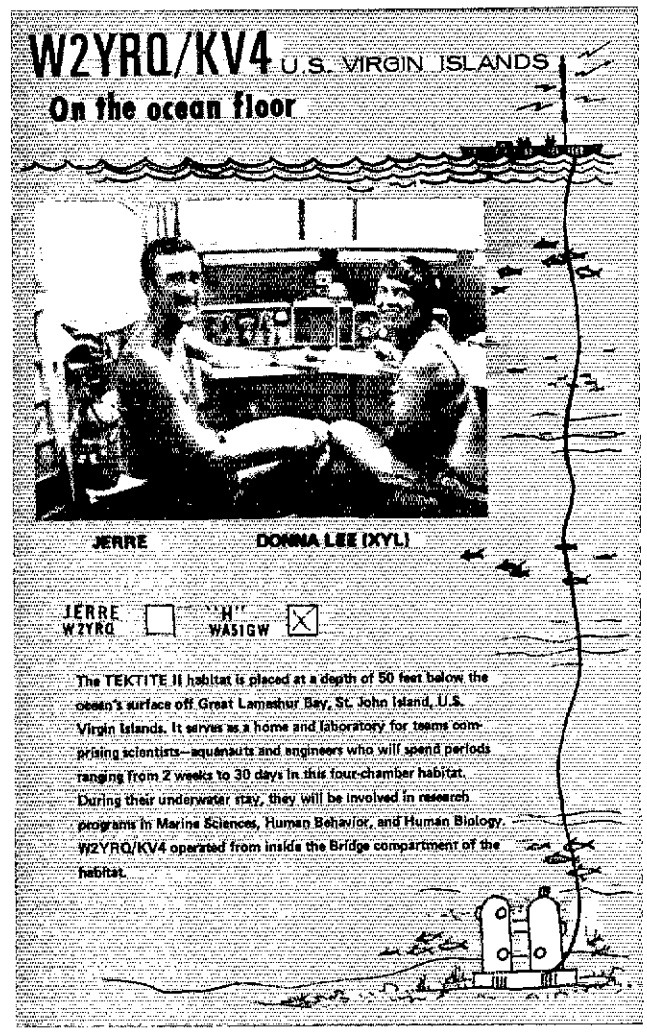
ICOM America, Inc has kindly donated a set of new HF/VHF/UHF multimode transceivers for use at the Hiram Percy Maxim Memorial Station, W1AW. ICOM Marketing Manager Evelyn Garrison, KA7LPK (shown here), visited ARRL HQ to personally make the presentation. Of special interest to ARRL Executive Vice President Dave Sumner, K1ZZ, is this IC-1271A for 23-cm satellite and terrestrial work. W1AW is open evenings seven days a week as well as during normal HQ business hours, so if you're going to be in the Hartford area, why not plan to visit the station and HQ.

Amateur Radio at EXPO '86

Among the many things the more than 13 million expected visitors to EXPO '86 will see is state-of-the-art Amateur Radio station VE7EXPO. Located in the main exhibit hall of the Canada Pavilion at the World's Fair on Transportation and Communication, in Vancouver, British Columbia, VE7EXPO is open to the public and on the air from 10 AM to 10 PM PDT daily until October 13. A special feature of the station is a packet-radio/computer system hooked into a bulletin board that hams there can use to answer visitors' questions about Amateur Radio. Hams who wish to operate from VE7EXPO or arrange a sked should contact the VE7EXPO Amateur Radio Society, 202-13640 67 Ave, Surrey, BC V3W 6X5.

JY2RBH: World's Youngest Ham?

Congratulations to King Hussein, JY1, and Queen Noor, JY2NH, on the birth of their fourth child, Her Royal Majesty Princess Raya. In keeping with recent Jordanian tradition, she has been assigned the call JY2RBH.



The item on the underwater operation of KV4KD that appeared in this column in March 1986 got W1AW chief operator W1WPR to thinking. Digging through his station QSO files, Chuck found this QSL from an "aqua" SSB two-way dated July 3, 1970.

League Lines

In what may be the most significant FCC NPRM of the 1980s, the FCC—in response to an ARRL petition—has issued a major proposal to enhance Novice/Technician privileges. The NPRM *very closely* follows the proposals of the ARRL Petition. It would allow Novices/Technicians digital and SSB privileges on portions of the 10-meter band, and also allow Novices to operate phone on 220 MHz and on a portion of the 1240-MHz band (all authorized modes).

Although the NPRM was released only 48 hours prior to this issue being sent to the printer, details on the proposal, plus its complete text, can be found beginning on page 48.

Just at press time, the FCC ***adopted a Report and Order on Repeater Coordination, in PR Docket 85-22.*** The new rules make amateur stations in repeater or auxiliary operation mutually responsible to resolve interference between them, except when one repeater or auxiliary operation is coordinated and the other is not. In that case, the station that is not coordinated has primary responsibility for resolving the interference; however, the Commission decided not to require coordination as a prior condition to repeater or auxiliary operation, nor to adopt more-detailed rules for coordination unless the present measures prove inadequate.

There was one big surprise that was not contemplated in the Notice or in the League's comments: With coordination of stations in repeater or auxiliary operation virtually universal, the Commission feels it can leave to the coordination process the matter of determination of acceptable power levels and heights above average terrain. Thus, Section 97.85(g) setting forth these parameters has been dropped from the rules, effective 0001 UTC, July 12, 1986.

The ARRL has petitioned the FCC to ***require the labeling of home electronic equipment relative to its susceptibility to radio-frequency interference.*** The petition requests that the Commission ***require*** that a tag or notice be attached to home electronic devices or their instruction manuals to indicate whether the device incorporates shielding, filtering or circuitry designed to reduce its susceptibility to nearby radio transmitters. The tag or label also would warn the owner that the device may be subject to radio-frequency interference.

Bills have been introduced in both houses of the New York state legislature relating to the construction of towers. The legislation would restrict towers to the height of the tree line or 50 feet, whichever is lower. An exception is given to towers attached to a residence.

The Committees on Environmental Conservation are considering the legislation, but as yet no action has been taken and there does not appear to be any immediate danger of passage. For further information, New York amateurs should contact their respective ARRL Section Manager.

New Extra Class Question Pool: The FCC has issued the new Extra Class written element question pool, with a release date of April 1986. Because the FCC's instructions to the VECs direct that the new material must be used on exams no later than six months after its issuance, ARRL VEC will be putting the new pool into use in tests beginning October 1, 1986. Also, the ARRL/VEC will be changing the tests for the Advanced class on July 1, 1986.

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

Attention SHF Enthusiasts: ***The First Annual ARRL 10-GHz Cumulative Contest*** will be held on the weekends of September 27-28 and October 10-11. Full details appear on page 84 of this issue. CU there!

The ***1986-87 Repeater Directory*** is here, and it's still $3! It'll fit in your shirt pocket or purse, and it's got a whopping 10,000 entries. Also available (for $5) from ARRL HQ or your local dealer is the ***QRP Notebook,*** a builder's guide to low-power gear. Its author, Doug DeMaw, W1FB, has been a QRP enthusiast for many years. The ***Advanced Class License Manual*** second edition (also $5) is due out soon, and will contain the newly revised question pool and answers. If you order a book from HQ, please add $2.50 for book-rate postage or $3.50 for UPS. The ***ARRL 1985 Annual Report*** will be available to members for $1 postage in mid-June.

The International Amateur Radio Union (IARU) was granted observer status at the International Telecommunication Union Regional Administrative Planning Conference for the Broadcasting Service that opened April 14 in Geneva. This Conference was called to plan the introduction of the 1605-1705 kHz broadcast band in Region 2. Representing the IARU are President Richard L. Baldwin, W1RU; Region 1 Secretary John Allaway, G3FKM; and Region 2 EC Member Steven Dunkerley, VP9IM.

VHF Meteor Scatter—An Astronomical Perspective

Are you ready for the showers—the meteor showers, that is?

By Michael R. Owen, W9IP/2
Dept of Geology, St Lawrence University
Canton, NY 13617

Each year, VHFers look forward to several major meteor showers. Meteor scatter provides the opportunity for well-equipped stations to make contacts over distances of up to 1400 miles on 2 meters. When a meteor shower arrives, the 2-m band goes wild with signals. Meteor scatter is not only a lot of fun, it can really help you increase your state or grid-square total on VHF!

When will a meteor shower peak, and when is the best time to be on the air (they're not necessarily the same)? What is the best direction to point your antenna? Why are some meteor showers terrific one year and poor the next? I will attempt to answer these questions, and explain how meteors and comets travel in the solar system, how to calculate the meteor-shower peaks, and how to tell if the meteors will support propagation in a particular direction.

Meteor Basics

As you probably know, most meteors are tiny bits of rocky space debris. Some of them are particles of leftover matter from the formation of the solar system, and others come from interstellar space. Most of the meteors that we see at night as "shooting stars" are only the size of a grain of sand. Tons of this debris enter the Earth's atmosphere every day, and virtually all of it burns up as it falls. Only an extremely small amount of this meteoric debris makes it to the ground (if one does, it is called a *meteorite*).

Meteors are of two types, depending on their source: "sporadic" and "shower." There are far more sporadic meteors than shower meteors.[1] Sporadic meteors fall at random times and their source is unknown. About three times more sporadic meteors are swept up by the Earth's atmosphere in the morning (around 6 AM) than in the evening (minimum at 6 PM local time).[2] Furthermore, the Earth encounters more of them during June, July and August, apparently because there is a somewhat higher concentration of meteoric "space dust" in the portion of the solar system through which the Earth passes during those months.

The "shower" type of meteor is a much more predictable group. Shower meteors travel in relatively concentrated orbits around the sun, and the Earth passes through some of these orbits at predictable times during the year. During a meteor shower an observer, either visually or using radio, may detect tens, hundreds or (rarely) even thousands of meteors per hour. Our encounters with these intense concentrations of meteors usually do not last long, and it is an advantage to know when the peak of a shower will occur so that you can be on the air when the most meteors are available.

Shower meteors are closely related to comets. Comets travel in elliptical orbits, with the sun at one focus and the other "end" far out in the solar system, often past the orbit of Jupiter. As a comet nears the sun, it boils and breaks up much like a dirty snowball on a warm day. It sheds millions of particles of rocky debris, and almost all of this debris remains in, or near, the comet's orbit. The solar wind, composed of charged particles blown away from the sun, disperses the meteor debris, but most of the debris remains relatively near the comet's orbit, and after many years, the comet's orbit is littered with fragments of the comet. This littered orbit is called a *meteor stream*. When the Earth, in its annual trip around the sun, crosses this stream it is bombarded by the litter, and we experience a meteor shower.

Although some debris gets scattered throughout the comet's elliptical orbit, much of it (especially the larger particles) remains concentrated near the comet itself. Therefore, if we cross a comet's orbit somewhere close to the comet, we often see a huge increase in the number of meteors entering the Earth's atmosphere that can produce a meteor "storm" of thousands of meteors per hour! These are very rare—most of us will experience only one or two in our lifetime.

Orbits and Ecliptic Longitude

Like all orbiting bodies, including planets, comets travel in elliptical orbits. Comet orbits differ from planet orbits, however, in that they are more strongly elliptical, and although the solar system's planets all travel in nearly the same plane (*the ecliptic*), comets do not (Fig 1). The orbits of many comets don't come close to the Earth's orbit so we never cross their path. Other comet orbits cross the Earth's at some point in space, and we experience a meteor shower as a result. In some cases, we cross orbits twice each year, and therefore get two meteor showers from the same comet. This is the case with Halley's comet

[1]Notes appear on page 20.

and the meteor showers known as the Eta Aquarids and the Orionids. See Fig 2.

We can predict when meteor showers will occur because the location in space of the intersection where the Earth's orbit crosses the meteor stream's orbit is more or less fixed in space. Astronomers keep track of the Earth's orbit by means of *ecliptic longitude* (E L), which is sometimes called *solar longitude*. E L is much like Earthly longitude, except that it is referenced to the sun. E L is measured in degrees around the Earth's orbit, starting at each year's vernal equinox. E L is a handy way to keep track of the Earth's position in space because Earth returns to the same E L at about the same time each year—therefore, we can translate between a *location* in space and a *date* when the Earth will be there. If we know the E L of a meteor stream's orbit where it crosses the Earth's, we can calculate the date in the future when we will cross it again (Fig 3). If meteor watchers notice a meteor shower peaking at a certain time one year, that time can be translated into the E L the Earth occupied *at that time*. Why would we want to know this? Well, remember that each year is about (but not quite) 365¼ days long; a meteor shower peak will come about 6 hours later each year (leap years are tricky). To reliably predict the time of a meteor shower, all we need to know is when the Earth will arrive at the celestial "address" where the meteor's orbit crosses ours.

A simple method for locating the approximate peak time for meteor showers, based on published E L data, was developed by Russ Wicker, W4WD, and described by Joe Reisert, W1JR.[3] Joe's excellent article includes a short computer program that gives approximate peak times for several showers and a lot of other useful information about meteor scatter.

Peak prediction is actually very simple. Basically it involves calculating Earth's location in terms of E L for 0000 UTC the day *before* and the day *after* the expected peak of a shower. Values of E L are tabulated in the Nautical Almanac each year, and we know fairly accurately the E L of most major showers.[4] If you have the E L at 0000 UTC for the day before and the day after, all you need do is interpolate what time corresponds to the E L of the peak. Formulas for this calculation are provided in the Appendix.

Here's where things start getting complicated. Unfortunately, just calculating the E L isn't enough. The E L of the Earth has a slightly different starting place in space each year, referred to as the "mean equinox of date." The difference is caused by the wobble of the Earth's axis, known as *precession*. It amounts to only about 25 minutes each year, but the years add up. Before long a lot of error can creep into predictions that don't take precession into account. You can't use the same E L for one year, and then again four years later—you'll be off about 2 hours.

All published E L data for meteor showers are specified in the coordinates of a specific "epoch," usually 1950. For example, the most up-to-date research indicates that the Perseids meteor stream intersects the Earth's orbit most completely at E L 139.19 degrees, "epoch 1950."[5] If we want to know when, during 1986, the Earth will arrive at the spot in its orbit which was 139.19 degrees in 1950, we must first add an appropriate amount of precession to 139.19 to find the shower's E L in 1986 terms. It sounds complicated, but it isn't.

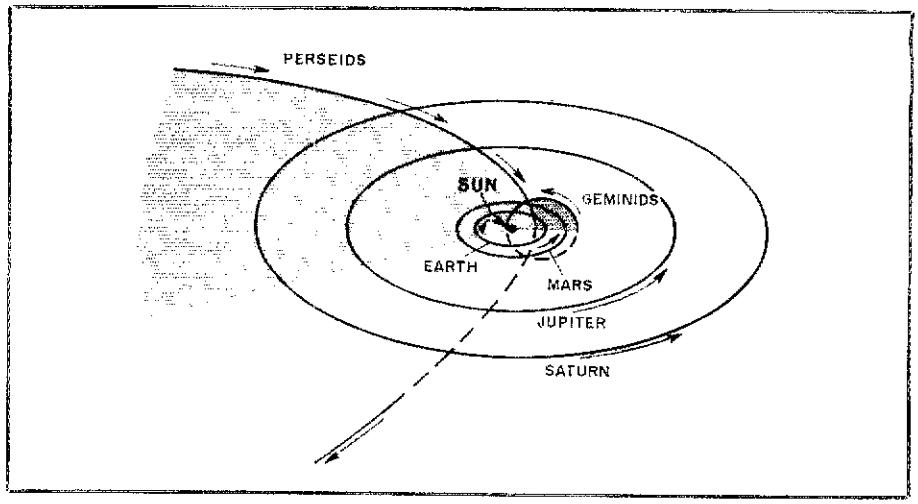


Fig 1—Orbits of the Perseids and some of the solar system planets. (From *The Astronomical Companion*, with permission of the author; see note 2.)

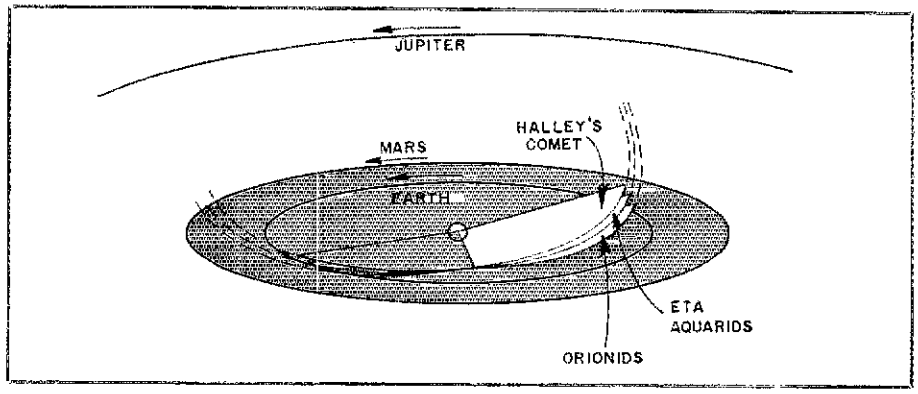


Fig 2—Orbits of the Eta Aquarids, Orionids and Halley's comet with respect to the Earth's orbit. (From *The Astronomical Companion*, with permission of the author; see note 2.)

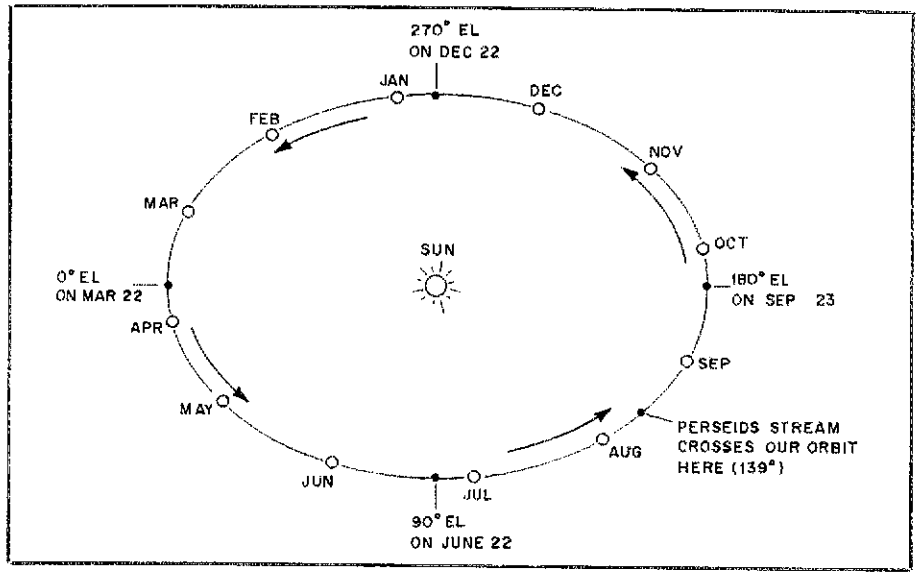


Fig 3—Illustrations of ecliptic longitude relationships.

The formula for finding the precession factor is shown in the Appendix. Using these calculations, we can predict meteor-shower peaks as accurately as many professional astronomers.

Complications: Real Meteor Streams Aren't Simple

The above-described calculations of meteor-shower peak times are precise to within a few minutes. That really doesn't matter, since most meteor showers last for many hours or even days. There are, however, several serious problems facing VHFers who seek to pinpoint a shower's peak.

Some showers have sharp peaks, it is true, but others have hardly a peak at all! For example, the Eta Aquarids and the Orionids, both associated with Halley's comet, have peaks that are spread over nearly two days. The Andromedids shower occurs during the span from August 31 to the end of November and is above half-strength for nearly a month! A peak for this shower is not easily detected. To make matters worse, the peak E L for some showers wanders around from year to year, so that it is impossible to accurately predict the peaks. Fortunately, many showers are better behaved, and their peak E Ls have been pretty well established. Accordingly, you will have a good chance of success when you calculate their peaks for any particular year. In general, the narrower the peak of a shower, in days or hours, the more accurately we know the actual peak E L.

An additional problem, that is nearly impossible for the casual observer to predict, is that some meteor streams are strongly influenced by the planet Jupiter. This planet, more massive than the rest of the planets combined, can drastically divert meteor streams that come near it in space. This means that some showers may move, intensify or disappear completely—or perhaps a new shower may appear "out of nowhere." The Draconids shower is an example of this phenomenon.

Further complications arise with many showers because the solar wind has pushed particles of different sizes to different parts of the orbit, causing different sized meteors to fall at different times during some showers. In many showers, small particles, that may be more abundant, peak earlier than larger particles. In the case of the Perseids, smaller meteors that give shorter bursts at VHF than larger ones are more abundant early in the shower. Long-burning meteors are more common slightly after the main peak of the shower. If you want to work really long-haul DX, schedule your attempts for the peak of the larger meteors because they begin ionization at higher altitudes.

The ionization altitude, which directly affects the maximum possible DX, depends on a number of factors. Most important is the velocity of the meteor. All meteors in a given shower travel at about the same velocity relative to the Earth, but different showers have different velocities. This is due mostly to the angle at which the meteor stream's orbit intersects Earth's orbit. Recall that meteor and comet orbits are often not in the same plane as the ecliptic (the plane in which all the planets rotate), therefore we can collide with meteor streams at many different angles (Fig 4). If the meteor streams's orbit crosses Earth's at a high angle, we perceive the meteor speed to be about equal to their actual velocity relative to the Sun. If the stream runs into us "head-on," that is, if the meteors are travelling in a direction opposite to ours, then their apparent velocity is much greater. The "slowest" meteors are those that overtake us from behind. Since we know the direction from which the meteors are coming relative to the Earth's orbit, we can calculate the *relative* velocity of the stream's meteors. These values are shown in Table 1. Faster meteors ionize high in the atmosphere and are best for *high* frequencies and *long* paths. Slower meteors ionize lower in the atmosphere and are best for *low* frequencies and *short* paths.

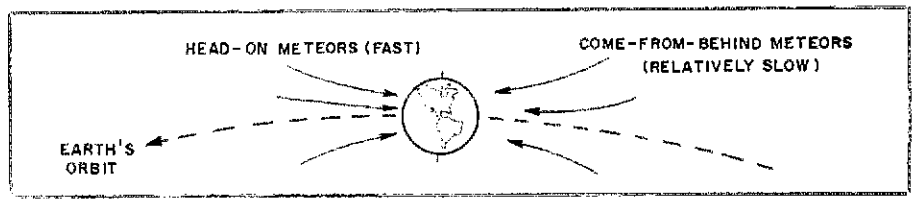


Fig 4—Relative speeds of the Earth and meteors.

Table 1
Major (and Minor) Meteor Showers

Shower	Date Range	Peak Date	Time Above Quarter Max	Approximate Visual Rate	Velocity km/Sec
Quadrantids	Jan 1-6	Jan 3	14 hours	40-150/h	41.5
(Lyrids)	Apr 18-25	Apr 21	2.3 days	10-20	47.6
Eta Aquarids	Apr 21-May 12	May 4/5	3 days	10-40	65.5
Arietids	May 29-Jun 19	Jun 7	?	60	37.0
Perseids	Jul 23-Aug 20	Aug 12	4.6 days	50-100	59.4
Orionids	Oct 2-Nov 7	Oct 20	2 days	10-70	66.4
(Taurids)	Oct 20-Nov 20	Nov 3/4	?	15	28-30
(Leonids)	Nov 14-20	Nov 17	4 days	5-20	70.7
Geminids	Dec 4-16	Dec 13	2.6 days	50-80	34.4
(Ursids)	Dec 17-24	Dec 22	2.2 days	1-15	33.4

Meteor Shower Astronomical Data

Shower	1950 E L of Peak (Source)	Radiant RA	Radiant Dec	Height of Ionization	Associated Comet	Period (Years)	Notes
Quadrantids[1]	282.55 (a)	15 h 28 m	+50	100 km	unknown	—	1
(Lyrids)	31.4 (b)	18 h 8 m	+32	105 km	Thatcher	415	
Eta Aquarids[2]	45 (c)	22 h 20 m	− 1	115 km	Halley	75	2
Arietids[3]	76 (d)	2 h 56 m	+23	100 km	unknown		3
Perseids[4]	139.19 (e)	3 h 4 m	+58	110 km	Swift-Tuttle	120	4
Orionids[2]	208 (c)	6 h 20 m	+15	115 km	Halley	75	2
(Taurids)	222 ± (b)	3 h 32 m	+14	100 km	Encke	3.31	
(Leonids)[5]	234.462 (d)	10 h 8 m	+22	150 km	Temple-Tuttle	33.17	5
Geminids[6]	261.16 (f)	7 h 28 m	+32	95 km	unknown	1.6	6
(Ursids)	270 (d)	14 h 28 m	+78	100 km	Tuttle	14	

Sources for E L Values

a) McIntosh and Simek, 1984
b) Ottewell, 1985
c) McIntosh and Hajduk, 1983
d) Cook, 1971
e) Simek and McIntosh, 1986, in press
f) McIntosh and Simek, 1980

Notes

[1]Variable peak time (±3.8 hours) from year to year; long-duration meteors peak about 1.5 hours after main peak.
[2]For the Eta Aquarids and Orionids, the peaks are similar: rather broad with several subpeaks. This is a very complex meteor stream and predicting its exact peak is futile.
[3]This is a rich shower, but the particles are small and therefore bursts are short.
[4]Parent comet has apparently been lost. Long-duration meteors peak about 2 hours later than main peak. The peak is not sharp.
[5]Shower has widely variable duration. These meteors are the swiftest of all major showers. Usually weak, but occasionally spectacular.
[6]Long-duration meteors peak about 3 hours later than main peak.

Where Do I Point My Antenna?

If all that we need to know is the time of a meteor shower's peak, we could just get on the air and start working DX! Unfortunately, knowing the shower's peak time isn't enough if you want to know how favorable the propagation conditions will be. Many VHF DXers spend many hours during supposedly "peak" times trying to make QSOs, but in vain. Why?

An essential piece of information is what the orientation of the shower's *radiant* will

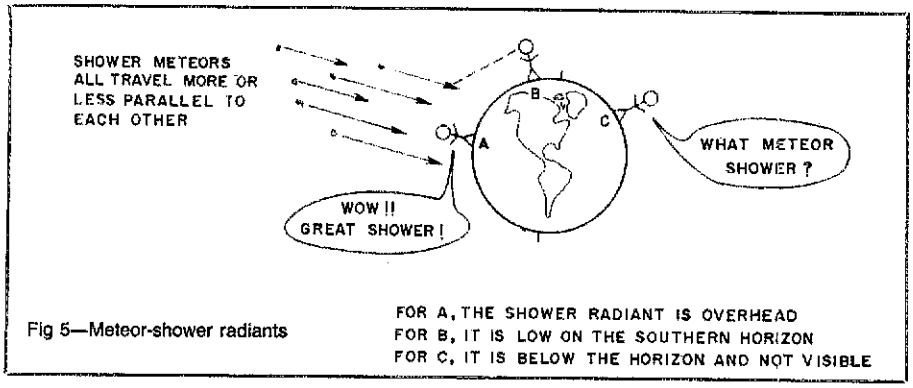


Fig 5—Meteor-shower radiants

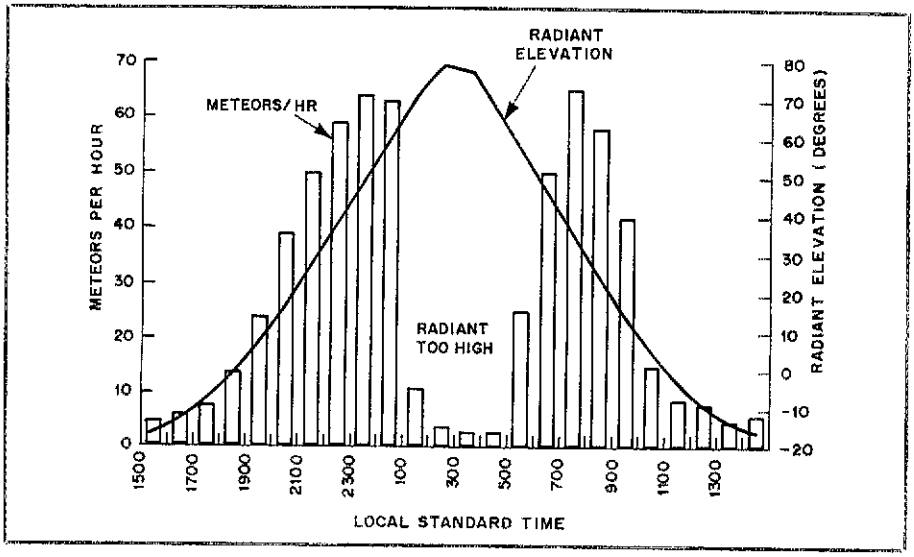


Fig 6—Geminids meteor activity on December 12-13, 1985 as monitored on TV Channel 4 (67.25 MHz).

be with respect to the path you want to work. If the orientation is wrong, you will have a hard time making a contact even if the shower is very rich.

What is the radiant of a meteor shower? Well, the radiant is the area of the sky from which the shower meteors appear to fall. It's somewhat like looking along railroad tracks: They appear to originate at a single point in the distance although they are actually parallel to each other. In a meteor shower, the meteors seem to radiate from a spot in the sky, although they are actually travelling virtually parallel to each other. This spot, the meteor shower's radiant, appears to move just as stars appear to move through the night sky. During some part of the night (or day) the radiant may be below the horizon; in that case we won't see many of the shower's meteors (although other parts of Earth will). At other times the radiant may be high in the sky and both VHFers and meteor watchers will see many meteors (Fig 5).

If we know where the radiant is located in the sky, we can predict when the shower meteors will support propagation in a particular direction. This aspect of meteor-scatter propagation is discussed in detail by Bain.[6] Many amateurs have noticed that certain meteor showers appear to be best at particular times of the day, year after year. For example, most VHFers think that the Perseids shower is best on the morning of August 12 every year.

You might think that this contradicts the foregoing discussion of peak times and ecliptic longitude, and you would be partly right! Here is an amazing fact: It doesn't really matter precisely *when* most meteor showers peak. If the radiant is in the wrong position, the shower doesn't do *you* any good! On the other hand, most showers are near their peaks for many hours, if not days, and their radiants pass through the "right" spot in the sky on a regular basis. For example, consider the Perseids again. When I lived in the Midwest, it was common knowledge that the long-haul path to Arizona opened up briefly at around 10 AM, local time on the morning of August 12 each year. Why? Well, because at that time the Perseids' radiant is always at an elevation of about 45° over the midpoint of the path. No matter whether the shower was actually peaking, or not, it *appeared* to peak for that path at the same time each year. From a VHFer's point of view, that's all that really matters.

Fig 6 shows the effect of the radiant's position on echos from TV stations during the Geminids shower. The greatest number of echos are received around the time that the radiant is at an elevation of 30-50°. When the radiant is lower, or *higher* in the sky, a smaller number of meteors appears to be present.

Low radiant elevations, even somewhat below the horizon, are still usable but there will appear to be many fewer meteors. Interestingly, however, the meteors you do catch will often provide very intense signals because they arrive more-or-less tangentially to your portion of the Earth's surface, and this is favorable for propagation. High radiant elevations will provide a wealth of meteors, but in many different directions of propagation, so that for a particular path you may not be as well off. Also, meteors that fall when the radiant is above 50° or so produce trails that appear much shorter than those of meteors from lower angles. The best situation is when the radiant is at right angles to the path of interest, and at about 45° elevation.

How can we tell where the radiant is? After all, most VHF meteor-scatter buffs would rather be indoors working DX than outside trying to figure out where the shower's radiant is. Luckily, meteor-shower radiants are much more reliably predictable than ecliptic longitudes. Radiants, just like celestial objects, have a position that may be described by *right ascension* (RA) and *declination* (dec). Right ascension is much like longitude, except it is translated to the celestial sphere instead of Earth. Declination is a lot like latitude—it is referred to the plane which Earth's equator would make if it were extended into outer space (the equatorial plane). If we know a meteor-shower radiant's RA and dec, we can determine the radiant's azimuth and elevation at any time for any spot on Earth. For meteor scatter, we want to know the radiant's apparent position at a point about midway between our QTH and the station or grid square we wish to work. To optimize our use of time, we may want to know when the radiant will be in the "right" position—when, or if, it will be at right angles to the desired path and at about 45° elevation. Alternatively, we may want to know the best direction to point our antennas at, say, 1200 UTC.

Calculating the azimuth and elevation of a celestial body, or a radiant, is not an easy task, unfortunately. The procedure is described in the *Almanac for Computers* (see note 4). It involves calculation of local apparent sidereal time and other factors that are rather time consuming. It is much easier to use a computer program called *Meteor* to perform the calculations for determining the peak time of all major meteor showers, the optimum time for propagation in any particular direction from your QTH, and provide a simple graph of the radiant's path over any desired period of time. *Meteor* is written for the IBM® PC and all compatible computers. The program is menu driven, meaning you are given a list of choices that tell the com-

puter what information you want. You don't have to calculate anything.

Option 1 of *Meteor* calculates the peak date/time for major meteor showers, based on an algorithm similar to that developed by W4WD, W1JR, and Jim Reisert, AD1C. Option 2 tells you the best time to try to make contacts in a specific direction during a shower. You can specify a general direction, such as southeast, or you can specify another station's latitude and longitude. The program provides the bearing and distance to the other QTH, as well as a diagram of the azimuth and elevation of the shower's radiant from the path midpoint in hourly increments. Option 3 looks from your QTH to distant points in each of the main directions (N, NE, E, SE, S, SW, W and NW) and calculates "good" and "best" times for each direction. Option 4 calculates the best direction at any particular time.

A program listing for *Meteor* is available from the ARRL Technical Department. Send $3 and a business-size SASE to ARRL-TD, 225 Main St, Newington, CT 06111 and ask for "Meteor/ Owen." A program disk is available directly from the author. Send a business-size SASE to the author for price and availability.

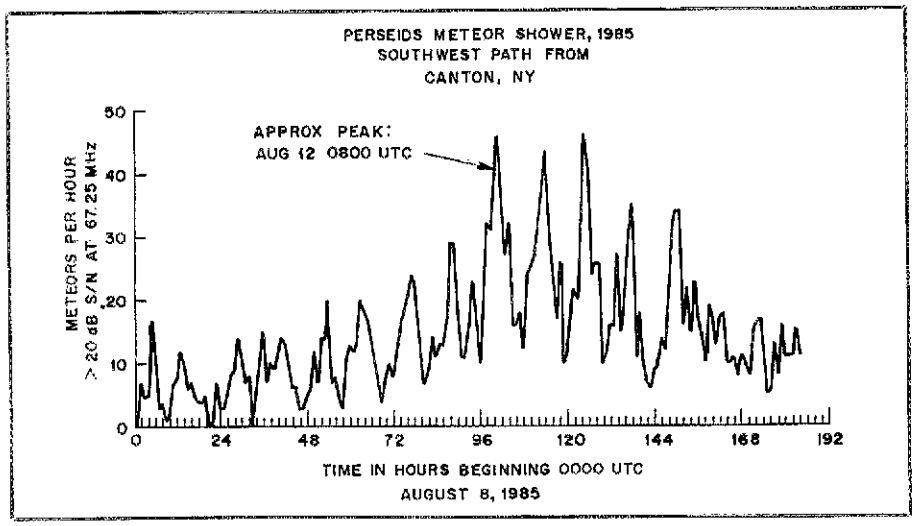


Fig 7—Perseids meteor activity as monitored on TV for a period of eight days in 1985.

Meteor Showers, Big and Small

High-power meteor radar observatories in Ontario, Czechoslovakia, the USSR and Sweden operate in the 30-50 MHz frequency range. The following information comes from these radar observations, and it correlates very well with what you can expect on VHF. In most cases, the observations occurred over many years and so the descriptions of the various meteor showers are "averages" of thousands of individual meteor radar observations.

Quadrantids

The Quadrantids meteor shower is the first of the year (Jan 1-6), and it is one of the best. It has not been extensively studied by visual meteor observers because of cold weather in the Northern Hemisphere. The peak time of the Quadrantids is variable from year to year, within a range of ± 0.15 degree of E L for most years.[7] The value of E L in Table 1 is the average value and a good starting point for calculations. The peak of the Quadrantids is somewhat asymmetrical—that is, the number of meteors falls off more rapidly after the peak. Large and small meteors peak at about the same time, but in some years the larger meteors may appear to peak an hour or so later than the main peak. The "parent" comet of the Quadrantids has not been identified. The Quadrantids are best for NE-SW and SE-NW paths and poor for N-S and E-W paths.

Eta Aquarids

The Eta Aquarids (April 21-May 12) are associated with Halley's comet.[8] Most of the following comments also apply to the Orionids, in October, because they, too, are pieces of Halley's comet. The Eta Aquarids travel in Halley's orbit, but ahead of the comet as it approaches the Sun. The stream is complex in that different sized particles travel in different parts of the stream, with several substreams within the main orbit. Therefore, the peak of the Eta Aquarids is broad and hard to pinpoint in any single year. These meteors are coming nearly head on into the Earth at a high velocity (67 km/s) and ionize rather high in the atmosphere (good for long-haul DX). The Eta Aquarids are best for NE-SW and SE-NW paths, fair for E-W and poor for N-S paths.

Arietids

The Arietids shower (May 29-June 19) has not been studied by visual meteor watchers for a very simple reason: It occurs during the daytime. This was one of the first showers to be detected with radar. British radar operators during WW II were confused because they thought that some of the radar echos were from approaching enemy aircraft. Up to 60 meteors/h may be heard on VHF, but the bursts are often rather short because most Arietid particles are small. The Arietids are very good for N-S paths and poor for others.

Perseids

The Perseids shower, in August, has been an old faithful for years. Many VHFers (including me!) made their first or best meteor-scatter QSOs during this shower. Its comet, Swift-Tuttle, was seen only in 1862. It was expected to return around 1982 and is now overdue. These meteors are relatively fast (59-60 km/s). The Perseids shower has a well-developed peak, although the longer-burning meteors peak somewhat after the main peak of small meteors. Some observers believe that the Perseids have been declining in strength since 1980, but it is still the most popular shower of the year for VHFers. Virtually all of the VHF DX records for meteor scatter have been set during this shower because activity is high, lots of meteors are available, they have a high velocity, and the radiant is well situated for NE-SW and SE-NW paths. Other paths are rather poor.

Leonids

A few veteran VHFers can recall the incredible night in 1966 when the Leonid shower lit up the sky like a Roman candle, and the VHF bands went wild. Literally thousands of meteors per hour fell for a short time—a situation called a "storm" by meteor watchers. The Leonids (Nov 14-20) have produced similar storms of meteors many times in the past. Peaks of activity occurred in 1961, 1965, 1966 and 1969, with the last two being very brief. Since that time the Leonids have been very meek, hardly noticeable. Contrary to popular opinion, the occurrence of these storms is not easily predictable; they may occur in any year. However, the greatest likelihood of a storm is during the time that the Leonids' parent comet, Temple-Tuttle, comes near the sun. This will happen next in the latter half of the 1990s. The Leonids collide with Earth at a very high velocity, about 71 km/s, so when they are good, they are very, very good. The Leonids are exceptionally favorable for N-S paths, fair for NE-SW and NW-SE and poor for others.

Geminids

The Geminids (Dec 4-16) are very reliable from year to year. This stream has been studied carefully for a long time. It lasts for about one day and often yields about 50 meteors/hour. It may be increasing in strength, which may offset the apparent decrease in strength of the Perseids. However, the Geminids are very slow (34 km/s) so they are not good for long distances or high frequencies. Not many bursts are heard on 2 meters. The peak of the Geminids is complex, with larger par-

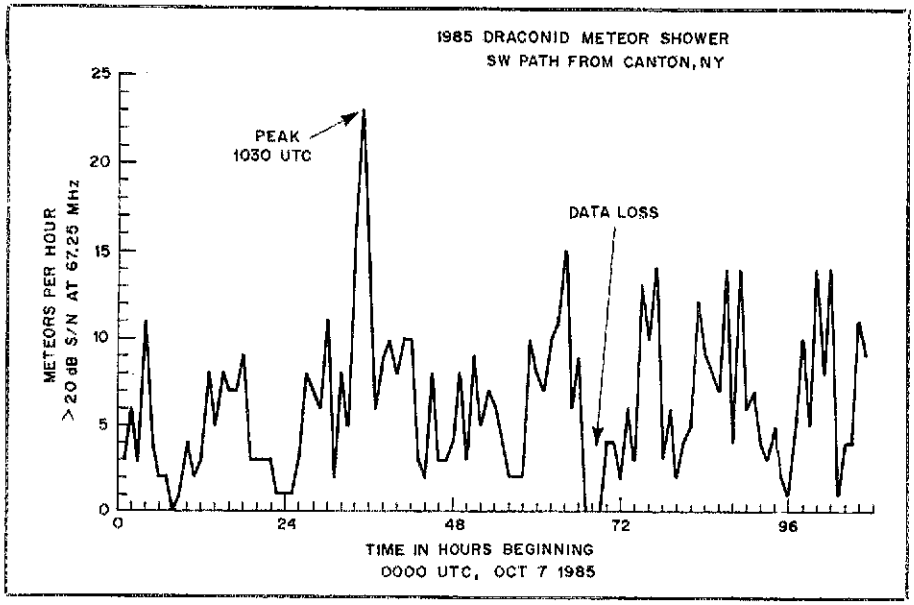


Fig 8—Draconid meteor activity as monitored on TV for a period of more than four days in October 1985.

ticles peaking later than the small ones. More variability in numbers is seen in the small meteors than in the large ones. The Geminids are extremely good for N-S paths, and poor for others.

Minor Showers

A large number of meteor showers are not shown in Table 1 because they are so-called "minor" showers, yielding only a couple of meteors per hour during their peak. Actually, there are dozens of minor showers, but they provide so few meteors that they aren't much help to VHFers.

Some showers, such as the Lyrids, Taurids and Ursids, were once more prolific than they are today. They have declined almost into "minor" status so that not much is expected from them in the near future. They are included in Table 1, but don't count on them too much. Other minor showers, however, occasionally surprise us with tremendous activity. These outbursts are usually correlated with the passage of the shower's parent comet. For example, the usually dull Draconids shower (October) produced about 30,000 meteors/hour in 1933 and 10,000/hour in 1946. The Andromedids displayed 13,000/hour in 1885, but they have hardly been seen since. Some truly spectacular DX opportunities become available during meteor storms, so it pays to be aware of the times they may occur.

The best way to predict increased activity of otherwise minor showers is to read amateur astronomy magazines, such as *Sky and Telescope*. If you read that a comet is expected to be visible, that means it is approaching the sun, and a larger number of meteors should be available from its accompanying meteor stream. Find the meteor shower that is associated with the comet, and there's a good chance that an increased number of meteors will fall during the shower's annual appearance.

Studying and Using Meteors

Technically minded radio amateurs can contribute significantly to the advancement of meteor research. The cost of operating a 20-kW radar transmitter has become prohibitively high in the past decade, and several of the more famous research sites have ceased operation. Information from amateurs is valuable to those who still study meteor streams and showers. The recording of the relative activity of different showers (such as in The World Above 50 MHz) is read by astronomers, who appreciate the worldwide abundance of radio amateurs.

Dr David Meisel of the State University of New York at Geneseo is president of the American Meteor Society. This society is primarily interested in studying meteors by traditional visual means, but Dr Meisel is actively trying to organize VHF radio amateurs to collect information by radio. He seeks correspondence from serious amateurs who wish to assist in this effort. His address is Dr David Meisel, c/o Dept of Physics and Astronomy, The State University of New York at Geneseo, Geneseo, NY 14454.

During the past three years, I have had good results monitoring meteor activity on both the FM broadcast band and TV Channel 4. A spare receiver, tuned to a local, unoccupied FM or TV channel will pick up dozens of meteor bursts per hour, even during nonshower times. During several major showers in 1985, I connected a strip-chart recorder to the S meter of a homemade receiver tuned to TV Channel 4 (67.25 MHz) and detected thousands of meteors. An additional advantage of this approach is that by watching the receiver S meter dance, you can anticipate good bursts on 144 MHz. This saves a lot of exhaustive calling into empty space when you are trying to work "random" DX near 144.200 MHz!

Fig 7 reflects my results from the 1985 Perseids shower, and it shows how a typical shower acts each day. The graph clearly shows the jagged curve of numbers of meteors through the day. Each day there is a distinct peak and also a very deep null in meteor abundance. If you listened only one day, you might conclude that the shower peaked and then disappeared! The peaks and valleys are caused by the rising and setting of the shower's radiant. When it is below the horizon, I detect very few meteors. When the radiant is at about 45° elevation at a point between my QTH and the distant TV "beacons," my monitor records lots of meteors. When the radiant is too low or too high, fewer echos are recorded. The curves are complicated by the pattern of my antenna, by the varied on-off times of the TV stations and by natural variability of the number of meteors. Nevertheless, you can see the broad peak of the Perseids shower.

The Draconid shower, whose peak is very sharp, is shown in Fig 8. Its peak was predicted to last only a few hours, and it did exactly that. Unfortunately, it didn't live up to its "storm" potential. The Draconids move very slowly, so virtually nothing out of the ordinary was heard on 144 MHz, even though there were lots of meteors evident on 67 MHz.

Tips for Working Meteor-Scatter DX

Meteor scatter is one of the best ways to increase your state or grid-square total. DX up to 1400 miles, perhaps (rarely) even more, is possible during the better showers. You will need good operating skills to take advantage of the super-short openings which meteors provide.

Working meteor scatter requires three main qualities: patience, patience and more patience. You can never tell when, or if, meteors will fall or how long the bursts will last. In meteor scatter, you usually don't hear anything at all from the other station until the "right" meteor falls in the "right" orientation. When that happens, the 144-MHz bursts are sometimes as long as 30-45 seconds, but usually much shorter. You have to be very patient, but always ready to pounce on the microphone button.

There are two principal formats that VHFers use in meteor scatter: prearranged schedules and "random" contacts. Prearranged schedules usually run for ½ to 1 hour, occasionally 2 hours on 220 or 432 MHz. The two stations agree on a frequency, a time, and a "sequence" for transmitting. Usually the westernmost station transmits during the first and third 15-second period in each minute, while the other station listens. The eastern station transmits during the second and fourth segments of the minute. Needless to say, both stations must be on frequency, and synchronize their clocks with WWV. Anten-

nas should be pointed directly along the great-circle path for long-distance attempts. For distances between 600 and 1000 miles, however, antennas may be offset somewhat from the great-circle path. The offset isn't critical because most VHF antennas have a 3-dB beamwidth of 30 degrees, or more.

Random contacts are more challenging because you are often competing with several other stations on the same frequency. During major showers, most 2-meter meteor-scatter enthusiasts congregate near the national SSB calling frequency of 144.200 MHz. It doesn't pay to stay exactly on the calling frequency, however, because QRM often makes reception impossible. If you live near a population center, your signal will probably be buried by others in your area. Try to move 5 or 10 kHz off—there will still be plenty of stations to work, and with a lot less QRM. Because local signals can easily QRM the incoming signals, the majority of stations keep to the 15-second sequencing even on random meteor-scatter contacts. Only during the rare 30-second-long "Blue Whizzers" is the sequencing abandoned—then it's every operator for himself!

Antenna pointing is not as important as you might believe. First, most antennas cover a 30-degree beamwidth and can catch signals arriving from a relatively wide variety of directions. Super-high-gain EME antennas aren't well suited to meteor scatter because their narrow beamwidth misses many meteor signals. Second, high-altitude winds blow the ionized meteor trail as soon as it is created; although it may have formed with orientation that supports propagation in one particular direction, if it lasts more than a few seconds it will deform. In this way, a single long-lived meteor trail may permit QSOs over numerous different paths.

The duration and intensity of meteor-scatter signals are strongly related to frequency. As most 6-meter operators know, there are plenty of meteor-scatter signals on 6 meters almost every morning. However, you hear very few on 2 meters, and fewer still on the higher frequencies. A meteor that creates a long, loud burst on 6 meters may make one only a few seconds long on 2 meters, and be only a ping on 220 MHz. As anyone who has tried it can tell, meteors are an endangered species on 432 MHz. As a rule of thumb, meteors slower than 50 km/s are usually poor for 144 MHz and up; for 220 and 432 MHz work, stick to the showers whose meteors travel > 60 km/s.

The best way to get your feet wet in meteor scatter is to run a few schedules with other, more experienced operators. Don't try to set a new world's distance record right off—make your first attempts in the 800-1000 mile range. How do you find someone to run with? Tune in the Central States VHF Net on 3.818 MHz on Sunday evenings. Near the time of major showers, you'll hear lots of VHFers making schedules. Don't be afraid to jump in and request a schedule—after all, everyone was a beginner once. Another way to learn about meteor scatter is to listen on the 2-meter calling frequency, 144.200 MHz, during showers. You'll learn the format for random contacts right away.

High power isn't necessary for successful meteor-scatter operation. Many stations run 100 W and a single Yagi antenna. Higher power is an asset, of course, but it isn't essential. Good ears and quick reflexes with the microphone are much more important. Listen first!

As with any new aspect of Amateur Radio, the best procedure is to listen on the bands, ask questions and read. The list of references at the end of this article is a good summary of current scientific work being done on meteor scatter. Some of the papers are technical, others are aimed directly at amateurs. If you have trouble locating some of the foreign journals, you might find them at a local university library.

A lot of exciting work is going on with meteor scatter, and you can join in. Give it a try!

APPENDIX

To calculate the Earth's ecliptic longitude (E L), first determine Julian dates for the days of interest, using the following formula:

$$JD = 367*Y - \frac{7*(Y+[(M+g)/12])}{4} + \frac{275*M}{9} + D + 1721013.5 + UT/24 \quad \text{(Eq 1)}$$

where
JD is the Julian date
Y is the year (between 1900 and 2099)
M is the month (between 1 and 12)
D is the day of the month
UT is the Universal Time in hours

Having determined the Julian date, calculate the Earth's ecliptic longitude, as follows:

$$\text{Step 1: } n = JD - 2451545.0 \quad \text{(Eq 2)}$$

$$\text{Step 2: } L = 280.460 + (0.9856474 * n) \quad \text{(Eq 3)}$$

$$\text{Step 3: } g = 357.528 + (0.9856003 * n) \quad \text{(Eq 4)}$$

Step 4: Put L and g within the range of 0-360 by adding multiples of 360, as necessary.

$$\text{Step 5: } E\,L = L + [1.915 * \sin(g)] + [0.20 * \sin(2 * g)] \quad \text{(Eq 5)}$$

where E L is ecliptic longitude in degrees.

Next, compensate meteor shower ecliptic longitude (Table 1), quoted in 1950 coordinates, for the effects of precession.

$$\text{Step 1: } a = 0.013968 * [(2433283 - JD)/365.25] \quad \text{(Eq 6)}$$

$$\text{Step 2: } E\,L_{now} = E\,L_{1950} + a \quad \text{(Eq 7)}$$

where
JD is the Julian date for the time you're interested in, determined above
$E\,L_{now}$ is the "corrected" ecliptic longitude; that is, 1950 ecliptic longitude corrected for precession
$E\,L_{1950}$ is the published ecliptic longitude of the meteor shower in 1950 coordinates

In practice, the effects of precession do not change noticeably from one day to the next, so a single calculation of $E\,L_{now}$ for each shower, every year, is quite sufficient. In other words, you don't need to calculate $E\,L_{now}$ for the day before and the day after the expected peak—just once is enough.

To calculate the peak time of a meteor shower (see note 3: W1JR/W4WD):

Step 1: Calculate the Earth's E L for 0000 UTC the day before the shower's peak day, using (Eq 5) and Table 1. This will be $E\,L_{before}$.

Step 2: Similarly, calculate the Earth's E L for 0000 UTC the day following the predicted peak day. This will be $E\,L_{after}$.

Step 3: Calculate $E\,L_{now}$ by using (Eq 6) and (Eq 7).

Step 4: Check to make sure that $E\,L_{before}$ is less than $E\,L_{now}$ and that $E\,L_{after}$ is greater than $E\,L_{now}$.

Step 5: Calculate T, the peak time of the shower (UTC):

$$T = 24 * \frac{E\,L_{now} - E\,L_{before}}{E\,L_{after} - E\,L_{before}}$$

Notes

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Introducing the Series-Parallel Network

Meet this wide-symmetrical-bandpass impedance-transforming network.

By Warren B. Bruene, W5OLY
7805 Chattington Dr
Dallas, TX 75248

The S-P (series-parallel) network is a superior LC impedance transformation circuit with many applications. A diagram of the S-P network is shown in Fig 1. It uses four elements in contrast to the two found in an L network, or three in a T or Pi network. The S-P network has the properties of a series resonant circuit on the low resistance side and a parallel resonant circuit on the high resistance side with the characteristics of a perfect transformer in between. It has a geometrically symmetrical band-pass response and zero phase delay at center frequency. An equivalent circuit is shown in Fig 2.

This impedance transformation circuit has been used in filter design, but it does not seem to be well known by transmitter, receiver and antenna-coupler designers. The network is discussed here as a separate circuit but, of course, other circuits can be added at either end.

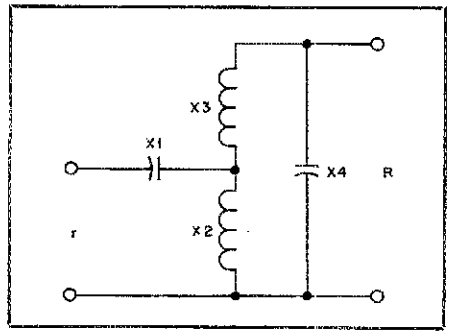


Fig 1—Basic S-P network configuration.

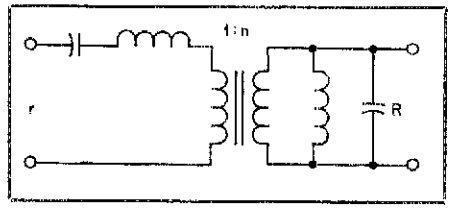


Fig 2—Equivalent circuit for the S-P network.

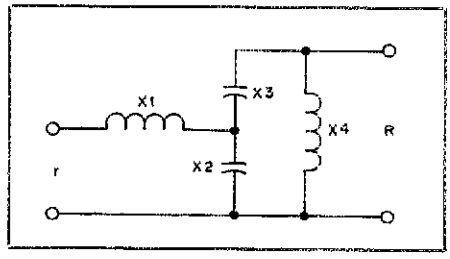


Fig 3—Alternative S-P network configuration.

Component Relationships

The circuit designer may choose any desired impedance step-up (or step-down by reversing the input and output connections). One may also choose the value of any single element. This choice must be made with care because it determines the frequency response as explained later. The signs of all reactances can be reversed. That means that the capacitors can be replaced with inductors, and the inductors with capacitors, having the same magnitudes of reactance as shown in Fig 3. The frequency response remains the same, however.

Component value relationships are easily grasped: X2 and X3 in series resonate with X4; also, X2 and X3 in parallel resonate with X1. The ratio $-X4/X3$ is equal to the voltage step-up ratio, n.

Frequency Response Shape

The S-P network is the equivalent of a classical 2-pole band-pass filter as shown by the equivalent circuit in Fig 2. Each pole (resonant circuit) has a Q defined as:

$$Q1 = \frac{X1}{r} \qquad \text{(Eq 1)}$$

$$Q2 = \frac{R}{X4} \qquad \text{(Eq 2)}$$

where r, R, X1 and X4 are as illustrated in Fig 1. (Omit the sign of the reactance when computing Q.)

Two factors affect the shape of the frequency response curve. One is the ratio Q1/Q2, and the other is whether one or both ends of the network are terminated with the design values of r and R. The effective internal resistance of the source must be the same as the design value of the input end of the network to provide a "terminated" input. A signal generator with a 50-ohm output is designed to have an effective internal resistance of 50 ohms. A receiving antenna matched to a 50-ohm load also has a source resistance of 50 ohms. Power transistors or transmitting tubes, however, may have a very high or a very low internal resistance (relative to their normal load resistance) depending on whether they are operating in a linear mode or in a saturated mode (class C or class D). If in a linear mode, it also depends on whether or not RF feedback is used.

Mismatching one end of the network changes the frequency response. For this discussion we examine four cases.

Case 1: Where both ends of the network are matched. An example is an input from an antenna which is matched to 50 ohms and a network load resistance of 200 ohms.

Case 2: Where the input is matched as in Case 1 to the low resistance end, but the high resistance end is open-circuited. An example is an antenna coupled to an FET.

Case 3: Where a matched load is connected to the high resistance end of the network, but the input is driven by a zero-impedance source. A class-D transistor amplifier approximates this condition.

Case 4: Where a matched load is connected to the low resistance end and the high resistance end is fed by a very high impedance source such as a tetrode linear amplifier.

When both ends of the network are terminated as for Case 1, the Qs are equal for a maximally flat response. Fig 4 shows the response for this case and for two widely different Q ratios when $R/r = 4$. A network design with nominally equal Qs will

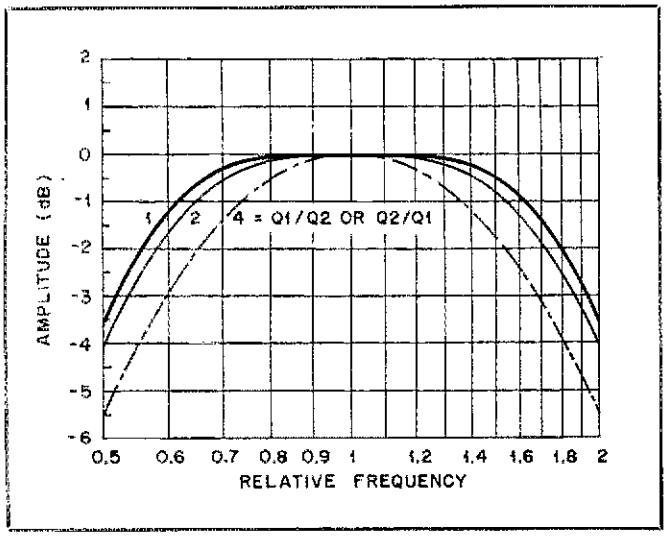


Fig 4—Network response is affected by Q1/Q2 ratio.

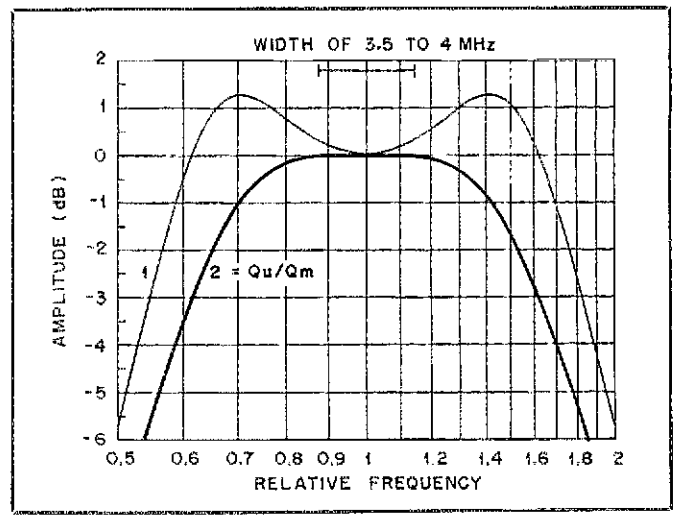


Fig 5—Network response where only one end is matched for two Qu/Qm cases for R/r = 4.

be most tolerant of the moderate mismatches on either or both ends. The frequency responses of Cases 2, 3 and 4 are the same when the ratio of the network Q on the unmatched end (Qu) to the Q on the matched end (Qm) is the same. For a maximally flat response, the ratio Qu/Qm equals two.

When equal Qs are used for these cases there will be a double-humped response with a rise of a little over 1 dB as shown in Fig 5. The bandwidth is widened by the double-humped response, however.

Bandwidth

The bandwidth of this network for a given response shape is principally determined by the impedance transformation ratio R/r. It is interesting that the product $Qp = Q1 \times Q2 = n - 1$. Fig 6 shows the maximally flat responses for several R/r ratios when the network is matched on both ends.

Calculating Element Values

First choose two of the values in one of the following set of three equations and compute the third.

$$n = \sqrt{\frac{R}{r}} \text{ or } R = r\,n^2 \text{ or } r = \frac{R}{n^2} \quad \text{(Eq 3)}$$

Then compute the Q product:

$$QP = n - 1 \quad \text{(Eq 4)}$$

From a selected ratio of Q1/Q2, compute Q1 and Q2:

$$Q1 = \sqrt{QP\,\frac{Q1}{Q2}} \quad \text{(Eq 5)}$$

$$Q2 = \frac{Qp}{Q1} \quad \text{(Eq 6)}$$

Then

$$X4 = \frac{R}{Q2} \quad \text{(Eq 7)}$$

$$X2 = \frac{-X4}{n} \quad \text{(Eq 8)}$$

$$X3 = -X4 - X2 \quad \text{(Eq 9)}$$

$$X1 = r\,Q1 = \frac{-1}{\frac{1}{X2} + \frac{1}{X3}} \quad \text{(Eq 10)}$$

Now convert the reactance values, minus (capacitance) to pF and plus (inductance) to μH. Capacitance (in pF) is calculated by

$$C = \frac{1{,}000{,}000}{2\pi f X} \quad \text{(Eq 11)}$$

where

f is the geometrical center frequency in MHz

X is the (negative) reactance value

Inductance (in μH) is calculated by

$$L = \frac{X}{2\pi F} \quad \text{(Eq 12)}$$

where X is the (positive) reactance value.

Using a Tapped Coil

If you are wondering if one coil with a tap on it could be used in place of the two

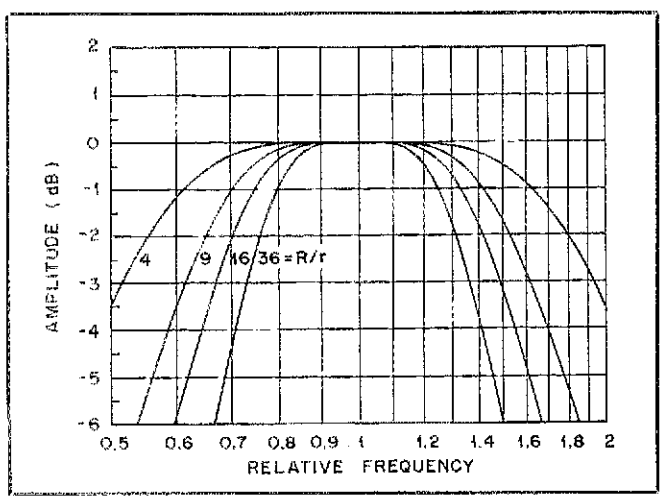


Fig 6—Bandwidth is related to R/r step-up ratio.

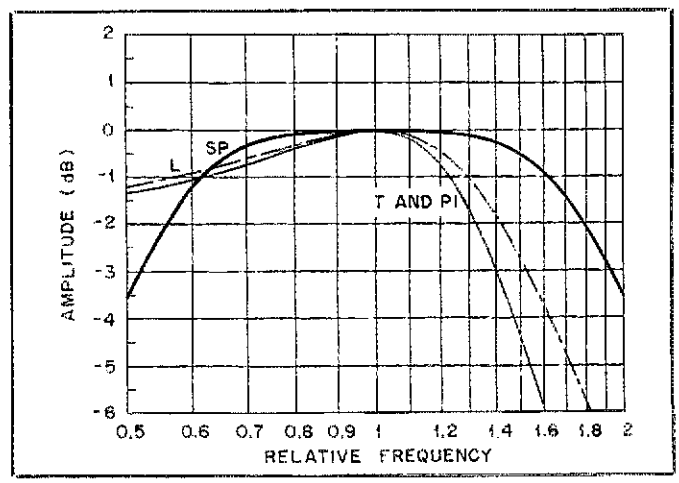


Fig 7—Relative responses for S-P, T and Pi networks where both ends are matched.

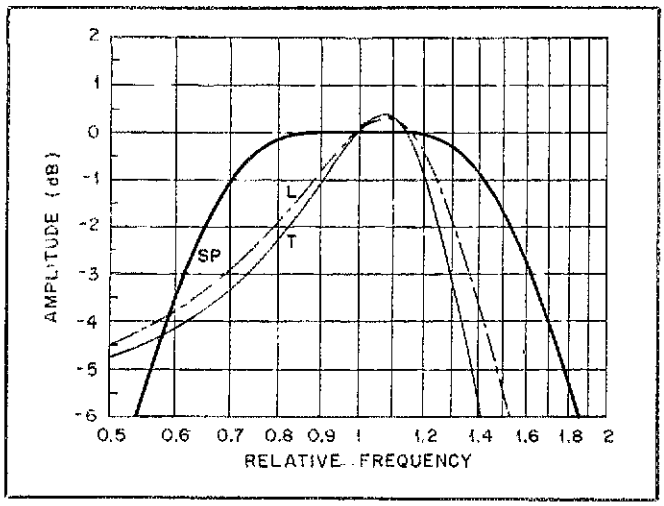


Fig 8—Relative responses for S-P, T and Pi networks connected to a voltage source.

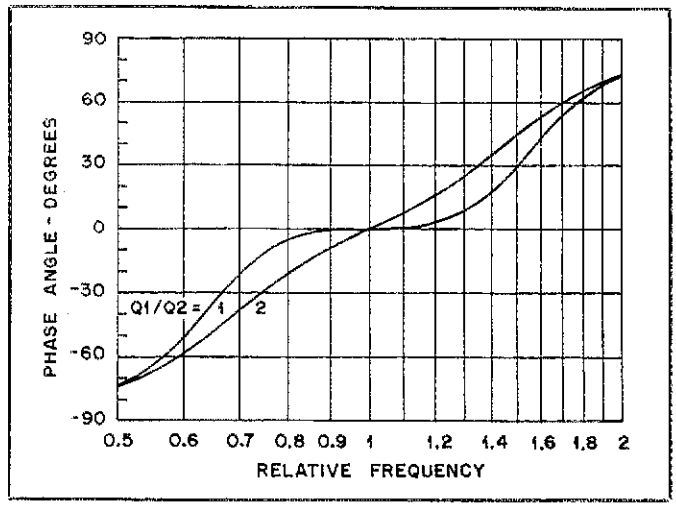


Fig 9—Input phase-angle variation of the S-P network with frequency for resistive loads and R/r = 4.

series inductors in the middle, the answer is yes. In fact the bandwidth will be even wider because of the mutual coupling between the two parts of the coil. The tap must be located on the coil to give the desired voltage step-up. The voltage along the coil is not proportional to the number of turns (except at the middle) because the end turns of a solenoid do not contribute as much to the total inductance as turns in the center. There are ways to calculate the correct tap position, but it is probably easiest to find it by experiment.

Tuning

A fixed-tuned S-P network can be tuned with a dip meter. Disconnect both ends of the network and adjust X4 to resonate at the desired center frequency. Then short-circuit both ends and adjust X1 to resonate at the same frequency.

The amount of resistance transformation can be varied by adjusting X2 (or the coil tap). X3 or X4 and also X1 should be readjusted after a change in X2. The network behaves as a double-tuned circuit when used in a transmitter output or antenna coupling circuit.

Comparison to L, T, and Pi Networks

In Fig 7, you can see the frequency responses of L, T, Pi and S-P networks when the source resistance is matched for the case of a 4-to-1 impedance step-up. Low-pass 90-degree (equal capacitive and inductive reactance) T and Pi networks are shown because they give wider bandwidths than networks with larger Qs. The responses of the T and Pi networks are identical. Fig 8 shows the comparison when each is designed for a source resistance of zero (constant voltage). The low-pass Pi network response is not shown because the input shunt element across a voltage source does not affect the network response. The S-P network response can be widened a little by choosing the Q ratio to give a double-humped type of response. Two examples of the input phase-angle variation with frequency are shown in Fig 9. In each case the network is terminated in a matched resistive load.

Conclusion

It is hard to understand how this network has escaped wider recognition and usage for so long. It deserves a place beside the popular L, T and Pi networks. I make no claim for originating the circuit, but perhaps some of the relationships have not been published previously. There are many ways to use this basic network which simply behaves as two resonant circuits with a perfect transformer between them. Now that the S-P network has been introduced to you, perhaps you have a good application for putting it to work.

Warren Bruene has been licensed since 1935, holding the calls W9TTK, WØTTK and W5OLY. Three widely used circuits he originated are tetrode neutralization, RF feedback and a directional wattmeter circuit. The wattmeter circuit, published in April 1959 QST, *is the basis for most wattmeters used by hams today. In addition, he has been granted 22 patents. He coauthored* Single Sideband Principles and Circuits, *McGraw Hill, 1964, and authored single chapters for several engineering handbooks. He is a graduate of Iowa State University, a member of ARRL and a life fellow in the IEEE. His fellow citation was "for advancing SSB radio communications." He spent 44 years with Collins Radio (Rockwell), where he designed the Collins 30K-1 amateur transmitter, the 30S-1 linear amplifier and many commercial, military and broadcast transmitters. He has been with Electrospace Systems two years, and is listed in* Who's Who in Engineering.

Next Month in *QST*

July *QST* will offer a variety of good reading. Builders should note the article on a general-purpose controller board that can be expanded for connection to other boards and circuits. Built in the ARRL Lab, this board will serve as a foundation for future projects. Also scheduled to appear is an article about a low-cost, self-adjusting ALC circuit that can be applied to any linear amplifier. Scheduled feature articles include a guide to choosing yesterday's gear for use today and a report on a recent Amateur Radio exhibit at the Boston Science Museum. Contesters should keep an eye out for the 10-Meter Contest results and the rules for the upcoming UHF Contest.

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 particularly interested in doesn't appear "next month," it most likely will be in the following month's issue.

Strays

I would like to get in touch with...

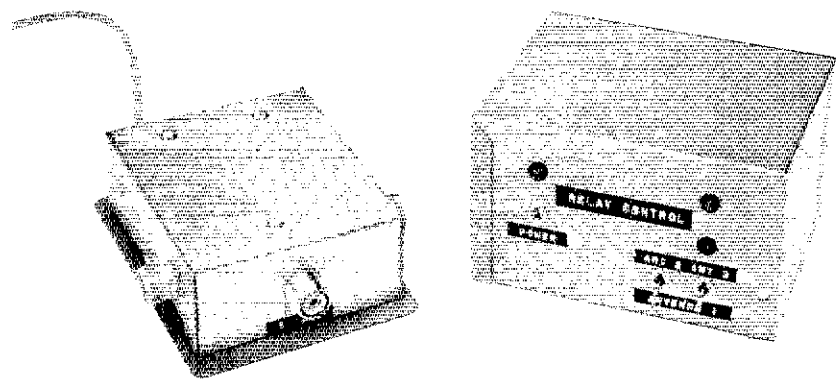
☐ anyone with a manual or schematic for an AVO Meter, Model 7. Patrick Lacey, VE3DIT, 114 Merner Ave, Kitchener, ON N2H 1X6.

☐ anyone with a schematic or other service information and crystal data for Inoue Communication FDFM-2S 2-m FM transceiver. Paul Goemans, WA9PWP, 4327 Clover Ct, Madison, WI 53711.

☐ anyone with information on how to convert a Henry 2-K3 linear amplifier for operation on 160 meters. Lee Wical, KH6BZF, 45-601 Luluku Rd, Kane'Ohe, HI 96744.

• *Under Construction*

A Remote Antenna Switcher for HF



Part 8: One feed line—three antennas? Save dollars by reducing the amount of coaxial cable in your system. Enjoy the convenience of remote selection for two or more skywires!

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

Commercially made remote antenna switches are well built and convenient, but expensive. I think we should get back to the practice of constructing our own accessory gear. It will save us money while providing some interesting work along creative lines. After all, isn't the purpose of the *QST* series slanted toward workshop knowledge and practices? If you agree, let's consider as this month's project a gadget that any ham can use in the station lineup.

How many times have you wished that you had fewer feed lines coming into the house from an assortment of antennas that were fed by means of coaxial cable? Handling multiple feed lines can become a problem for some of us, and the high cost of several feed lines can be a serious matter for those with modest hobby budgets. A remote antenna switch can help here. But there are other benefits associated with remote-switching units for antennas: We may invest in one high-quality feeder, such as Hardline, and this will minimize feed line losses compared to using two or more runs of RG-58 or RG-8 line. Also, if we weigh the advantages of electronic remote switching against manual remote switching, we can conclude quickly that doing the antenna switching from within the shack is far better than going out of doors to do it! That is, we don't have to deal with rainy weather, snow, cold temperatures, mosquitoes or darkness when going into the yard to change the position of a hand-operated antenna switch.

Typical Applications

How might we employ a remote antenna switcher? Let's suppose you have a tower with an HF Yagi antenna atop it. You also have a quarter-wavelength "sloper" attached to the top of your tower. This means that two feed lines are required since there are two antennas. Let's expand this concept by adding a third radiator—perhaps a 160-meter inverted-L antenna. Now you need three feeders in order to use these antennas from a central point—the ham shack. We will assume, for example, that you need 70 feet of 50-ohm cable for each of the HF antennas and perhaps 40 feet of cable for the 160-meter one. This adds up to 180 feet of coaxial cable, which amounts to $45 (average) if you are using RG-8 feeder. On the other hand, if you use a remote antenna switch and only 70 feet of RG-8 line, your cost is $17.50. Not only do you save $27.50, but the installation will be more orderly in appearance.

Relays as Switches

There are a number of electromechanical devices that we might use for the remote-switching function. Stepping switches, solenoidal wafer switches and ordinary relays may be used. The latter component is the easiest to obtain and is by far the least expensive of the three devices. The limitation for any RF-switching unit is the highest frequency at which it may be used without the switch causing an SWR condition. At some upper frequency it is necessary to use design methods that minimize stray inductance (lead lengths) and capacitance in the signal path of the switcher. Not all relays are well suited to this use without disturbing the impedance of the overall feed line. For example, if the relay has long contact arms, the point at which the signal passes through the relay contacts may not present a 50-ohm condition, even though the line either side of the relay has a 50-ohm characteristic. In this situation the relay causes what is known as an "impedance bump" in the line. This is not a significant problem below 30 MHz, but the consequences be-

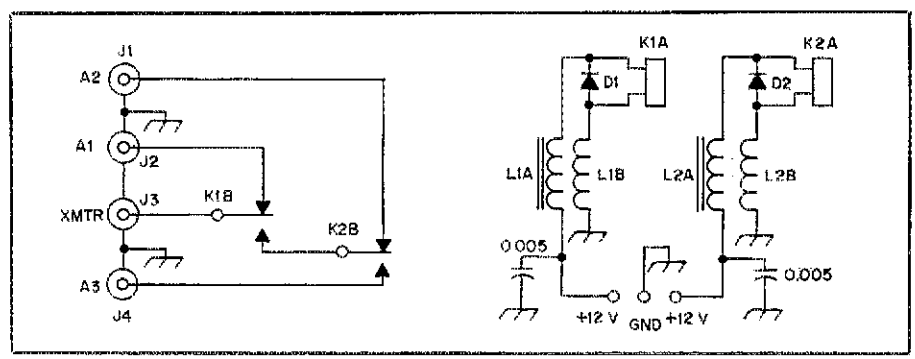


Fig 1—Schematic diagram of the antenna switcher. Designator "A" stands for "antenna." D1 and D2 are 1N914 silicon diodes; 1-A, 50-PRV rectifier diodes may be substituted. J1-J4, inclusive, are SO-239 jacks. K1 and K2 are 12-V dc relays, SPDT, with 10-A or greater contacts, ORA Electronics TW-3415 (see note 1); (Radio Shack 275-218 suitable, but has extra set of contacts, which may be wired in parallel with first set). L1 and L2 are toroidal-wound, bifilar RF chokes. Use 15 bifilar turns (see text) of no. 24 enam wire on an Amidon Assoc FT-50-43 toroid core (mu = 850, OD = 0.5 inch). Four Radio Shack 273-102 RF chokes (100 μH) may be substituted for L1 and L2.

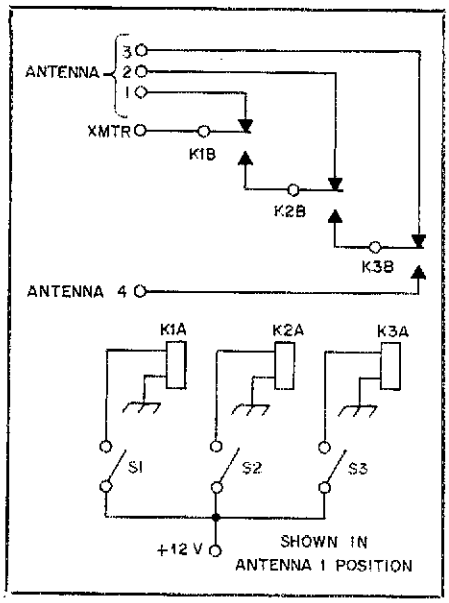


Fig 2—Suggested method for switching four antennas with three relays. K1, K2 and K3 are not shown as floating above RF ground (see Fig 1).

come a matter of concern at VHF and even more so at UHF. Therefore, we need to choose a relay with minimum conductor lengths, and we must keep the connecting wires to the relay as short as practicable.

I don't recommend the use of 117-V ac relays for remote-control use. I always use 12- or 24-V dc relays for my control circuits. This removes the potential hazard of shock to persons or animals. It also lowers the chance for fires caused by short-circuited control lines.

We need also to select relays that have contacts that are heavy enough in current rating for the job we plan to do. Suppose that you will be operating part of the time with, say 600 watts of RF output power. This means that your transmitter will develop 173-volts RMS at 50 ohms, and the current through the relay contacts will be 3.5 A. This can be determined by using Ohm's Law. Now, if your transmitter delivers only 150 W of output power into a 50-ohm line, the RMS voltage will be 86.6 and the RF current will be 1.7 A. These are best-case conditions. The contacts on most relays are rated for a specific maximum voltage and current, and this information must be considered when selecting your relay.

Our next concern is for the field coil of the relay. The higher the field resistance (dc ohms), the lower the current required to operate the unit. Various coil resistances are available for a given operating voltage. Generally, the larger the physical size of a relay, or the greater the number of contacts and poles, the lower the coil resistance. The higher resulting current is needed in order to operate the relay.

We need to ponder the matter of relay insulation also. Ideally, an antenna relay has ceramic or steatite insulation. Unfortunately, these excellent relays are very expensive—if you are lucky enough to find one! Some surplus dealers may still offer ceramic relays of WW-II vintage. Most of today's relays have plastic insulation, which under adverse conditions can be burned by excessive RF voltage.

An SP3T Antenna

Fig 1 shows the switcher-head circuit for this month's project. You will note that two 12-V, SPDT relays are required. Four coaxial jacks are used to permit attachment of the main feed line to the station, plus short feeders for the three antennas. K2 is wired in series with K1 to achieve the switching function we need (contacts K1B and K2B).

K1A and K2A are the field coils of the relays. Each relay has a 1N914 silicon diode in parallel with the field coil (D1 and D2). These diodes clip the voltage transient that occurs when the fields in the coils collapse: The momentary high-voltage spikes could travel down the relay control line and cause damage to the power supply.

L1 and L2 are bifilar-wound (two wires wound simultaneously in parallel on the core) toroidal chokes. These units isolate the relay from ac ground, which helps prevent arcing when RF current is flowing through the relay contacts. In order for this measure to be effective, we must mount the relays on an insulator to "float" them above RF ground. The use of L1 and L2, plus floating the relays, permits us to use relays with plastic insulation, even at the higher power levels. A small piece of phenolic, Plexiglas® or similar nonconductive sheeting is suitable as the mounting plate for K1 and K2 of Fig 1. The relays I am using are automotive types that are enclosed in sealed plastic cases. They also have a plastic mounting lug through which a hole has been made—ideal for this application: I did not have to make an insulator mounting block.[1]

An SP4T Switcher

You may add as many relays as you wish

[1]Obtained from ORA Electronics, 20120 Plummer St, PO Box 4029, Chatsworth, CA 91313, tel 800-423-5336. Also, check local automotive supply houses for similar relays.

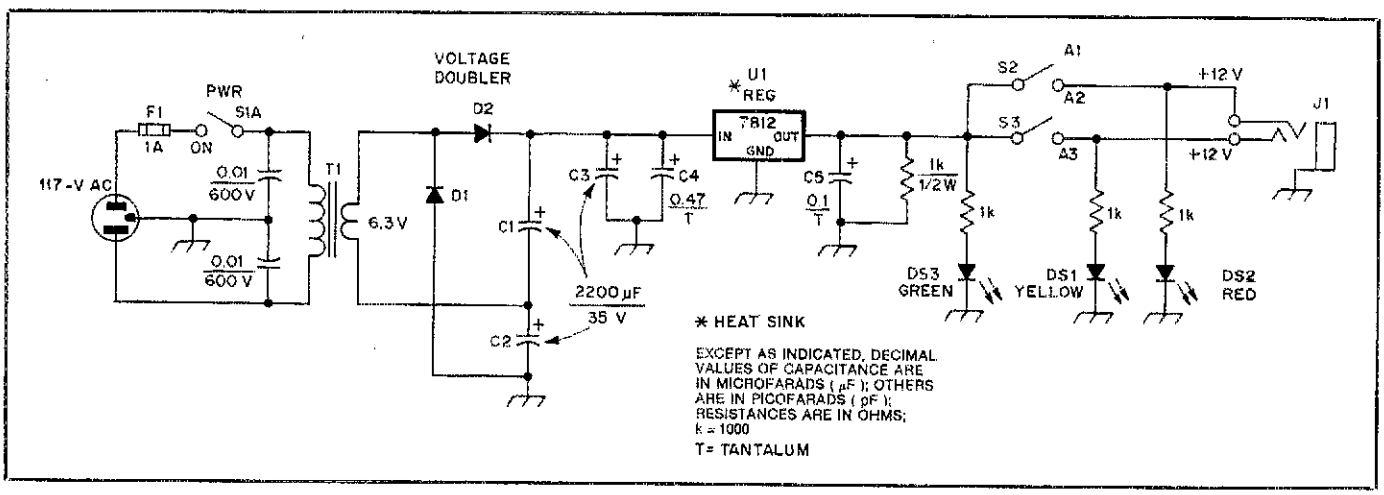


Fig 3—Schematic diagram of the power supply and control circuit. Capacitors are disc ceramic unless otherwise noted. Polarized capacitors are electrolytic or tantalum. Resistors are ¼-W carbon-composition types.

C1, C2, C3—2200-µF, 35-V (RS 272-1020 or equiv).
C4—Mylar or tantalum, 0.47-µF, 35-V (RS 272-1433 or equiv).
C5—0.1-µF, 35-V capacitor, disc ceramic, mylar or tantalum (RS 272-1432 or equiv).
D1, D2—1N914 50-PRV, 1-A rectifier diode (RS 276-1101 or equiv).
DS1, DS2, DS3—Yellow, red and green LED (RS numbers, respectively, 276-021, 276-041, 276-022).
F1—1-A fuse in panel-mount holder (RS 270-364 or equiv).
Heat sink—TO-200 bolt-on heat sink (RS 276-1363 or equiv).
J1—Three-circuit phone jack (RS 274-312 or equiv). Mating plug is RS 274-139. Use three-wire cable, RS 278-371 or equiv.
S1, S2, S3—Miniature SPST toggle (several RS types avail).
T1—6.3-V, 1.2-A filament transformer (RS 273-1351 or equiv).
U1—See text. 12-V, three-terminal regulator (RS 7812 or equiv).

to extend the switching capability of the remote unit. Fig 2 contains a suggested circuit for switching up to four antennas. Three relays are required. Irrespective of the number of relays employed, each is connected with the contacts in series with the successive relay. K1, K2 and K3 are not shown as RF-isolated from ground, but they need to be treated in the same manner as K1 and K2 of Fig 1.

Power Supply and Control Circuit

A 12-V, 0.5-A regulated dc power supply is shown in Fig 3. This may seem "overengineered" for so simple a project. But, although the diagram looks rather "busy," the circuit is pretty ordinary. A 6.3-V transformer was selected because I happened to have one on hand. I added a voltage-doubler circuit (D1 and D2) that actually delivers 17.8-V dc (no load) to the three-terminal regulator, U1. You may use a 12-V regulator if your control line to the relay switcher (Fig 1) is less than 50 feet long and if the control wires are number 22 or heavier. For longer runs, I suggest a 15-V regulator at U1. This will compensate for the voltage drop in the control cable, thereby ensuring that K1 and K2 receive ample voltage to make them operate reliably.

DS3 (green) serves as the ON indicator for the power supply. DS2 (red) signifies, when lit, that ANTENNA 2 has been selected. DS1 (yellow) shows us that ANTENNA 3 is activated. J1, a three-circuit phone jack, serves as the connector for the control line. A view of the interior of the power supply is seen in Fig 4.

You may opt for a less elaborate relay power supply. If so, the circuit in Fig 5 will satisfy your needs. It has a 12-V transformer and uses a single diode in a half-wave rectifier circuit. A 7812 three-terminal regulator may be used if you have short runs of control line. If you plan to have more than 50 feet of control cable, simply eliminate U1 from the circuit. In either event, the dc output from the power supply may be routed to the control switches and LEDs (optional) of Fig 3.

Construction Notes

My relay box is made from sections of double-clad PC-board stock. The box walls are joined by soldering the adjacent surfaces with a 100-W iron or soldering gun. Make certain that there are no air holes along the soldered seams: This box needs to be weatherproof for outdoor installations. You may use silicon-rubber sealant (such as RTV cement, Silastic compound or caulking) around the outer edges of the four coaxial connectors to prevent moisture from entering the box. A dab of the same material should be placed over each screw head.

The box cover is a piece of PC board. It is held in place by means of four no. 6 spade bolts that are affixed to the walls of the relay box. Upon installation, apply sealant around the edges of the cover and over the four no. 6 nuts that are screwed onto the spade bolts. I also place a blob of sealant around the control cable where it enters the box. If you do not mind spending some extra money for this project, consider housing the relays in a die-cast aluminum box.

My power supply is built in a 3 × 4 × 5-inch aluminum box. There is no reason why you can't make a case from PC-board material. You may prefer to impart a more professional appearance by housing the circuit in one of the many two-piece cabinets that are available.

It will be best if you choose your own mounting technique for the relay box. Perhaps a metal plate can be attached to the back side of the box, allowing two inches of overhang at each end of the box. This will provide two lips that can be used to affix the relay box to a tower leg by means of two U bolts. The approach used for mounting the unit will depend entirely upon how and where you plan to locate the assembly. My installation requires the relay box to be near ground, where I have three coaxial feed lines that are switch-connected to a single length of impregnated 50-ohm line. This cable is buried in the ground between the relay-box site and the house. I am switching a Cushcraft A3 tribander, an 80-meter Delta Loop and a 160-meter vertical radiator. My relay box is attached to a 2- × 4-inch wooden post with two no. 6 sheet-metal screws through the back wall of the box.

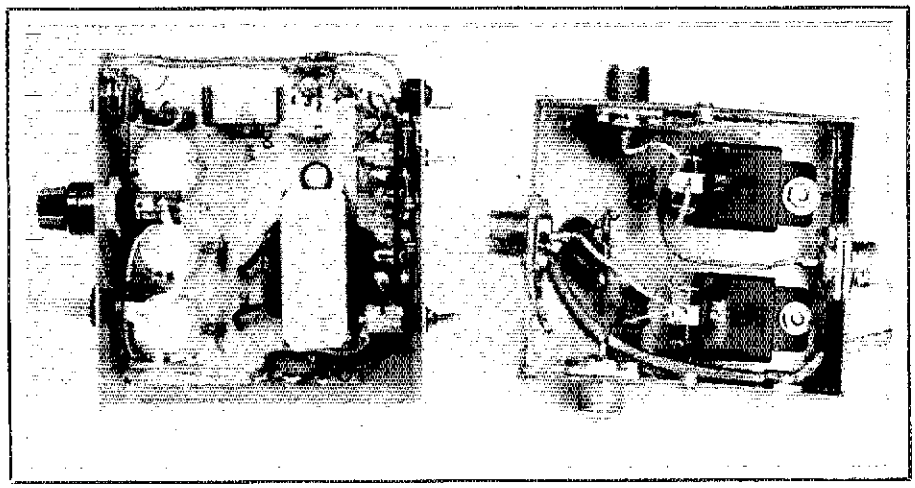


Fig 4—Photographic view of the interior of the power-supply/control unit. The LED dropping resistors are mounted on a terminal strip on the inside surface of the front panel. The power supply is assembled on a PC board that is supported above the chassis on ¼-inch spacers. Adhesive-backed plastic feet (4) are affixed to the bottom of the box. Dymo tape labels identify the panel controls.

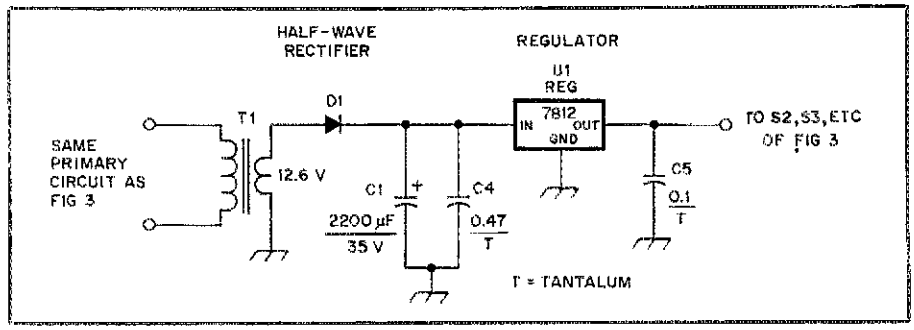


Fig 5—Alternative miser's power supply. See Fig 3 for RS part numbers applicable to C1, C4, C5, D1 and U1. T1 is a 12.6-V, 0.45-A filament transformer (RS 273-1365 or equiv). See text for a discussion of this circuit.

Checkout and Use

Test the power supply/control box first. Apply 117-V ac and measure the dc output voltage. Make sure that the appropriate LED illuminates when the corresponding switch is operated.

Next, connect the relay box to the control unit via three-wire control cable. Operate S2 and S3 and observe whether or not K1 and K2 are being actuated in the proper manner. Check from J3 to each of the remaining jacks (J1, J2 and J4) to ensure that continuity is present in accordance with the switching procedure. A VOM will be suitable for the test.

This relay system will accommodate 2-kW PEP if the line SWR is less than 1.5:1. It will handle 1.2-kW PEP at SWR values less than 2:1. Relay-contact burning or pitting may occur at high SWR values, so make certain your antenna system is matched for a low SWR before using the antenna switcher. Most of the parts for this project can be obtained from Radio Shack. Appropriate numbers are supplied in the parts list.

Adventures in Satellite DXing

Part 3: Now that you've decided on some equipment for OSCAR work, it's time to assemble it into an effective station.†

By Dick Jansson, WD4FAB
1130 Willowbrook Trail
Maitland, FL 32751

Last month, we talked about different ways of setting up your station for OSCAR 10, Mode-B operation. Now that you have a receiver, transmitter and a pair of antennas, you are probably wondering how to tie these parts together into a working system. In this part of the series on satellite DXing, you will discover those sometimes elusive techniques needed to make your radio equipment come alive with action.

Satellite work, like any other specialized facet of Amateur Radio, requires some specialized knowledge. Having the best equipment does not necessarily guarantee success. Presented here are a number of "hints-and-kinks" type ideas that have made OSCAR 10 operation more satisfying for me. Remember that this is my way of converting a basic receiver, transmitter and a pair of antennas into a fun operating position. My solutions are not the only ones—there are several ways to achieve the needed results.

Some of the items discussed here will provide capabilities beyond that of just operating AO-10, Mode B. They also apply to VHF and UHF terrestrial work. It's only natural: I enjoy terrestrial work as well, so I've equipped my VHF/UHF station with several uses in mind. Design your station to suit your own needs.

An often-heard cry is that there is nothing left to build in Amateur Radio these days. Hogwash! There are lots of useful items to construct, and this can be done without the investment of vast fortunes. Nearly everything you will see here has my own handmade (or modified) label attached. This arena also allows room for customizing a job *your* way. Of course, there are commercially available equivalents for nearly everything, if you prefer that route, but you'll miss a lot of fun.

Antenna Rotators

Unlike stations located on the surface of this good Earth, OSCAR 10 will be found

†Parts 1 and 2 appear in April and May 1986 *QST*. Part 4 will appear in a subsequent issue.

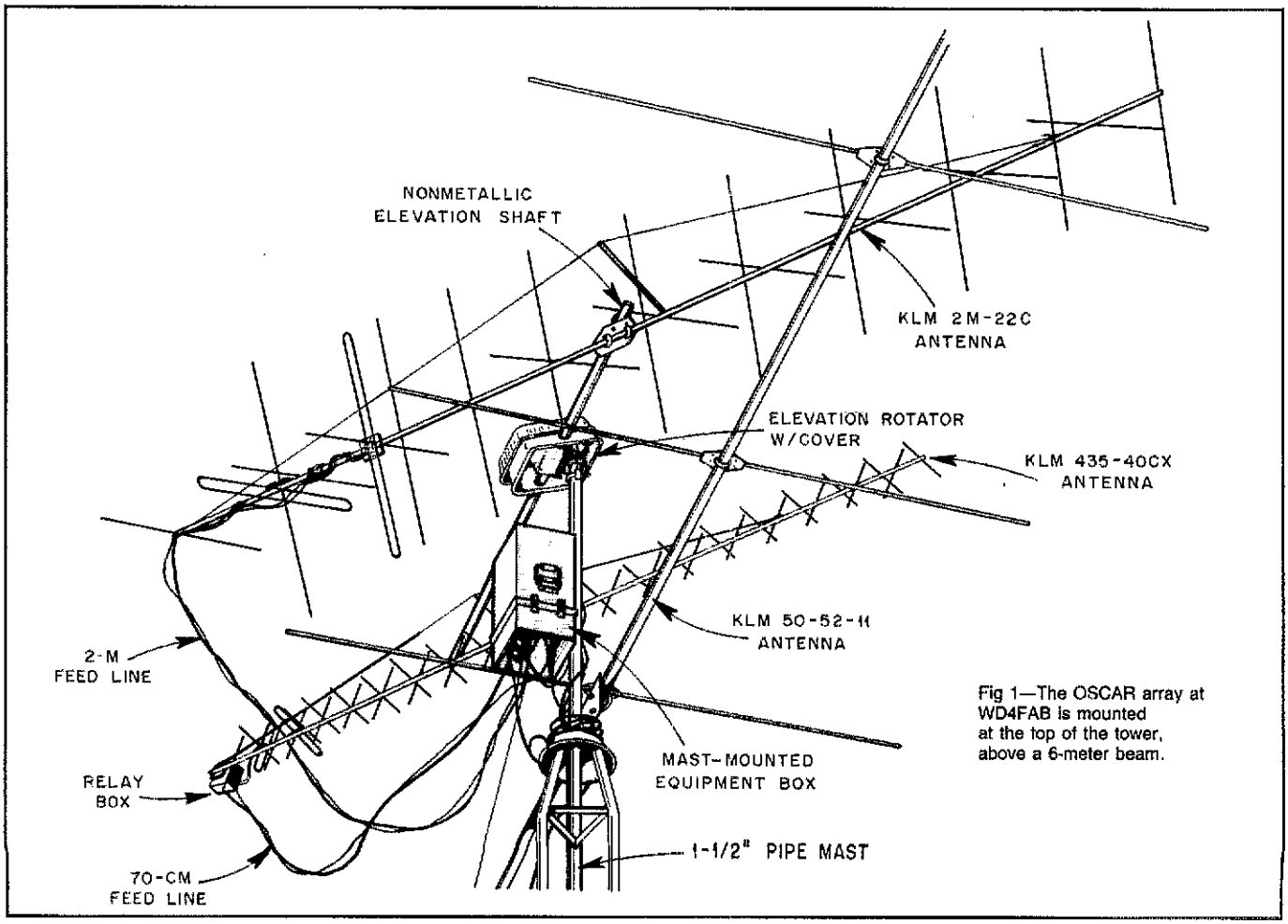


Fig 1—The OSCAR array at WD4FAB is mounted at the top of the tower, above a 6-meter beam.

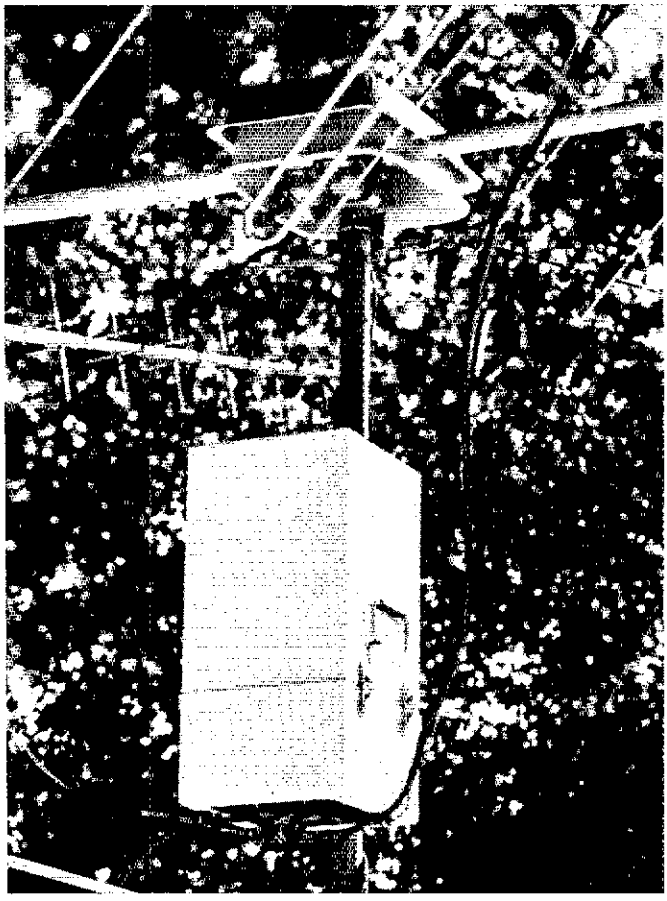


Fig 2—The elevation rotator, an Alliance U110, is protected from the elements by plastic and aluminum covers. The large white box holds tower-mounted equipment.

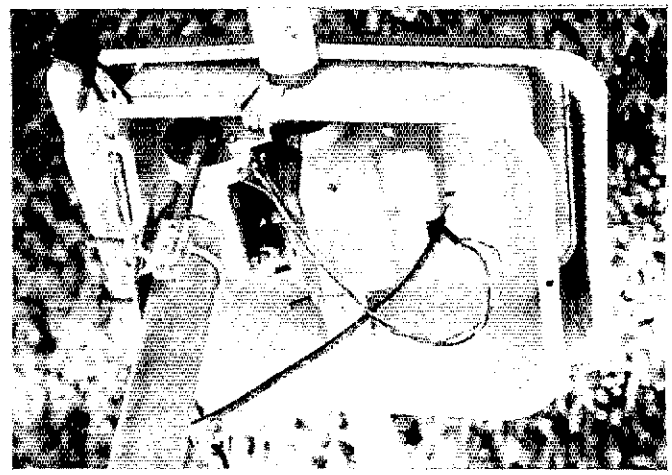


Fig 3—Close-up of the U110 showing how it mounts to the mast. Note the PVC pipe that slides over the steel stub protruding from the rotator.

somewhere in the sky above us. You are used to pointing your antenna toward another station by changing the pointing angle, or azimuth (sometimes called az). To find OSCAR 10, you'll also need to be able to control antenna elevation (el). Your antenna must be able to rotate from side to side and up and down simultaneously. See Fig 1. While I will talk about the use of electrically controlled antenna rotators here, you might note that OSCAR 10's motions are slow enough that hand-operated, "armstrong" antenna control is feasible. At times, the antennas don't need to be repositioned for periods of up to four hours.

Azimuth Rotators

Azimuth rotators are common—you've probably got one turning your HF or VHF antenna right now. Antennas for OSCAR 8 and other low-orbit satellites were on the smaller and lighter side, so light-duty TV-antenna rotators such as those sold by Alliance, Channel Master, Radio Shack and others could be used for the azimuth rotator. Today's high-gain satellite array, such as the one described in Part 2 of this series, is a bit large for these light-duty rotators. You really should look for something more robust, such as a rotator recommended for turning a small HF beam or VHF array. Various models manufactured by Alliance, Daiwa, Kenpro, Telex and others are routinely advertised in *QST*.

Elevation Rotators

Elevation rotator selection is somewhat more limited, but there are some interesting things that can be done. Commercially manufactured models are available. The Kenpro KR500, designed specifically for elevating small- to medium-size VHF or UHF arrays, is quite popular among satellite operators. Recent additions to the marketplace include two combined az-el offerings: the Dynetic Systems DR10 and Kenpro KR5400.

A lower cost, commercially manufactured alternative is the Alliance U110 TV-antenna rotator. Rotators of this type have been used by satellite operators (including me) for quite a few years. Despite its relatively light construction, I have had antenna loads weighing up to 80 pounds mounted on a U110! The key to success is to achieve static balance of the antenna mass so that the rotator does not have to elevate a "dead" load. A highly attractive feature of the elevation rotators noted above is that the cross boom to be rotated passes completely through the rotator. This allows you to mount one antenna on each side of center and adjust their respective positions for a side- to-side balanced load.

Figs 2 and 3 show my particular method of mounting the U110. The rotator is clamped to the mast (the one that the azimuth rotator turns) with a plate that permits it to mount 90° from its normal orientation. With the rotator mounted in this position, it is not protected from rain or snow as well as it is in the normal position. I added a cover (an appropriately sized plastic dishpan or bucket is ideal) to afford protection from the elements. A problem with polyethylene plastics, commonly used in kitchenware, is that solar radiation quickly deteriorates their polymeric structure and causes the plastic to break apart. As shown, I have covered the plastic with an aluminum foil baking pan to provide some protection from the sun.

There are other ways to elevate your OSCAR array, although I have found the method just described to be inexpensive and reliable. An ingenious "tilt rather than twist" concept was described in *Orbit* magazine by Al Zoller, W6OTE.[1] This method uses a modified Alliance HD73 azimuth rotator and appears to be viable, despite some limitations for long-boom antennas.

Cross Boom Construction

One requirement not commonly discussed is that of using a nonmetallic elevation axis boom for antennas that have their boom-to-mast mounting hardware in the center of the boom. A metal cross boom will seriously distort the beam pattern of a circularly-polarized antenna, so it's important to make the cross boom from nonmetallic material. My cross boom is made from a combination of metallic and nonmetallic tubing. For strength and stiffness, I used a short length of steel tubing through the middle of the U110. Thick-walled aluminum tubing would work as well. The steel tubing extends for about 6 inches on each side of the rotator. I then installed nonmetallic masting over the steel stubs.

From a structural standpoint, the best nonmetallic material for this job is glass-epoxy tubing, because its stiffness is

[1]Notes appear on page 36.

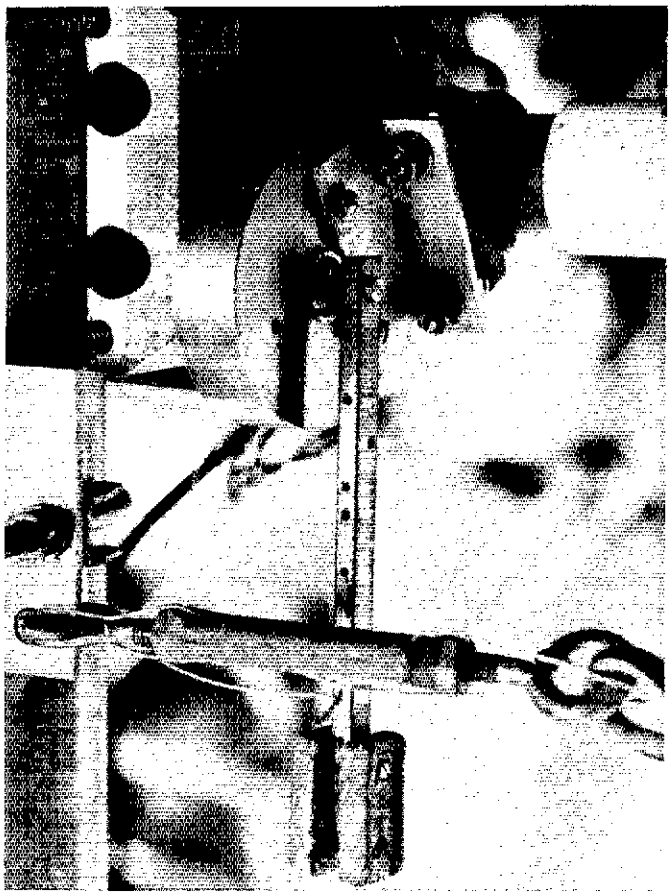


Fig 4—Details of the position potentiometer mounting and weighted arm.

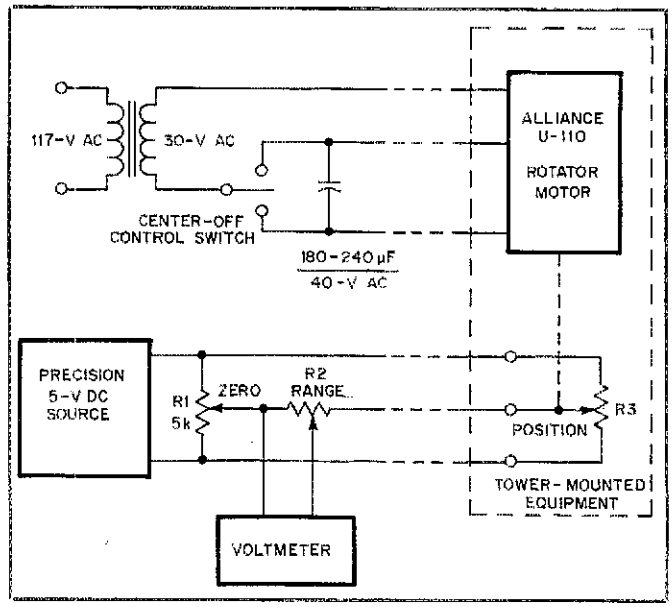


Fig 5—Block diagram of the elevation rotator direction control and position readout.

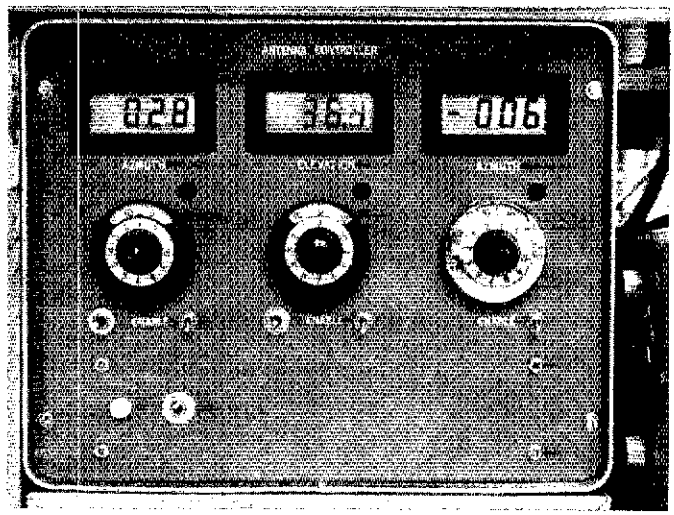


Fig 6—The circuitry in Fig 5, taken to extremes, provides control and position readout for three rotators.

excellent. You may be able to find this material at an industrial supply house that specializes in plastics. Also, KLM sells lengths of 1½-inch-OD fiberglass masting for this purpose. If you have a rotator that will accept a 1½-inch elevation boom, then your best bet is to use a single section of this tubing.

An alternative nonmetallic material, one that I use, is PVC pipe. Unlike glass-epoxy tubing, however, PVC pipe is not very stiff; it needs help. Based on a suggestion from Nick Laub, WØCA, I built the elevation boom pictured in Figs 1-3. The center piece that fits through the U110 is a 2-foot section of 1.33-inch-OD steel tubing that originally was part of the top support rail of a chain-link fence. Attached to the steel stub on each side of the rotator is a 3- or 4-foot length of 1¼-inch, schedule-40 PVC pipe. PVC pipe is specified by the nominal ID, here 1¼ inches. There are several varieties of 1¼-inch PVC pipe—schedule 40 indicates a thick-wall, heavy-duty version. I was able to slip the PVC pipe over the center stub. The fit is perfect—no machining needed!

Now comes the secret to making PVC pipe capable of supporting satellite Yagis. Insert a wooden dowel into the PVC pipe, along its entire length. The finished dimension of 1-3/8-inch wooden clothes rod dowel (the kind you might hang inside a closet) is just perfect for a slide fit into the pipe. This material is available from most lumber yards. Add a few ¼-inch bolts to each side to secure the pieces, and you've got a sturdy, inexpensive, nonmetallic elevation boom.

Position Indicators

You've probably noticed additional hardware around my elevation rotator. With the use of high-directivity antennas, the accuracy of the U110 control box is questionable. Adding a single-turn, 1-kΩ precision potentiometer provides the ability to closely control and position the elevation boom. See Fig 4. The potentiometer (a large surplus instrumentation model) is attached to the elevation boom with a U bolt and angle bracket. A metal arm with lead weights at the end is attached to the potentiometer shaft. The weighted arm and gravity hold the shaft still while the potentiometer body turns with the elevation boom.

A simple circuit, shown in Fig 5, is all that is needed to control the U110 and to use signals from the precision potentiometer (R3) for an accurate position indicator. R1 is used to zero the scale, while R2 calibrates the range of the indicator. The value of R2 will depend on the value of the voltmeter you use. For example, you might use a 0- to 100-mV meter and adjust it so that 10 mV equals 10° elevation, 30 mV equals 30° elevation, and so on. Just to show that simple circuits can easily be corrupted by some of us, Fig 6 shows a controller for up to three rotators. One *useful* feature of this box is that the voltmeters are OEM digital panel meters. The calibration is set up so that 1 mV equals 1 angular degree.

Tower-Mounted Preamplifiers

Last month we briefly discussed low-noise receiving preamplifiers and said that

you'll probably need one to get the most out of your satellite station. For best results, the preamp should be located on the tower or mast, near the antenna so that feed-line losses do not degrade low-noise performance. Feed-line losses ahead of the preamplifier add directly to receiver noise figure. A preamp with a 0.5-dB noise figure won't do you much good if there is 3 dB of feed-line loss between it and the antenna.

Mast mounting of sensitive electronic equipment has been a fact of life for the serious VHF/UHFer for years, although it may seem to be strange or difficult technology for many HF operators. A mast-mounted preamp is not difficult to construct if you prefer to build things yourself. There is a growing number of commercially available models as well. See the list of equipment suppliers in Part 2 of this series. Just to show you that simple ideas can really be made complicated, let's take a look at what I've done with mast mounting of radio equipment.

Take another look at Fig 2. You can't miss the large white box located below the elevation rotator on my antenna stack. Fig 7 shows the interior of this box: It contains a lot of items besides a simple preamp! The box holds two racks of equipment. On the right are two dc voltage regulators with their pass-transistor heat sinks. These regulators provide on-site-regulated 28-V dc and 12-V dc from an unregulated 50-V dc supply located in the shack. Below the regulators is a 24-cm transmitting converter for Mode-L operation (1269-MHz uplink, 436-MHz downlink). Opposite the regulators on the other rack panel is a 70-cm solid-state power amplifier, a 70-cm preamplifier and relays.

Fig 8 is another view that details the area below the 24-cm transmitting converter. If you look closely, you'll see a 2-meter preamplifier and relays to switch it in and out of the line to the antenna. Before you close the magazine in dismay, remember that this is my particular way of doing things. I'm a fanatic about feed-line loss. There are plenty of successful OSCAR 10 stations that mount only the preamp at the antenna, and that will most likely work for you, too.

Control Circuitry

Fig 9 is a schematic diagram of the control circuitry for the tower-mounted rack. You'll find parts of this diagram helpful, even if you mount just a preamp at the antenna. You should note that I designed this circuit around the surplus coaxial relays that were available at the time. Your version will probably be different and will depend on the relays available to you. Switching requirements for coaxial relays were the subject of a comprehensive discussion by Joe Reisert, W1JR.[2] Fig 9 is my version of his concepts.

This circuitry performs several functions. For starters, it places the preamp in the line only during receiving periods and takes it out of the line during transmitting periods and at those times when the station is not in use. This is necessary because I use my satellite array for terrestrial transceive operations as well. The circuitry isolates the preamplifier when it is not used for receiving, protecting it from stray electromagnetic pulses (EMP), such as lightning strokes. EMP protection is desirable even if you use the antenna and preamp only for receiving AO-10 signals.

Fig 9 is a bit more complicated than the average mast-mounted preamp setup because I also use 2-meter RF to drive the 24-cm transmitting converter. I have an extra relay (K3) to switch between 2-meter and 24-cm operation. K1, a DPDT transfer relay, switches the input of the preamp between the antenna and a 50-ohm termination. K2, another DPDT relay, switches the preamp output between a 50-ohm termination and the feed line to the shack. The coaxial cable used for connections between the relays is cut to 0.1 to 0.2 electrical wavelength as recommended by W1JR to

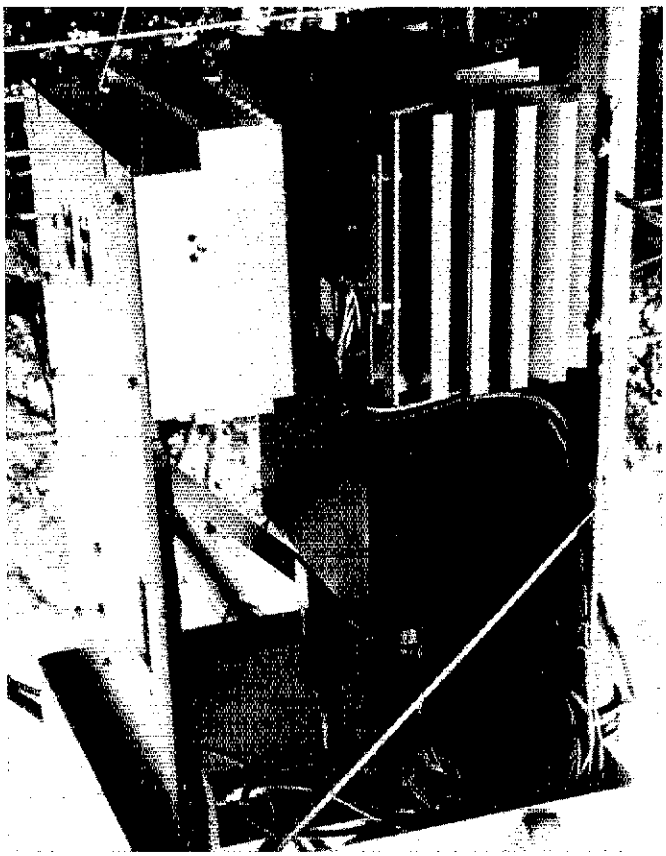


Fig 7—Interior of the tower-mounted equipment rack with the cover removed. The 70-cm equipment is on the left, while power-supply regulators, a 24-cm transmit converter and a 2-meter preamp are mounted on the right.

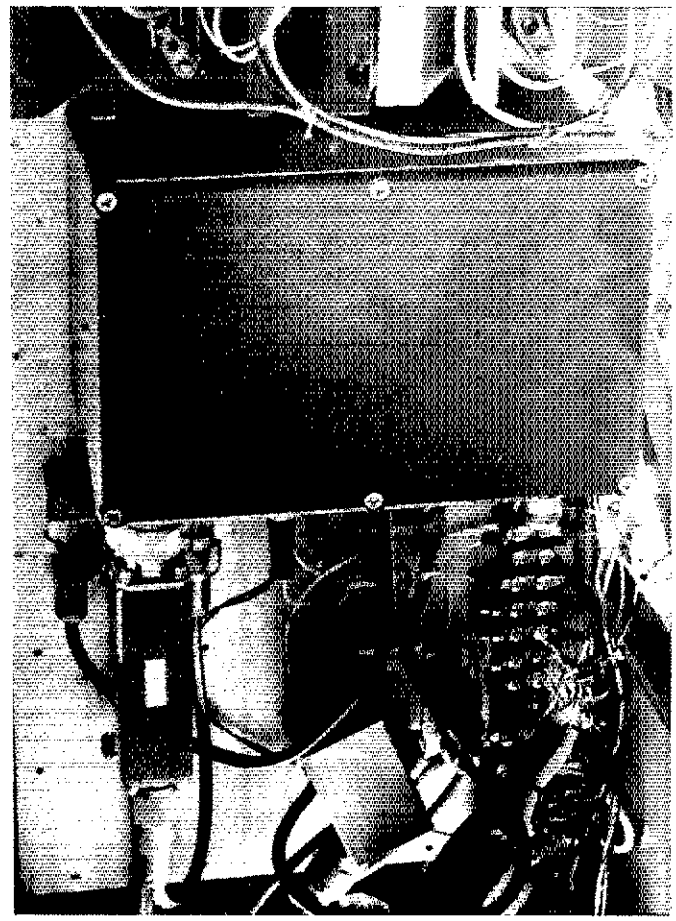


Fig 8—Close-up of the 2-meter preamplifier and relays.

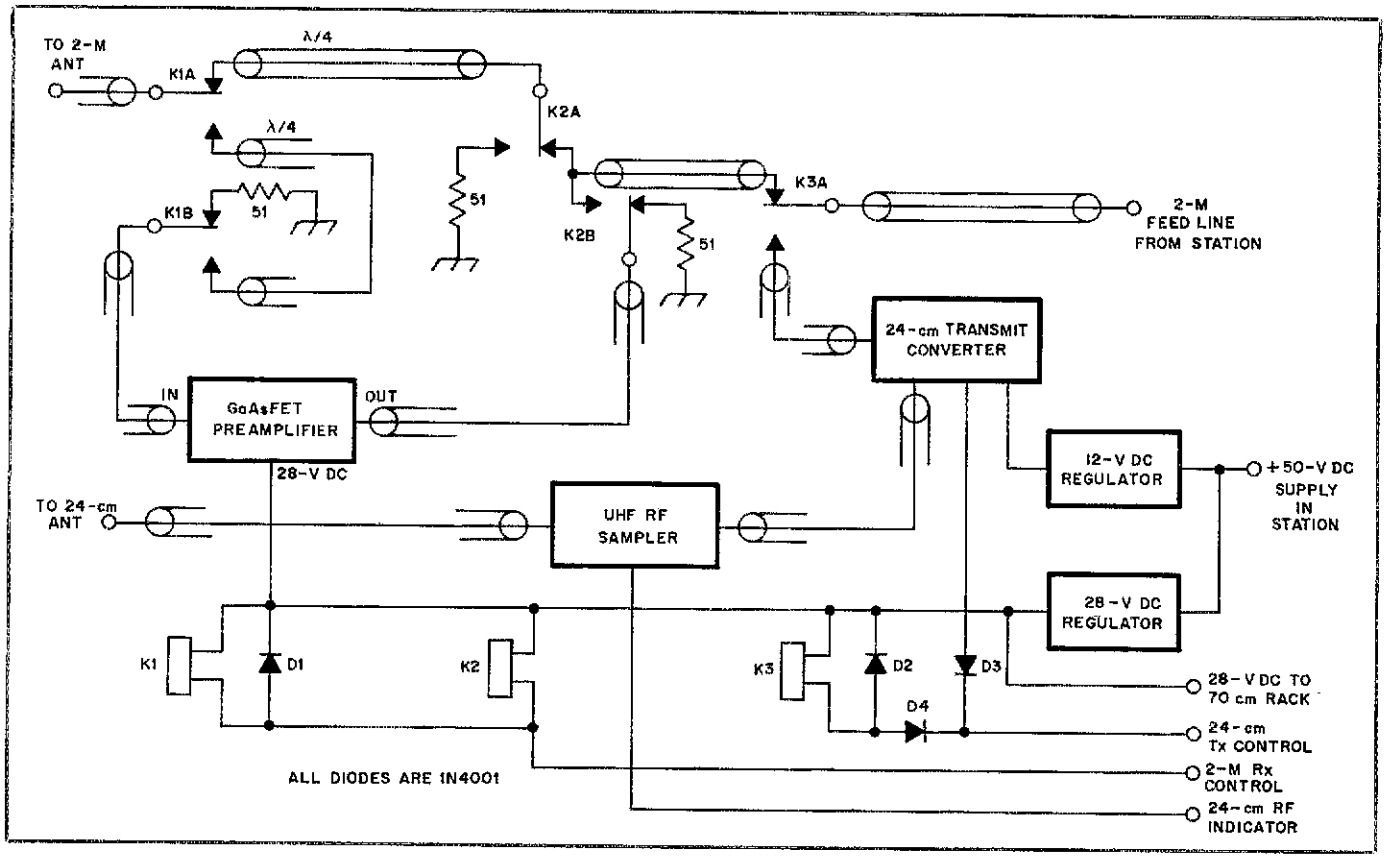


Fig 9—Control circuitry for the mast-mounted 2-meter preamplifier. K1-K3 are surplus coaxial relays.

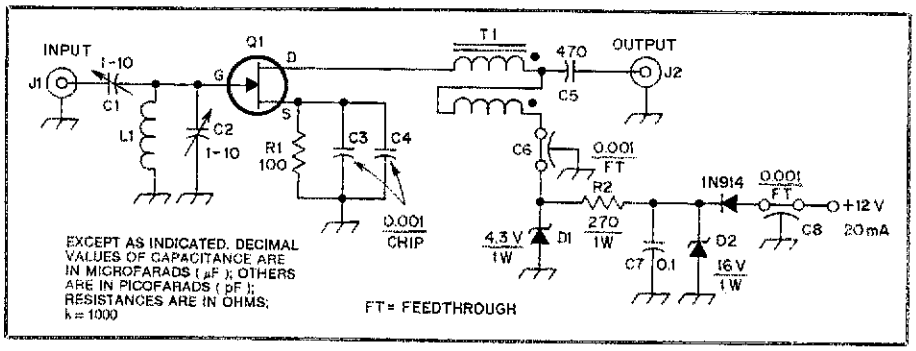


Fig 10—Schematic diagram of the 2-meter, W6PO-type GaAsFET preamplifier. Construction hints may be found in Chapter 31 of *The 1986 ARRL Handbook*.

C1, C2—1-10-pF ceramic or piston trimmer capacitor.
C3, C4—0.001-μF ceramic chip capacitor.
C5—470-pF silver-mica capacitor.
C6, C8—0.001-μF feedthrough capacitor.
C7—0.01-μF disc-ceramic capacitor.
D1—4.3-V, 1-W Zener diode.
D2—16-V, 1-W Zener diode.
J1, J2—Female chassis-mount BNC connector.
L1—6t no. 14 wire, ¼-inch ID, ½ inch long.
Q1—GaAsFET: Suitable parts include MGF1202, MGF1402, NE72089.
R1—100-Ω, 1/4- or 1/8-W carbon-composition resistor installed with leads 1/8 inch or less.
R2—270-Ω, 1-W resistor.
T1—12t of a twisted pair of no. 24 enam wire on T37-0 toroid core.

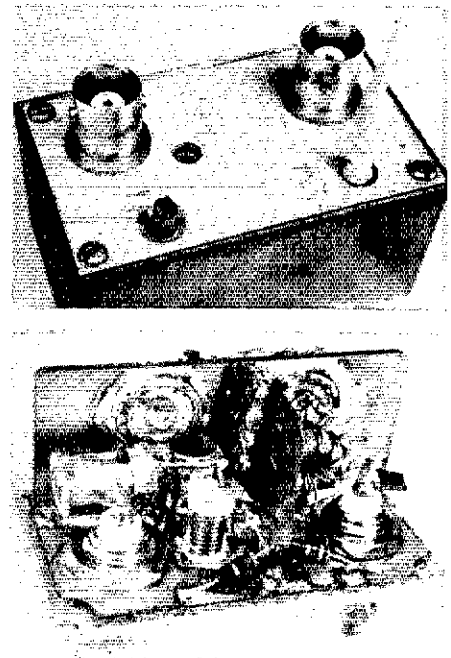


Fig 11—The completed preamplifier is housed in a small aluminum enclosure.

achieve maximum isolation between the transmitted RF and the preamp input. The relays are connected so that they must be energized to place the preamp in line. This setup has worked well for me. I have not lost any GaAsFETs because of EMP or routine RF transmissions, and central Florida is probably the champion lightning-storm area of the country, if not the world.

As you can see, this is all homemade or modified surplus equipment—I enjoy doing things myself. Construction of preamps has been rewarding and relatively easy. I found the basics for the W6PO design (Fig 10) in a newsletter.[3] Similar designs have been documented in *QEX*.[4] There is also a wealth of ideas in Chapter 31 of *The 1986 ARRL Handbook*.[5] The construction process is not terribly complicated, as shown by my 2-meter preamp (Fig 11).

Tower-Mounted Equipment Shelters

A great many amateurs seem apprehen-

sive about placing their valuable radio equipment outdoors. My experiences to date show that such fears are unfounded. Since 1977, I have owned only one Microwave Modules MMt 432/50 (70-cm to 6-meter) transverter. For at least three of those years it was in the wild outdoors of the Florida climate serving its mission well. It has suffered no ill effects other than mild corrosion on the heads of some plated screws that hold the RF connectors. The equipment shown in the photos has been outdoors, without adverse effects, for years.

My present mast-mounted enclosure that you saw earlier is a welded aluminum box I purchased at a local surplus dealer for $6. I used it because it was available and because it is large enough for my needs. You don't need a fancy box like this, especially if all you want to protect is a preamp and two relays.

Fig 12 shows the basic scheme for weatherproofing tower-mounted equipment. This is what I used before I got so carried away with remote mounting. The fundamental concept is to provide a cover to shelter equipment from rain (or snow for you northerners). A 2-inch-deep aluminum cake pan is about the minimum acceptable cover. A trip to the housewares section of the local department store will reveal all manner of plastic and aluminum trays and pans that make great rain covers. As mentioned before, polyethylene plastic must be protected from sunlight. Clear polystyrene refrigerator containers work better, and aluminum is best of all. Choose a cover that is large enough for your equipment; remember to leave room for connecting cables.

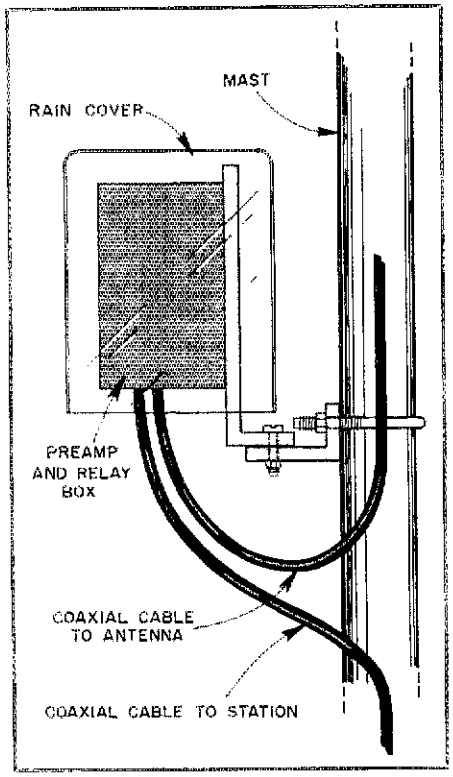


Fig 12—Protection for tower-mounted equipment need not be elaborate. Be sure to dress the cables as shown so that water drips off the cable jacket before it reaches the enclosure.

You'll notice that the bottom of the rain cover is open to the elements. This is done on purpose and will not cause any problems. Do *not* try to hermetically seal the enclosure. By leaving the bottom open, you provide adequate ventilation, and there will be no accumulation of water condensation. Just make sure that water cannot run into the enclosure by way of cables coming from above. Bend the cables as shown in Fig 12 to provide drip loops.

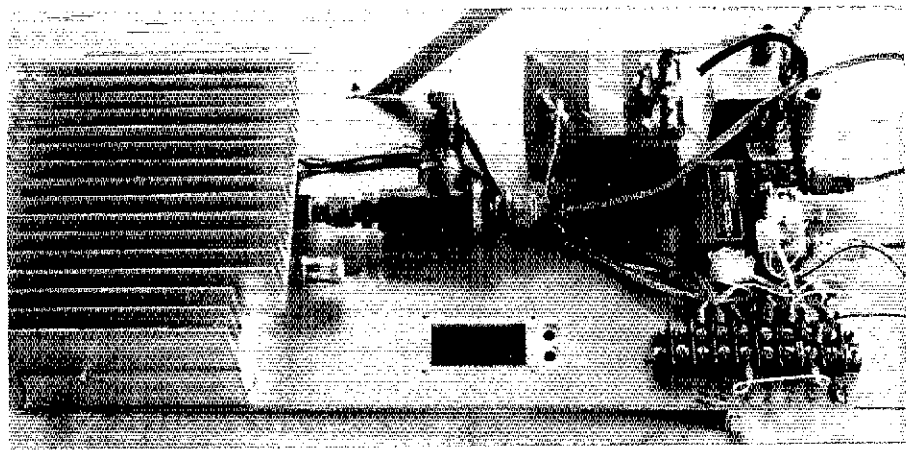


Fig 13—The 70-cm equipment panel holds a power amplifier, preamp and TR relays.

Fig 14—The station control unit at WD4FAB fits underneath a transceiver. It houses the TR sequencer and provides instant control of many station functions.

Transmitting

Fig 13 shows the 70-cm rack from the mast-mounted equipment box. I mounted my 70-cm power amplifier (built on the heat sink at the left of the photo) near the antenna to avoid feed-line losses, but this isn't necessary. I probably wouldn't do it again. Attached to the amplifier output is a coaxial RF sampler for remote power monitoring. To the right of the power amplifier is a 70-cm preamp and coaxial relays I use for OSCAR Mode-L reception and terrestrial operation.

One very important aspect of using GaAsFET preamps with transmitting equipment is getting everything to switch in the right sequence. If you apply voltage to your transmitter, amplifier and antenna relays simultaneously, it's likely that RF will be applied before the relays are fully closed. Such hot switching can easily arc the contacts on your expensive coaxial relays. In addition, if the TR relay is not fully closed, RF may be applied to your preamplifier. Such bursts of RF energy will, in less than the wink of an eye, cleanse your treasured preamplifier of its expensive active device, *guaranteed*. Many pieces of transmitting equipment (especially multimode transceivers) emit a short burst of RF power when switched on or off, so you run the risk of transmitting into your preamp even if you are careful to wait a second to speak or press your CW key.

Ideally, you would set your sequencing up something like this: When you switch into transmit, the coaxial relays change state to remove the preamplifier from the line. Next, the power amplifier is keyed on. The last thing that happens is that the trans-

(continued on page 36)

Small, High-Efficiency Loop Antennas

An alternative antenna for small spaces.

By Ted Hart, W5QJR
PO Box 334
Melbourne, FL 32902

The small loop antenna is akin to an uncut diamond. It has been around a long time, and has only recently been cut and polished to reveal a shining new gem. This antenna is small, operates well when mounted at ground level, and exhibits performance that competes with almost any HF antenna except a multi-element beam at a wavelength or more above ground. This article explains how the wrapper was taken off this antenna, and why.

History

The so-called "Army Loop" antenna was the first effective implementation of a small loop for transmitting.[1] It performed well, in spite of poor efficiency, but efforts to duplicate the design for amateur operation failed.[2] Antenna Research Associates developed the loop into an excellent small communications antenna and patented it in 1967, and Technology for Communications, International (TCI) also developed a version. Both companies have marketed the units at a price tag exceeding $13,000 including automatic tuner. My efforts have been directed to developing a small practical antenna that any ham can duplicate.

I was searching for a small antenna design to help hams with restricted space, and concluded that the loop was one feasible approach to achieve high efficiency in a small space. Small antennas are characterized by low radiation resistance, and the addition of a loading coil adds losses that result in poor efficiency. If a large capacitor is added to a small antenna to bring it into resonance, and the antenna conductor is bent to connect the two ends to the capacitor, a loop antenna is formed. If the losses in the conductor are small and there are no losses in the capacitor, a high-efficiency antenna can be achieved in a small space. The amount of losses that could be tolerated was unknown; therefore, I developed a set of equations to allow the various parameters to be calculated. Once that was done, the other problems were easily solved.

Small-Loop Definition

A small loop is defined as an antenna in the shape of a loop with a conductor length (circumference) less than one-third of a wavelength. It will produce a radiation pattern that compares to a doughnut (see Fig 1). If the doughnut is standing on the ground with its axis horizontal, there will be a null through its center (on its axis). A unique feature of the loop is the radiation polarization. First, consider the straight dipole. The polarization of the straight

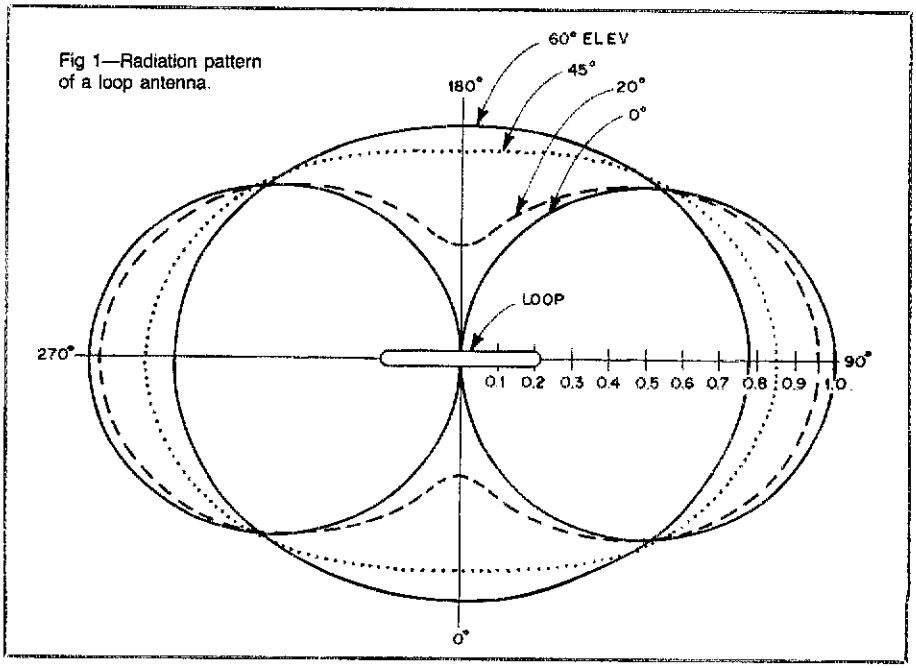


Fig 1—Radiation pattern of a loop antenna.

[1]Notes appear on page 36.

Table 1
Recommended Loop Antennas

Circumference (Feet)	Frequency (MHz)	Efficiency (Below 100%) (−dB)	Tuning Capacitor (pF)	Bandwidth (kHz)
8.5	29	0.4	9	109
	24	0.7	9	55
	21	1.0	23	36
	18	1.6	35	22
	14	3.1	60	12
	10	6.5	125	7
20	14	0.3	6	66
	10	1.0	29	20
	7	2.7	73	7
38	7.2	0.5	10	27
	4.0	3.0	102	5
	3.5	4.1	143	4
60	4.0	1.0	23	10
	3.5	1.5	47	7
	2.0	5.8	255	2
	1.8	7.0	328	2
100	2.0	2.1	88	4
	1.8	2.7	128	3

Notes
[1]All of the above use ¾-in copper tubing.
[2]Values of efficiency and bandwidth without radials.

dipole is taken to be the direction of the electric field, which is parallel to the axis of the dipole—no electric field or polarization exists in any other direction. If we bend the dipole into a circular loop having a single plane, the only polarization component radiated by the loop lies in the plane of the loop. However, in this plane the polarization component radiated from any given point on the loop is parallel to a line tangent to the loop at that point. Consequently, if the plane of the loop is oriented horizontally, the polarization will be horizontal everywhere—no vertical component exists because no polarization component exists outside the plane of the loop.

On the other hand, if the plane of the loop is oriented vertically, the tangent line at the point of 0° in elevation is vertical, yielding vertical polarization. At the point of 90° in elevation, the tangent line is horizontal, yielding horizontal polarization. However, at all points in the loop plane between 0° and 90° in elevation, the tangent line is at an angle between vertical and horizontal, yielding a linear polarization comprising both vertical and horizontal components. For example, at 30° elevation the polarization angle is 60°; at 45° elevation, the polarization is at 45°, and so on. The fact that it radiates at vertical and horizontal angles allows the benefits of both vertical *and* horizontal dipoles to be realized.

Mathematical Equations Used to Define the Loop

The equations I developed to define the loop follow.

Radiation resistance, R_R,

$$= 3.38 \times 10^{-8} (F^2A)^2 \quad \text{(Eq 1)}$$

Loss resistance, R_L,

$$= 9.96 \times 10^{-4} \sqrt{F\frac{S}{D}} \quad \text{(Eq 5)}$$

Efficiency, η, $= \dfrac{R_R}{R_R + R_L}$ (Eq 3)

Inductance, L, $= 1.9 \times 10^{-8}$

$$S(7.353 \log_{10} \frac{96S}{\pi D} - 6.386) \quad \text{(Eq 4)}$$

Inductive reactance, X_L,

$$= 2\pi FL \times 10^6 \quad \text{(Eq 5)}$$

Tuning capacitor, CT,

$$= \frac{1}{2\pi FX_L \times 10^6} \quad \text{(Eq 6)}$$

Quality factor, Q,

$$= \frac{F}{\triangle F} = \frac{X_L}{2(R_R + R_L)} \quad \text{(Eq 7)}$$

Bandwidth, $\triangle F$, $= \dfrac{F}{Q}$ (Eq 8)

Distributed capacitance, C_D, $= 0.82$ S

Capacitor voltage, V_C, $= \sqrt{PX_L Q}$ (Eq 9)

where
A = area of loop (sq ft)
S = length of conductor (ft)
F = operating frequency (MHz)
D = diameter of conductor (in)
P = transmitter power (W)

Efficiency

Efficiency is defined as the power radiated by the antenna divided by the power applied to the antenna. Power applied to the radiation resistance will radiate, while power applied to the loss resistance will be converted to heat. Radiation resistance is a function of the area of a loop. For a conductor of given length, a round loop will have more area, hence a higher radiation resistance than any other shape. When mechanical factors are considered, an octagon loop is the preferred shape. A loop will have a radiation resistance approaching 0.05 ohm; therefore, loss resistance must be kept low. A loop made of ¼-in-diameter copper pipe is a reasonable compromise if the circumference is greater than 1/8 wavelength. Loops with circumference less than that require larger conductors. Table 1 shows recommended loop sizes for various frequencies.

Frequency Range

The inductance of a loop can be calculated and the inductive reactance determined. The value of tuning capacitance that resonates the loop at a given frequency can then be calculated. I constructed several loops and measured them to find a value for the distributed capacitance. An equation was then empirically developed to define the distributed capacitance for any size of loop. Then, by subtracting distributed capacitance from tuning capacitance, we can determine the actual value of tuning capacitor required. With a large variable capacitor, a loop can be tuned to operate over a wide frequency range. The highest operating frequency of a small loop is determined by self-resonance, and the circumference must be less than ¼ wavelength. A 2:1 frequency range is reasonable for a loop—for example, a 14- to 30-MHz loop won second place in the ARRL Antenna Design Competition.[2]

Bandwidth

Here's the bad news—the loop is the equivalent of a high-Q tuned circuit, which means it has a narrow bandwidth. We can tune the loop over a wide frequency range, but the instantaneous bandwidth at the operating frequency will be low. At the lower design frequency of the recommended loops, the Q may be as high as 1000 and, therefore, the bandwidth is measured in kilohertz. This means you will need a remote motor drive on the tuning capacitor to shift frequencies. It's a low price to pay, and the only shortcoming of the loop antenna. You are simply trading bandwidth for size—you don't give up any other performance parameters.

The bandwidth can be calculated from the equations. After building your loop, it is im-

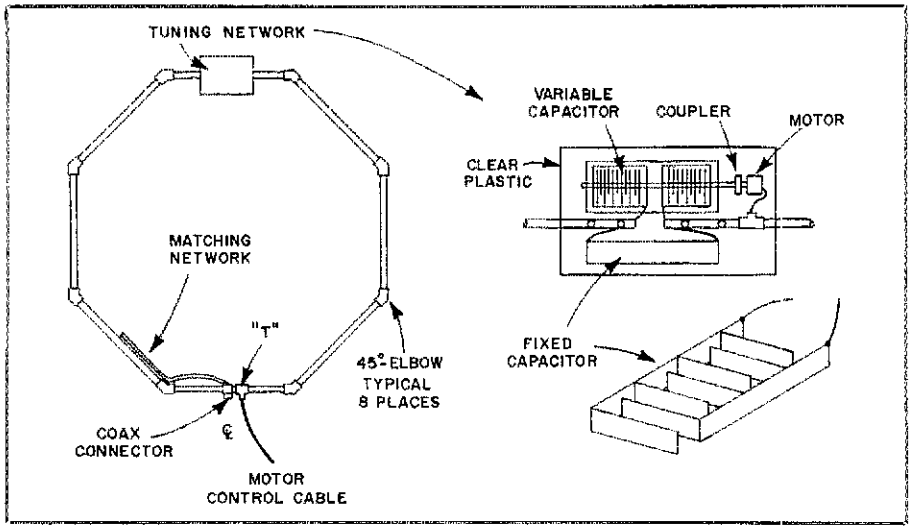


Fig 2—Construction details for the recommended loops.

portant to measure the actual bandwidth. Comparing the measured value to the calculated value will tell if you did a poor job of construction—it will be apparent. Any metal in close proximity to the loop will absorb radiation and reduce the efficiency. This will become apparent from the bandwidth measurement.

Choosing the Tuning Capacitor

A high-Q antenna also means a high voltage on the tuning capacitor. An air gap of one inch in air is good for about 75,000 V. A power input to the antenna of 500 W will produce voltages of up to 30,000 V, so you need a capacitor spacing of ½ inch (¼ in for 100 W). The ideal capacitor for this application is a high-voltage vacuum variable, if you can afford one. Using a conventional variable capacitor will make the antenna useless because of the losses in the wiper contacts. This was one dilemma I ran into during development of the antenna. Then, late one night, I realized that a split-stator capacitor has *no* wiper contacts. If you connect each side of the loop to the stators, the RF coupling is through the rotors—no wiper contacts—and the spacing is effectively doubled since the two sections of the capacitor are in series. Now you have an inexpensive capacitor with no wiper contacts. However, you will not get the low losses and high efficiency unless the plates are welded together. No mechanical contacts are allowed! This means that you cannot use a capacitor with mechanical spacers between the plates unless a conductor is welded to electronically bond the plates. A local welding shop can do the job for you. (Note: The amateur version of the "Army Loop" used wiper contacts in the tuning network—now you know why it didn't work.)

If you need a fixed capacitor to parallel the variable, make one of printed-circuit-board material. The value of capacitance can be determined from: $C = 0.225\ (N-1)\ A/D$, where N is the number of plates, A is the area of a single plate in square inches and D is the spacing in inches. Remember that you need a 30,000-V rating for 500 W—½-in spacing for a high-Q loop.

A Broadband Matching Network

The next step is to build a matching network to allow us to put power into the loop. Some builders use a coupling loop, but such a method is very critical. The amateur "Army Loop" used a very inefficient network. The easy way turns out to be the best—a simple form of gamma match that does not use reactive components. A piece of ¼-in copper tubing is soldered to the loop and to the coaxial cable connector (see Fig 2). A perfect match can be achieved by bending the tubing, and if the match is made at the center frequency of the loop, the SWR will be 2:1 or less over a 2-to-1 frequency range.

A Remote Motor Drive

There isn't space in this article to cover all the details, but take it on faith that you need a stepper motor with a gear drive to give adequate tuning resolution. The computations are left to you. (Hint: A 10-foot loop will have a 14-kHz bandwidth at 14 MHz. A 50-pF capacitor can tune over a 16-MHz range with 180° rotation.) A possible answer is a motor, part no. 3004-001, and controller, part no. 22001, available from Hurst Manufacturing Co, Princeton, IN 47670. The cost of both units is about $90. The controller is an integrated circuit that requires a speed potentiometer, control switches and a 12-V source.

Loop Construction

Fig 2 shows construction details for the octagon loop. The octagon shape is easy to construct using 45° elbows, available at any plumbing store. Just determine the size of your loop and cut eight equal-length pieces of copper pipe to total the circumference. Solder all lengths with 45° elbows to form the octagon. Make a cut in one side of the loop and install a copper T. Split and flatten a 3-in piece of pipe to make a mount for the coaxial-cable connector and solder it to the loop next to the T. On the side opposite to the coaxial connector cut out a section about two inches long. Mount a clear piece of ¼-in-thick plastic sheet to the gap and mount the tuning capacitor, motor and a high-voltage coupler for the capacitor on the plastic. Install another T about 6 inches from the capacitor/motor and run the control cable from the lower T to the upper T inside the copper pipe—in one T and out the other. Connect the tuning capacitor stators to the ends of the gap with pieces of copper strap soldered on each end. Cut a piece of ¼-in copper tubing the length of one side of the octagon. Bend it to conform to the shape of the loop and solder one end to the coaxial cable connector and the other end to the loop. Wrap it with plastic electrical tape.

Mount the completed loop vertically on a wooden pole (no metal allowed). Connect the receiver to the loop and find the resonant frequency by listening for a noise peak in the receiver.

Tuning Up

Connect an SWR bridge at the base of the loop. Turn on the transmitter and tune the loop or the transmitter frequency for maximum output as indicated on the SWR bridge or a field strength meter. Bend the matching network tubing to achieve minimum SWR. That's all there is to it!

If you have a lossy tuning capacitor or metal in the vicinity of the loop, you won't be able to get a low SWR and the bandwidth will be high. You will lose some efficiency, but you may not be able to get far enough away from the metal that is causing the problem (such as power lines). Just enjoy your antenna and realize that 6 dB is probably only one S unit. If you must operate near metal, you can extend the length of the ¼-in copper-tubing matching section. Trial and error with the extended matching section should result in a lower SWR.

After the antenna is working to your satisfaction, build a box from pieces of plastic to shield the tuning unit from the weather. Any good sign shop will cut the pieces to size for you. Don't use colored plastic because the materials that give it color are conductive. (Mine caught fire one night!)

Conclusion

Since there are few low-loss capacitors commercially available, except vacuum variables, a variable capacitor has been designed specifically for this application (see Fig 3). This capacitor has an effective capacitance

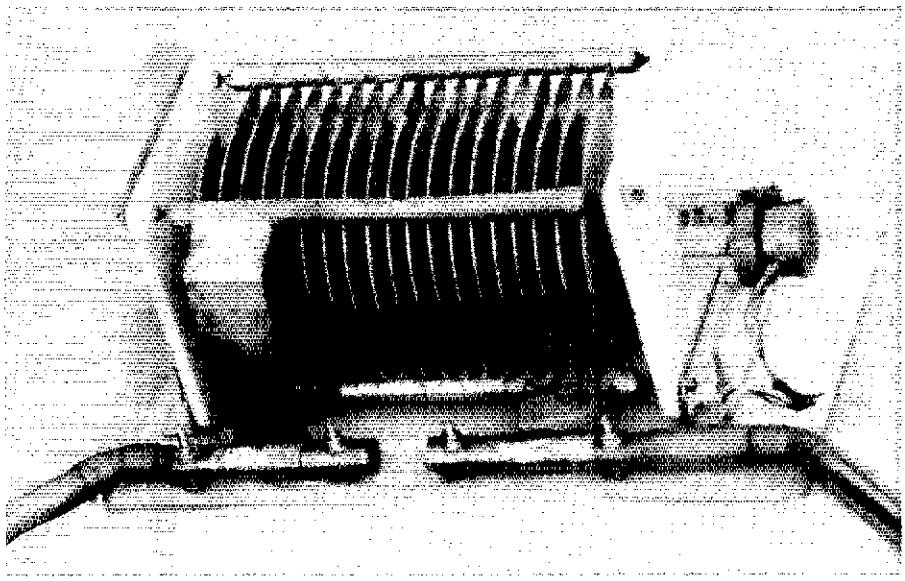


Fig 3—The W5QJR variable capacitor for loop antennas. Note the mounting details.

of 150 pF (300 pF per section) and uses the butterfly concept rather than the normal split-stator mechanical design. It has copper stator plates, with spacing ¼ inch on each section to allow high-power operation. The large capacitance range allows coverage of all the HF ham bands from 3.5 to 30 MHz with just two loops.[4]

I would like to thank Roger Faulstick, KD4AS, for his encouragement and all the work he has done performing experiments and collecting meaningful performance data. I also wish to acknowledge and thank all those who have written to me with encouraging comments.

Notes

[1]K. Patterson, "Down To Earth Army Antenna," *Electronics*, Aug 1967.
[2]L. McCoy, "The Army Loop in Ham Communications," *QST*, Mar 1968, pp 17-18.
[3]G. Hall and B. Schetgen, "Six Winners Emerge from the ARRL Antenna Competition," *QST*, Feb 1985, pp 44-47.
[4]This capacitor is available from W5QJR Antenna Products, PO Box 334, Melbourne FL 32902. Send a business-size SASE for further information.

Satellite DXing

(continued from page 32)

mitter is enabled. When you switch back to receive, the sequence is just the opposite. First, the transmitter is switched off, then the power amplifier is disabled, and then the TR relays change state.

Proper TR sequencing is easy to implement with simple circuitry described in *The 1986 ARRL Handbook*.[5] If you wish to purchase a sequencer, check with the equipment suppliers listed in Part 2 of this series. I've found out the hard way that some form of automatic TR sequencing is necessary with remotely controlled equipment to protect the unwary preamp from cockpit error. Most of us are more fallible than the GaAsFET can stand.

Receiving

The only additional equipment I have found useful applies to those of you who use a receiving converter and an HF receiver for downlink reception. I built an in-line switchable attenuator to use between the converter output and the antenna jack of my 10-meter receiver. I use the attenuator to lower the AGC level and improve the perceived signal-to-noise ratio. In addition, by adjusting the attenuator so the S meter on my HF rig rests at zero, I can give more-accurate signal reports. The attenuator circuit is shown in Chapter 25 of *The 1986 ARRL Handbook*, but I modified it so that there are only three steps: 5, 10 and 20 dB. These three settings allow attenuation in 5-dB steps from 0 to 35 dB.

Station Control

Depending on how complicated you make your satellite setup, you might want to combine most of the switching and control circuitry into a single box so that you have ready access to all controls. Fig 14 shows the system I use. A Minibox cut to a low profile (small enough to fit underneath a transceiver) contains all of the switches I need to control my station, as well as the TR sequencer circuit board. With these switches, I can change polarization on both antennas from RHCP to LHCP; activate, at will, the 2-m and 70-cm preamplifiers; and switch the power amplifier in or out of the line for QRP/QRO operation. I also have the option of manual PTT. The microphone PTT line activates the sequencer.

I hope that this discussion has provided some food for thought for your station. The setup is really not complex; by no means do you need all of the gadgets described here. Perhaps it is all in the mind of the beholder—I happen to enjoy building and modifying equipment. In any event, the last installment of this series will discuss finding and operating through OSCAR 10.

Notes

[1]A. Zoller, "Tilt Rather Than Twist," *Orbit*, Sep/Oct 1983, pp 7-8.
[2]J. Reisert, "VHF/UHF World—Protecting Equipment," *Ham Radio*, Jun 1985, pp 83-87.
[3]C. Osborne, ed, *Southeastern VHF Society Newsletter*, May 1983.
[4]G. Krauss, "VHF and UHF Low Noise Preamplifiers," *QEX*, Dec 1981, pp 3-6.
[5]M. Wilson, ed, *The 1986 ARRL Handbook* (Newington: ARRL, 1985). Available from your local radio store or from ARRL for $18 ($19 outside US). Add $2.50 ($3.50 UPS) per order for shipping and handling.
[6]Sequencing ideas are shown on pp 31-6 to 31-12, 32-37 and 32-38.

Antennas: From the Ground Up

One end of my 80-meter dipole points straight at Ted, who lives about 250 miles away. There isn't supposed to be any radiation off the ends of a dipole, but I can always work him. How come?

By Jerry Hall, K1TD
Associate Technical Editor, ARRL

Do you know what a half-wave dipole antenna is? Sure you do, if you have an amateur ticket or are studying for one! The dipole is probably the most common antenna used by radio amateurs. It is simple to build and it doesn't cost much. And other than the length, there's nothing to be adjusted for it to work right.

A dipole is a balanced antenna. What this means is that with the right kind of feeder, the feed line will have currents flowing symmetrically—equal in amplitude but opposite in phase. This is portrayed in Fig 1. When the current from one leg of the feeder reaches the antenna, it continues flowing along the antenna conductor. The return current flows along the other half of the dipole and down the second feed-line leg. The net result is that all the current flowing in the antenna at a particular instant travels in the same direction, shown by the broken line in Fig 1. The amplitude of the current, however, is not the same at every point along the antenna; it is maximum at the center and goes to zero at the ends.

The current flowing in the antenna sets up a charge or voltage along the conductor. The voltage is maximum at the two ends, but of opposite polarity. There is a phase reversal of the voltage at the center of the antenna.

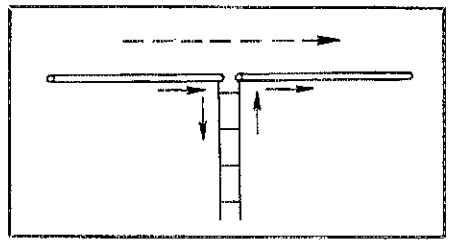


Fig 1—The instantaneous flow of current in a half-wave dipole with feed line. The resulting current that causes radiation is shown by the broken line.

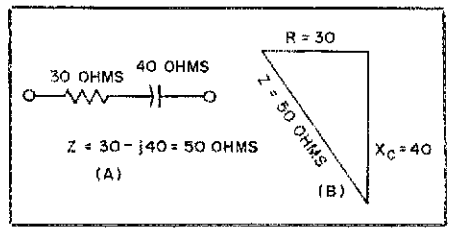


Fig 2—Electrical circuit and diagram for an impedance of 30 – *j*40 ohms. The total impedance value is 50 ohms, but this load is not a perfect match for a 50-ohm feed line because of the reactance. The SWR is actually 3:1.

Impedance

You hear a lot of talk about the impedance of an antenna. If the charge or voltage and the current flowing in the antenna could be measured, the impedance could be calculated using Ohm's Law. The impedance would be

$$Z = \frac{E}{I} \qquad \text{(Eq 1)}$$

The letter Z is used in place of an R to indicate the impedance may contain a reactance as well as a resistance.

Since neither the voltage nor the current is constant along the antenna, the antenna impedance will be different at different places along the antenna. If the antenna were opened and fed away from its center, a different impedance would be present than if the same antenna were opened and fed at the center. Phase is also a consideration. If the voltage and current are not in phase, there is reactance present in the impedance.

The equation often used to show the impedance of an antenna is

$$Z = R + jX \qquad \text{(Eq 2)}$$

This equation says the impedance is equal to the resistance plus the equivalent series reactance. The little *j* is a shorthand notation to indicate that the two values cannot be added directly. Fig 2 illustrates this.

In the circuit of Fig 2A, 30 ohms of resistance and 40 ohms of capacitive reactance are in series. Our shorthand way of writing this is Z = 30 – *j*40 ohms. By convention, a minus sign is used for capacitive reactance and a positive sign for inductive reactance. For these values, the total impedance has a magnitude of 50 ohms. That number is obtained by vector addition, shown graphically with the right triangle at Fig 2B. The hypotenuse of the triangle represents the total impedance. It is the custom in drawings like this to show the resistance line horizontally and the reactance line vertically, up from the resistance line for inductive reactance and down for capacitive reactance.

For a moment let's consider the resistance and reactance of a dipole. Suppose we have an antenna for the 80-meter band, made of 125 feet of no. 12 wire and fed at the center. At the feed point, the voltage and current will be in phase at only one frequency. This is the frequency of antenna resonance. At other 80-meter frequencies the voltage and current will be out of phase with each other, and the result will be a reactive impedance. Resonance (no reactance) occurs at about 3750 kHz. Both the resistance and the reactance change almost linearly with frequency across the band when the antenna is near resonance, but the reactance changes much faster with frequency than the resistance. Engineers usually plot impedances of resistance and reactance on a Smith chart.

SWR

Impedance plots on a Smith chart are probably not familiar to most of us. The reason may be that equipment to make accurate impedance measurements is expensive. Almost every one, however, has a way of measuring standing-wave ratio, or the SWR, so we're more familiar with plots of the standing-wave ratio versus frequency.

Just exactly what is SWR? A standing wave is developed on the transmission line

any time there is power reflected from the antenna, illustrated in Fig 3. The forward power wave and the reflected power wave travel in different directions along the transmission line. If the line is long enough, the two waves will be in phase at some points and 180° out of phase at other points. Where they are in phase, the voltages will add, and the resulting voltage between the two conductors of the line will be greater than the voltage from either wave alone. Where they are out of phase the voltages will tend to cancel, so the resulting voltage will be less than from either alone. The wavy line in Fig 3 indicates the voltages that are developed along a mismatched line. The minimum and the maximum voltage points will always be a quarter wave apart, and their ratio, by definition, *is* the standing-wave ratio. It's as simple as that.

The drawing of Fig 3 shows a resistive load. If a reactance was present, it would merely shift the phase of the reflected wave, and the resulting wavy line would be moved to the right or left a bit. But the maximum and minimum points would remain a quarter wave apart. Keep in mind that the wavy line is a plot of *RF voltages*. At any point along the line, the voltage goes through a sine-wave cycle, so at some instants of time the actual voltage will be zero. What Fig 3 shows is that the *amplitudes* of the RF sine waves are different at various places along the line. Disregarding line losses, the SWR for any given load is always the same at any point along the line. And that SWR does not change for different lengths of line!

In Fig 2 we saw that for the 30 − *j*40 ohm impedance, the total impedance was 50 ohms. Does that mean the SWR would be 1:1 in a 50-ohm line? It is important to remember that while the reactance doesn't consume any power, it does prevent some of the forward power wave from being radiated; thus a reflected power wave also exists. In the case of 30 − *j*40 ohms, the SWR would be 3:1. This raises an important point about impedances. We amateurs tend to ignore the mention of a phase angle when we talk about impedances. To be precise, we should say that 30 − *j*40 ohms equals $50\angle -53°$. As you see, this is a lot different load than 50 ohms of pure resistance, which *would* give an SWR of 1:1.

Another point where we amateurs often err, too, is in talking about the *impedance* of an antenna when we actually mean radiation resistance. For example, it's the *radiation resistance* of a quarter-wave vertical antenna that is 36 ohms, not necessarily the impedance. The word impedance tends to imply a complex load, one containing resistance and reactance. The feed-point impedance of an antenna will include the antenna radiation resistance *and* any ohmic losses that may be present in the antenna system.

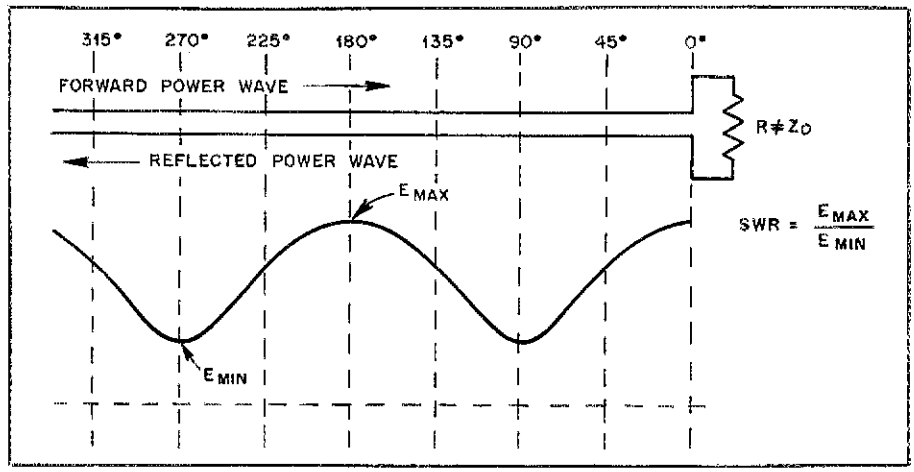


Fig 3—Voltage standing wave along a mismatched line. The energy source is at the left and the load at the right. The wavy line represents the amplitude of the RF voltages between the conductors at various points along the line.

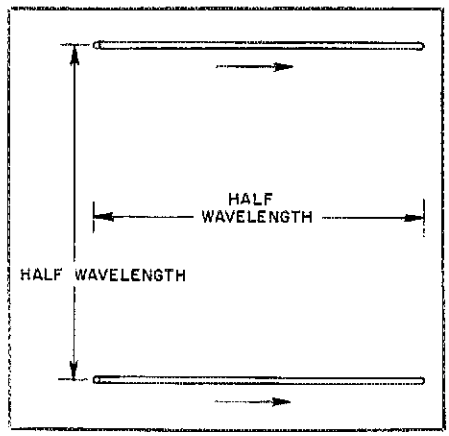


Fig 4—Two parallel or stacked dipole elements, fed in phase. For simplicity, the feed lines are not shown.

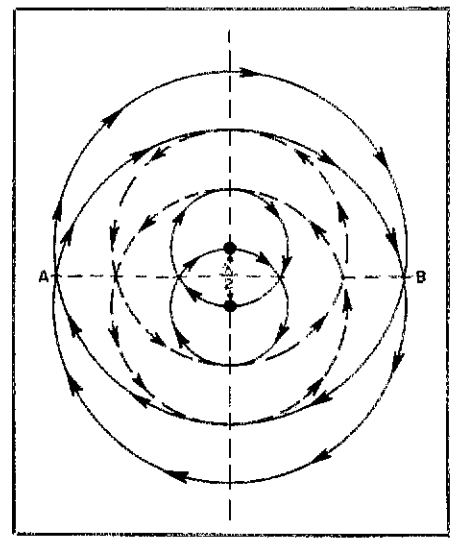


Fig 5—Interference between waves from two separate radiators causes the resultant directional effects to differ from those of either radiator alone. The resulting pattern is shown in Fig 6.

Radiation Patterns

Think again about our half-wave dipole of Fig 1. The current that flows in the antenna causes an electromagnetic field to be radiated. If we viewed the dipole from one end, and if we could see the RF field, it would look like a series of concentric circles. The waves radiate outward like ripples in a pool of water when a pebble is dropped into it. Each circle grows larger and larger. If you were standing at a fixed point, you would see a phase reversal in the RF wave at alternating half cycles. From this we can visualize that the radiation pattern of a dipole antenna, viewed from its end, is simply a circle. But, in fact, the complete radiation pattern really has three dimensions.

A convenient antenna for reference is an isotropic radiator, which is simply a point source. This is a theoretical antenna, one that doesn't exist in practice, but is the basis for the theoretical analysis of antennas. The radiation pattern of an isotropic radiator, in three dimensions, is a perfect sphere. When we draw patterns on paper, we're limited to two dimensions, so remember that those patterns never tell the whole story.

Let's suppose we have two dipoles, each a half wavelength long. Let's stack them a half wavelength apart as shown in Fig 4 and feed them in phase. This is called a parallel antenna system, because the elements are parallel to each other. Fig 5 shows the waves radiated from the two elements, viewed from their ends. The alternating solid and broken lines represent the phase of the radiated waves at half-wavelength intervals. At distant points along the horizontal line AB, the waves from the two elements are in phase with each other, and along the vertical line they are out of phase. What happens is that on line AB the signal is stronger than from either element alone. Along the vertical line, since the waves are exactly out of phase, there will be complete cancellation of the received energy. At intermediate angles, there will be partial addition or par-

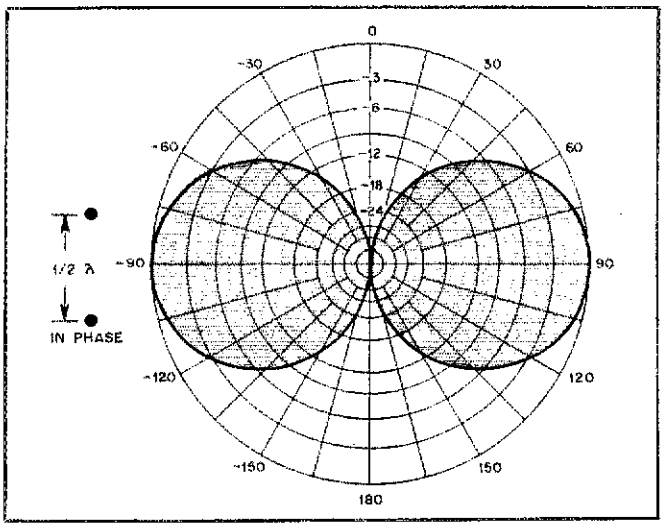


Fig 6—Radiation pattern of two stacked dipoles, as seen from the ends of the elements. The elements are horizontal with one above the other, and this is the elevation-plane pattern in free space. In engineering vernacular, this is known as the H-plane pattern.

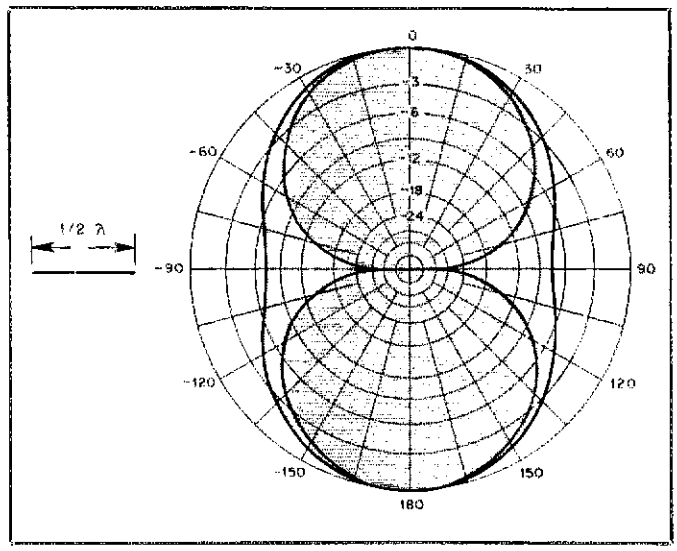


Fig 7—Azimuth patterns from a half-wave dipole lying along the 90°-270° axis. The pattern with dark shading is that in the plane of the element, the E-plane pattern. That with lighter shading is at an elevation angle of 30°.

tial cancellation. The result is a pattern that is not circular.

It is possible to calculate the theoretical pattern by using trigonometry. This involves taking the sine or cosine function of various angles for several points in different directions from the antenna, and doing vector summations. The resulting pattern can then be plotted on a grid having polar coordinates. The relative field strength in voltage units or in decibels is plotted for various points of the compass, as shown in Fig 6. ARRL publications use a log-periodic grid, called that because the graduations vary periodically with the logarithm of the relative field strength in voltage units.

Gain

The radiation patterns of an antenna can give some idea of the gain. An important thing to remember is that you cannot have antenna gain unless there is a loss in some direction. For example, we have always heard that the dipole does not radiate any energy off the ends. The familiar dipole pattern is shown in Fig 7, with dark shading. You may have heard that a half-wave dipole has a gain of 2.15 dB over an isotropic radiator, which is a point source. What this means is that in the broadside direction and for the same power, you get a signal that is 2.15 dB stronger from the dipole. But that gain is at the expense of a loss in the direction off the ends of the dipole.

Let me dwell on this subject of radiation off the ends a bit longer. It says in the preceding paragraph that the dipole doesn't radiate off its ends, and we've seen plots like that of Fig 7 which *prove* this. Yet those of us who have used a dipole in the HF bands know that you can make contacts in directions off the ends. How do you explain this contradiction?

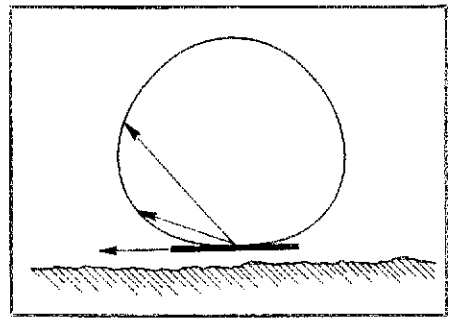


Fig 8—See text. At elevation angles above the horizon, a horizontal dipole does radiate in the directions off its ends. With ionospheric propagation, it is this radiation that makes contacts possible.

Well, it isn't a contradiction, really. In context, the dipole radiates no energy off its ends *in the plane of the antenna.* Fig 8 shows a dipole placed horizontally above the earth, with the dipole pattern superimposed. (There is no radiation downward because of the presence of the earth.) It is true that no energy radiates at an angle tangent to the earth. But at higher angles, there certainly is radiation, and with ionospheric propagation, it is *this* radiation that lets us make contacts.

The pattern at a fixed elevation angle for a dipole looks quite different than the one we are accustomed to seeing. Peer at the pattern with lighter shading in Fig 7. This is the dipole pattern for a 30° elevation angle. You can see that the radiation "off the ends" is less than 8 dB down from broadside. That equates to about 1½ S units. *Of course* there is radiation off the ends, in this context!

Antenna arrays, two or more elements combined, can be more directive than a dipole. Directivity and gain go hand in hand, except gain is usually thought of in just one direction (or two, if bidirectional). Directivity implies 3-dimensional considerations, taking both the electric-plane and the magnetic-plane patterns into account (usually abbreviated E-plane and H-plane). Gain and directivity are both related to the effective aperture, often called the capture area. Effective aperture is a more precise term and is related to the volume of space the antenna occupies. When you talk about antenna gain, you must also talk about the reference, because antenna gain is always taken as a ratio.

Beamwidth is usually defined as the width of the major lobe in degrees at the half-power points. The half-power points are those points on the lobe that are 3 dB down. For a dipole antenna, the beamwidth of the E-plane pattern is about 78°. A rough idea of the relative gains of two antennas can sometimes be had by comparing their 3-dB beamwidths. For accuracy you should compare more than just two plots, because patterns are 3-dimensional. At the very least you should look at both the E- and the H-plane patterns of the two antennas to get a true idea of gain and directivity.

Earlier, I mentioned effective aperture. If we increase the size of an array by adding more elements, we increase its aperture. We also increase its gain. A general rule of thumb is that any time you double the size of the antenna, you gain about 3 dB.

Polarization

The polarization of an antenna is always taken to be that of the plane of the element. If that plane is perpendicular to the earth, the polarization *is* vertical. If the plane is parallel to the earth, the polarization is horizontal. The polarization is the same as

that of the electric field of the antenna.

Antenna systems may be horizontally polarized or vertically polarized. Vertical systems can be either phased arrays, or they can be parasitic arrays. We don't often see parasitic vertical arrays, but they can be effective with a good radial system.

There is a class between these two polarizations that has both vertical and horizontal components. A common example is the inverted V, using its popular name. This is usually a half-wave dipole with the ends brought near the earth. I call it the drooping dipole, because it doesn't have the same characteristics as a true V antenna, which has legs of one wavelength or greater. The drooping dipole antenna is horizontally polarized in the broadside direction, but has primarily vertical polarization off the ends. In between, it is diagonally polarized.

Yagi Arrays

The most popular amateur beam antennas are parasitic arrays, where the dipole becomes the building block. In a parasitic array, one element is driven and one or more others are mutually coupled. The current flowing in the driven element induces currents in the parasitic elements. Those currents contribute to the total radiation pattern. A 2-element Yagi can have either a director or a reflector, in addition to the driven element. With the parasitic element tuned as a director at 0.12-wavelength spacing, the theoretical gain is 5.7 dB over a dipole (dBd). This equates to about 7.9 dB of gain over an isotropic radiator (dBi), because the dipole has a gain of 2.15 dBi. (The 7.85-dB figure rounded to two significant figures is 7.9 dBi.) With the parasitic element tuned as a reflector at 0.15 wavelength, the gain is slightly less, 5.4 dBd or 7.6 dBi. At other spacings the gain falls off. The front-to-back ratio is higher with a reflector, so this is the arrangement you usually see for a 2-element array. The slight decrease in gain is barely perceptible.

Three-element Yagis almost always have a director, a driven element and a reflector. The theoretical maximum gain is about 7.5 dB over a dipole or 9.7 dBi. In Yagi arrays, the design must always be a compromise between gain, front-to-back ratio and SWR bandwidth. If you adjust for maximum gain on a spot frequency, you sacrifice front-to-back ratio, and the SWR rises rapidly as you depart from the adjustment frequency. If you adjust for maximum front-to-back ratio on a spot frequency, you sacrifice gain. And when you move away from the optimized frequency, your front-to-back ratio suffers. I have heard of some antennas that were peaked in the phone end of a band, but in the CW end they behaved like a dipole, or even had a *back-to-front ratio*.

Adding more directors to the Yagi array increases the gain. For four elements, the maximum theoretical gain is 8.8 dBd or 11.0 dBi. More than one reflector is seldom used below VHF. For VHF arrays it is not uncommon to see 10 or more directors. And, of course, the Yagis can be stacked in collinear or parallel fashion, or both, for additional gain.

Other Antenna Types

Another building block for amateur arrays is the loop element. Loops having a perimeter on the order of one wavelength are found in most applications. The radiation pattern of a loop is similar to the figure-8 pattern of a dipole, with the maximum response at right angles to the plane of the loop. If the loop is square, it has a gain of about 1.3 dB over a dipole. The polarization of a loop antenna in a vertical plane may be either vertical or horizontal, depending on how it is fed. If fed at the bottom, whether in the center of one of the sides or at a corner, the polarization is horizontal. If fed at one side, the polarization is vertical.

An array of two vertical loops comprises the well-known cubical quad antenna. You'll sometimes see HF quads with three and four elements. A disadvantage of the quad array is that it is not mechanically sturdy and, therefore, does not endure the stresses of harsh weather for long. Large quad arrays are also difficult to erect. But for the same overall antenna length, the quad exhibits somewhat more gain than the Yagi, assuming each array is adjusted for maximum gain. This is true because the quad has a greater effective aperture. However, the quad is inferior to the Yagi in terms of front-to-side ratios.

Another type of antenna that will likely see more use as our amateur bands at 10, 18 and 25 MHz become populated is the log-periodic antenna. There are various versions, but the most common one is shown in Fig 9. Known as a log-periodic dipole array, this version looks something like a Yagi with all elements driven. Depending on the exact design, only three or four elements are active on a spot frequency, so its pattern is similar to that of a Yagi. Its advantage is that it can cover a large frequency range and yet exhibit essentially constant characteristics—the same

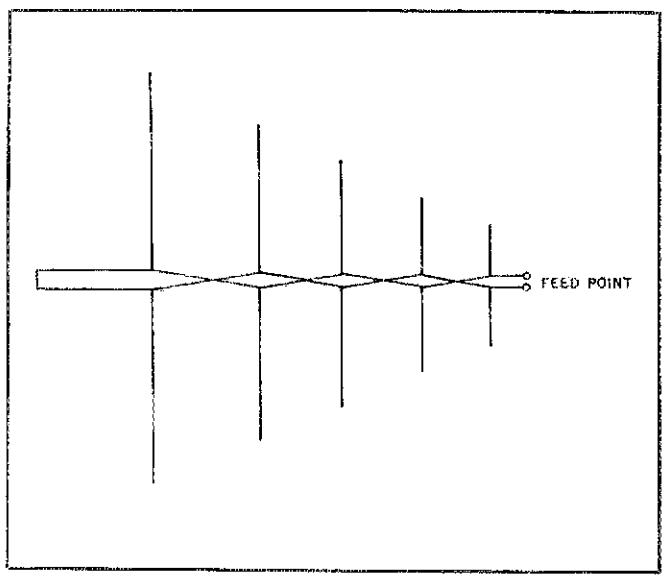


Fig 9—A log-periodic dipole array. Sometimes the elements are sloped forward, and sometimes parasitic elements are used to enhance the gain and the front-to-back ratio.

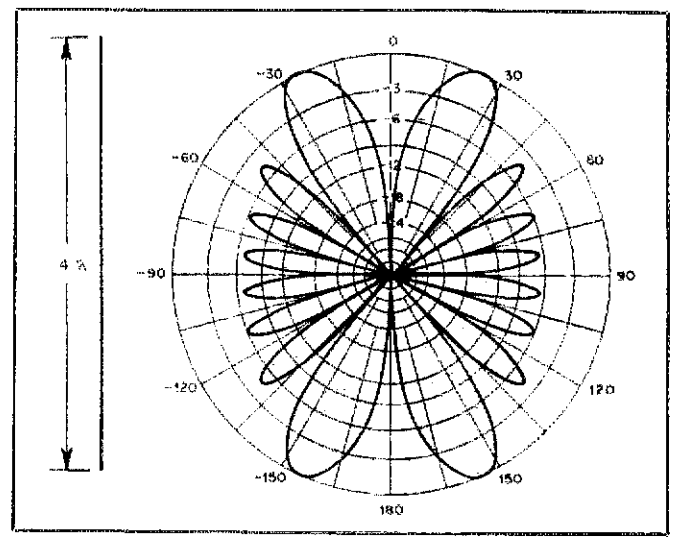


Fig 10—Typical radiation pattern of a long-wire antenna. The wire lies along the 0°-180° axis. Note the four major lobes close to the wire and the several minor lobes. The number of lobes in a quadrant (90°) of the radiation pattern is the same as the wire length in wavelengths. Thus, this pattern is for a wire that is 4 wavelengths long.

radiation resistance (and therefore the same SWR) and the same pattern over a frequency range of 2:1 or even 3:1. Imagine having *one* antenna that gives continuous coverage between, say, 10 and 30 MHz! Sometimes the elements of a log-periodic array are sloped forward, and sometimes parasitic elements are used with a log-periodic array to enhance the gain and the front-to-back ratio.

Traveling-Wave Antennas

Antennas in a totally different class are long wires and harmonic antennas. The name of these antennas implies that there must be a reversal of current direction along the wire. This is not possible for antennas less than one wavelength long, so we're really talking about the antenna length in wavelengths, not in feet. These antennas must be fed at one end, or else opened and fed an odd multiple of ¼ wavelength from either end with a balanced line.

In a long-wire antenna there is no radiation off the ends. The pattern always contains four major lobes. In addition, the pattern will contain several minor lobes, the number depending on the antenna length (see Fig 10). The major lobes move closer to the axis of the wire as the length is increased. In a long-wire antenna, the total number of lobes in a quadrant is always the same as the length of the wire in wavelengths, ie, four lobes in a quadrant (16 lobes total) for a 4-wavelength wire.

Long-wire antennas can be combined into arrays. A type once popular was the horizontal V antenna, two long wires aligned so the major lobes reinforced each other. The V antenna is bidirectional. Disadvantages of this antenna are that it requires an open-wire feeder, three supports and a lot of real estate.

Two V antennas can be combined back-to-back in an array called a rhombic. This is a diamond-shaped array, fed at one end of the diamond. Of two rhombic types, one is a resonant or unterminated rhombic, meaning not that each leg is necessarily resonant, but that there is a forward traveling wave from the feed point to the end of the antenna and a reflected traveling wave back toward the feed point. For the same wire length, the rhombic antenna has more gain than the V, but it does require one additional support. It can be used over a large frequency range, such as a 2:1 frequency ratio. The resonant rhombic is a bidirectional array. For the HF bands we're talking about *acres* of real estate; thus, amateurs seldom use a rhombic antenna.

The second type of rhombic is the terminated or nonresonant rhombic. A resistor at the end opposite the feed point absorbs any power that is not radiated in the forward traveling wave, so there is no reflected wave. This arrangement gives a unidirectional pattern in the direction of the terminating resistor. It also gives a more constant impedance across the broad frequency range over which it may be used. Antennas like these were used for military and commercial point-to-point communication before the existence of satellites, but they are gradually becoming extinct.

Ground Effects

The earth has a significant effect on any antenna placed near it, caused by ground reflections. Acting somewhat like a mirror, the earth reflects waves radiating downward from the antenna. The result is like having an image of that antenna in the earth, or a second antenna. Earlier I mentioned that we get additional gain by adding more elements. Well, the same thing happens here. If the earth were a perfect conductor, we would get an added 3 dB of gain just because the image effectively doubles the size of the antenna. And we also get another 3 dB of gain from the antenna because its pattern cannot penetrate the earth. The lower half of the free-space pattern no longer exists, and the power that was there is now contained in the upper half of the pattern through reflection. So, with an antenna over a perfect earth, we get a gain in some directions of 6 dB over that of the same antenna in free space. We don't get this much gain with real antennas, of course, because the earth is not a perfect conductor.

Over a perfect earth, if the antenna is vertical, there is no phase shift during ground reflection. But if the antenna is horizontal, there is a phase shift of 180° during reflection. For this reason, the presence of the earth has different effects on a horizontal antenna than it does on a vertical antenna.

If we place a horizontal antenna close to the earth, the ground-reflected wave causes a complete cancellation of the signal toward the horizon. We end up with no signal at low elevation angles—definitely not good if you want to work DX. The elevation-plane pattern changes significantly as the antenna height is increased. A whole series of pattern-factor plots appears in *The ARRL Antenna Book* for horizontal antennas at various heights, from 1/8 wavelength to 2 wavelengths.[1] The higher the antenna, the lower the angle of radiation. That's why you often hear the advice to get your antenna as high as possible if you want to work DX; low-angle radiation is usually best for longer distances. Also, the higher the horizontal antenna, the more lobes there are in the vertical pattern. Raising the antenna to greater heights does not sacrifice radiation at higher elevation angles.

If the antenna is vertical and mounted on the ground, its image in the perfect earth effectively doubles the length of the antenna. The current and voltage distribution in a quarter-wave vertical and its image is identical to that of a half-wave dipole, with maximum radiation toward the horizon. Here we also get a 6-dB gain over the quarter-wave conductor in free space. The elevation-plane radiation pattern of a vertical antenna such as a ground plane changes with antenna height, too, every bit as much as for a horizontal antenna.

If the maximum radiation from a quarter-wave vertical is in the direction of the horizon, why isn't it used more often for working DX? One answer is the vertical is not directional in azimuth—it has equal response to signals in all directions. To hear the weak DX stations, you'd like to have some help from your antenna in reducing the strong signals from closer stations in different azimuth directions. Or in jest, many amateurs might answer this question by saying that a vertical is an antenna that responds equally poorly in all directions. It is true that for efficient operation, a current-fed vertical radiator requires a rather elaborate system of radials or a counterpoise.

There's another reason that verticals don't behave the way theory leads us to believe they should. Most theoretical discussions have been based on that ever-elusive *perfect earth*. Real earth acts quite differently. For vertical antennas at radiation angles below the Brewster angle, about 15°, the phase shift of the reflected signal is closer to 180° than to zero. The exact Brewster angle depends on frequency and on soil conductivity.[2] The amplitude and phase of the reflected energy rays vary with frequency, with the angle of reflection and with soil conditions in the Fresnel zone.[3] What this all means is the degradation of low-angle radiation from verticals is related to frequency, being more severe at higher frequencies. Even with soil having good conductivity, at 14 MHz and above the radiation below 5 or 6 degrees will be nonexistent from a practical standpoint.

The material in this article has covered several fundamentals of antennas and antenna terminology—gain, directivity, how patterns are formed, earth effects, and so on. From all this, there are two important things you may want to remember. First is that you cannot have antenna gain in any direction except at the expense of a loss in other directions. Second, when you're talking about the gain of an antenna, you must know the reference before the numbers begin to mean anything. For example, a recent catalog from a company catering to CB operators shows a 5/8-wave ground-plane antenna. The description says that the antenna has 4-dB gain. But 4 dB over what? A dipole? Probably not. An isotropic radiator? Maybe. Over a quarter-wave vertical? I doubt it. Maybe they mean that the gain is 4 dB over that of a coat hanger—do you suppose?

Notes

[1] G. Hall, ed, *The ARRL Antenna Book*, 14th ed (Newington: ARRL, 1982), p 2-18.

[2] E. C. Jordan, and K. G. Balmain, *Electromagnetic Waves and Radiating Systems*, 2nd ed (Englewood Cliffs, NJ: Prentice-Hall, 1968), pp 147-148, 632-634.

[3] Loosely defined, the Fresnel zone is the area where the rays from the antenna are reflected from the earth, extending out to a distance of several wavelengths from the antenna.

Spread Spectrum: Frequency Hopping, Direct Sequence and You

Are you ready for this month's spread-spectrum rule implementation? How do you operate in spread mode? Here's the answer.

By Hal Feinstein, WB3KDU
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As regular readers of *QST* know, after studying the issue since June 1981, the FCC passed a delayed rule allowing radio amateurs to use spread-spectrum frequency-hopping and direct-sequence systems, effective June 1, 1986.[1] However, readers may not know about experimentation that has been ongoing in the spread-spectrum area and how Amateur Radio interoperability will work. This article covers those topics.

This is the station used in the FCC direction-finding test. An ICOM IC-2A was used as a frequency-hopping spread-spectrum beacon. The hop rate was 80 hops/s.

What Is a Spread-Spectrum System?

In the 1986 *ARRL Handbook*, Chapter 21 contains a description of spread-spectrum communications. That section of the *Handbook* should be consulted for an extensive discussion of the subject. The basic explanation is that spread spectrum is a modulation scheme whereby the signal is spread over a very wide bandwidth. This results in a dilution of the signal energy such that the power density present at any point within the spread signal is slight. Beyond a certain distance from the transmitter, the spread signal can be below the noise level yet still be recovered with the proper spread-spectrum receiver. Only the intended receiver (or receivers in a net operation) can recover the signal, as both sender and receivers hold copies of the binary sequence that is used to spread the signal and know when it was started in time. Interference to other users of the same spectrum is slight or nil (unless they are close to the transmitter).

There are two spread-spectrum modes authorized to the radio amateur. Frequency hopping is a mode in which the operating frequency is changed rapidly over the spread bandwidth. Both the transmitter and receiver visit the same frequencies at the same time, and must stay in exact synchronization. Each holds the same list of pseudorandom-ordered frequencies, and the transmitter and receiver start hopping together using the same starting point on the list.

In direct sequence (the other authorized mode), a high-speed pseudorandom binary data stream is used to shift the carrier phase between 0 and 180 degrees. The phase shifting is normally done in a balanced mixer, and the information being transmitted is normally added to the high-speed code sequence.

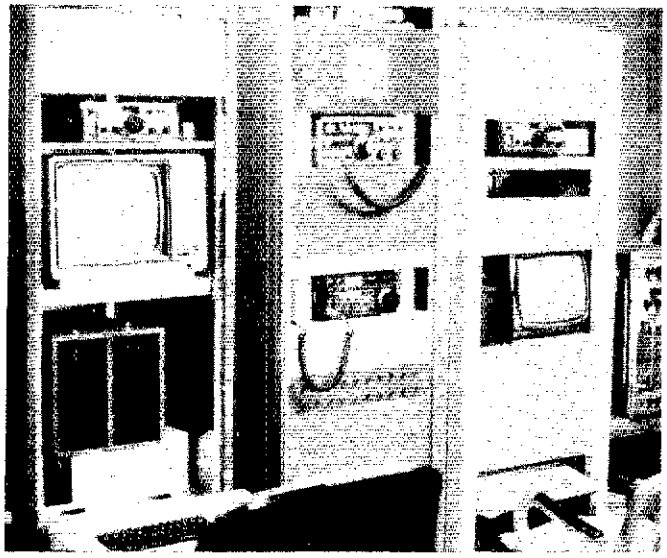
Why Use Spread-Spectrum Systems?

Effective spectrum management allows the greatest use of a band of frequencies by the largest number of possible users. A large number of spread-spectrum systems can occupy the same band and not interfere with each other. Spread spectrum can make use of unused portions of a frequency band—such as between repeater channels. Only by experimentation can radio amateurs learn the true potential of this new mode. The military has been using these systems for years for "antijam" communication, and the radio amateur can benefit from this experience. Computer-assisted power control can be used effectively in this mode to meet the FCC requirement that amateurs run only the minimum power needed for communication. This has not been done to date, but it is a feature for advanced experimenters to work on.

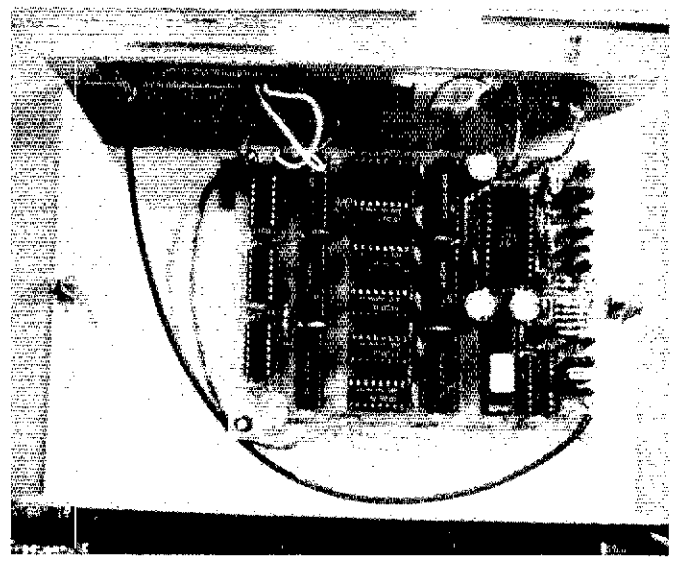
What Has Been Done Up to Now?

The Amateur Radio Research and Development Corporation (AMRAD), a nonprofit club composed of radio and computer amateurs, has been involved with a series of investigative experiments with spread-spectrum systems since September 1980. The investigations fall into five general experiments authorized by a series of FCC Special Temporary Authorities (STAs).

1) Commercial/military frequency-hopping radios were borrowed and used to test on amateur frequencies in the HF bands. The hop rate was slow—only 5 hops



The HF spread-spectrum station at K8MMO. A Xerox 820 computer was used for control. The transmit position is on the right; receive is on the left.



The heart of the HF spread-spectrum station is the frequency synthesizer designed by Fred Williams. This version of "Fred," as the synthesizer is affectionately called by AMRAD members, came from A & A Engineering.[2]

per second (hops/s). The system worked well using voice while hopping in a nonvoice portion of a ham band. Little, if any, interference was noted in a nearby receiver. When the hopper came by, an "aup" or "thu" noise resulted. This experiment was lots of fun. However, the greatest benefit was to get everyone fired up to go build some equipment for the ham bands.

2) Chuck Phillips, N4EZV, constructed hand-held, frequency-hopping FM transceivers. These units hopped at 10-80 hops/s over 3.2 MHz. If the receiver or transmitter lost synchronization, the lost unit would return to a "homing frequency" and "scream" for help. Periodically, the transmitting station would stop and listen on the homing frequency for screams. If one was heard, a new start-up would be initiated. Further details of this system are not available.

3) ICOM IC-2A transceivers were modified to allow a computer (Commodore C64) to set the frequency instead of using the radio's thumbwheels. A beacon was set up to test for interference caused in the 2-meter repeater band. Receiver synchronization schemes were tested. This project was abandoned after spectral analysis of the transmitted signal revealed that the synthesizer was never "locking up." For that reason, fast-hopping operation was not feasible. Modifications of the phase-locked loop filter improved the lockup time, but produced some "strange audio." The FCC located this unit in a direction-finding test in only 25 minutes, proving that the agency is able to regulate this mode of operation using current equipment.

4) Fred Williams of the TRW LSI Products Division designed a direct-synthesis oscillator that is described in February 1985 *QST* and Chapter 29 of the 1986 *ARRL Handbook*. AMRAD has used this synthesizer with the Yaesu FT-7 and FT-101ZD and Xerox 820 computers to frequency hop cleanly on the HF bands. Experiments with these units continued as synchronization software was being perfected. This experiment came to a standstill when the FCC denied AMRAD's latest STA request for permission for further HF experimentation. The net effect of this denial is to force all experiments to 420 MHz and above. Andre Kestleloot, N4ICK, is building a mixer to convert signals from HF to UHF. This mixer will allow these experiments to resume on the air at UHF. Conventional UHF transverters could also be used, but are costly—the AMRAD gang prefers to build their own and save money.

5) Dick Bingham, W7WKR, has produced a single PC board add-on for a 440-MHz hand-held transceiver that allows direct-sequence transmission or reception. It appears that this unit, while allowed under the AMRAD STA, would not be allowed under the new Part 97 rules, because of the method used to add information to the basic spreading sequence. This requires further study.

What Is Interoperability?

The ARRL Board of Directors has authorized, and President Price has appointed, an ad hoc Spread-Spectrum Committee to study interoperability. When the rules go into effect, two radio amateurs who have been working together closely can communicate using spread-spectrum techniques. This is possible because both operators understand how both systems operate and how to begin their spread-spectrum communication and maintain synchronization. But how does an amateur call CQ using spread spectrum, and expect to receive a reply? How does the amateur communicate the spreading sequence in use, starting signal, hopping frequencies, hopping rate and the like to another amateur listening for a spread-spectrum CQ call? How does the amateur identify spread-spectrum transmissions? The rules require conventional identification.

In packet radio, we have a protocol called AX.25 to answer similar questions. It is too early to agree on a protocol for this new mode of communication, but some basics need to be established, such as a home or calling frequency on each band from 420 MHz and above.

The Committee recommends that you use the national FM calling frequency (or another FM simplex frequency if the national frequency is in frequent use in your area) for calling CQ and for announcing spread-spectrum operating parameters. A further recommendation is that you let others in your area know of your experiments through clubs, over repeaters or by any means that seems appropriate. The committee will publish more on these matters as we gain on-the-air experience.

Your suggestions and comments concerning these matters are welcome. Please remember that it is not our goal to stifle experimentation by needless regulation or standardization. Send your comments and suggestions to the committee secretary: Chuck Hutchinson, K8CH, ARRL Headquarters, 225 Main St, Newington, CT 06111.

How Can an Amateur Keep Current on Spread-Spectrum Progress?

Read *QST* and *QEX* to keep current on fast-breaking spread-spectrum news updates. Take advantage of this unique form of Amateur Radio communication. Start by learning the basics that are found in the 1986 *ARRL Handbook*.

Notes

[1] D. Newkirk, "Our new Spread-Spectrum Rules," *QST*, Apr 1986, p. 45.

[2] A & A Engineering, 7970 Orchid Dr, Buena Vista, CA 90620, tel 714-521-4160.

Product Review

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

AEA PAKRATT™ Model PK-64

The Commodore 64™ and the PAKRATT 64—a marriage made in techni-heaven. The PK-64 is more than just a packet TNC; it also operates RTTY (Baudot, ASCII and AMTOR) as well as CW. Rick Palm, K1CE, reviewed the operation of the PK-64 in VHF packet-radio communications since his interest and equipment are limited to this mode. Don McGrath, KZ1A, whose interests include RTTY and CW operation on the HF bands, reviewed the PK-64 in use in these modes. With such a versatile piece of equipment, it may be hard to find *anyone* who can use all the capabilities available in this little gray box.

The PK-64 plugs into the cartridge port of the C64—one simple connection to the mic input of a 2-meter rig then allows instant operation on packet. No adapters or excessive cabling are required. The terminal software is in ROM (read-only-memory) in the PK-64 so that no further program needs to be entered into the C64 for operation. The PK-64 does everything an outboard terminal emulation program should do.

What is a TNC?

First things first? TNC stands for Terminal Node Controller, a device that receives data from a computer or terminal, assembles the data into small "packets" of information and sends the packets to a transmitter. In the receiving mode, the TNC accepts packets of data from the receiver, extracts the text information and sends the text to the computer or terminal. The transmission and reception of packets, the detection and correction of errors, and the exact format for each packet is managed by the TNC through a "protocol." The protocol can be thought of as a program that runs on a microprocessor in the TNC. The PK-64 protocol is fully compatible with the latest AX.25 (version 2.0).

VHF Packet Operation

User friendly and largely menu driven, the PK-64 is a pleasure to operate. It supports C64 disk operation from a simple menu: LOAD, to load text stored on disk into one of ten available message buffers and/or a QSO buffer (which is used to capture incoming data); BROWSE, to allow a quick review of the contents of the QSO buffer; SAVE, to permit saving text stored in the buffers to disk or to the printer; and an EDIT menu for editing text stored in the buffers. Several highly useful editing commands facilitate quick and easy word processing of message text off line. Disk commands, including a directory of disk files, are easily made without entering lengthy DOS commands.

A nice feature is the set of 10 packet-parameter files that can be saved to or retrieved from disk to allow quick parameter changes as operating situations change. User-selected parameters are instructions to the TNC covering a wide range of operating conditions. The PK-64 has a large choice of parameters to allow maximum operating flexibility. Parameter differences for HF and VHF operations, for example, can be loaded instantly. When booting the PK-64, the system command will automatically engage the selected set of parameters stored on disk. It literally takes only seconds to be on the air.

As many as 10 connects can be performed and managed at the same time with the PK-64. On one occasion, just to see what can be done, I maintained two packet QSOs with friends and was checked into two mailboxes at the same time! If you are busy with one connection and someone else tries to connect to you, the PK-64 connects with that station on another channel. A real party line!

To reduce on-line time with busy packet bulletin-board systems (BBS), the contents of any buffer, composed off line with the editor, can be sent to the modem with a simple CONTROL N, where N is the number of the buffer. I can compose a file in Speedscript®, convert it to a sequential file using Convert64® and save it to disk for later retrieval and transmission by the PK-64. I can take all the time I want to compose my message for quick on-line forwarding to my local BBS, W1AW-4.

Additional handy commands that can be entered with the C64 function keys include a toggle for QSO buffer recording and a HOLD feature for freezing the receive screen so that incoming data can be read before it is scrolled off screen. With a touch of a button, the QSO and keyboard buffers can be cleared instantly. Another touch and the parameters are displayed for easy change entry. Changes can be made while you are still connected to another station.

Beacon and connect message texts can be keyboarded easily. If your station is unattended and another station connects, a message of your choice will be transmitted, and the QSO buffer automatically toggled on to record the incoming message.

An audio alarm sounds when another station connects to yours. As the manual states, "If the volume is turned high enough, you'll have the spouse and the kids in the shack, wondering what's up!"

HF Packet, Morse and RTTY Operation

The PK-64 operating manual says that reasonable performance can be expected on HF RTTY (Baudot or ASCII), CW and AMTOR without the optional HFM-64 modem. We found performance is unsatisfactory when signal strength is below S9. Tuning is also more critical.

Using a Yaesu FT-107M HF transceiver, we found that operation was significantly enhanced after installation of the HF modem. The HFM-64 contains 4-pole band-pass filters for mark and space tones, an AM demodulator with an automatic threshold detector and a true Data Carrier Detect (DCD) output to the PK-64. The filters are set for 200-Hz shift at 2110 Hz and 2310 Hz, suitable for HF RTTY, AMTOR and packet. The modem also incorporates a 10-segment LED bar-graph tuning indicator that allows about 25-Hz tuning resolution.

Without inclusion of the HFM-64, the PK-64 uses a phase-locked-loop demodulator that can lock up on extraneous signals. Using the HF modem, the front panel THRESHOLD control is used to set the demodulator threshold so that extraneous characters will not print. The HFM-64 is precalibrated at the factory, but you must reset the PK-64 1600- and 1800-Hz transmit tones to 2110 and 2310 Hz. The calibration chapter in the operating manual makes this procedure foolproof!

Operating on HF packet with the PK-64 is a joy! Parameter files, saved to disk, can be retrieved as quickly as your needs dictate. Rotate the threshold control just enough to blank out the DCD light on the front panel, and you are ready to have FUN.

Tuning an HF packet signal can be tricky business. Distorted signals will be difficult to copy. To tune normal packet signals, care must be taken to use as little audio gain as possible. This may be easily accomplished by

simply turning down the receiver's RF gain. You must tune while a packet is being transmitted and wait for the next packet to see if you are properly tuned. The bar-graph tuning indicator makes this easier. When a packet is present, the DCD light comes on, and the illuminated portion of the bar-graph separates into two areas. If the signal is properly tuned, the illuminated portions are equidistant from the center of the display. If you have properly used the tuning indicator, an on-screen tuning indicator in the packet status window indicates proper reception of mark and space with vertical and horizontal bars. Procedures for tuning RTTY, ASCII and AMTOR are essentially the same as for packet because we are still dealing with AFSK two-tone signals. In CW operation, your radio must be in the proper SSB mode. CW is generated as a 2310-Hz tone and is fed to the radio through the mic connector. You don't use the CW key input! When tuning CW, the 2310-Hz tone is displayed on the left-hand bar of the tuning indicator.

Much of the "nonpacket" operation is identical to packet operation. The message and text editing are accomplished in the same manner. The disk, cassette and printer operations are also essentially the same, with a few exceptions. We encountered some problems using Commodore printers, but AEA has since released updated software, at a modest cost, to accommodate those and several other types of printer. In the PK-64, speed changing is a single-key command function—nice! The '64 provides RTTY operation at 60, 67, 75, 100 and 132 WPM, and ASCII operation at 110, 150 and 300 bauds.

CCIR-compatible AMTOR ARQ and FEC operations are provided. Although AEA concedes that the Mode-A (ARQ) operating system imposes more exacting switching-speed requirements than older operating modes, most radios will operate in either AMTOR mode without modification. We were unable to test either AMTOR mode, and so must take their word for it. Remember that AMTOR Mode-B (FEC) operation is similar to conventional RTTY, so the transmitter operates continuously without any on-off switching.

The Screen

Because the PK-64 is designed for exclusive use with the C64, it can do many things other TNCs can't do. True split-screen operation is possible—a receive window where data scrolls upward across the screen, and a transmit window where text and commands are composed for transmission. A user-selectable parameter permits text and commands to be echoed to the receive window. A third on-screen window provides status indicators for unacknowledged packets, channel of operation, QSO-buffer capacity, incoming data, connect/disconnect and command/converse mode.

The Manual

The manual is clear, concise and actually entertaining to read. It contains explanations in plain language that even I, a technical illiterate, can understand. A bibliography is included, and there is even a chapter entitled "Quick Check and Sneak Preview" for those of us that read manuals only as a last resort before operating a new piece of gear. Packet-radio tutorials and appendices round out the excellent manual.

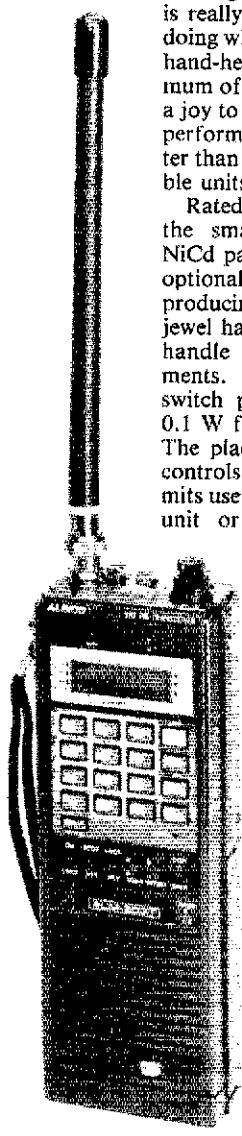
Conclusion

If you presently own or are planning to purchase a C64, SX-64 or new Commodore 128, add a PK-64 for packet radio—you'll be in on the most exciting thing that's happened in ham radio for a long, long time. What else can you say about a little gray box that does almost everything for you? Great! HPE CU AGN is now Hope to Connect with You Again here at KZ1A and K1CE.

The PAKRATT 64 is manufactured by Advanced Electronics Applications, Inc, PO Box C-2160, Lynnwood, WA 98036-0918, tel 206-775-7373. Price class: PK-64 $220; HFM-64 $100.—*Rick Palm, K1CE and Don MacGrath, KZ1A*

ALINCO ALM-203T 2-M FM HAND-HELD TRANSCEIVER

After a while, you get tired of looking at all the new goodies—the bells and whistles that some manufacturers feel make an established design appear new to the buying world. There has been a flood of hand-held radios over the past few years, ranging from the multimemory, 100-mW units to the shirt-pocket models that do everything but make the breakfast coffee. Alinco has entered the US market with a hand-held radio that does nothing particularly new, but is really exciting in terms of doing what every other small, hand-held does with a minimum of fuss and bother. It is a joy to operate and provides performance equal to or better than most other comparable units.



Rated at 3-W output with the small, standard 9.6-V NiCd pack and 5 W with an optional dc-to-dc converter producing 13.8 V, this little jewel has plenty of power to handle most FM requirements. A HIGH/LOW power switch permits operation at 0.1 W for the easy contacts. The placement of all of the controls and indicators permits use either as a hand-held unit or as a mobile unit for the small, cramped foreign-built cars most of us are driving these days.

Controls

Except for the PTT switch, all controls and indicators needed for normal operation are mounted on the top and front of the '203. The PTT switch is inset into the left side of the unit. The top-mounted array includes a BNC antenna connector, an OFFSET channel switch for nonstandard repeater offsets, external SPEAKER and MIC jacks, dual VOLume/SQL control, HIGH/LOW power select, 20-dB ATTenuator and S/RF meter. Although this may seem to be a lot of controls for the small area involved, there is only one adjustable control, the VOL/SQL. The other top-mounted controls are push buttons. Accordingly there is plenty of room, even if you have fairly thick fingers, to adjust only the control you want.

Front-mounted controls and indicators show the same manufacturer's concern for operating ease as the top-mounted ones. At the very top of the panel are two LED indicators, BUSY and TX. The green BUSY lights only when there is a received signal or the squelch is open; the red TX indicator lights during transmit. Immediately below the receive/transmit indicators, the LCD display shows status of all operations and commands. A 16-key pad is used for all frequency and memory selection and programming of the various operational modes. The 16 keys include numbers 1 through 0, an up-scan function, a down-scan function, Clear/Stop, Function, Memory Recall and Memory Scan. On the main control panel, but to the left and below the key pad, is a small key for BATTERY SAVE. Opposite the BATTERY SAVE, on the right side of the panel is the RESET button.

Additional controls mounted horizontally under the key pad include: LAMP ON/OFF, PTT/STOP, KEY LOCK, SUB A/B, OFFSET ± and DUPlex/SIMPlex. There are two controls that are mounted inside the battery compartment and thus are generally inaccessible from the outside of the case: The band selection switch allows selection of either band A, 144.000-147.995 MHz (receive and transmit) or band B, 150.000-160.000 MHz (receive only); also two six-position DIP switches recessed under the front panel allows selection of two subaudible tones (see Table 1). When programmed, the subaudible tone selected on the front panel is activated by the PTT.

Wow! What a bunch of switches and buttons! Let's look at some of the less obvious ones and see what they accomplish. The first thing to remember is that there are only two controls on the rig to be adjusted—VOL/SQL. Every other function is selected or programmed through switches, push buttons or the key pad.

Frequency Selection

Instead of thumbwheel frequency selection, the '203 allows direct entry of the desired receive frequency from the key pad. By entering the last four digits of the desired frequency, the LCD shows the receive frequency (such as 5.450 for 145.450 MHz.) An audible beep sounds after each digit is entered. The position of the OFFSET ± switch determines the transmit frequency, and when PTT is pressed, the transmit frequency will be displayed, either +600 or −600 kHz from the receive frequency. If the frequency requested is outside the range of the transceiver, an error message, (E), will appear on the display.

Memory/Memory Recall (MR)

Once the receive frequency is displayed, it may be programmed into one of the ten memory channels by pressing the function key, F, MR and a numeral from 1 to 0 for the memory channel number. A lower-pitched audible beep will sound upon completion of the program. The receive frequency will remain in that memory location until replaced

Alinco ALM-203T 2-M Hand-Held Transceiver, Serial No. 05109613

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage:	
Band A—144.000-147.995 MHz in 5-kHz steps.	As specified.
Band B—150.000-160.000 MHz (receive only).	As specified.
Mode of operation: FM.	As specified.
Transmitter	*Transmitter Dynamic Testing*
Transmitter power (output)	
High: 3.0 W at 9.6 V.	144.100 MHz, 3.5 W; 147.990 MHz, 2.9 W.
5.0 W at 13.8 V.	Not tested.
Low: 0.1 W at 9.6 V.	144.100 MHz, 0.25 W. 147.990 MHz, 0.27 W.
Harmonic and spurious suppression: 60 dB.	See Fig 2.
Receiver	*Receiver Dynamic Testing*
Receiver sensitivity	
Less than 0.3 μV for 20-dB quieting.	0.17 μV for 20-dB quieting.
Less than 0.2 μV for 12-dB signal + noise + distortion/noise + distortion (SINAD).	0.14 μV for 12-dB SINAD. Min 0.066 μV, max 0.30 μV.
Squelch sensitivity: Less than – 10 dB (threshold).	
Receiver audio output at 10% total harmonic distortion: More than 350 mW.	383 mW at 9% distortion.
Color: Dark gray.	
Size (height, width, depth): 7¾ × 2½ × 1½ in (not including antenna).	
Weight: Approximately 1.1 lb with battery and antenna.	

or all power is removed and the RESET button pressed. In case of computer malfunction, turning the power switch off and pressing RESET will reactivate the microcomputer. It is not necessary to enter the frequency into memory to operate—once the frequency is displayed, it will be the receive frequency and the transmit frequency is determined by the OFFSET switch.

To recall any memory-channel frequency, press MR and the channel number. The desired memory frequency will be displayed.

Memory Scan

The memory scan function can be activated by pressing the MS button with the squelch set at the threshold level or above. Scan speed is 0.5 second per channel, and the scan stops at a channel where a signal is present, but will resume scanning two seconds after the signal disappears. Scan function can be stopped by pressing the C key or by pushing PTT.

Program Scan

By setting the scan width and scan step beforehand, Program Scan will scan between two desired frequencies. First set the low-edge frequency and press F and up-scan keys, then select the scan step by incrementing the low-edge frequency by the desired spacing and repress F and up-scan. Enter the top-edge frequency and again press F and up-scan keys. Now the low-edge and high-edge frequencies and the scanning steps are defined. Press F and *down-scan* to initiate scanning. As in Memory Scan, the squelch must be set at threshold or above.

The up-scan and down-scan keys may also be used for manual scanning in 5-kHz increments. Each time the scan key is pressed, the frequency will move either up or down by 5 kHz.

Battery SAVE

Battery consumption can be greatly reduced during standby periods by pressing the B. SAVE key with the squelch set at threshold or above. In this function, the receiver frequency is monitored for about 500 ms every 5 s. If a signal appears, the receiver will function normally and when it disappears, the Save function will resume about 2 seconds later. This function is cleared by pressing C or the PTT, or turning power off.

PTT STOP and KEY LOCK

When the PTT STOP switch is set to STOP, the PTT will not function. This antitransmitting device is used when carrying the transceiver. When the KEY LOCK switch is in LOCK, the 17 keys on the keyboard will not function (great to keep the kiddies out of the memories.)

LCD Panel

A representation of the LCD panel is

Table 1
Subaudible Tones (ON = 1)

Freq (Hz)	P1	P2	P3	P4	P5	P6
67.0	1					
71.9		1				
74.4	1	1				
77.0			1			
79.7	1		1			
82.5		1	1			
85.4	1	1	1			
88.5				1		
91.5	1			1		
94.8		1		1		
97.4	1	1		1		
100.0			1	1		
103.5	1		1	1		
107.2		1	1	1		
110.9	1	1	1	1		
114.8					1	
118.8	1				1	
123.0		1			1	
127.3	1	1			1	
131.8			1		1	
136.5	1		1		1	
141.3		1	1		1	
146.2	1	1	1		1	
151.4				1	1	
156.7	1			1	1	
162.2		1		1	1	
167.9	1	1		1	1	
173.8			1	1	1	
179.9	1		1	1	1	
186.2		1	1	1	1	
192.8	1	1	1	1	1	
203.5						1
210.7	1					1
218.1		1				1
225.7	1	1				1
233.6			1			1
241.8	1		1			1
250.3		1	1			1

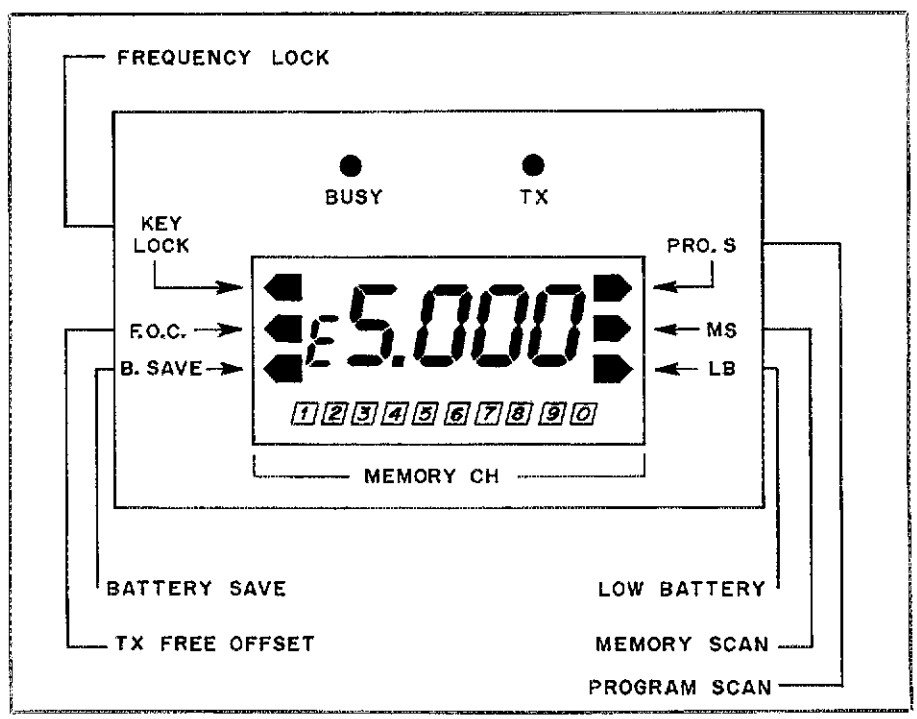


Fig 1—LCD panel layout, showing various indicators.

shown in Fig 1. Operating frequency is displayed in four large numbers in the center. By setting LAMP ON the display is illuminated. Avoid battery problems; use only as required. The various operational functions are indicated by a black arrowhead pointing to "Frequency Lock," "Program and Memory Scan," "TX Free Offset," "Battery Save" and "Low Battery." During operation, the active memory channel is shown. During memory scanning, each programmed memory channel will be shown as it is scanned. If there are unprogrammed memories, they do not appear during scanning.

Testing Problems

When we first received the review unit, we sent it to the ARRL Lab for testing. A significant problem reared its ugly head right away! When the transceiver was placed in transmit mode, the spectral display showed a very short period (fractions of a second) of operation without the synthesizer in lock. This resulted in spurious emissions, at the full rated power level, but ranging from a few kilohertz to several megahertz away from the selected fundamental frequency. These spurious signals could cause in-band interference, but worse yet, could be outside the ham bands in no-no land. They were of sufficient power to access other 2-m repeaters in the area. There was no apparent pattern—these were random-frequency signals. It takes not only a spectrum analyzer to detect these signals, but also a very knowledgeable operator to identify them.

In accordance with ARRL product-review policy, we contacted the manufacturer's representative. Upon hearing of this problem, Everett Gracey, President of Alinco Electronics, immediately shifted into high gear. The entire stock of unsold units in this country was examined! The factory was advised and immediately went into an accelerated program to come up with a viable fix. The results of that program were encouraging. Only a very few (one or two) of the in-stock units, seemed to show the problem, and those had the highest serial numbers. An engineering change to eliminate the problem was incorporated into every unit in stock. This is a relatively simple modification, accomplished at the Reno, Nevada facility of the company.

We have been assured that future production units will not exhibit this fault and that the great majority of the existing units in the field are free from the problem. Alinco Electronics has offered to retrofit any unit that shows this problem, but don't just send your unit to them! Try to discover if there are any problems in operation first. If your unit has a low serial number, the probability of it occurring is less. If you suspect a problem, call the company and ask their advice. As I said before, it takes a specialized piece of test equipment and a very competent operator to determine if the problem exists.

We returned our unit to Reno for repair, and it was returned in a very few days, with no problems. When we went back to the Lab for testing, we really got a pleasant surprise. The performance of the unit met or exceeded all of the manufacturer's claims and showed a spectral purity that is outstanding (see Fig 2).

Operation

Working 2-m FM in the "boonies" of Connecticut is not for the impatient. There aren't a lot of repeaters within a radius of 20 miles of my QTH. In addition, the gently rolling hills and lush foliage extending up to a hundred feet or more make it difficult to get a 2-m signal where you want it. In any event, I have been successful in accessing several repeaters in the local area, with good signal reports. When I manage to get around to where the concrete "grows," however, performance picks up a lot. I took the unit on a weekend to New York City and had nothing but fun with it. There isn't a lot more to be said about performance with a 2-m FM handheld rig—if you can hear them and you can work them, it's gotta be right!

If you're considering the purchase of a no-nonsense, hand-held 2-m rig, this one is certainly worth looking at. The Alinco ALM-203T is available at your local dealer or from Alinco Electronics, Inc, PO Box 20009, Reno, NV 89515, tel 702-359-1414. Price class: $280.—*Bruce O. Williams, WA6IVC*

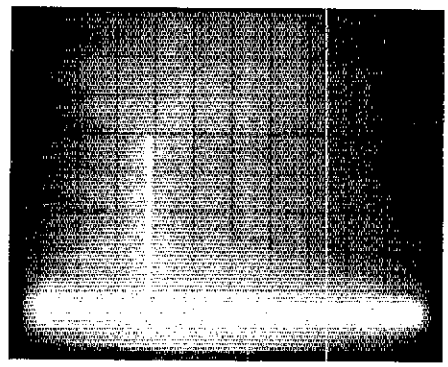


Fig 2—Spectral display of the ALM-203T operating at 146.000 MHz with no modulation. Vertical divisions are each 10 dB; horizontal divisions are each 50 MHz. Power output was 3.4 W. The fundamental (pip at the left center) has been reduced in amplitude approximately 31 dB by means of a notch filter to prevent spectrum analyzer overload. All spurious and harmonic emissions are at least 70 dB below peak fundamental output. The ALM-203T complies with current FCC specifications for spectral purity.

SOLICITATION FOR PRODUCT REVIEW EQUIPMENT BIDS

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

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

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

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

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

Trio-Kenwood TS-940S HF transceiver, s/n 51110330, with AT-940 antenna tuner, YK-88C-1 500-Hz CW filter, YG-455-1 500-Hz CW filter (as a package only—see Feb 1986 *QST*). Min bid $1268.

ICOM IC-735 HF transceiver, s/n 1257, IC-FL-32 500-Hz CW filter, IC-EX243 keyer (as a package only—see Jan 1986 *QST*). Min bid $568.

Ace Communications MIZUHO MX-15 (15-meter) transceiver, s/n 811855, PL-15 10-W amplifier, MS-1 speaker/mic, NB-7 sidetone kit (sold as a package only). Min bid $170.

HAL ARQ-1000 code converter, s/n 158. Min bid $440.

Santec LS-202A 2-m SSB/FM hand-held transceiver, s/n 401197, NP-9 battery pack, CA-110 charger, SH-1 speaker/mic (sold as a package only—see Dec 1985 *QST*). Min bid $193.

Mirage C211 220-MHz amplifier, s/n 018384 (see Feb 1986 *QST*). Min bid $153.

New Products

M.S.S. WONDER RODS

☐ Medford Specialized Service is marketing an aluminum brazing rod that can be used with a propane torch. Originally developed for repair of motor boat propellors, this rod allows low resistance joints in aluminum masts and antenna parts. It has a low melting point of 732° F, contains its own flux, and can be used by anyone who can solder.

Repair procedures are similar to soldering, with just three simple steps: (1) Clean area to be welded under heat with wire brush; (2) heat area to be welded until rod material flows, brushing with wire brush in area of weld; (3) reheat area again until rod material flows, fill in, and let cool.

Other uses for M.S.S. Wonder Rods include welding copper to aluminum, repair or plug holes in aluminum panels or chassis pans, repair holes in aluminum boats or alternators. Other metals, such as copper, brass, galvanized and white metal, can also be welded.

Available from Medford Specialized Service, N3401 Castle Rd, Medford, WI 54451, tel 715-748-3974. A kit of rods with a stainless steel brush is $19.95, including instructions, tax and postage.—*Bruce O. Williams, WA6IVC*

FCC Issues Novice Enhancement NPRM

By Phillip M. Sager, WB4FDT
Manager, Regulatory Information Branch, ARRL

The following table shows the attrition rate for Novices:

	FY 83	*FY 84*	*FY 85*
New Novices	18,744	17,392	15,913
Upgraded	10,274	8,829	10,422
Dropped out	9,129	14,883	9,615
Novices at year end	86,781	80,461	76,337

Just look at these statistics! A *loss* of almost *10,000* Novice class amateurs over this three-year period. It has become apparent that the Novice license, as presently constituted, is *not* doing the job for which it is intended: to provide a training ground from which newly licensed amateurs can develop radiocommunications skills. Increasingly, it has become generally recognized that present Novice privileges are insufficiently attractive in motivating prospective hams to join our ranks. Furthermore, these privileges are not attractive enough to encourage many who do have a Novice license to get on the air. Of the four amateur bands now authorized for Novice operation, propagation conditions are so poor in the current phase of the sunspot cycle that, except for local communications, operation is largely limited to the 80- and 40-meter bands. Even in these two bands, Novices are frustrated and inhibited because of Canadian amateur telephone operations in the 80-meter band and international broadcast activity in the 40-meter band. Novices must be allowed enhanced opportunities if they are to pursue greater operating privileges in Amateur Radio.

Concerned by these factors, the ARRL Board of Directors authorized a petition, which was filed by the ARRL in June 1985, requesting a drastic "enhancement" of Novice privileges to revitalize the crucially important entry level of Amateur Radio.

The FCC, acting on the League's petition, has now issued a Notice of Proposed Rule Making (NPRM), PR 86-161. *This is probably the most important FCC proposal of the 1980s* and *very closely* follows the Novice Enhancement requests by the ARRL! (For further background information, see "It Seems to Us," July 1985 *QST*.)

The following are the specific FCC proposals:

- The 10-meter Novice band would be expanded 300 kHz from the present 28.1-28.2 MHz to 28.1-28.5 MHz. CW and digital communications (eg RTTY, AMTOR and packet) would be allowed in the 28.1-28.3 MHz subband, and *SSB* and CW emissions on 28.3-28.5 MHz at the present power limit of 200 watts.
- The 1¼-meter band, on 220-225 MHz, would be added to Novice privileges, allowing them all authorized emissions with a power of 25 watts. The Commission cautions, however, that there are several petitions for rule making pending requesting the use of this band for other services. Until these petitions are resolved, the Commission cannot finalize any rule makings permitting Novice amateurs on this band.
- A portion of the 23-cm band, 1246-1260 MHz, would be added to Novice privileges, allowing all authorized emissions with a power of 5 watts.
- Novices would *not* be allowed to be a control operator or a licensee of a station that is in repeater, auxiliary or beacon operation.

ARRL HQ is already receiving many questions concerning these proposals. The following are some of the ones most commonly asked.

Q. Why give Novices phone privileges?

A. While Morse code is, and probably always will be, an integral part of Amateur Radio, it is not the only mode that is appropriate for a beginner to use. This was recognized as early as 1951, when the Novice license was established. Novices were given phone privileges at 145-147 MHz and retained them until as recently as 1968, when the privilege was withdrawn by the FCC "to foster the code proficiency of licensees." At the time the license was nonrenewable, so it was "up or out" for Novice licensees—a situation that no longer exists, since the license is now renewable and carries a 10-year term.

Q. Would giving Novices phone privileges discourage upgrading?

A. If a taste of HF phone were enough to discourage upgrading, why would anyone upgrade from General to Advanced?

Q. Why allow Novices/Technicians phone privileges on 10 meters? Isn't this a new policy of the ARRL?

A. The Novice 10-meter expansion can be accomplished with a minimum of inconvenience to others. 28.3-28.5 MHz has been a part of the phone bands only since September 1984. Mostly because of the sunspot cycle, activity there has been extremely sparse, even during contests. It has been League policy since 1969 to favor "Techs on 10," so earning 10-meter SSB privileges with a 5-WPM code test is hardly a new thought.

Q. Why allow Novice privileges on 220 MHz? Isn't this a new policy of ARRL?

A. The League has supported Novice privileges on 220 MHz since 1975. Three years ago, the FCC dismissed an ARRL proposal for Novice privileges on 220 MHz. VHF FM offers Novices a chance to contact local hams, which could help local clubs and help make Novices a part of mainstream local activity, and expose Novices to local public-service communications.

Q. Would Novices be able to operate through repeaters on the 220-MHz and 1240-MHz bands?

A. Yes, although they would not be allowed control-operator privileges on repeaters.

Another important aspect of the FCC's proposal was their request for comments concerning the ARRL's request to expand the Novice examination to 30 questions. (The ARRL *does not* want to make the examination more difficult. The League wants to increase the comprehensiveness of the examination in order to accommodate the operational aspects of the additional privileges available to Novice class operators.) The ARRL also requested that Section 97.28 be amended to require that each Novice examination be administered by two volunteer examiners holding General class licenses, or above, rather than the presently required one examiner, in order to maintain the integrity of the Novice examination.

We hope that the basic elements of this dramatic Novice enhancement proposal will survive and move quickly through the Commission's administrative processes. The sooner we can make Amateur Radio more attractive to newcomers, without compromising the entrance requirements that are so important to maintaining a quality Service, the sooner the future of Amateur Radio will be assured.

Formal comments on this proposal are due on or before July 16, and comments by August 20, 1986. Formal participants must file an original and five copies of their comments. Amateurs wishing to comment informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of comments submitted. Remember to send a copy to your ARRL Director! Comments should be addressed to the Secretary, Federal Communications Commission, Washington, DC 20554.

The complete text of PR 86-161 immediately follows.

Before the
Federal Communications Commission
Washington, DC 20554
FCC 86-192

In the Matter of	) PR Docket No. 86-161	
	)	
Amendment of the	)	
Amateur Radio	)	
Service Rules to	)	
Expand the	) RM-5022	RM-5038
Privileges Available	) RM-5023	RM-5251
to Novice	) RM-5024	RM-5281
Operators.	) RM-5025	RM-5282

NOTICE OF PROPOSED RULE MAKING

Adopted: April 18, 1986
Released: April 30, 1986

By the Commission:

1. Notice of Proposed Rule Making in the above-captioned matter is hereby given.

2. Larry W. Garens, Brady, Texas, has filed five petitions for amendment of the Amateur rules. Their object is the expansion of operating privileges for Novice operators. Petition RM-5022 proposes to allow Novice and Technician[1] operators the use of telegraphy and radioteleprinter privileges in the 10-meter band; RM-5023 proposes to allow telephony privileges in the 10-meter band; RM-5024 requests radiotelephony on 30 meters; and RM-5025 proposes telegraphy and telephony in the 1.25-meter band. These petitions were filed on February 27, 1985. Mr. Garens filed another petition on November 29, 1985 (RM-5251) requesting Novice privileges in a small segment of the 902-928 MHz band. In this frequency band, he proposes telegraphy, telephony, radioteleprinter, packet radio and ASCII digital communications. Both in RM-5022 and RM-5251, Mr. Garens says he is looking for persons with computers to enter the Amateur Radio Service and use their radios and computer together.

3. On June 6, 1985, the American Radio Relay League, Inc. (ARRL) filed a petition for rule making (RM-5038) to enhance the operating privileges of Novice operators. The ARRL seeks to provide greater motivation for amateurs-to-be to obtain their first license, without reducing the incentive to upgrade by attaching too many privileges to what is, and should continue to be, an elementary license. It proposes to allow Novices telephony and data privileges sufficient to permit communication with other local amateurs and to provide an occasional opportunity for long-distance communications. The essential elements of the ARRL's proposal are:

> (a) Authorize Novice control operators digital communication privileges in the 10 meter band on frequencies 28.1-28.3 MHz;
> (b) Authorize Novice control operators emission J3E telephony privileges in the 10 meter band on frequencies 28.3-28.5 MHz;
> (c) Authorize Novice control operators frequency privileges in the entire 1.25 meter band with all emission privileges authorized for that band and with a transmitter power limit of 25 watts. Stations in repeater operation could retransmit the signals from Novice stations, but no Novice licensee could be the control operator or the station licensee of a station in repeater operation;
> (d) Authorize Novice control operators frequency privileges in the 0.23 meter band on frequencies 1246-1260 MHz with a transmitter power of 5 watts similar to the conditions proposed for the 1.25 meter band.

4. The ARRL requests that Section 97.67 (d) be amended to allow Novice operators 200 watts PEP power on the proposed expanded 10-meter Novice subband; 25 watts at 220-225 MHz; and 5 watts at 1246-1260 MHz. It also requests that other operators who are now authorized to operate at higher power levels in these three subbands be permitted to continue to operate there with those higher powers.[2]

5. The ARRL also requests that the Element 2 examination syllabus be expanded to include topics about digital communications and telephony techniques. According to the ARRL:

> This is necessary in order that the examination content be commensurate with the privileges granted by the license class. In this connection, it would be proper to expand the Novice written examination to thirty questions and the question pool (PR Bulletin 1035A) to 300, to accommodate additional questions on operational aspects of the additional privileges available to Novice licensees.

In replying to comments to its petition, the ARRL elaborated:

> It is not the League's intention by this suggestion that the examination be made more difficult, as that would discourage newcomers to amateur radio—the antithesis of the League's proposal. Rather, the goal is to increase the comprehensiveness of the examination without increasing the difficulty thereof. Merely expanding the Novice class examination question pool to 300 to accommodate questions on the *operational* aspects of the additional privileges should create no deterrent to prospective entrants to the Novice ranks. It *will*, however, insure that at least the use of the new privileges are understood by the newcomer, and that his or her on-the-air operating practices are well disciplined and orderly from the outset.

6. The ARRL also seeks to preserve the integrity of the Novice examination. To this end, the ARRL requests that Section 97.28 be amended to require that each examination for the Novice class operator license be administered by two volunteer examiners holding General class licenses or above, rather than the presently required one examiner.

7. Richard E. Darwicki also seeks enhancement of the Novice operator privileges in RM-5282. He proposes to add new privileges in the 160-meter band, and expand privileges in the 40-meter and 80-meter bands for Novice and Technician operators. Mr. Darwicki says that his proposal is designed to increase the possibility of obtaining training in emergency traffic handling and promoting higher technical skills, including telegraphy proficiency.

8. Albert D'Errico, Jr., and others, many of whom are affiliated with the Six Meter International Radio Klub (SMIRK), propose additional Novice privileges for the 6-meter band (RM-5281). They propose to add telegraphy, upper sideband and amplitude modulation emissions to the 6-meter band for Novice operation, with a maximum authorized power of 15 watts. SMIRK suggests a frequency subband of 200 kHz between 50.3 and 50.5 MHz.

9. The comments received were, in the main, directed to the proposals contained in RM-5038. The greatest concern was with the proposal to allow Novices single sideband telephony emission on 10-meters. Commenters believe that this would pave the way for the 10-meter band to become undisciplined radio operation. They also fear that Novices will buy ready-made equipment and not get into the technical aspects of amateur radio. Some commenters suggest instead that double sideband amplitude modulation be permitted. This would give Novices the opportunity to use either home-constructed equipment or minimally-modified CB equipment, both options being cost-effective, and technically relatively simple.

10. Another concern is that once the Novice operator is authorized telephony privileges, the incentive to upgrade would diminish or become nonexistent. Also argued is that Novices are "entry level" operators and, therefore, inexperienced. One commenter stated that such operators would cause second harmonic interference to TV channel 2 and to other radio services, if they are given privileges at 28.3-28.5 MHz.

11. The comments also suggest that, if enhanced privileges are granted Novices, the Novice license should be made nonrenewable (or be changed from 10 years to 5 years and then made non-renewable) in order to force Novices to upgrade. Making the Novice license a part of the volunteer examination system (with or without a fee) to preclude cheating was also suggested. A commenter also opposed the ARRL's proposal to "grandfather" existing Novice licensees for the enhanced privileges, without reexamination.

12. One commenter said that it would be a mistake to take "entry level" licensees and give them the privilege of digital communications, especially on an international frequency band such as the

[1]Since the Technician class license includes all the privileges of the Novice class, any enhancement of Novice class privileges would also benefit the Technician class.

[2]The ARRL would retain the present 200 watts PEP power limit for all licensees in the three existing Novice subbands below 28 MHz. At present, the 200 watt power limitation for all licensees also applies in the subband 28100-28200 kHz. Under this proposal, that limitation would be removed for other than Novice and Technician operators. We are especially interested in hearing from Novice licensees on this issue.

10-meter band. The commenter noted, as did others, that Novice privileges between 28.3-28.5 MHz would interfere with international beacons. The proposal to allow Novice privileges at 1246-1260 MHz was also questioned. One commenter objected on the basis that operation in that band requires technical skill at the suggested lower power of 5 watts, and that "entry level" operators should not be exposed to the radiation there. Opening the 220 MHz band to Novices was opposed on the ground that repeater operation in that band needs to be protected from amateurs who are not allowed to be control operators or licensees of stations in repeater operation.

13. Support for the various proposals reflects a concern that something must be done to attract a new generation to amateur radio. Mr. David C. Andrus captures this idea rather succinctly:

> I feel that the single most important thing that the ARRL's proposal for enhancement of the Novice license will do is to encourage many young people who are presently involved in computers at home and school to consider the expansion of their "reach" with radio-linked telecommunications.

The same theme is sounded by other commenters, but with the caveat that bringing new people into amateur radio should be done carefully and not with a "quick-fix" approach.

14. Our statistics show a decline in both the number of new Novice operators and of total Novice operators. There are 10,000 fewer Novices now than there were two years ago.[3] The ARRL blames the decline on limited operating privileges of Novices. Of the four amateur bands now authorized for operation, the ARRL states that propagation conditions are so poor in the current phase of the sunspot cycle that, except for local communications, operation is largely limited to the 80-meter and 40-meter bands. According to the ARRL, even in these two bands, Novices are frustrated and inhibited because of Canadian amateur telephony operations in the 80-meter band and international broadcast activity in the 40-meter band. The ARRL reasons that persons at the beginner level must be allowed enhanced opportunities if they are to pursue greater operating privileges in amateur radio.

15. One of the fundamental purposes of amateur radio is to maintain a pool of operators, technicians and electronics experts. In light of the apparent downward trends in Novice operators, we are concerned that a valuable national resource is being diminished. Accordingly, we will propose rule making, largely along the lines proposed by ARRL, in the hope that an enhanced Novice license will benefit the service and reverse the trends.[4] It must be recognized that there are currently two petitions for rule making pending before the Commission, RM-4829 and RM-4831, seeking accommodation for narrowband land mobile operations in the 216-225 MHz band. Additionally, in General Docket 80-739 the Commission decided to maintain the fixed, mobile and amateur services as co-primary allocations until the FCC/National Telecommunications and Information Administration working group develops an appropriate allocation plan for this band.[5] In view of this, we will not finalize the matter of permitting Novice amateurs in the 220-225 MHz band until these petitions are resolved.

16. We invite particular discussion of the ARRL's request for two examiners to administer Novice examinations should the privileges of this license be enhanced. Integrity of the license is important, but we are not convinced that two examiners is the right safeguard to employ. Including Novices in the Volunteer Examination System has merit, but we are reluctant to disturb the present procedure under which aspirants to amateur radio receive their licenses quickly and free of charge. Moreover, we are unsure of the capacity of the Volunteer Examination System to handle this volume of applicants. Commenters should also have due regard for the need to minimize changes to FCC forms.

17. For purposes of this non-restricted notice and comment rule making proceeding, members of the public are advised that ex parte contacts are permitted from the time the Commission adopts a Notice of Proposed Rule Making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting. In general, an ex parte presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written ex parte presentation must serve a copy of that presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral ex parte presentation, addressing matters not fully covered in any previously filed comments in the proceeding, must prepare a written summary of that presentation; on the day of the oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each ex parte presentation must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's Rules, 47 CFR 1.1231. A summary of the Commission's procedures governing ex parte contacts in informal rule makings is available from the Commission's Consumer Assistance Office, FCC, Washington, D.C. 20554, (202) 632-7000.

18. Authority for issuance of this Notice is contained in Sections 4(1) and 303(c) and (r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(1) and 303(c) and (r). Pursuant to applicable procedures set forth in Section 1.415, 47 CFR 1.415, of the Commission's Rules, interested persons may file comments on or before July 16, 1986, and reply comments on or before August 20, 1986. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided further that the fact of the Commission's reliance on such information is noted in the Report and Order.

19. In accordance with Section 1.419 of the Commission's Rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. Each set of comments must state on its face the proceeding to which it relates (PR Docket Number) and should be submitted to: The Secretary, Federal Communications Commission, Washington, D.C. 20554. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

20. Pursuant to 5 U.S.C. 603, we submit this initial regulatory flexibility analysis. We propose to enhance the Amateur Novice class operator license by allowing Novice licensees greater operating

[3]The following table shows the attrition rate for Novices.

	FY 83	FY 84	FY 85
New Novices	18,744	17,392	15,913
Upgraded	10,274	8,829	10,422
Dropped out	9,129	14,883	9,615
Novices at year end	86,781	80,461	76,337

[4]We inquire whether the trends discussed above may not be a result of the limited privileges of the Novice class license, but may instead reflect an imbalance in the privileges and qualifications associated with the present license classes. If so, we ask for comment whether the following adjustment would be helpful. The Technician operator written test requirements could be confined to those topics from Element 3 commensurate with the VHF and UHF privileges authorized by the license. It would be a simple matter to rearrange the topics into two syllabi: Element 3(A) for VHF and UHF; Element 3(B) for MF and HF. Element 3(A) would be a written text requirement for a Technician-and-above license. Element 3(B) would be a written test requirement for a General-and-above license.

[5]See paragraphs 30 and 31, Second Report and Order in General Docket 80-739, adopted November 8, 1983, implementation of the 1979 WARC, FCC 83-511; 49 FR 2357, January 19, 1984.

privileges. These privileges are proposed for portions of the 28, 220 and 1200 MHz bands and will include telephony which is not presently permitted for Novices. Appropriate power levels are also proposed. Our authority to promulgate such rules derives from Sections 4 (I) and 303 (c) and (r) of the Communications Act of 1934, as amended. The new rules are expected to increase interest among all persons in becoming amateur radio operators. We estimate that at least 20,000 persons each year will become Novices. It is possible that some of these new applicants will purchase single sideband telephony radio equipment. Thus, there is expected to be some effect on the sale of amateur radio equipment, including antennas, towers, transmission lines, transceivers, microphones, connectors and filters. No additional record keeping requirements are being imposed. We cannot currently determine with any specificity the increase in equipment sales, if any, that small entities may experience. We will examine this proceeding's effect on small entities further in the Final Regulatory Flexibility Analysis in this proceeding.

21. Insofar as they are consistent with the proposed rules adopted herein, rule making petitions RM-5022, 5023, 5024, 5025, 5038, 5251, 5281 and 5282 ARE GRANTED, and in all other respects ARE DENIED.

22. IT IS ORDERED, That the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and the Secretary shall also cause a summary of this Notice to be published in the Federal Register.

23. For information concerning this proceeding, contact Maurice J. DePont, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

FEDERAL COMMUNICATIONS COMMISSION
William J. Tricarico
Secretary

APPENDIX

Part 97 of Chapter 1 of Title 47 of the Code of Federal Regulations would be amended as follows:

1. The authority citation for part 97 would continue to read as follows:

Authority citation: 48 Stat. 1066, 1082, as amended;
47 U.S.C. 154, 303. Interpret or apply
48 Stat. 1064-1068, 1081-1105, as amended;
47 U.S.C. 151-155, 301-609, unless otherwise noted.

2. Secton 97.7 (a) would be revised, as follows. The line entry for the 10-meter band would be revised to read as shown below. Following the kilohertz listing, a megahertz listing for the 1.25 and 0.23-meter bands would be added.

§97.7 Frequency privileges.

* * * * *

(a) Novice class:

Meter band	Terrestrial location of the amateur radio station ITU Region 1	ITU Region 2	ITU Region 3	Limitations (see para.(g))
		kilohertz		
*	*	*	*	*
10	28100-28500	28100-28500	28100-28500	1
		megahertz		
1.25	------	220-225	--------	1,3,4,5,32
0.23	1246-1260	1246-1260	1246-1260	1,5,11,32
*	*	*	*	*

3. In Section 97.7 (b), the line entry for the 10-meter band would be revised to read:

§97.7 Frequency privileges.

* * * * *

(b) * * *

Meter band	Terrestrial location of the amateur radio station ITU Region 1	ITU Region 2	ITU Region 3	Limitations (see para.(g))
*	*	*	*	*
10	28100-28500	28100-28500	28100-28500	1
*	*	*	*	*

4. Section 97.7 (g) (1) would be revised to read, as follows:

97.7 Frequency privileges.

* * * * *

(g) Limitations:

(1) Novice and Technician class control operators are limited to the use of international Morse code when the station is transmitting emission A1A on frequencies 3700-3750 kHz, 7100-7150 kHz (7050-7075 kHz when the terrestrial station location is within Region 1 or 3), 21100-21200 kHz and 28100-28500 kHz.

* * * * *

5. Section 97.61 (a) would be revised by adding a new line entry before 28000-28300, by removing limitation 1 from the line entry for 28000-28300 kHz and by adding a new limitation 3 in the line entry for 28300-29700 kHz, as follows:

§97.61 Authorized emissions.

(a) kilohertz:

Frequency Band (kHz)	Emissions	Limitations (see para. (d))
*	*	* * *
28000-29700	A1A	
28000-28300	A1A, F1B	
28300-29700	A1A, A3E F3E, G3E, A3C, F3C, A3F, F3F, H3E, J3E, K3E	3
*	*	* * *

6. Section 97.61 (d) would be revised to add a new limitation (3), as follows:

§97.61 Authorized emissions.

* * * * *

(d) * * *
(1) * * *
(2) * * *
(3) Novice and Technician class control operators may not use emissions A3E, F3E, G3E, A3C, F3C, A3F, F3F, H3E, or K3E when operating in the frequency band 28300-28500 kHz.

7. Section 97.67 is revised by removing subparagraph (6) of paragraph (d), and by adding new paragraphs (j) and (k), as follows:

§97.67 Maximum transmitting power.

* * * * *

(j) The transmitter power of each amateur station at which the control operator holds only Novice or Technician class operator privileges shall not exceed 200 watts peak envelope power when transmitting in the 10-meter band.

(k) The transmitter power of each amateur station at which the control operator holds only Novice class operator privileges shall not exceed 25 watts peak envelope power when transmitting in the 1.25-meter band, and 5 watts peak envelope power when transmitting in the 0.23-meter band.

8. Section 97.85 would be revised by adding a new paragraph (l).

§97.85 Repeater operation.

* * * * *

(l) No amateur station at which the control operator station licensee holds only Novice class privileges shall be in repeater operation.

9. Section 97.86 would be revised by adding a new paragraph (e).

§97.86 Auxiliary operation.

* * * * *

(e) No amateur station at which the control operator or station licensee holds only Novice class privileges shall be in auxiliary operation.

10. Section 97.87 would be revised by adding a new paragraph (f).

§97.87 Beacon operation.

* * * * *

(f) No amateur station at which the control operator or station licensee holds only Novice class privileges shall be in beacon operation.

Happenings

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

FCC Reinstates Emergency Communications Definition

The FCC has reinstated the previous definition of amateur emergency communication in a Memorandum Opinion and Order in response to an ARRL Petition for Partial Reconsideration in BC Docket 79-47. In its original Order last June, the FCC replaced the previous definition of 97.3(w) (any amateur communication directly relating to the immediate safety of life of individuals or the immediate protection of property) with a new definition, "a non-directed request for help or a distress signal directly relating to the immediate safety of human life or the immediate protection of property."

The ARRL filed a Petition for Partial Reconsideration stating that the original definition had adequately served to inform amateurs as to what constitutes an emergency communication, and that the new definition was overly specific and would prohibit entire categories of service communications permitted under the prior definition.

The Commission stated that in view of ARRL's Petition, it was concerned that the new definition may have made an unintended change in the nature of permissible amateur emergency communications, and in order to resolve any ambiguity, it would rescind the new definition it had adopted and revert to the previous definition, effective May 4, 1986.

In this same order, the Commission dismissed a Petition for Reconsideration from the National Association of Broadcasters to increase the scope of permitted broadcast use of Amateur Radio in broadly defined emergency situations. The Commission stated that broadcast stations may retransmit *normal* amateur communications for whatever purpose they wish—for example, the rebroadcast of a message exchange between amateur stations taken off the air where no prior arrangements for broadcasting were made.

However, in an emergency situation, newsgathering is permitted via Amateur Radio only when all of these conditions are met: (1) The event is unforeseen; (2) the news information is directly related to the event; (3) the event involves the safety of human life or the immediate protection of property; and (4) the news information cannot be transmitted by any other means other than Amateur Radio because of the remote location of the originating transmission or because normal communications have been disrupted. The Commission stated that *"these standards are not to be construed liberally, but literally."* Thus, if alternate communications facilities are available, Amateur Radio may *not* be used to gather news information even if the other three elements are present. The Commission further noted that even routine program production and newsgathering involved many business-related activities, from live interviews to ordering equipment and accommodations. "We determined to maintain an absolute ban on communications of this sort from the amateur service as inconsistent with its nature and purpose."

Part 97 is amended as follows:

97.3 Definitions.

(w) *Emergency Communication.* Any amateur radio communication directly relating to the immediate safety of life of individuals or the immediate protection of property.

FCC STUDY OF AMATEUR POWER

"Notwithstanding other limitations of this section, amateur radio stations shall use the minimum transmitting power necessary to carry out the desired communications." Thus speaks Section 97.67(a) of the amateur rules! The FCC Field Operation Bureau conducted 184 field inspections of HF amateur stations in early 1985, and their conclusion is that 65 percent of the operators of those stations violate this rule! The stations visited by FCC aren't typical, so the percentage figure cannot be applied generally. The FCC observes that the likelihood your signals will be intercepted by nearby home-entertainment equipment increases as the transmitter power increases, and that in most of the cases they observed, communications effectiveness was not significantly enhanced by transmitter power levels of more than 200 watts. Sometimes more power is necessary, but if it isn't, don't use it; that's the law, and it's also good neighbor relations.

FCC PROPOSED PRIVATE LAND-MOBILE RADIO SERVICE PROHIBITION ON EXTERNAL FREQUENCY CONTROL

The FCC, in PR Docket 85-87, has proposed prohibiting the use of transmitters having external frequency controls in the Private Land-Mobile Radio Service. The Commission's concern is that such equipment enables operators to select unauthorized frequencies easily. Even occasional use of unauthorized channels by a large number of land-mobile users could cause harmful interference to authorized users on the same and adjacent bands. This amendment, if adopted, will require manufacturers of land-mobile radios to redesign any external frequency controls so that operators will be unable to select unauthorized frequencies.

WAYNE GREEN, W2NSD, VISITS ARRL HQ

Wayne Green, W2NSD, editor of *73 Magazine*, visited HQ March 26. Wayne said that it was his first visit to HQ since the League moved to Newington from LaSalle Road in West Hartford, some 25 years ago. He characterized his visit as "bridgebuilding," and he had long discussions with Executive Vice President Dave Sumner, K1ZZ, and other members of the staff concerning his ideas for revitalizing Amateur Radio.

OPEN HOUSE AT HQ

The ARRL HQ building and W1AW, the Hiram Percy Maxim Memorial Station, will be open on Sunday, June 8, from 10 AM to 5 PM. If your club would like to schedule a visit to HQ on this date, please notify HQ and be sure to bring a copy of your operator's license if you'd like to operate W1AW. Over 170 visitors toured ARRL HQ during the ARRL Open House on April 5. The most popular section of the tour was, naturally, W1AW, where all operating positions were kept busy throughout the day.

SIMPLEX AUTOPATCH ADVERTISEMENTS

ARRL members are reminded that it is legal to operate a home simplex autopatch transmitter by remote control from a mobile rig in auxiliary operation only within certain constraints. The station in auxiliary operation must be above 220.5 MHz (except 431-433 and 435-438 MHz). ARRL policy requires that ads describing the features of simplex autopatches include the following statement: *"Use of this device with a transceiver operating in the 2-meter band, or on any frequency below 220.5 MHz, is not permitted unless a separate control link is provided."* Some advertisers in other publications are advertising devices that contain a simplex autopatch feature, and stating or implying that *any* VHF/UHF portable or mobile can be used to control these devices. ARRL members are reminded that control via a 2- or 6-meter rig is illegal. It is exactly this sort of confusion which the ARRL policy was intended to address.

WØORE CARDS

Many thanks go to the Milwaukee Radio Amateurs Club, a prestigious Special Service Club, for processing several thousand QSL cards confirming SWL reports of WØORE's Space Shuttle operation. For those of you fortunate enough to work WØORE, cards are now in his possession and should be signed and mailed shortly.

NORTHERN KENTUCKY TOWER FUND

Amateurs in Kentucky have established the "Northern Kentucky Tower Fund" to assist John Thernes, WM4T, with his legal expenses. WM4T says his case, which in a victory for Amateur Radio was remanded from the Federal Appeals Court back to the Federal District Court, has cost him over $16,000 in

legal fees, with no end in sight. He is presently waiting for the District Court to set a hearing date for his case. WM4T hopes that this fund can eventually grow into a national fund to help other amateurs fighting restrictive-tower ordinances. Anyone wishing to contribute to the fund can contact Northern Kentucky Tower Fund, PO Box 17721, Lakeside Park, KY 41017.

FAR SCHOLARSHIP ANNOUNCEMENT

The Foundation for Amateur Radio, Inc, a nonprofit organization with headquarters in Washington, DC, plans to award 21 scholarships for the academic year 1986-87. The Foundation, composed of 50 Washington-area Amateur Radio clubs, fully funds two of these scholarships from the proceeds of its annual hamfest. It administers, without cost to the donors, seven scholarships for the Quarter Century Wireless Association, two for the Dade (Florida) Radio Club, and one each for the Radio Club of America, the Richard E. Chichester Memorial, the Young Ladies' Radio League, the Edmund G. Redington Memorial, the Amateur Radio News Service, The Columbia (Maryland) Amateur Radio Association, the Baltimore (Maryland) Amateur Radio Club and the Lewis W. Wilkinson Memorial scholarships.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of study beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college or technical school. Most of the scholarships require the applicant to at least hold an FCC General class license or equivalent. The scholarship awards range from $350 to $900, with preference give in some cases to residents of specific geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by sending a letter or QSL/postcard to FAR Scholarships, 6903 Rhode Island Ave, College Park, MD 20740.

NEW ARES BROCHURE

A new ARES disaster/public-service communications brochure is hot off the presses. FSD-25 was created in response to Board Minute 54 and is designed to be used by local ARES members in explaining the potential of ARES to nonamateur governmental officials. Special thanks are in order to the Emergency Communications Advisory Committee and especially Jerry Boyd, KG6LF, for their initiative and assistance on this project. Copies are available from HQ upon receipt of an SASE.

BROADCASTERS REQUEST PREEMPTION OF RF LEVELS

Of great interest to the amateur community is a National Association of Broadcasters (NAB) request for a declaratory FCC ruling for preemption of local RF radiation regulations that arbitrarily restrict broadcast and other interstate communications services. NAB requested specifically that, absent new scientific evidence showing potential harm from public exposure to RF energy at levels below the guidelines established by the American National Standards Institute (ANSI), the FCC *preempt* state or local standards that are more stringent than the ANSI standard. In the FCC's ruling last year requiring broadcasters to limit human exposure to RF radiation to levels established by the ANSI, the FCC declined to take a final position on the federal preemption issue, but indicated it would consider the topic on a case-by-case basis.

The NAB has also submitted to the FCC a Petition for Partial Reconsideration in Docket 85-87, pertaining to the Federal preemption of local zoning or other regulation of receive-only satellite earth stations (dishes). In its Petition, the NAB suggests a *stronger* preemption statement than contained in the FCC's Report and Order.

International Amateur Radio Arrangements

The following are countries with which the United States shares a reciprocal-operating agreement.

V2	Antigua**	DL	Fed Rep of Germany	PJ	Neth Antilles
LU	Argentina	SV	Greece	ZL	New Zealand
VK	Australia	J3	Grenada	YN	Nicaragua
OE	Austria	TG	Guatemala	LA	Norway
C6	Bahamas	8R	Guyana	HP	Panama
8P	Barbados	HH	Haiti	ZP	Paraguay
ON	Belgium	HR	Honduras	OA	Peru
V3	Belize	TF	Iceland	DU	Philippines
CP	Bolivia	VU	India	CT	Portugal
A2	Botswana	YB	Indonesia	J6	St Lucia
PY	Brazil	EI	Ireland	9L	Sierra Leone
VE	Canada	4X	Israel	H4	Solomon Islands
CE	Chile	I	Italy	ZS	South Africa
HK	Colombia	6Y	Jamaica	EA	Spain
TI	Costa Rica	JA	Japan	PZ	Suriname
OZ	Denmark	JY	Jordan	SM	Sweden
HI	Dominican Rep	T3	Kiribati	HB	Switzerland
J7	Commonwealth of Dominica**	9K	Kuwait	9Y	Trinidad
HC	Ecuador	EL	Liberia	T2	Tuvalu
YS	El Salvador	LX	Luxembourg	G	United Kingdom*
3D2	Fiji	3A	Monaco	CX	Uruguay
OH	Finland	PA	Netherlands	YV	Venezuela
F	France			YU	Yugoslavia

The following are countries with which the United States shares a third-party-traffic agreement.

V2	Antigua	YS	El Salvador	HP	Panama
LU	Argentina	C5	Gambia	ZP	Paraguay
VK	Australia	9G	Ghana	OA	Peru
V3	Belize	J3	Grenada	VR6	Pitcairn Is**
CP	Bolivia	TG	Guatemala	V4	St Christopher & Nevis
PY	Brazil	8R	Guyana	J6	St Lucia
VE	Canada	HH	Haiti	J8	St Vincent
CE	Chile	HR	Honduras	3D6	Swaziland
HK	Colombia	4X	Israel	9Y	Trinidad
TI	Costa Rica	6Y	Jamaica	GB	United Kingdom***
CO	Cuba	JY	Jordan	CX	Uruguay
HI	Dominican Rep	EL	Liberia	YV	Venezuela
J7	Commonwealth of Dominica	XE	Mexico	4U1ITU	ITU Geneva
HC	Ecuador	YN	Nicaragua	4U1VIC	VIC Vienna

*Includes the following territories: VP2A, VP2D, VP2M, VP2V, VP5, VP8, VP9, VS6, ZB2, ZD7, and ZF.
**These countries hold informal, temporary agreements with the United States.
***Limited to special-event stations with call-sign prefix GB (GB3 excluded).

"GIL" W1CJD

His name was Phil Gildersleeve, W1CJD, but the ham community knew him simply as "Gil," *QST's* premier cartoonist from 1927 through the 1960s. Gil drew many hundreds of humorous cartoons during this period, and the best of them will be reprinted in a new ARRL book. *QST* Managing Editor Laird Campbell, W1CUT, is editing the best of Gil's cartoons and arranging them by subject. The book is scheduled to be published this summer. This month's *QST* cover is in the spirit of many "Gil" covers and is offered as a tribute by our present cartoonist, Jim Massara, N2EST/4.

A self portrait (Nov. 1939)

Private Radio Bureau Worklist

Revised to March 21, 1986

Items Completed in First Quarter, 1986

PR Doc 84-5-104, 7-MHz Phone in Caribbean
*BC 79-47, Reconsideration, BC Use of Amateur Radio
*PR Doc 85-22, Repeater Coordination
PR Doc 85-168, F2A Emission on 29.5 MHz
*PR Doc 85-215, Remote Control of Aux Link Stations
Denies PRB-2, Shoblom Request for Waiver to use 434 MHz for TV Newsgathering

Miscellaneous Petitions Dismissed in First Quarter, 1986

S. C. Schallon, Station Identification
Gordon Girton, Call Sign Formats
Sunnyvale VEC, Techs on ten, etc
Beverly, MA, RACES Drills
W. T. Holt, Adjustment of Privileges

Items forthcoming

PR 85-105, Reconsideration, Automatic Control of Amateur Stations	3 Qtr 86
PR 85-21, Reconsideration, Exam Waiting Period After Failure	2 Qtr 86
PR 85-23, Reconsideration, Microwave Access	3 Qtr 86
PR 85-51, Reconsideration, 3rd Party Participation	3 Qtr 86
PR 85-196, Question Pools to be maintained by VECs	2 Qtr 86
PR 86-63, Element Credit in Examinations	3 Qtr 86
PR 86-161, Expanded Novice Privileges	2 Qtr 86
RM 5208, F8E SCRBBA	2 Qtr 86
RM 5241, Stoner, Create a Computer Service Upper 2 MHz of the 6-Meter Band	2 Qtr 86
Reconsideration, Beverly, MA RACES Drill Time Request	3 Qtr 86

Miscellaneous Petitions to be Considered

C. F. Janes, Technician Code Test
P. R. Garner, Limit Amateur Power to 50 Watts
Gordon Girton, Grade Periods
Gordon Girton, VE Record-Keeping
R. J. Jakobowski, Automatic Rebroadcast, NOAA Info
J. H. Chase, Three Classes of Amateur License

*Work in Special Services Division is complete; the Private Radio Bureau should sign off by the end of March and send it on to the Commissioners.

DAYTON AWARDS

At press time, the annual Dayton HamVention® awards were announced. They are: Ham of the Year—*Roy Neal, K6DUE;* Technical Excellence—*Doug DeMaw, W1FB;* Special Achievement Award—*The Rev. Michael Mullen, WB2GQW,* President of the International Mission Radio Association (IMRA).

ARRL HQ STAFF CHANGES

Welcome to the ARRL HQ staff Lee Hayford, AH2W. Lee is the new Assistant DXCC Manager and, as his call sign indicates, is from Guam, where he taught school and was an active DXer. He is a former Radioman for the Navy and attended Andrews University in Berrien Springs, Michigan. Scott Gee, WB9RRU, transfers from the DXCC Branch to W1AW as a station operator, replacing Bernie Glassmeyer, W9KDR, who has moved to Maine.

W8RC NAMED CHAIRMAN OF THE LEGAL STRATEGY COMMITTEE

ARRL President Larry Price, W4RA, has appointed Vice President Leonard Nathanson, W8RC, as Chairman of the Legal Strategy Committee. The Committee is charged with working with the Volunteer Counsel Program by providing assistance in matters relating to antenna ordinances, zoning restrictions and deed-restriction problems as they relate to Amateur Radio operators. ARRL Director Rodney Stafford, KB6ZV, has been named Vice Chairman of the Committee. Other Committee members are Clyde O. Hurlbert, W5CH, George S. Wilson, III, W4OYI, Wayne Overbeck, N6NB, Marshall Quiat, AGØX, and ARRL Counsel Christopher D. Imlay, N3AKD. The Legal Strategy Committee was created at the 1986 annual meeting of the ARRL Board of Directors.

PETITION THREATENS 220 BAND

Another petition threatening the 220-MHz band has been filed with the FCC. On April 15, the Association of Radio Reading Services, Inc, an organization providing reading services to persons with visual impairment via subcarriers on FM broadcast stations, filed a request for 500 kHz of the 220-MHz band for their service on the grounds that FM broadcast subcarriers are becoming unavailable to them. FCC has not yet assigned a file number to the petition, so comments would be premature. W1AW and *QST* will carry further information as it becomes available.

MORE ON FCC PREEMPTION OF RFI

ARRL Counsel Chris Imlay, N3AKD, wrote to the FCC for an opinion concerning a new ordinance enacted by the Township of Ewing, in Mercer County, New Jersey. The ordinance provides that it shall be unlawful for any person to transmit any radio signals that interfere with home electronic equipment in such a manner as to disturb the peace, enjoyment or general well-being of others. Imlay said in his letter that the question of interference is completely preempted by federal regulation and the Township's ordinance is invalid.

The Commission's reply, written by General Counsel Jack Smith, agreed completely with Imlay's assertions. The Commission stated that under the provisions of the Communications Act, the Commission has the authority to establish minimum performance standards for home-entertainment equipment. The Commission further noted that the rules in Part 97 "delineate the technical standards for operating Amateur Radio stations. State and local laws that either require amateurs to cease operation or pay fines when interference occurs conflict with our regulatory scheme. This is especially true when amateurs, who are fully complying with our rules, *must cease operation* or *operate at technical levels below* those established in our rules in order to avoid state or local sanctions." Copies of the Commission's letter are available from HQ upon receipt of an SASE. And what do the Township officials think of the FCC letter? HQ understands that the ordinance in the process of being rescinded.

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 April 1, 1986. For more information about call-sign assignment in the Amateur Radio Service, see *The FCC Rule Book*, Section 97.51 of the FCC Rules, or write to the FCC, Consumer Assistance Branch, Gettysburg, PA 17325.

Radio District	*Group A Am. Extra*	*Group B Advanced*	*Group C Tech/Gen*	*Group D Novice*
0	NRØO	KEØEN	NØGYW	KAØWIP
1	ND1X	KB1XK	N1EAR	KA1OGR
2	NQ2P	KD2SG	N2GFH	KB2AJQ
3	NA3A	KC3WC	N3EVK	KA3PIE
4	AA4RT	KJ4SK	N4NTA	KB4SIH
5	WJ5K	KF5KY	N5JAZ	KA5ZIO
6	WR6P	KI6DQ	N6NKB	KB6MCX
7	NT7K	KE7OI	N7IAF	KA7YJS
8	NQ8W	KE8EK	N8HHG	KA8ZDK
9	NJ9T	KD9WB	N9FSP	KA9VBW
Hawaii		AH6GV	NH6FR	WH6BHS
American Samoa	AH8B	AH8AB	KH8AD	WH8AAV
Alaska		AL7HU	NL7HS	WL7BJQ
Virgin Islands	KP2O	KP2AX	NP2BT	WP2AES
Puerto Rico	WP4Q	KP4KA	NP4UB	WP4FFI

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

Montage . . .

" . . . an artistic composite of juxtaposed more or less heterogeneous elements."—*Webster's.* In other words, crew, this is what the DX world looks like—an almost WAC-full assortment of the ops "on the other end."

Julio, D44BC

W7AMM (left) with PS7KM during W7AMM's 1985 visit to Natal. *(PU7IBZ photo)*

4X6OL with OM 4X4AT. *(tnx DK7PE)*

New ham TA2C, Teomam Basarin, visited Atlanta in January, relaxing at WI4K's station. He expects a lot of action on his return to Ankara, Turkey. *(tnx WI4K)*

4Z4DX: DXCC Honor Roll, 5BWAS, 5BDXCC, 5BWAZ, 160 Meter DXCC.

WBØCGJ (left) and HS1AMP on Bob's Christmas visit to Bangkok to visit his son. CGJ is now an honorary member of the Radio Amateur Society of Thailand (RAST).

Introducing JA1HVS/W6 with daughter Sada.

The ubiquitous K7ZZ/CT4AT (left) with N6TJ. *(tnx N6TJ)*

K4YT, BV2B, BV2FA (l-r) at last November's China Radio Exposition in Taipei.

An outstanding Honor Roll team: DJ7ZG (above), who made HR in 1969, and XYL Christa, DK9FB, on the HR since 1984.

DJ7ZG

Some time back I queried Lothar Linge, DJ7ZG, vis-à-vis his almost 25 years of activity (see photo herein). Lothar, along with XYL DK9FB (also a DXCC Honor Roller), uses a 4-L beam, plus assorted ground planes. He found Clipperton to be his toughest DX, which along with 3Y and BY were the last ones he needed. But, he's not retired! You can find him via OSCAR 10 and in the next pileup for Peter I! (But, that may be a while; note next item!)

PETER I ISLAND

In his January *Newsletter*, JW5VAA (with distribution through LA4YW) thanked all those who responded to his Peter I note (about a year and a half ago in this column). Geir particularly appreciated the information from W6YO and WB3KLQ (who has gone ashore to Peter I from the *Lindblad Explorer*). Careful analysis by JW5VAA made it clear that the resources involved in funding a prudent expedition of this type, with the incredible rigors anticipated, would make the plans less than feasible at this part of the sunspot cycle. But, says Geir, he'll keep in touch. Along this line, recent correspondence from LA8CJ of the LA DX Group indicates that the Norwegian Telecommunications Administration has rejected a proposal from their group to assign separate prefixes for Bouvet, Peter the First and Antarctica. This means that 3Y will continue to be the only prefix for Norwegian territories in the Antarctic.

THE CIRCUIT

☐ **N5RM:** Through June you may be hearing Bob Mitchell tooting around the South Pacific, with an itinerary including: Fiji, New Zealand, Cook and Tahiti. Cards go to his home address.

☐ **CT4AT:** Don (see photo herein) notes that cards for him go via W1JZ. Look for plenty of activity from his 2500-acre hilltop antenna farm (about 25 miles west of Lisbon)!

☐ **NCDXC:** The February item carried the wrong post office box number (it should be 608). The club wants it clarified, too, that membership is limited to the area. The item was not meant to solicit membership; sorry, crew!

☐ **Operating Overseas?** Ws should immediately get updated info (new printing via an SASE to ARRL Information Services). Canadians should contact the CRRL, Box 7009, Station E, London, ON N5Y 4J9, Canada.

☐ **SCCCORE:** That stands for the bimonthly paper of the Southern California Contest Club Operations, Results and Enlightenments (no wonder they abbreviate it!). The club recently elected WA6OTU as Pres, N6VR as VP and, as chief handyman, Ski, N6ADI (ex-V3DX/V30DX/V30AA, etc). Their BOD contains some particularly savvy ops, too: NE6I, N6TJ, N6VI. A recent club paper included some sharp articles by Ski on effective QSLing, and 80-meter DXing. The club's mailing address is Box 62, Oakview, CA 93022.

☐ **F8HH:** Paul Curasi (ex-TT8AK, 5U7AW, 5R8AW, 6W8AW) reminds us that he left Africa a long time ago, but that his calls continue to be pirated (as is the call of his XYL, 5U7AT). In a note to NG6W, Paul hoped to be in Niger for a two-month vacation continuing into this month.

☐ **KH8AC:** Gary is tired, and no wonder. Once and for all he wants it noted that cards for AH8-KH8-WH8 *are* accepted at the USA 8 Bureau. This is for Samoa-licensed stations, *not* the numerous expedition-type operations. Please pay attention! Gary's KH8AC operation goes to Gary Mitchell, Box 1003, Fairfield, CT 06430. He notes, too, that apparently there is only one active "regular" on Samoa (AH8A), and no one seems to know much about him.

Troster's Tips for Easy Listening

You are on your first DXpedition. Take good equipment. If possible, take equipment that will run the maximum legal power that the country allows. Take a beam, and hang the highest wires you can for the low bands (don't forget 160!).

Very important: Have one or more receivers capable of operating "split," ie, you transmit on one frequency and listen on a different frequency a few kilohertz above or below your transmitting frequency. This helps keep *your* frequency clear so the callers in your pileup know who you answered. (That is the basic theory, of course!). It also helps you sort out your callers.

Split operation can be managed by using two receivers or an "outboard" VFO, or a receiver incremental tuning (RIT) control, now built into most new equipment.

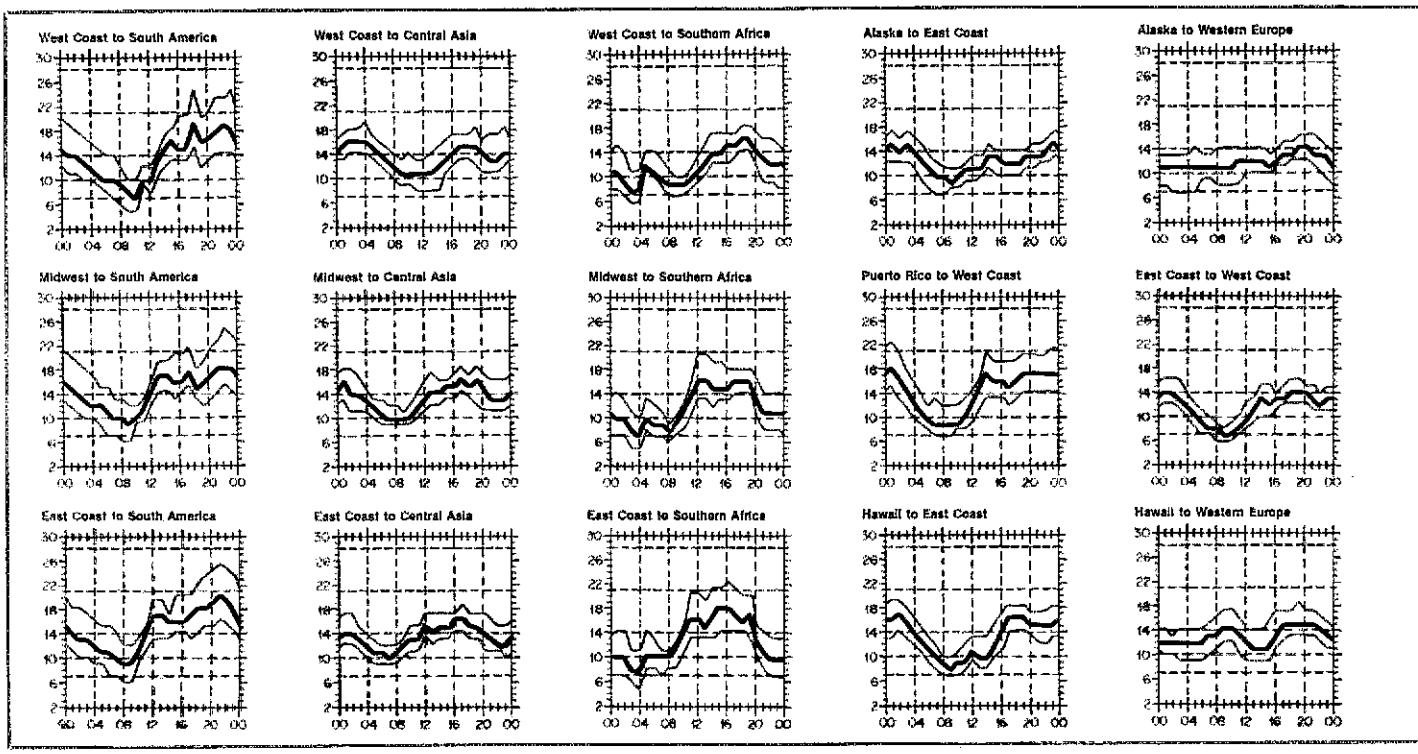
So call your first CQ. Aaaahaaa, there are five or six answers. Whee! "What do I do now, coach?" Well, turn your RIT up a few kilohertz, and we'll tell you next month.

QSL Corner

Administered By Joanna Hushin, KA1IFO

The ARRL DX QSL Bureau System (Incoming)

Within the US and Canada, the ARRL DX QSL



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

Bureau System is made up of call area bureaus that act as central clearinghouses for QSLs arriving from foreign countries. These "incoming" bureaus are staffed by volunteer workers. The service is free, and ARRL membership is not required.

How It Works

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

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

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

Claiming Your QSLs

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

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

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

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

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

Helpful Hints

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

DOs

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

Do send the bureau enough postage to cover envelopes on file and enough to take care of possible postage-rate increases.

Do respond quickly to any bureau request for envelopes, stamps or money. Unclaimed card backlogs is the bureau's biggest problem.

Do notify the bureau of your new call as you upgrade. Please send envelopes with new call, in addition to envelopes with old call. Please put only one call on an envelope.

Do include an SASE with any information request to the bureau.

Do notify the bureau *in writing* if you *don't* want your cards.

Do be appreciative of the fine efforts of these volunteers.

DON'Ts

Don't expect DX cards to arrive for several months after the QSO. Overseas delivery is very slow. Many cards coming from overseas bureaus are over a year old.

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in March 1986 *QST*).

Don't send envelopes to your "portable" bureau. For example, WB8TDA/1 sends envelopes to the W8 bureau, *not* the W1 bureau.

ARRL DX QSL BUREAU SYSTEM

First Call Area: all calls*—W1 QSL Bureau, Mt. Tom Repeater Assn, Box 216, Forest Park Station, Springfield, MA 01108.

Second Call Area: all calls*—NJDXA, PO Box 599, Morris Plains, NJ 07950.

Third Call Area: all calls—C-CARS, PO Box 448, New Kingstown, PA 17072-0448.

Fourth Call Area: single-letter prefixes—Mecklenburg ARS, PO Box DX, Charlotte, NC 28220.

Fourth Call Area: two-letter prefixes—Sterling Park Amateur Radio Club, Call Box 599, Sterling Park, VA 22170.

Fifth Call Area: all calls*—ARRL W5 QSL Bureau, PO Box 44246, Oklahoma City, OK 73144.

Sixth Call Area: all calls*—ARRL Sixth (6th) District DX QSL Bureau, PO Box 1460, Sun Valley, CA 91352.

Seventh Call Area: all calls—Willamette Valley DX Club, Inc, PO Box 555, Portland, OR 97207.

Eighth Call Area: all calls—Columbus Amateur Radio Assn, Radio Room, 280 E. Broad St, Columbus, OH 43215.

Ninth Call Area: all calls*—Northern Illinois DX Assn, Box 519, Elmhurst, IL 60126.

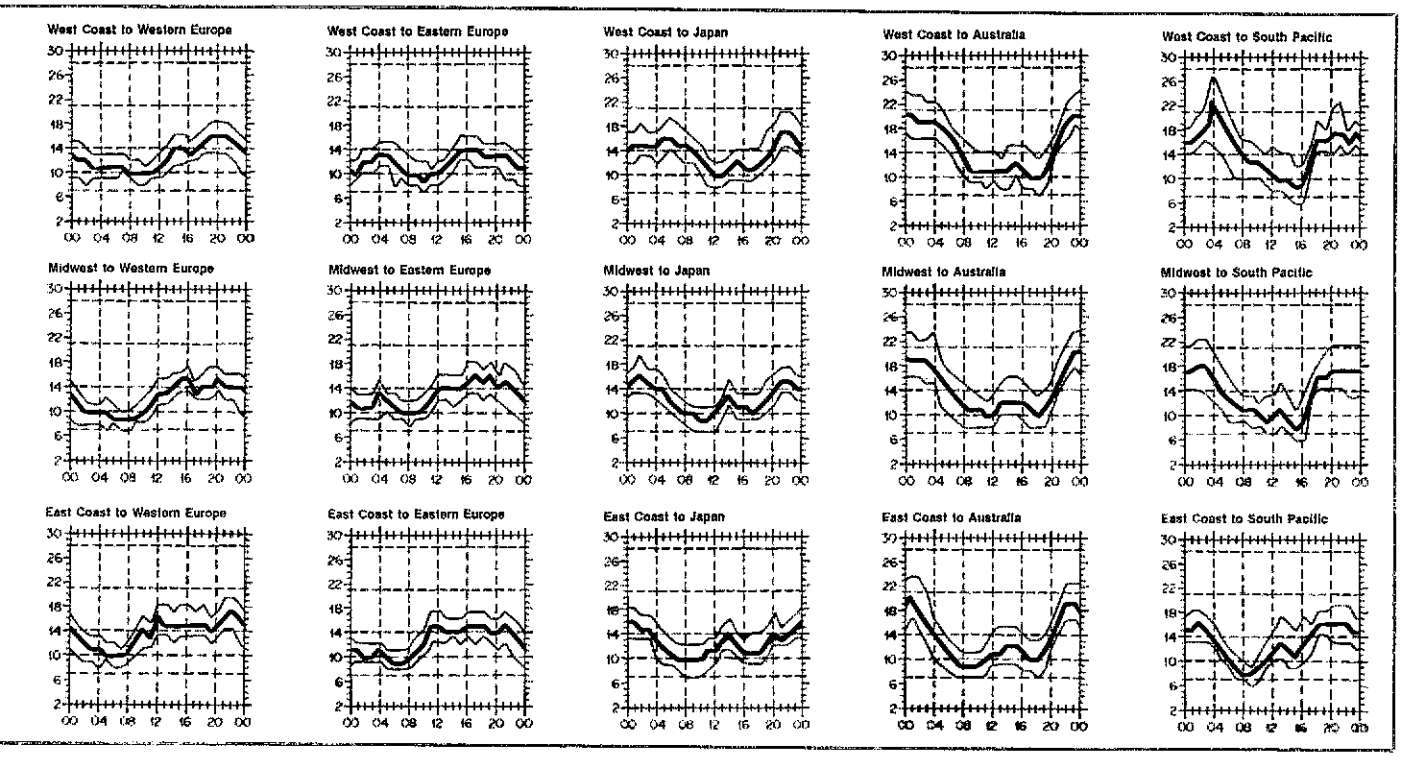
Zero Call Area: all calls*—WØ QSL Bureau, Ak-Sar-Ben Radio Club, PO Box 291, Omaha, NE 68101.

Puerto Rico: all calls*—Radio Club de Puerto Rico, PO Box 1061, San Juan, PR 00902.

U.S. Virgin Islands: all calls—Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St Thomas, VI 00801.

Hawaiian Islands: all calls*—John H. Oka, KH6DQ, PO Box 101, Aiea, Oahu, HI 96701.

(continued on page 73)



frequency, or FOT). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35, and January 1979 *QST*, page 11, for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for June 16 to July 15, 1986, assume a sunspot number of 10, which corresponds to a 2800-MHz solar flux of 72.

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 your award in 25-country increments through 250, 10-country increments through 300 and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from February 1 through February 28, 1986. An s.a.s.e. will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

DA1CR/106	DL7AFV/272	JN1GIV/114	JA7IL/318	SP2FAP/280	KJ1F/137	KF4AV/106	WD5FUR/109	W7HRR/104
DA1KQ/102	EA1CIM/128	JR1IFC/107	LU6DHR/295	TG9EO/115	KR1D/106	N4EKD/101	WB6ZWS/111	N8DDL/125
DF2UA/106	FM5CD/282	JR2KHX/110	OH2BDP/319	TG9RB/102	K2PEQ/129	WS4G/120	WI6L/102	WB8CCL/127
DL1KBL105	HB9AAY/176	JA4DBV/220	OH2BQG/123	VE3FOI/110	KD2HE/101	WZ4Z/139	KD7RX/100	KZ9A/104
DL2KBS/121	JA1OJZ/108	JA4YQO/156	ON5BI/124	WL7E/275	WB3GRA/103	W5SL/183	KD7XO/106	N0FYM/106
DL3TX/135	JL1IEO/245	JA7ARD/318	OZ8JYL/102	K1BG/106	AA4LI/103	W5VWN/105	N7GWF/104	

Radiotelephone

CT1CNI/135	F9ER/288	JA4DBV/194	OE5RLM/103	SM5LZ/128	YCØBLO/103	N3ARK/103	WB5KTD/162	KD8KY/104
CX2CX/121	G2DRT/103	JA4ESR/214	ON5FV/102	TG9EO/115	9H1GO/100	WB3HTT/137	KE6KT/102	NI8Y/108
DJ3YP/127	I5RUR/125	JA4YQO/135	OZ1HAS/107	TI2BAM/157	KB1HJ/233	N4CXK/103	KD7PC/120	N9CWQ/110
DL7AFV/249	JA1EPL/123	JA7ARD/316	PY2CRN/101	VE3FOI/105	KJ1F/135	N5BCL/105	N8ADA/113	KDØMC/109
F6CQT/303	JL1IEO/221	JA7IL/318	SM5CCH/223	WL7E/251	WA1GPI/101	W5SL/109		

CW

DF1UQ/110	DL7KBU/106	JN1GIV/111	OH2BQG/102	PY4WS/107	WA2UKA/104	N4FVE/100	WS4G/104	NR5Q/105
DL3TX/117	DL9DY/132	JR2KHX/105	OZ1KAQ/122	WL7E/207	W3TI/110	KE4R/132	WT4G/100	W5SL/140
DL5EBE/106	DL9IE/107	JA7IL/215	PA3CBU/133	YU2LCF/104	KF4AV/103	WB4YZC/101	WZ4Z/139	W7QN/100
DL7AFV/179	JL1IEO/180	OE2VEL/200	PY3CJI/117	KB1HJ/162	N4DDK/109			

RTTY

WØWP/101

160 Meters

OK3EY/101	UG6GAW/101	K3FN/100	W3GG/101	N4JF/103

Satellite

DK2LM

5BDXCC

YU2NW	FD6HSI	FM5CD	OZ8AE	I2WZX	WD4NBX	WC4B	N4IR	KC6H
HC5EA	K8UNP	SP3CB	OH6RA	DL7AFV	LU2CC			

Endorsements

Mixed

DJ5DA/342	HK3YH/292	JF2HPA/273	ZS6RM/353	N3AKD/275	NK4L/294	N5FG/318	W7AM/306	WA8HFN/315
DJ9RQ/322	I2LLD/323	JA3AAW/333	4X4DK/360	N3UN/317	W4PZV/330	N5NW/337	W7FP/318	WB8JEY/312
DK3FD/319	I2PJA/322	JA3AQ/331	4Z4XW/198	N3US/316	W4WKB/174	W5OG/289	W7FPT/250	K9BIL/305
DK3QJ/261	I2VDX/319	JA3BAG/174	6Y5HN/232	W3ARK/300	W4WD/332	W5YU/332	W7IIT/235	K9BWQ/322
DL6OL/266	IS0LYN/306	JH3CXL/308	KB1HJ/257	W3SO/330	W4XR/334	WA5NQJ/225	W7LI/200	KC9AT/280
DL7CS/335	JA1BFF/277	JA4CQS/322	KB1HY/200	W3TEF/269	WB4HOK/312	WB5KTD/262	W7MCG/275	KD9E/317
DL7MAT/205	JA1CHN/282	JA4ESR/254	KG1F/170	W3XM/338	WB4MAI/299	K6SIK/176	W7QN/211	KJ9I/280
DL8AK/296	JA1CRR/335	JA5AUC/312	W1ELR/346	W3XX/322	WB4OSN/312	K6PZ/328	W7TS/289	NA9A/175
DL8WD/138	JA1FHK/335	JA5JGY/274	WA1SMH/132	AA4CM/303	WC4K/199	NS6P/274	AC8W/280	NB9C/157
EA9IE/303	JA1GTF/328	JH7NRE/273	NA2M/282	K4IPO/126	WD4NKP/308	W6EKW/225	K8CH/332	W9KGW/252
F6HWU/226	JA1GV/335	LA8CE/235	KY2D/153	K4NST/130	WS4E/262	W6TMD/306	K8UNP/219	WD9GQV/282
F2VX/326	JA1IFP/333	PA0LEG/311	W2AAN/265	K4QE/200	K5FNQ/306	W6TPJ/337	KA8FFW/126	WD9IIC/304
G3GNM/202	JA1JAT/175	VK6HE/304	W2QJT/260	KF4L/295	K5OTI/297	W6TTK/185	KD8KY/150	ACØM/308
G3HTA/335	JA1MJ/337	SLØZZI/145	W2SR/300	KF4SA/204	KB5DQ/300	W6XP/328	KX8N/200	KCØFJ/187
G3NKQ/306	JA1WSK/320	SM6VR/336	WB2PMP/306	KF4YB/278	KC5M/301	WB6WKM/285	NG8S/254	WØJM/201
G4DYO/314	JH1IED/283	UP1BZZ/316	WA2UKA/128	N4DDK/232	KC5NO/230	WK6E/227	W8DA/348	W0LYI/326
G4IJW/256	JH1QJC/201	VE4MT/178	K3NZ/318	N4IQN/167	KD5RO/300	K7EQM/306	W8GOC/278	W0RI/332
GM3BQA/335	JR1BLX/306	YV5CWO/325	KA3CRC/208	NF4A/326	N5DC/291	K7RLS/321	WA8CZS/273	WØWP/316
HB9AIJ/329								

Radiotelephone

CO2HQ/252	F6AJA/327	I6IXJ/250	LA9TCA/250	9M2MM/150	WB3BAP/250	KC5M/300	N7RO/327	WD8MRC/249
CX9CO/307	F9MD/340	I8IGZ/174	LU2DX/326	KB1FE/201	KC4BX/280	KC5NO/229	NK7Y/150	K9BIL/301
DF4PL/289	G3TJW/331	IT9KZW/318	LU5HN/298	KG1F/169	KD4HO/260	N5FG/313	W7FP/318	K9BWQ/322
DF9RB/280	G3ZBA/330	IKØEPS/174	LU8DPM/262	W1WAI/126	KD4XN/229	N5NW/316	W7KTI/295	K9LCR/249
DJ1DX/221	G4DYO/314	JA1CHN/271	PA0LEG/311	K2SHE/322	KE4YD/266	NQ5W/238	W7QN/179	KC9SF/129
DJ4QC/154	G4IJW/255	JA1GTF/306	PP2ZDD/250	N2AMI/292	N4IQN/167	NW5K/268	WA7EJU/124	N9CIW/126
DJ9RQ/322	GM3BQA/335	JA1GV/313	SM5VS/310	W2AO/313	NK4L/283	W5RRK/330	K8RJI/258	W9DS/217
DJ0UR/250	HC1HC/274	JA1IFP/318	SM6VR/327	W2NZG/280	W4PZV/327	W5YU/331	K8UNP/187	W9HPS/342
DK9KX/318	HK3YH/276	JA1WSK/314	SV8RX/252	W2RGU/322	W4SPK/141	K6EDA/307	KB8WC/272	W9KGW/251
DL4YAH/312	I2BCU/201	JF1PJK/320	VE4IS/280	K3UA/313	W4WKB/155	K6PZ/321	KC8OB/281	WB9SYF/303
DU1GJM/152	I2ODZ/175	JH1IED/282	VE5AEC/207	KA3CRC/175	WA4VDE/311	K6SIK/175	W8GDA/280	WD9GQV/279
EA3AOC/312	I2PJA/321	JR1BLX/304	YCØDPO/185	N3UN/314	WB4MAI/274	W6ABC/144	W8GUS/305	WD9IIC/269
EA5BYP/204	I2TZK/263	JF2HPA/252	YV5CWO/325	N3US/310	WZ4I/301	W6TTK/183	W8MAW/319	NI0S/155
EA7ARK/150	I2WZX/264	JA3AQ/316	ZL1AMO/303	W3ARK/204	K5GZ/304	W6XP/328	WA8CZS/270	WØJM/175
EA9IE/303	IK2AWT/174	JH7NRE/271	ZS6RM/347	W3DR/271	K5IH/282	WA6LFN/290	WA8HFN/310	W0LYI/322
F2VX/321	I5PAC/330	LA9GV/311	4X4DK/360	W3XM/337	KB5DQ/292	KQ7U/257		

CW

DJ3BE/165	JA1ELY/310	JA3BAG/155	XE1VV/200	W2MIG/305	K4MF/200	K5CON/138	K6EID/211	WB8JEY/293
DJ5DA/254	JA1GTF/307	JH3CXL/303	6Y5HN/130	W2SR/280	N4FKZ/261	K5FNQ/256	W6TMD/270	K9BIL/264
DJ5IO/255	JA2GV/283	JA4ESR/200	NA1G/150	KA3CRC/178	N4MM/306	KA5FXX/155	W7TS/250	K9KA/178
DL8ZAJ/150	JA1IFP/302	OZ7BW/310	K2LFL/176	N3AKD/191	NF4A/251	KK5K/149	AC8W/251	WD9IIC/290
HK3YH/255	JA1GV/283	SLØZZI/144	K2UO/309	W3ARK/251	W4OYI/202	N5CID/269	K8SW/252	WD9JKZ/130
I4YNO/179	JF1PJK/309	SM3LGO/230	NA2M/225	W3EVW/300	WB4MAI/260	W5OG/274	NG8S/156	WØPT/269
I5JRR/180	JA3AQ/290	SMØLJF/162	W2AO/186	AA4CM/295	WB4OSN/294	W5SVZ/253	W8DA/275	WØWP/310

RTTY

JA1DSI/204

160 Meters

JA1GTF/130

DXCC Notes

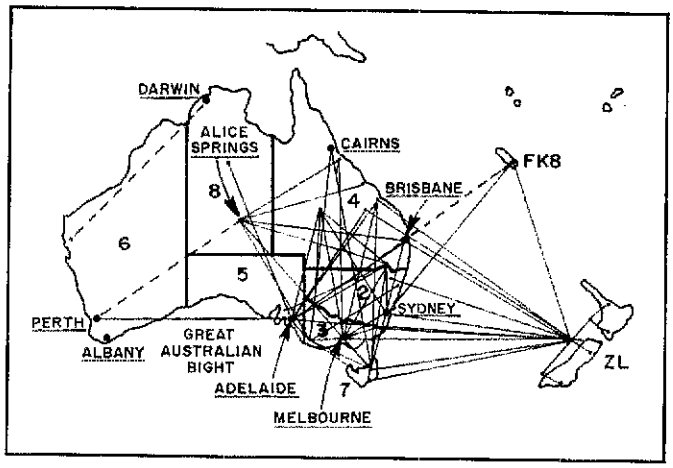
Annual Listing Corrections

Mixed: KD8VM/358. Phone: GW3AHN/358, W2HX/328, NW5K/253, K6XJ/325, KD8VM/357

Conducted By Bill Tynan, W3XO
Send reports to PO Box 117, Burtonsville, MD 20866,
or call 301-384-6736 to record late-breaking information.

Best Sporadic-E Season Ever Down Under

When many of us in the Northern Hemisphere were shoveling out our cars, going skiing or sitting in front of roaring fires waiting for fleeting winter 6-meter E_s openings, our brethren south of the Equator were enjoying the pleasures of summer. For VHFers, one of these pleasures is the return of long distance E-layer propagation on 6 and 2 meters. Yes, while our E_s season runs from May to August, theirs is November through February. Like us, they experience a secondary peak in their winter, around the end of June. It seems like a topsy-turvy world to those of us accustomed to living in the Northern Hemisphere, but it is simply one of the idiosyncrasies caused by our planet being tilted with respect to the plane containing the sun and the various members of the solar system. Maybe we can put this natural phenomenon to work for us to get an inkling of what might be in store for us during our summer E_s season. There is no proof that our conditions necessarily mirror theirs, but there does appear to be a trend in that direction.



This map indicates the spread of 2-meter contacts between December 26, 1985 and January 4, 1986 between Australia, New Zealand and New Caledonia. The dotted lines indicate signals that were heard but not worked.

If there is a correlation between Southern and Northern Hemisphere E_s, we may be in for a special treat this year. The column, VHF/UHF—An Expanding World, by Eric Jamieson, VK5LP, for the Wireless Institute of Australia's monthly magazine *Amateur Radio*, tells of a tremendous E_s season lasting from early November until mid-January. In fact, VK5LP characterizes the season as "the best in many years and perhaps ever." He goes back to 1963 to find comparable E-layer propagation. VK5LP does not limit his characterization to 6 meters. According to his account, the outstanding DX conditions affected 2 meters as well. The lower band is described as being open around the clock on a number of days. On 2 meters, it was possible, on at least two occasions, to work VK2, 3, 4, 5, 7 and 8 from VK5. Also on 2 meters, New Zealand stations contacted a number of FKs in New Caledonia, most of whom were running 10-W mobile rigs. The outstanding conditions resulted in the first accomplishment of working all Australian states from a single location on 2 meters. VK5LP and VK5RO, both of the Adelaide area in South Australia, accomplished the feat on December 16 by working VK8GF Alice Springs, Northern Territory, in the north central part of the country. Several other VKs have since qualified for the coveted award.

The openings apparently began November 7, at least for Darwin Station VK8GB and several others in his vicinity. Graham notes 6 meter contacts with VK4, 7 and 8 on that occasion. The VK8s were in Alice Springs, about 600 miles south of Darwin. The same day produced a 2-meter E_s opening for Melbourne station VK3DU. That's pretty early for a 2-meter E_s opening and equivalent to the first week of May in the Northern Hemisphere. In December, things got started in earnest. ZM8OY on Kermadec had a field day on 6 meters December 12, working into VK2, 3, 4, 5 along with one VK8 contact, VK8GB. The same day, VK3DU worked five countries in 2½ hours on 6 meters. This sort of thing continued into mid-January on both 6 and 2 meters. On 2 meters, ZL1BKX made a number of over-1800-mile contacts with several stations in the Adelaide area. These were the first such contacts since 1965, according to VK5LP's account. Other outstanding 2-meter accomplishments include: Twenty-three contacts between FK and VK stations. ZL1BHX reportedly worked 3D2CM. VK2BKL exchanged 2-meter reports with nine New Caledonia stations, including completing the first mobile-to-mobile contacts on the band between VK and FK.

The accompanying map displays the 2-meter openings between December 26 and January 5. It should be especially helpful in appreciating the extent of the propagation, and should also be helpful in following the various descriptions of 6- and 2-meter contacts made in the Australia-New Zealand area during this past outstanding E_s season.

No one can say for certain that the superb E_s conditions experienced in the Southern Hemisphere portend similar results for us. However, many, including VK5LP, feel that sporadic E tends to better during low sunspot years. If that is true, and conditions Down Under would appear to bear it out, we may be in for a very exciting next few months. It could be especially rewarding for new 2-meter operators who may be able to significantly add to their state and grid-square totals.

The 1986 season should be well underway by the time this appears in mailboxes, so start watching right away. What should you be on the lookout for? I will aim my comments mostly at 2-meter E_s, as 6-meter openings are much more frequent than those on 2 meters. Nevertheless, vigilance is the watchword on any band, so 6-meter operators should keep their ears open as well. This is especially true for those seeking some rare multihop openings, which can bring in some rather rare countries. Recall the July 2 and 30 openings to the UK last summer.

In addition to your VHF amateur gear, a TV set and/or an FM radio are helpful in determining the presence of sporadic E that might reach 144 MHz. TV Channels 2 through 6 can be very helpful in spotting the occurrence of E_s by the presence of interference on local stations or pictures and/or sound from stations perhaps 1000 miles away. The same kind of thing is true of FM broadcast stations from abnormal distances. There is a lot of evidence for E_s being connected with intense weather structures such as thunderstorms with very high clouds, as well as tornadoes. The weather map published in your local newspaper and shown on the TV national weather summaries can be helpful in determining the existence of such storms. When they are in the vicinity of 500 to 1000 miles from your location, be on the lookout for 2-meter E-layer propagation. Another tip-off is the presence of very-short skip on 6 meters. Some of the skip distances reported from Australia this past season were in the neighborhood of 150 to 200 miles. Particularly if you hear stations working each other on 6 meters that are only a few hundred miles from each other, changes are good that your area may be in for 2-meter E_s. If the stations you hear are very loud and only a few hundred miles from you, chances are that someone else is experiencing 2-meter E_s. Don't give up, however, as sporadic-E clouds usually drift about, sometimes quite rapidly. Your turn may come before too long.

If you do begin to hear 2-meter signals from 1000 or more miles away, by all means get into the fray and see what you can come up with. But don't sit right on 144.200. Move up or down 10 or 20 kHz. Very often, the reason some do not do better making 2-meter E_s contacts is because they are smothered in QRM trying to battle it out with everyone else. During the winter months, when not much is going on, we all get into a bad habit in terms of abuse of the calling frequency. When things start hopping, we must quickly mend our ways or no one will be able to work anything.

It will be interesting to watch the season unfold and see if the conditions reported from Australia and New Zealand are repeated for us. We should not have to wait long to find out. One thing we can do is keep activity at a high pitch and be ready to take advantage of whatever comes our way.

Six-Meter Beacons

This list was compiled based on information from a variety of sources. Additional information on the beacons listed, as well as information on other 6-meter beacons, would be greatly appreciated by this column conductor.

Freq (MHz)	Call	Location	Mode	Antenna	Power	Remarks
50.005	ZS1SIX	Cape Province, RSA	A1A	Omni	10 W	
50.008	PY1RO	Rio de Janeiro Brazil	A1A			
50.033	LU8YYO	Cordoba, Argentina				
50.010	JA2IGY	Mie, Japan				
50.010	ZS1STB	Still Bay, RSA				
50.010	ZS6STB	Vereeniging, RSA				
50.015	PJ2B	Bonaire Neth Ant	F1A		15 W	
50.015	SZ2DH	Athens, Greece				
50.020	GB3SIX	N Wales (IO73TJ)	F1A	3 el NW	25 W	
50.020	JA6YBR	Japan				
50.023	HH2PR	Haiti				
50.025	6Y5RC	Jamaica	F1A			
50.025	5Z4YV	Kenya				
50.025	ZS6SIX	Kempton Park, RSA				
50.029	ZS6PW	Pretoria, RSA				
50.035	ZB2VHF	Gibraltar	A1A			
50.038	FY7THF	French Guiana	F1A	Vert	100	
50.040	ZS6VHF	South Africa			30 W	
50.041	WA8KGG	Ohio				Attended
50.045	OX3VHF	Greenland				
50.048	VE6ARC	Alberta	A1A			
50.048	WA6IJZ	S California	A1A	Vert	10 W	Attended
50.050	ZS6LN	Petersburg, RSA			10 W	
50.050	GB3NHQ	London (IO91VQ)				
50.055	WA9FEF	Chicago	A1A			Attended
50.059	GB3RMK	Cornwall	F1	B US	15 W	
50.060	KH6EQI	Pearl Harbor	A1A			
50.060	WA8ONQ	Cincinnati	A1A		1 W	
50.060	PY2AA	Sao Paulo, Brazil	A1A	GP	25 W	
50.060	GB3RMK	Scotland (IO77UO)				
50.062	W3VD	Laurel, MD (FM19)	A1A	Halo	10 W	
50.064	WB8IGY/4	Florida	A1A	GP	10 W	
50.064	N4PZ	Sarasota, FL	A1A			
50.065	WØIJR*	Aurora, CO (DM79)	A1A	2 Rng Halo	20 W	
50.065	WB5ZRL	New Orleans	A1A	Halo	2 W	
50.065	WA5VAS	Metairie, LA				
50.069	NØBJ	Nebraska	A1A			
50.070	KS2T	Toms River, NJ (FM29VX)	A1A	Vert	10 W	
50.070	W2CAP/1	Cape Cod (FN41)	A1A	B UK	25 W	
50.070	K1NFE	Burlington, CT		GP	25 W	
50.071	W9KFO	Eaton, IN				
50.071	WA2YTM	Victor, NY	A1A			
50.072	VE1CCP	Prince Edward Is	A1A			
50.075	N5JM	New Orleans (EL49)	A1A	2 el NE	2 W	
50.075	VS6SIX	Hong Kong				
50.077	VE3DRL	Toronto				
50.077	NØLL	Smith Center, KS	A1A	Halo	30 W	
50.080	TI2NA	San Jose, Costa Rica	A1A			
50.080	W1AW	Newington (FN31)	A1A/F1A			Sked trans
50.085	VE2YB	Michel, Quebec				
50.086	VE2STL			Dlo	3 W	
50.086	VE2TH	Val Belair, Quebec (FN46)		Dlo	3 W	
50.088	VE1SIX	New Brunswick	A1A			
50.090	WA6JRA	S California	A1A			Attended
50.095	K7IHZ	Arizona				Attended
50.098	KG6JIH	Guam				Attended
50.100	HC2FG	Guayaquil, Ecuador	A1A			
50.112	JD1YAA	Minami Torishima				
50.498	5B4CY	Cyprus				
50.740	TV Sound	Auckland, NZ	FM		High	
50.750	TV Sound	Kaukau, NZ	FM		High	
50.760	TV Sound	Whakapunake, NZ	FM		High	
50.945	ZS1SIX	Piketberg, RSA (JF98BJ)	FMAF	GP	16 W	
51.002	ZL1BPW	Auckland, NZ				
51.020	ZL1UHF	Auckland, NZ				
52.013	P29BPL	Papua, New Guinea				
52.020	FK8KAB	Noumea, New Caledonia				
52.100	ZK2SIX	Niue				
52.200	VK8VF	Darwin, Aus				
52.250	ZL2VHM	Manawatu, NZ (RE79)				
52.310	ZL3MHF	Hornby, NZ				
52.320	VK6RTT	Wockham, West Aus		Vert		
52.325	VK2RHV	Newcastle, Aus				
52.370	VK7RST	Hobart, Aus				
52.420	VK2RSY	Sydney, Aus				
52.425	VK2RGB	Gunnedah, Aus				
52.440	VK4RTL	Townsville, Aus	F1A			
52.450	VK5VF	Mt Lofty, Aus				
52.460	VK6RPH	Perth, Aus				
52.470	VK7RNT	Launceston, Aus				
52.490	ZL3SIX	Blenheim, NZ				
52.510	ZL2MHF	Upper Hutt, NZ				

*also signs KA9CDN

CENTRAL STATES VHF SOCIETY CONFERENCE SET FOR ST LOUIS

One of the high spots of the VHF calendar is the annual conference sponsored by the Central States VHF Society. This year it will be in St. Louis, which should be convenient for many people, located as it is on north-south and east-west Interstate highways and served by several major airlines. The conference site will be the Holiday Inn at St Peters, which is on I-70 ten minutes west of St Louis's Lambert International Airport. The program will include topics from the VHFs through the microwaves, with a special effort made to include talks aimed at newcomers to VHF as well as old hands looking for new challenges. Antenna-gain measurements are scheduled for the first day, Friday, July 25, with WBØTEM officiating. That evening will be devoted to preamp and converter measurements along with a feature begun a few years ago—an indoor VHF flea market.

Central States VHF Conferences are well known as family affairs, with facilities, programs and tours tailored for women and junior ops. For further information, including hotel rates, contact Bob Sluder, NØIS, 5331 Cherryview La, St Louis, MO 63128.

ON THE BANDS

The major news this month is of seasonable improvement in tropospheric propagation. The earlier-than-usual warm weather that hit the East Coast in late March brought a welcome sample of summertime VHF conditions. Signals are said to have been outstanding in strength, and bands from 2 meters up were hopping with activity Tuesday evening, April 1. K3ZO, just south of Washington, says that he came home late and called CQ on 2 meters about 0325Z April 2, producing a pileup of stations to the northeast that didn't quit for the next 1½ hours. Fred comments that the best DX he heard was VE1UT.

W3IP, near Baltimore, says that the same evening produced a number of incredibly strong 23-cm signals. In particular, Mike cites W1RIL Paxton, MA as a prime example, with a meter reading of S9 plus 50 dB. This represents 75 dB above the noise. He also notes that the K3IVO beacon on 1296.075 was reported heard in New England that evening. The beacon is located at Fort Mead, Maryland. QST

VHF/UHF Century Club Awards

The ARRL VUCC numbered certificate is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in italics for each band listing. Initial qualifiers are shown first, followed by those with endorsements, for February 14, 1986 through April 14, 1986. An SASE will bring you the rules and application forms.

6 m (50 MHz)

110	WD6BCN
111	NC9F
112	VE3FGU
113	W9UD
KA3B	125
WA6BYA	225
K9HEK	150
WBØPKN	225

70 cm (432 MHz)

48	G6HKM
W8LSC	50
NI8O	100

23 cm (1296 MHz)

18	K3YTL
19	G4PRJ
20	WB5AFY
N6CA	35

2 m (144 MHz)

92	G4WAD
93	G6HKM
94	W9IJD
95	N4AVV
96	DL6LAU
97	W9YCV
98	W7HAH
99	K9VGE
100	G4XEK
101	W2RS
102	KE2N
103	W8NJR
AA4FS	125
NI8O	150
KA9LDS	150
K9MRI	250
AF9Y	125
WBØDGF	125
WAØTKJ	150

FM/RPT

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

A Popular Repeater Run by BRATS

The following account on the care and feeding of a successful repeater club is told by Mayer D. Zimmerman, W3GXK (8711 Allenswood Rd, Randallstown, MD 21133).

Why is W3DID/R one of the most popular repeaters in the Baltimore-Washington corridor? Is it the repeater's features? Is it the nature of the repeater's users? Is it the conglomeration of repeater activities that appeal to area amateurs? The answer to each of these questions is yes and no!

To understand why 63/03 has been so successful, we should look at its sponsoring organization, the Baltimore Radio Amateur Television Society (BRATS). By no means is it the largest club in the area. It has a paid membership of approximately 225. However, since its inception, BRATS has had a reputation of being dedicated to specialized communication techniques and technical expertise. BRATS has always encouraged "the use of all modes of communications considered legal on these frequencies . . ." The lack of trepidation regarding something new and the willingness to try new modes play a major role in the success of the repeater system. As a result, the BRATS's repeater became known as the residence of the technically informed.

Much of the BRATS's repeater equipment is of the homebrew variety by design, if not necessity. 63/03 currently has two receivers linked back to one transmitter. Its 440-MHz link is traditional. The other link is W3WVV's homebrewed microwave link on 2.3 GHz running a few milliwatts. Besides, the BRATS's 2-meter repeater is an ATV repeater, W3WCQ/R. The amateurs on ATV often use the 2-meter repeater for audio purposes, and that generates even more interest in ATV. There is also a packet-radio digital repeater, which was assembled by W3GXT. RTTY is often heard on 63/03.

But, we believe that the mainstay of our success is our weekly nets. Nearly every evening, during prime-time television viewing, we hold nets on 63/03. There is an equipment trading net and a traffic and information net on Monday evenings. On Tuesdays, there is an RTTY net with a voice portion that allows RTTY novices to ask questions and get assistance. Wednesdays finds a reading for the visually impaired net, in which a club member reads articles from *QST*, *The BRATS Milliwatt* and other publications of interest to amateurs. Thursday evenings are dedicated to a photography net and a DX-information net. There is also a packet-radio net on Fridays and a news-bulletin net on Saturdays that covers items of national and local interest. To round out the week, our resident technical experts hold a technical question and answer net called "The Answer Man" after the news bulletin net on Saturdays. Questions about antennas, feed lines, etc, are answered, as are a large variety of questions dealing with all aspects of Amateur Radio and television. Listeners are invited to submit questions in writing if they cannot or do not wish to check into the net.

Interestingly enough, each net has check-ins who do not check into any other net. Each net also has check-ins who are not club members, because each net begins with this announcement, "This is the X Net of the BRATS. Anyone may check into this or any other net or use the repeater at any time." We do not solicit new members, nor do we pass out membership application forms. We wait for hams to ask for an application to join. The increased use of the repeaters, along with good leadership and a dedicated cadre of members, has kept the club together and created a sense of personal pride and accomplishment for each member. As a result, there is a greater percentage of membership renewals each year and a greater club growth.

Of course, our nets are coupled with interesting club meetings, public-service participation, a successful annual hamfest, and the knowledge that there are club members who are always able and willing to help others with technical problems.

Why, then, our success and growth? We believe it is, in large measure, because of our weekly nets on 63/03. These nets encourage people who are interested in a specific facet of Amateur Radio to participate. And, they get people who may not be interested in a particular area to become interested and learn something new. The nets promote growth and achievement. After all, that's what Amateur Radio is all about.

REPEATER USER AID

A recent issue of the Liverpool Amateur Repeater Club (Syracuse, NY) newsletter, *The LARC Longwire*, included a 1- × 3-inch self-adhesive, address label that has the club's repeater autopatch information imprinted upon it. The label can be mounted on or near a transceiver for quick reference.

This is a good, simple and inexpensive user aid for all repeater clubs. Anyone with a computer, printer and blank address labels could generate enough labels for their club and have the label included with the club's next mailing or distributed at the club's next meeting.

FLORIDA REPEATER MAP

If you operate or plan to operate 2-meter mobile in the Sunshine State, you should have a copy of the *Florida Skip* repeater map. Designed by Bill Tucker, W4FXE, the 11- × 17-inch state map locates each 2-meter repeater that is approved by the Florida Repeater Council, and lists each repeater's operating frequencies. To obtain a copy of the 5th edition of the map, send 25 cents and a business-size SASE to Map, Florida Skip, PO Box 501, Miami Springs, FL 33266.

REPEATER LOG

According to Feb 1986 reports received, repeaters were involved in the following public-service events: 307 vehicle emergencies, 33 public-service events, 20 fire emergencies, 20 medical emergencies, 12 drills/alerts, 11 criminal-activity reports, 5 weather emergencies, 2 power failures and 1 search and rescue.

The following repeaters were involved (followed by the number of events): WA1DGW 20, KG1O 7, W2VL 30, WA2ZWP 5, W4BDC 3, N4CLA 26, WA4SWF 5, WA6BJY 2, W6FNO 288, KH6H 1, WB6JPI 6, K7OMR 7, K8DDG 7, WA0FYA 4.

Strays

***QST* congratulates...**

☐ Art Donahue, KA1GGG, of Tolland, Connecticut, on being named 1985 National News Photographer of the Year by the National Press Photographers Association.

I would like to get in touch with...

☐ anyone with a manual or schematic for a NEMS Clarke Model 1301-A special-purpose receiver manufactured by Vitro Electronics. Thomas Seizer, K9SQU, 8047 S 59 St, Franklin, WI 53132.

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
Club Contest Rules	Jan 1986, p 94
DX Contest Awards Program	Feb 1986, p 83
Emergency-Traffic Committee	Apr 1986, p 69
Field Day Rules	May 1986, p 79
Frequency/Mode Allocations	Jan 1986, p 62
Great Armadillo Run of 1986	Apr 1986, p 73
Hamfest Calendar Rules	Feb 1986, p 72
IARU HF Championship Rules	Apr 1986, p 78
June VHF QSO Party Rules	May 1986, p 88
License Renewal Information	Jan 1986, p 62
Major ARRL Operating Events and Conventions—1986	Jan 1986, p 61
MARS Information	Jul 1985, p 46
QSL Bureaus	
Incoming	This issue, p 56
Outgoing	Mar 1986, p 71
Spread-Spectrum Rules	*April 1986, p 45*
902-MHz Interim Band Plan	Jan 1986, p 74

The New Frontier

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

13-cm NEWS

Al Ward, WB5LUA, has written with information about a new US tropo-record contact on 2304 MHz between himself and W4ODW at a distance of 624 miles. On Feb 20, at 0358Z, WB5LUA copied W4ODW's signal at 449 and received a report of 559. The next morning, at 1320Z, an SSB contact was achieved, with WB5LUA giving a 42 report and receiving a 58. This contact was Al's sixth state and 22nd grid square on 2304 MHz.

Gene, W4ODW, was running 500-mW output to a 4-ft dish at 75-ft. Al, WB5LUA, had 250-W output from a Varian V802B Klystron driven by a homebrew transverter. His front end was a DXL1503 preamp with a noise figure around 1.2 dB mounted in the shack, and his antenna was a 5-ft dish at 65 ft with a 1-lb coffee-can feed. The gain of this antenna has been measured at about 28 dBi.

In the same opening, W4ODW was heard by KD5RO and W5VC, but signals did not become strong enough to establish a QSO. Other activity has been between KD5RO, Plano, TX and W7CNK, Oklahoma City, OK at a distance of 160 miles. Numerous contacts between these two stations have been made with both stations running 500 mW out from SSB Electronics microline units and 4- and 6-ft dishes. W7CNK has also made a number of contacts with WA5DBY, Ft Worth, TX at a distance of 170 miles. WA5DBY is running 10 W to a 7-ft dish. WB5LUA comments that he has worked W7CNK several times using only 40 mW from four Avantek MSA-0404 MMICs (see New Frontier, Jan 1986, for more information on these devices). Under really good conditions, Al comments he could work the path (152 miles) using the 40 mW and a 2-lb coffee can as his antenna! Loop Yagi antennas have also been employed. W5VC in Anna, TX has worked W7CNK using 500 mW out to a 41-element loop Yagi at 70 ft. A loop Yagi design for 2304 MHz appeared in the Sep 1981 New Frontier column.

A SIMPLE 10-GHz DISH ANTENNA

Chuck Steer, WA3IAC, has sent along the following description of a small dish antenna system he has put together for 10-GHz work.

> When I was looking for a small, high-gain antenna for 10 GHz, I had a 2-foot dish in mind. I found an 18-inch parabolic reflector with a focal length of 4½ inches from Edmund Scientific (part no. 080254) for under $30. The next problem was how to mount the Gunnplexer to the dish, and the dish to some support. The dish comes with a 1-1/8 inch hole in the center that takes a PVC fitting very nicely. A 2- to 3-inch length of PVC pipe (¾-in-OD) was glued into the fixture and a ¼-inch aluminum rod about 10 inches long was bent and taped to the PVC-pipe. Some glue was added to reinforce the rod (see Fig 1). This assembly was mounted on an "L" bracket that was drilled and tapped to mate with the ¼- × 20 bolt on a camera tripod, which was used for the base. The Gunnplexer was fitted inside a plastic juice container with the cables running out the back. The container was supported to the aluminum rod with a 2-1/8 inch hose clamp. In this way, the Gunnplexer could be adjusted for the true focal length. This gave me a nice antenna that can go anywhere for less than $40 (US) total cost.

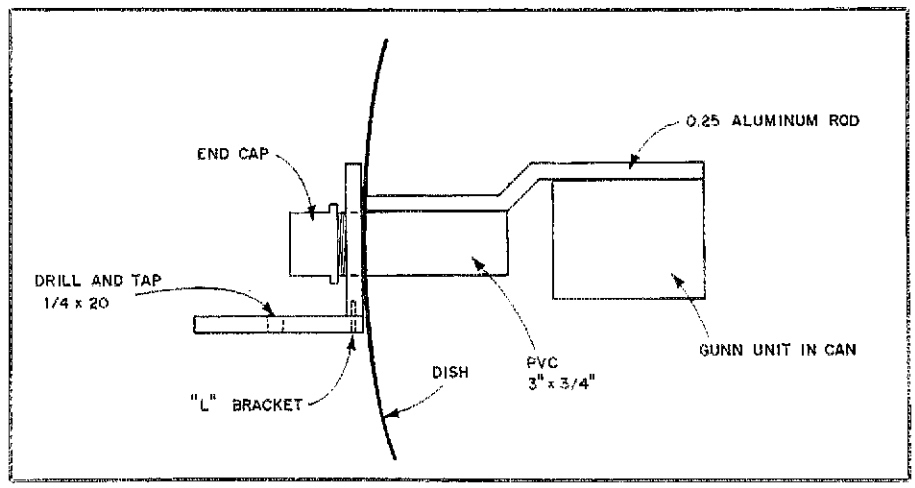


Fig 1—A simple 10-GHz dish feed.

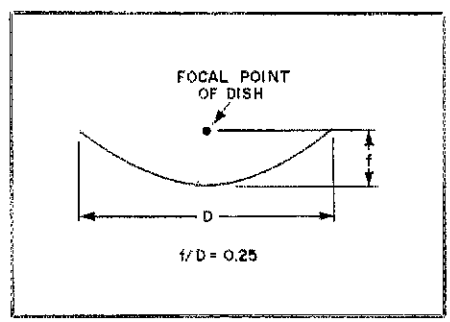


Fig 2—Focal-plane dish.

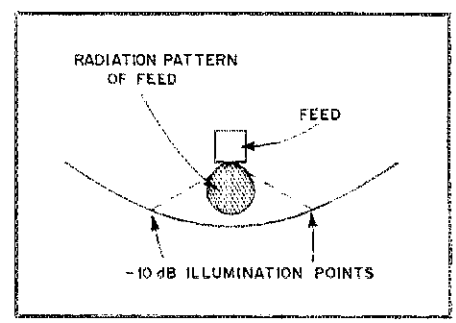


Fig 3—Under-illuminated dish.

The dish that Chuck describes here is known as a "focal plane" dish, since its focal point lies in the same plane as the rim of the dish. This necessarily corresponds to an f/D ratio of 0.25, as shown in Fig 2. Such dishes are quite difficult to illuminate optimally, ie, it is difficult to design a feed that will yield the maximum dish gain. An 18-inch-diameter dish would be expected to yield a maximum gain of around 30 dB. This will occur when the illumination at the edge of the dish is about 10 dB down on the illumination at the center. For a focal-plane dish, the edge of the dish is twice as far from the focal point as the center of the dish. This results in a natural reduction in illumination of the edge of the dish of 6 dB (known as "space loss"). Thus, to properly illuminate such a dish, a feed is required with a 4-dB beamwidth of 180 degrees—very difficult in practice.

Using a Gunnplexer to feed the dish will probably result in an under-illuminated situation, shown schematically in Fig 3. This is not necessarily a problem, but it does mean that the gain of the antenna will be reduced since only the center part of the dish is being effectively used. If the center 12 inches of the dish were illuminated, then the gain would fall to about 27 dB; if only the center 6 inches were illuminated, the gain would still be about 21 dB.

For more information on dishes and feeds, see The New Frontier columns of Feb 1981 and Jan 1983.

On Line

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

"RATTing" Apples Talk!

Getting an Apple IIc on RTTY was trickier than expected. Jim Hughes, W3HGM (419 West Washington Blvd, Grove City, PA 16127), tells how it is done.

I thought that all I would have to do to get my Apple® IIc on the air was purchase an interface and appropriate software. I found out that neither the interface nor the software worked with the IIc. Inquiries to all involved failed to help. So, I put RTTY on the back burner and played with the features of the IIc. I truly love the computer and look forward to local users' group meetings every month. Finally, I placed an inquiry in *QST* Strays that resulted in the following information.

Bob, N1CWA, got his IIc on the air with a Kantronics UTU universal terminal unit. The cable between the UTU and computer connects IIc modem port pins 4 (green), 5 (red) and 2 (black) of the IIc modem port to UTU pins 1 (green), 2 (red) and 3 (black). His printer has to be disconnected.

Bob uses a program called "Apple Term," version 1.5. He boots the program disk, configures the computer for half-duplex, pulse dial, 300 bauds, no parity, 1 stop bit, 8 data bits, 30-second delay and no line feed. (You need to do that once.) ESC returns to the main menu, where one selects choice "E." Then, turn on the power to the UTU, press RETURN on the IIc, and the UTU takes over. That's all there is to it!

In November On Line, Tandy Way, K4YSN, related the story of how blind hams got on RTTY and AMTOR. In this installment, Butch Bussen, WAØVJR (Box 142, Wallace, KS 67761), adds more information about his efforts to get into the digital world of Amateur Radio.

I wanted to get on RTTY the first time I was exposed to it. I even tried to learn to read paper tape as it came out of the machine, but that was not practical.

To get a talking Apple running on RTTY and AMTOR was not easy and took a lot of time, money and help from friends. Those of us who are handicapped have enough work without duplication of effort, so I am glad to share my experiences with anyone. Also, I want to give proper credit to all of the people who donated so much time and energy to this project.

Early on, I purchased a radio modem with software for my Apple in hopes that I could modify the program to make it talk. The program was copy protected. I could not even get into its directory. I called the manufacturer and was told that they would not help and, furthermore, that there was no way for a blind person to operate RTTY!

Next, I tried programs for the Apple that featured split screens (received and transmitted text displayed separately). To put it simply, split-screen programs, which are a joy for a sighted person, are not practical for a blind person. I tried several of them and had no luck making them talk satisfactorily. The problem is that there is too much going on the screen at one time; the voice synthesizer becomes confused and does not know what it is supposed to do.

We finally settled on the AEA AMT-1. The advantage of this unit is that it requires only a computer acting as a dumb terminal. A talking terminal program, Talking Transend, was already on the market. It was developed by Computer Aids of Fort Wayne, Indiana. Bill Grimms, KA9RUK, president of Computer Aids, and Doug Geoffray worked with the Transend authors to produce a talking version for use by the blind. All that was needed was to combine the software and hardware. We were on the right track at last.

Darel Graves, WAØGBN, wired the interface cables for me, and Gary McDuffie, AGØN, modified the AMT-1 and spent several hours on the air and on the telephone. He gave me operating tips and talked me through our first contact on the phone. He lives 250 miles from me, but was still willing to make two trips to help with some problems I was having.

Most voice synthesizers wait for a carriage return before they speak a line of text. We came up with the idea of redefining an incoming space as a carriage return. This lets you hear a word at a time rather than a line at a time; it looks strange on the screen, but audibly gives a much more even flow of data. We found the easiest way to tune in a signal was to record the proper tones on tape and just tune the received signal to match the tape.

With Gary's help and also help from Chuck Woodman, KØKXR, I am also writing a program for the Commodore® 64. Doug and I are also working on even a better program for the Apple.

I would like to thank all of the people who helped make this dream come true. I now operate a talking RTTY and AMTOR station.

ATARI HAMS

Amateur Radio operators who are using the Atari computers in ham radio have joined together as the Atari Microcomputer Network. Their national net meets every Sunday at 1600Z on 14.325 MHz; Dave Byrd, KD7VA, is the net-control station. As an adjunct to the network, the group publishes an informative newsletter, *Ad Astra*, six times per year. Its editor is Gil Frederick, VE4AG (130 Maureen St, Winnipeg, MB R3K 1M2). An annual $10 donation (to defray printing and mailing costs) is requested from those wishing to receive the newsletter.

If you are involved with an on-the-air net devoted to use of computers in Amateur Radio, please let WA1LOU know about it (address at top of this page) and get it publicized in this column.

HELP

☐ André Schmidt, DL8WX (Hofgutstrasse 13, 6204 Taunusstein 4, Fed Rep of Germany), is looking for anyone using a BMC IF 800 Model 20 or 30 computer (a Japanese CP/M® machine).

PX: Logging and Duping

BASIC logging and duping programs are featured in this installment of PX.

Program 118: a contest duping program written in BASIC by Al Snyder, N4US.

Program 119: an Amateur Radio logbook in BASIC written by Larry Baley, N8BFY.

Program 120: a program for duping Field Day logs written in BASIC by B. J. Brown, KD5CR.

Program 121: a program to log the CQ World-Wide DX Contest written in BASIC (and compilable using the Microsoft BASIC Compiler) by Bill Johnson, W6MUR ($1.24 postage on a 9 × 12-inch manila SASE).

To obtain a listing of PX programs, send a business-size SASE with 39 cents postage 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.

☐ Using a Color Computer on packet radio? Carl Nay, K8VQG (Box 471, Bettaville, OH 44815), would like to know what terminal program you are using.

☐ TI-99/4A users: Lyle Miller, WB9OKQ (3513 Hallie La, Eau Claire, WI 54703), is looking for anyone using a TI for Amateur Radio applications.

☐ GØAMP (Robert Senft, Mill Hay, Standard Rd, Downe, Kent, BR6 7HL, UK) has a TRS-80® Model 4 and seeks Amateur Radio programs that will run on his computer in either the Model 3 or Model 4 mode.

☐ TRS-80 Model 100 owners: Bill Ames, KB1LG (5 Turkey Roost Rd, Sandy Hook, CT 06482), would like to contact hams who are using Model 100s for RTTY and other ham radio endeavors. Bill is also interested in contacting others to share thoughts on the development of an "expert system, PC-based," for all phases of amateur operation and activities.

☐ Sending and receiving Morse code with a Xerox® 820-1 computer? Guillemo Payet, OA4BQ (180 Maiden La, New York, NY 10038), would like to know how you are doing it.

YL News and Views

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

NF9G and KA9UJM: Two YLs from Valpo

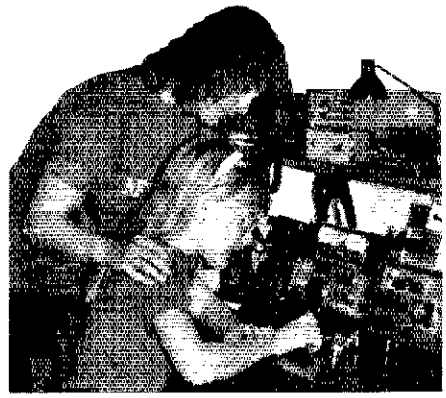
When Steve Kujawski, WD9EOP, of Valparaiso, Indiana, encouraged his wife, Kathy, to go for her Novice ticket, little did she realize how big a part Amateur Radio would play in her life as well as that of their daughter, Dawn. Like so many YLs, Kathy was interested in obtaining a Technician license so she and Steve could keep in touch via radio. And like many YLs, Kathy found that Amateur Radio has much more to offer than just the novelty of conversing with a spouse from the family car. Kathy found her own niche.

When she walked through the door to the Novice classroom, Kathy spotted Judy, KA9LAU. "I felt a growing confidence in knowing that Judy had 'made it' and that I could do it too." With lots of encouragement from Steve as well as other amateurs, including KQ9Q, KK9N and NG9B, Kathy obtained her Novice call, KA9RAI, in 1983. More hard work and more encouragement from friends brought her to the Extra Class license in 1985. As far as anyone knows, Kathy may be the first and only YL in Porter County (Indiana) with an Extra Class ticket.

A few years later when the Porter County Amateur Radio Club sponsored another Novice class, Kathy decided to attend the first session. "I knew there were other YLs present, and I wanted to give them the same kind of encouragement Judy gave me just by being there." Also attending the class was Kathy's daughter, Dawn. When asked if she would take the class, Dawn shrugged her shoulders and said "I don't know . . . maybe." That "maybe" turned into a "yes." In November 1985, Dawn passed her Novice test, and her call, KA9UJM, arrived in the Kujawski mailbox one day after her 11th birthday.

Dawn became the third (and final) member of the Kujawski family to hold an Amateur Radio license. If she was thrilled to have achieved this new status, then her young school friends were in awe and her parents were quietly ecstatic. For Steve and Kathy, this was another moment of pride and accomplishment for their little girl, who was born six weeks premature with Hyaline membrane disease, a condition that causes the lungs not to be fully developed. Because of the need for high concentrations of oxygen, there was fear that this newborn would become blind. Luckily, that never occurred. Dawn suffered from innumerable respiratory infections when she was an infant and was hospitalized several times. The Kujawski determination and pride were present in Dawn at a young age, and still are very much a part of her today.

This remarkable young lady is an honor student at Simatovich Elementary School, has served as Vice President of the Student Council, assists kindergarteners working with computers and was a member of a gifted music class. She has attended a Young Authors Conference, where she presented her story and illustrations entitled "The World Beyond the Stars." If this isn't enough for an 11-year-old, Dawn continues her work on the Student Council, participates in a variety of church activities, is learning to play the saxophone and has been taking piano lessons for four years.



Kathy Kujawski assists her daughter, Dawn, KA9UJM, with code practice.

It is no small wonder that Dawn enjoys challenges; her parents have presented that type of role model. Her father works as an electrician for a local power utility, but puts on the hat of the musician during the weekends. Kathy, on the other hand, earned a degree in nursing from Purdue and has worked in medical, surgical and oncology units. Today, she is active in the Porter County Amateur Radio Club, serving as its treasurer as well as the Volunteer Examiner Team's contact person. With Dawn and Steve, she helps with communications for the March of Dimes Walk-A-Thon and Valparaiso's own Popcorn Festival Parade. In 1985, the club set up a booth in the town square, where members handled traffic as well as demonstrated Amateur Radio. As recently as a year ago, Kathy was selected as the Porter County ARC's Ham of the Month, an honor designated for a member who has made outstanding personal accomplishments. Kathy was afforded this recognition soon after upgrading to Extra Class. In response to that accolade, Kathy commented, "I don't know if other clubs do this, but I feel it is worthwhile, and it is a means of letting the other members/guests know of the contributions/accomplishments of those in our club." NF9G also participates in the Porter County ARES-RACES Net as well as the Northwest Indiana Weather Net.

The Kujawskis agree that Amateur Radio is just one more way to enjoy life as a family. All three Kujawskis are busy with their own special interests and activities. But they share a love of Amateur Radio and the joy of being in it together. Putting up the tower was a real family affair. Steve, Dawn and Kathy assembled the tower. While Dawn gave positive encouragement from the ground, Steve and Kathy walked the tower up as high as they could using a saw horse for support. Kathy recalls, "Since I had never put up a tower, all I could picture was losing it and bringing down the power and cable TV lines. But Steve and Dawn were more optimistic. The only mishap was a bent-up gutter. I can now say I have experience climbing a tower!"

Because Dawn is so newly licensed, she has not yet begun to immerse herself in the many compelling facets of Amateur Radio. For now, she would be very happy to have a handheld radio so she could talk with her father. At school, her friends are fascinated that their classmate holds an Amateur Radio license and can actually communicate with people all over the world and hear an astronaut on 2 meters. When one of Dawn's teachers recently commented to the class that Dawn "knew another language," Dawn looked surprised. Until then she hadn't thought of Morse code as a special language. She finds herself answering questions such as "How can you understand that?" (CW) or "Is it like CB?" Dawn answers the many questions about the rules and regulations of Amateur Radio and her proud mother says, "Dawn can answer those questions, not in the way an adult would, but in terms that children understand."

Dawn is very aware of the excitement of being an Amateur Radio operator. "It's a privilege to be able to talk around the world and I think it's neat to know the International Morse Code. It's interesting to talk to Valpo or Australia. And maybe someday I can use the computer with ham radio to write disks to help people study for their licenses and make disks that help on Field Day."

As Kathy watches Dawn take those early and exciting steps into the world of Amateur Radio, she remembers her Novice days with a sense of humor. "During my first Novice contact, I was so nervous I sat there for what seemed like forever. When my call was sent back to me, I froze! (Sound familiar?) I wouldn't let Steve leave the room until I was finished. He'd start to leave, and I couldn't copy anything. As long as he was there copying along with me, I did okay . . . not good, but okay. In fact, I still get nervous when code is being sent to me. One of these days I'll get over that, with a little more practice."

Even though Kathy has yet to explore much of the activity on the low bands, she agrees that experience is the best teacher. As she and Dawn pursue the many activities of radio, they can share with each other their experiences and excitements, and thus learn together. "Amateur Radio is a great way to make friends, travel around the country and the world. And it is a great learning tool—not only learning radio theory and electronics, but also about other places and people and their cultures. I've learned a lot already, but I also have a long way to go." Dawn has a long way to go, too, but without a doubt she will have an incentive to upgrade and explore the world of Amateur Radio because her mother has set her own sights high.

Kathy feels a deep gratitude to those amateurs who gave so much of themselves to her. "How do I say thank you to those who devoted time, energy and interest to help me learn radio? Thank you just doesn't seem enough! The only thing I can think of is to encourage and help other hams and prospective hams. Therefore, that is my goal."

Washington Mailbox

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

Untangling the Mystery of the FCC Rules

Most amateurs know that the Federal Communications Commission is the Government agency charged by Congress with the task of regulating telecommunication services in the US except those of the Federal Government. And, most are familiar with its Amateur Radio rules. Less familiar, however, is the process by which the Commission makes these rules. Are they simply handed down to us, period? Do we simply drift along with the regulatory current? The answer is a resounding "no." Amateurs—any interested parties—have a right, thanks to Congress, to participate in the rule-making procedure. We can have a profound effect on what rules should be added, dropped or modified. With Amateur Radio the dynamic service it is, it's important that we promote awareness of the Commission's processes.

Q. What Act of Congress describes the procedures the FCC must use in its rule-making process?

A. The Administrative Procedure Act was enacted by the Congress and approved by the President in 1946. It sets forth the procedures to be followed by administrative agencies such as the FCC in adopting and amending their rules. Included in the provisions of this act are (1) Public Notice of a Proposal and (2) The Right of Interested Parties to Comment. Rules may be adopted, amended or repealed by an agency on its own initiative, or may be requested by an interested person by the filing of a Petition for Rule Making.

Q. I strongly disagree with certain amateur rules. How can I try to change them?

A. Any interested party may file a Petition for Rule Making for adoption, amendment or repeal of a rule. The petition should be addressed to the Secretary, Federal Communications Commission, Washington, DC 20554. It should be typed, double spaced, on 8½- × 11-inch paper and be signed by the petitioner. The petition should set forth the text of the proposed rule, the rule sought to be amended (or repealed), together with all facts, views, arguments and data needed to support the action requested and shall indicate how the petitioner's interest shall be affected. The accompanying sidebar shows the proper caption for petitions. An original and four copies of the petition should be filed.

Q. What is the next step after filing a petition to change the rules?

A. If the FCC's review shows that the petition warrants such action, it will issue a "Public Notice" entitled "Petition for Rule Making Filed" giving the file number (RM-), the name of the petitioner, the filing date and a brief summary of the proposal. The public notice is not published in the *Federal Register*, but is available for inspection at the FCC and is often summarized in amateur publications. Some petitions clearly do not warrant FCC consideration and are not given RM file numbers. They are acted upon by the responsible Bureau Chief. In amateur matters, this is usually the chief of the Private Radio Bureau. Any interested person may file a statement in support of or in opposition to a Petition for Rule Making, not later than 30 days after the Public Notice is given. Replies to supporting or opposing statements are due not later than 15 days after the filing of such statements.

Q. How does the FCC proceed if it deems my petition has merit?

A. The Bureau Chief will submit a draft *Notice of Proposed Rule Making* to the five FCC Commissioners for their consideration. If it is adopted, by majority vote, a docket number will be assigned and it will be released to the public and published for comments and *published in the Federal Register.*

Caption Format To Be Used for Petition or Formal Comments

Before the
FEDERAL COMMUNICATIONS
COMMISSION
Washington, DC 20554

In the Matter of	)	
Amendment of Section 97—	)	
(Insert rule number, if an amendment is proposed, and the subject matter of the Amateur Radio Service.)	)	RM

Q. Where can I obtain a copy of a Notice of Proposed Rule Making?

A. You can obtain a copy of a Notice of Proposed Rule Making by contacting the FCC's contractor for public records duplication: The International Transcription Services, Inc, Room 140, 2100 M St NW, Washington, DC 20037, tel 202-857-3800. Also, summaries of Proposed Rule Making are published in the *Federal Register*, which is available in most public libraries. Also, *QST* and many amateur publications carry summaries and announcements of NPRMs. Copies of the NPRM are also available from ARRL HQ for an SASE.

Q. What must I consider when filing comments in an FCC Notice of Proposed Rule Making?

A. You must consider several things. First, the FCC is interested in your experience in a certain area. This experience could shed new light on issues or questions raised in an inquiry or rule making. Secondly, the FCC is interested in the facts, "Just the facts, ma'am," to quote Sgt Friday. Your comments should explain the facts briefly, but fully. You should explain your position and the evidence which supports your position. The third thing you must consider in filing comments is that you must be specific. If parts of a particular rule making are acceptable to you and other parts are unacceptable, you must state this as such. In addition, you should state other opinions and then state how the public interest would be better served by your position. Comment only on the pending proposal. Do not use it as the vehicle to submit a new proposal of your own. Those should be reserved for future petitions.

Q. Once I have my comments written, where do I send them?

A. You should send your written comments to the FCC at the following address: Secretary, Federal Communications Commission, Washington, DC 20554. If you wish your comments to be received as a formal filing, you must submit an original and five copies. If you like, you may submit only the original. Your comments then will be received as an informal comment. All comments must indicate the appropriate Docket number.

Q. What happens after I submit comments to the FCC? Do my comments make a difference?

A. Yes, all comments are reviewed by the FCC staff and all comments are important to the Commission.

Q. Okay so I've filed my comments in a Notice of Proposed Rule Making. When will I know about the FCC's final decision?

A. The proposed rule change will be considered by the FCC commissioners. The Commission may adopt the rule amendments, may order revisions in the document, or may terminate the Docket without amending any rules. A Report and Order is then issued by the Commission stating the new or amended rules, or stating that the Rules will not be changed. This is usually "the end of the line"; after the FCC's Report and Order, the rules will become effective as specified in the Report and Order. All this takes time, sometimes several years, depending on the Commission's schedule.

Q. What if I disagree with the new rules in a Report and Order? How can I get the Commission to reconsider it?

A. You may file a Petition for Reconsideration. Section 405 of the Communications Act of 1934 states any person "aggrieved or whose interests are adversely affected" by a Report and Order has the right to petition the Commission for reconsideration. The petitioner must state which parts of the order should be changed. A Petition for Reconsideration must be filed within 30 days from the date of Public Notice of final Commission action. Public notice of the notice and comment proceeding is given by publication in the Federal Register. If new or additional facts are presented in petition for reconsideration, the FCC may grant it and modify the earlier action.

[You may be thinking, "How does this affect me?" In the next Washington Mailbox column, we will discuss specific rules affecting Amateur Radio.—Ed.]

Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL HQ, have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.

Canadian NewsFronts

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

Jack Ravenscroft, VE3SR: QRT

HR BULLETIN 13 FROM CRRL, LONDON, ONTARIO, 1986 APRIL 09, TO ALL RADIO AMATEURS BT
Today, in what Canadian amateurs will likely regard as a flagrant miscarriage of justice, the judge hearing the case of Houghtby vs Ravenscroft, in which Timothy and Dale Houghtby of Kanata, Ontario, sued their neighbour, Jack Ravenscroft, VE3SR, for damages arising from alleged interference to their furnace controls, microwave oven and home entertainment equipment, decided the case in favour of the Houghtbys and against Jack Ravenscroft. The judge granted a permanent injunction prohibiting Jack from transmitting radio signals, from his home or from his land, that would result in disruption of the operation of electrical or electronic equipment in the Houghtby's home. The judge also ordered Jack to pay $2558.60 in damages, all of the Houghtby's legal costs, plus interest on monies the Houghtbys laid out during the course of the case. The unexpected outcome of this case is a severe blow to the Canadian Amateur Radio community and a potential threat to the operators of any licensed transmitter, even a transmitter in broadcast or other commercial service. Jack will decide whether or not to appeal the case in the next few days. His decision, in part, will be based on whether or not the Canadian Amateur Radio community appears willing to provide financial support. Even if Jack does not appeal, there still is a need for money. Jack's own legal costs plus what he has been ordered to pay will add up to as much as $40,000. To date, the Canadian Amateur Radio community has donated some $18,000. In fighting for all of us in this precedent-setting case, Jack could be $22,000 out of pocket. We hope this makes you feel like writing a sizeable cheque. Please send it to the JRSD Fund, Box 8873, Ottawa, Ontario K1G 3J2. AR

Jack was convicted of being a nuisance. In his *Reasons for Judgement*, Judge Hollinger of the District Court of Ontario stated: "The (DOC) tests indicate that several devices in the Plaintiff's residence are affected by the operation of the Defendant's radio station." He added: "The tests did not involve any determination of the extent to which modifications of the Plaintiffs' electrical devices would reduce or eliminate the interference," and concluded, "On the evidence before me, it would be difficult and probably impossible to completely suppress the Plaintiffs' equipment (sic) from interference caused by the Defendant's radio station."

Judge Hollinger was not moved by a defence argument, put forth by Communications Minister Masse in the letter that appeared in last month's Canadian NewsFronts column. The Minister stated that the malfunction of various devices was " ... not the result of improper operation of the amateur radio station, but rather the inability of these devices to adequately reject the amateur's transmissions." Instead, Judge Hollinger took the Minister to task for not doing his duty. He quoted Section 64.4 of the General Radio Regulations, Part II: "Where interference to the reception of radiocommunications is caused by the operation of an amateur station, the Minister may require that such steps be taken as are necessary for the prevention of the interference, and the operator of the station shall comply immediately with any such requirement." He added: "In the case before me, the Minister took no such action. In fact the Plaintiffs got relief only by way of an interlocutory injunction granted after an action was commenced." Now, that injunction is permanent.

You can only take so much. Jack and his family have "been through the mill" on this case for two years. No one will blame Jack if he decides not to appeal. Of course, we all hope he will, for his sake and ours. As mentioned in the CRRL bulletin, a major factor in Jack's thinking will be whether he feels he has the backing of the Amateur Radio community. We feel that he has.

Only hours after Judge Hollinger's decision was announced, CRRL was flooded with calls from amateurs asking for details and how could they help. One of the most unexpected and perhaps the most meaningful was from a group in Cincinnati, Ohio. Their concern was a poignant reminder that Amateur Radio is still a fraternity, and when the going gets tough, borders be damned and amateurs stick together. Then there was the Durham Amateur Radio Fleamarket. CRRL people, I'm proud to say, set up a special booth to collect $500 for Jack. It quickly became a nonpartisan effort. At various times the booth was manned by a CARF Ontario Director, the CRRL President and representatives of RSO. In five hours they collected $2300.

At press time, there were indications that commercial radio organizations and possibly even DOC were preparing to support Jack. However, these may not come through—and it is our battle.

So what about you? If you're like me, you're probably sitting in front of two or three thousand dollars' worth of pretty nice radio equipment. It's a sobering thought that we could be put off the air because we were creating a problem in someone's home and it was the same situation as *Houghtby vs Ravenscroft* and the precedent was set. Surely it's worth $10 or $50 or $100 or more to ensure that we can remain on the air. Let's get to writing those cheques.—*Harry MacLean, VE3GRO*

WITH THE IARU

☐ CRRL will be representing Canadian amateurs at the IARU Region 2 Triennial Conference, to be held in Buenos Aires, Argentina on October 20-25. The Executive of IARU Region 2 has asked CRRL and other IARU member-societies for submissions on matters of interest or concern. If your group has an interest or concern that you feel should be addressed at the international level, please contact CRRL soon. It will take time to prepare submissions in both Spanish and English, the two official languages of the conference.

☐ How many ways can you work all continents? The IARU Worked All Continents Award, first introduced in 1926, remains popular. Under new rules, certificates are available for working all continents on mixed modes, CW, phone, RTTY, SSTV, FAX and satellite. There is also a five-band certificate. Endorsement stickers are available for working all continents on six bands, on 1.8, 3.5, 50, 144 or 432 MHz, or using QRP. The rules that all contacts have to be made from within an area with a 40-km radius and that certain contacts will be counted only if made after 1974 January 01 have been eliminated. Contacts made on 10, 18 or 24 MHz, or using satellites, will not count for the five- or six-band awards, and all QRP contacts must be made after 1985 January 01 using a maximum of 10-W input or 5-W output. Sound interesting? In Canada, the IARU Worked All Continents Awards are available only through CRRL. Contact Awards Manager Garry Hammond, VE3XN, for details.

SECTION MANAGER ELECTION RESULT

Congratulations to Jack Adams, VE4AJE, who was recently reelected Manitoba Section Manager. Jack's nomination was uncontested, eliminating the need for a ballotted election. His new two-year term of office begins on October 1.

NOTES FROM ALL OVER

☐ The amateur station in the Canadian Pavilion at Expo 86, the Vancouver World Fair, will be using the call VE7EXPO.

☐ Nominations are now open for 1986 CRRL Amateur of the Year. Please send your nomination and supporting documentation to the CRRL Secretary, c/o the CRRL Headquarters office in London, Ontario.

IARU News

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

NICK PERCIVAL, 9Y4NP, SILENT KEY

Nick Percival, 9Y4NP, immediate past president of the Trinidad and Tobago Amateur Radio Society, died recently after a 10-month bout with a crippling illness. A captain and a 30-year employee with the National Airline of Trinidad and Tobago, Nick had to resign for health reasons in 1985. He retired to his hometown of Vancouver, British Columbia, where he passed away on March 13. Although able to walk only with considerable difficulty, Nick courageously attended the Region 3 IARU conference in Auckland, New Zealand, in November 1985, where his keen mind and friendly demeanor made for a most welcome contribution to the work of the conference. His many friends in IARU know how much his wise counsel will be missed.

MEDAL OF HONOR TO HK4BHC

The Ministry of Communications of Colombia has awarded the Medal of Honor to the president of the Liga Colombiana de Radioaficionados, Eduardo Londono, HK4BHC, for the many services that the LCRA has provided to the government and the people of Colombia. This award has been made only three times in 15 years, and always to an LCRA member.

AMATEUR RADIO BEACONS

As you tune across the lower portion of the 28-MHz band and also around 14.1 MHz, you probably have heard the automatic transmissions of the various beacon stations. The International Beacon Project was originally conceived in Region 1, and was a way of letting amateurs know when various paths were open on the 10-meter band. To a limited extent, some scientific use has been made of the beacons, by recording their signal strengths at various points, to let the propagation scientists know how accurate their forecasts were. A feeling has grown in some quarters that the 28-MHz beacons were occupying too wide a band of frequencies, and so at the most recent meeting of the IARU Administrative Council in Melbourne/Auckland, the following resolution was adopted:

Resolution 85-1, Concerning 28-MHz Beacons
The IARU Administrative Council

Recognizing the popularity of the International Beacon Project on 28 MHz as well as the time and energy that has been dedicated to the endeavor,

Recognizing that it is desirable to improve, enhance, and technically update the 28-MHz beacon system, especially in view of the success of the 14.1-MHz program sponsored by the Northern California DX Foundation,

Recognizing that the IARU Band Plans of frequencies allocated to the Amateur Service should exemplify the most efficient use of the frequency spectrum,

Resolves that the 28-MHz beacon system be revised according to the following guidelines:

1) The segment 28.190 to 28.200 MHz will be assigned as International Beacon Project frequencies, effective immediately.

2) A worldwide network similar to the 14.1-MHz program of the NCDXF will operate on 28.200 MHz.

3) Regional networks, each encompassing approximately a continent, should be established on integral kilohertz between 28.190 and 28.199 MHz.

4) IARU member-societies are encouraged to sponsor the operation of beacons in this network.

5) Existing beacons operated by an IARU society will have preference in this new scheme.

6) The IARU International Beacon Project Coordinator will submit to the International Secretariat the technical parameters for the beacons as well as the specifications for the regional networks, information that will be sent to all member-societies. He will be responsible for frequency management, for time allocations, and will strive for global coverage.

7) The Administrative Council will insure that this new scheme of 28-MHz beacons as well as any other beacon systems in other bands will be adequately publicized and that the data collected from the operation of the beacons will be distributed regularly to all member-societies.

8) Beacons operating outside of the new system will cease to be protected from interference by IARU band plans on 1 January 1990.

For the information of the readers of this column, the International Beacon Project coordinator is Alan Taylor, G3DME, "Altadena," South View Road, Crowborough, Sussex TN6 1HF, England.

Although, as mentioned earlier in this column, *some* scientific use of amateur beacons has been made, they have been largely for our own convenience in spotting band openings. About a quarter of a century ago, amateurs made quite a scientific name for themselves by conducting a well-organized study of 50-MHz propagation. We could enhance our reputation, and perhaps even our credibility, at ITU conferences by doing the same sort of thing using the beacons at 28.2 and 14.1 MHz. It would take a lot of time and energy and the conviction that we don't already know everything there is to know about HF propagation. Who's ready to tackle that project? QST

Strays

***QST* congratulates...**

☐ Matthew Kehoe, KA2AYN, of Perth Amboy, New Jersey, on receiving an appointment to the US Coast Guard Academy.

☐ Fritz Clement, WØGQH, of Selby, South Dakota, on being inducted into the Newspaper Hall of Fame.

I would like to get in touch with...

☐ personnel who served at the USA Major Signal Relay—SARAN, near Orleans, France. Timothy Casey, W1EII, Box 447, Pepperell, MA 01463.

☐ any hams who served aboard *USS Hurst* DE 250, WW II. Joseph Strolin, K1REC, 21 Eller St, Norwalk, CT 06851.

☐ anyone from the 156th Armored Signal Co of the 16th Armored Div. Gerard Baldauf, W3WX, 175 Wernersville Blvd, Wernersville, PA 19565.

☐ any WW II radio operators, mechanics and instructors from the USAAF ROM School in Sioux Falls, SD. John Elwood, W7GAQ, 5716 N 34th Dr, Phoenix, AZ 85017.

☐ anyone who was a member of the US 106th Infantry Div, WW II. Jack Janicke, K2JFJ, 122 Bellevue Ave, Butler, NJ 07405.

☐ anyone with information on how to obtain Heathkit green and gray touch-up paints. Tony Berg, W1OT, 7 Conant Dr, Stow, MA 01775.

☐ anyone with a manual for a Measurements Corp Model 80 standard signal generator. Barry Newberger, W5KH, 9608 Paseo del Rey NE, Albuquerque, NM 87111.

Correspondence

Conducted By John Hennessee, KJ4KB
Regulatory Information Assistant

TIP-TOP MOUNTAINTOPPING

☐ John Lindholm's article on VHF mountaintopping (Mar 1986 *QST*, page 49) was top rate! I would like to offer three humble additions to his outstanding mountaintopping checklist.

First, under the "power source" section, include a fire extinguisher; many national/state parks will require you to have one if you plan to use a gasoline generator; why make Smokey The Bear mad?

Second, in the "camping equipment" column, add a first-aid kit. Granted, mountaintopping is supposed to be a nice weekend's jaunt, but bumps and bruises can occur.

Lastly, under "food," consider freeze-dried food. It only requires boiled water to reconstitute; it's quick and, believe it or not, it's good. Most important, it is very lightweight and takes little room, plus the pouches can be easily carried out. Remember: Leave the area better than you found it! Again, hats off to John for a great article on mountaintopping.—*Thomas M. Webb, WA9ARM/TF, FPO NY*

CHASING AWARDS

☐ Operating awards are all very popular, but the big one at the top of the heap is DXCC. It takes an "aggressive" person, which is a nice word for "pushy," to jump into a pileup and fight the good fight. In a pileup, you are no longer Ted, Harry or Joe. You are Rambo, Clint Eastwood and Attila the Hun rolled into one. What started out as a nice relaxing hobby has now become a white knuckle compulsion. I've noticed, if 20 is shut down, and a Virgin Islands station calls CQ, the pack will jump on him like they would on Uganda or Lesotho. They have all worked the Virgin Islands before, but he's someone to chase for the sake of the chase. All present awards, especially DXCC, start out inclusive and end up exclusive.—*Rudy Dietz, W8KKB, Kearneysville, West Virginia*

CW ON SSB

☐ I am getting more and more disgusted with unorthodox practices by phone operators concerning the use of "contact" or "re-check." This is totally unnecessary. It is far more appropriate to use your call to gain attention. The excuse that it is a better way to get recognized is absurd.

Another bad practice, the use of made-up words, especially on two meters, such as "destinated," is revolting.—*Joseph F. Werden, WD9MJB, Conway, Michigan*

KNIGHTS OF THE ROAD

☐ Those of you who may recall the days of Citizen Band radios, and have traveled over our turnpikes and expressways, can well recall Channel 19 and the drivers of the 18 wheelers. Many over the road drivers have become Amateur Radio operators, holding every class from Technician to Extra Class, and this includes quite a few female drivers.

To talk and meet with these drivers is to be introduced to a new world. You would only have to turn your HF rig to 3.992.5 MHz at 0000Z every night or listen in at 14.303 during the day and you would find the TDF Net (Truck Drivers and Friends Net) in progress. Truck Drivers, through their friends at base stations, relay road conditions, weather conditions, personal family messages, some good news, some bad. It is not unusual to talk to a TDFer on the East Coast one night on 75 meters and the next night in the Midwest or Southeast.

More than one driver has perfected a method of sending CW mobile without taking his hands off the wheel. Yes, my friends, your fortitude and perseverance paid off.—*Paul D. Langendorfer, N8CKV, Olmsted Falls, Ohio*

IT SEEMS TO ME

☐ I've always been quite happy with old time radio and have no desire to buy a computer. I guess this leaves me as a has been who enjoys ragchewing, scrounging, fixing and, of course, complaining about progress. I do believe that progress is inevitable, but like anything else there is a price to be paid!

Seems to me that when it's simply "buy it, plug it in and talk" a lot of the romance is lost.—*Frank Plankey, W1KDA, Hyannis, Massachusetts*

APRIL TECHNOLOGY

☐ What a horrible, grave situation,
We've all been seduced,
Transduced and reduced
By an earthshaking manifestation.
Happy April 1.
—*Boyd L. Nelson, KC3PP, Silver Spring, Maryland*

☐ I read NS5D's article on Gravity Gradient Modulation with great interest. I was glad to hear of someone else who is engaged in this type of research. It also probably explains the mysterious signals I have been receiving. The receiver as diagrammed in *QST* is for horizontal polarization and mine is designed for vertical polarization. I had not previously realized that the polarization would be so critical. My receiver is similar to that shown except I use one ball suspended by a spring to allow it to oscillate up and down. A photospectrometer underneath the ball detects the slight Doppler shifts in reflected light as the ball oscillates. Unless polarization is standardized, a polarization converter will be required for each station.

In my system, gravitons are collected in a graviton collector, and a graviton gun accelerates and aims the gravitons by means of a variable mass deflection plates (VMDPs). The gravitons are aimed at assorted size lead balls contained in a vacuum chamber. When a ball is bombarded by gravitons its relative mass increases causing perturbations in the gravitational field around it. The amount and length of time of mass increase, and the sum and difference perturbations (if more than one ball is variated) determines the perturbation "frequencies." A system of filtering harmonic perturbations has not been developed at this point, so all harmonics are radiated. Our local club has conducted some experiments with GGM Packet, but we have been plagued with problems. Currently we are searching for an alloy to use in place of the lead balls as they quickly become deformed under mass variation at packet speed.

I feel that expansion of this communication medium is inevitable, and I urge ARRL to determine what controls need to be placed on it and lobby the Government to take action. If it is not controlled, I fear disastrous consequences could result. Let's not wait until we lose a ham in a DX GGM pileup to take action.—*Rick Sims, N4NDO, Monroe, North Carolina.*

LOOMIS MAKES WAVES

☐ I wish to call your attention to a statement in a story on page 90 of February *QST* made in regards to Hertz's experiments in electromagnetic waves.

The first electromagnetic waves (radio) were signals transmitted and received by equipment designed and built by Dr. Mahlon Loomis between two mountain peaks, 18 miles apart, in Loudoun County, Virginia, in the years 1866 to 1873. In 1868, he demonstrated his ability to send and receive messages to a group of Congressmen and eminent scientists of the day. In 1872, he received a patent for his transmitter and receiver.

This letter is not intended to degrade the work of Dr. Hertz. I just want to set the record straight.—*John S. Coe, KA4TGY, Winchester, Virginia*

PDRS ON 6

☐ Thanks to the ARRL for filing comments opposed to Don Stoner's proposed PDRS and takeover of 52-54 MHz. I would like to go on record as strongly opposing PDRS on 6, and offer my sincere thanks to the ARRL for your comments to the FCC. Our six meter band is no place for Stoner's "high tech citizen band packet service"—if one is needed at all. The spectrum adjacent to channel 2 is not the place for any unlicensed radio service, particularly taking into account the broadband design of present day television receivers. We hams have been good neighbors with broadcasting, and have been judiciously using this spectrum well.—*Richard S. Penc, NE2J, Laurel, Maryland*

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

ON GIVING NOVICE EXAMINATIONS

Complete instructions for giving Novice examinations appear on page 79 of November 1985 *QST*. Reprint copies are available from your League Headquarters for an SASE. They cover everything necessary to give the examination legally and properly. Nevertheless, we have been asked for additional suggestions, so here are some.

Dealing with the Jitters

Anyone about to sit for a Novice examination probably will be anxious and a bit jumpy, too. Most (but not all) people do their best work on examinations when they are alert but relaxed. To you, the examiner, tension before a *Novice* examination might seem rather ridiculous. After all, the Novice test is so easy!

But be assured that it does not seem that way to most candidates. This is a real hurdle to be jumped, even though the pass rate is running about 80 percent. Many candidates think they might not be up to it. It's scary—especially if the candidate is middle-aged or older. It's been a long, long time since such a candidate has been examined for anything more difficult to obtain than a driver's license. Show compassion—even though time has dulled the pain you felt when you faced your first ham examination.

Although teenagers and those younger might not have the squirms the older candidates have, they might be just as tense. The hurdle they are about to leap quite probably is, in their own minds, the most important thing they ever have tried to do. Failure might be as big a blow to their egos as it would be to the ego of one much older. Few will fail, but those who do fail—even though it's their own fault for not studying enough at home—will be lost to ham radio forever, unless *you* handle the situation properly.

Dare I mention the old-fashioned word love? Your loving words and actions can save the day. Even though you don't feel love toward the candidates, treat them as though you care. The results might surprise you as well as them. Suffice it to say that *your* actions and attitudes determine far more than most people realize whether a candidate passes. The more tense and nervous the candidate is, the more thoroughly this statement applies.

Provide the Right Setting

Of course, you will score the examination honestly. You will do no favor to the candidate by passing one who really has failed. You simply will lose that candidate's respect and sabotage respect for Amateur Radio to boot. But if you handle the matter properly, the candidate is almost certain to pass the next time. Passing with integrity is the result all of us want.

Unless you personally know the candidates, you must check identification carefully. The candidates should have been told to bring two forms of identification, including one with a picture. Check them scrupulously. (A commuter in Chicago rode the trains for a full year recently with an annual commuter pass bearing the picture of an authentically costumed eighteenth-century Chinese mandarin, and no conductor even raised an eyebrow!) Your careful checking will win respect for the Amateur Radio Service from those taking the test. They will feel more secure knowing that no impostors are present.

The very process of checking identity could contribute to the tension, however. This is where the use of volunteer examiners is a real advantage. A "homey" examination room helps a lot. A roaring fire in the fireplace and some easy chairs or sofas can add to the relaxation motif. Nevertheless, be sure your candidates are seated where you can watch them throughout the examination. Other candidates might not notice someone's cheating and might be unwilling to "blow the whistle" if they did notice. An honest examination is *your* responsibility; it's *your* signature that will appear on the Form 610 when it goes to the FCC!

Incidentally, it's a good idea to collect the completed 610s from the candidates when you check their identification. Ask any candidate who does not have a Form 610 to fill one out and sign it *before* the examination begins. For this purpose, of course, you will have a supply of the 610s available in the examination room. The 610s are available from any FCC Field Office, the FCC's Gettysburg office or League HQ.

Tips on Examining a Group

Unless you have an unusually large number of candidates, you probably will want to scatter them around the room to discourage them from looking at someone else's paper. Another important reason for this is to spare a candidate the pain of being pestered by another candidate about one or more questions on the examination. As Robert Frost wrote, "Good fences make good neighbors."

You also should have on hand a stock of sharpened pencils, erasers and a supply of blank scratch paper. Candidates should have been asked to bring their own supplies, but not all will have done so. They should be warned, however, that they may not bring any notes of any kind to the examination. Pass around a wastebasket for them to throw away any paper they might have with them—no questions asked. All books, notebooks and other unnecessary paraphernalia should be placed *and kept* on the floor or at the front of the room during the examination.

Then distribute one or two sheets of scratch paper to each candidate. Ask them to write their names on each sheet of scratch paper. Be sure to collect this scratch paper from each candidate when the examination is over. Keep the scratch sheets, along with the test papers, on file for at least one year.

If there is a time limit for the examination (you may set one if room-rental expense, etc, make it advisable), be sure to make it clear at the very beginning of the examination session what time you will collect all papers, whether or not the candidates are finished. In such a case, be sure an accurate clock is visible to all candidates throughout the examination. Most will complete the Novice written Element 2 examination in a half hour or less; you should, however, allow them at the very least one full hour on the written examination (preferably more time). It is unusual, though, for any candidate to take over an hour on the Novice examination. (Candidates for higher-level licenses often take two hours or more.)

Next installment, we'll discuss the actual administration of the code and written portions of the Novice exam.

Strays

THE FIRST HUNDRED FEET

☐ Potential hams may be just next door—or around the corner. Wisconsin Section Manager Richard Regent, K9GDF, shares a lesson in helpfulness.

One evening as my wife and I crossed a street on our way to an Amateur Radio club meeting, there ahead of us, rambling and searching on the street corner, appeared a fellow questioning passersby. "Probably another beggar," I thought, as we stepped up on the sidewalk. He approached us and politely asked about an address. A little thought revealed this was the club address. "Are you going to the radio club meeting?" I asked, noting his paralyzed left arm. "Yes," he replied, his voice full of excitement and relief. "I heard about it on a local radio program. My name is Frank." Frank, neat appearing and about 20 years old, stood on an unfamiliar street corner where a taxi-cab driver had dropped him off. He had been asking for directions and trying to find the radio-club building for some time, yet only a hundred feet from the entrance. Frank is blind.

We shared excitement as the three of us walked toward Frank's first radio-club meeting. The meeting began, and visitors introduced themselves. Frank, sitting in a chair angled slightly sideways, didn't take a turn, but continued smiling. Catalogs, books and magazines were held up at the front of the room and auctioned or given away. Now for the program: 50 slides followed by two color videotapes, a great job. I looked at Frank and worried about so many visuals and his introduction to Amateur Radio.

After the meeting we headed toward the exit. "What a variety Amateur Radio has to offer," Frank enthusiastically said. "Communicating through repeaters and satellites, learning Morse code, building your own equipment! Each amateur has his own call letters, and they're listed in a book like a phone book." As Frank captivated me with his amazing insight into the radio hobby, I felt the renewed joy I had when first licensed. Frank loved his first Amateur Radio Club meeting, as anyone could realize by just listening to him. "Learn about electronics and how to communicate," he continued to describe what he heard club members talk about. "If I get my license, can I wear a name tag with my call on it, too?" he asked. Swallowing hard, I tried to gather some words. "Let's get you registered for those radio license classes before we leave tonight."

Walking to my car, I guided Frank down the now dark sidewalk where we had met only a few hours ago. "You're better than a seeing-eye dog," my blind companion jested. "But I'm not as smart as one of them dogs," I quickly replied. We talked about the taxi-cab ride that cost Frank $10.50 and then stuck to the fun subject of Amateur Radio. Soon Frank was safely home. Driving away I whispered to myself, "Frank won't have any problems getting his license. He just needed a little help the first hundred feet."

We should always watch for new people trying to join our ham radio groups and then help make them feel welcome.

Silent Keys

Administered By Nancy A. O'Neill

It is with deep regret that we record the passing of these amateurs:

NIBOS, John H. Hughes, Marion, MA
W1EF, Alston M. Wheelden, Brewer, ME
KA1FCC, James D. Robson, Sr., Swampscott, MA
W1JVP, John J. Fitzgerald, Belmont, MA
K1RK, Francis A. Kohout, East Falmouth, MA
W1YCP, William J. McMahon, East Hartford, CT
K2AHX, Ralph L. Lewis, Ellenton, FL
N2ARZ, George W. Chase, Lake Katrine, NY
WA2HCI, Howard Miller, Bricktown, NJ
*K2JHV, Cornell L. Morgan, Jr., Hempstead, NY
W2KAV, James Scairpon, Piscataway, NJ
WB2LAP, Peter L. Manzo, Lodi, NJ
N2LK, Heinz Milark, New Hyde Park, NY
WA2OPL, Stahley W. DeMerritt, Rochester, NY
W2OV, Harry B. Wattson, Albuquerque, NM
WB2OYN, Anne L. Jones, Burnt Hills, NY
W2QU, Dudley F. Phelps, Port Washington, NY
N3AH, Donald F. Mulvey, Stroudsburg, PA
WA3CPD, Frederic James, Chester Springs, PA
WA3EUI, Richard E. Chesney, Bowie, MD
WA3HRO, John P. Taylor, Thornton, PA
K3LEY, Vincent E. Mohan, Reading, PA
*W3PZW, Richard A. Young, Fort Washington, MD
W3QFI, Thomas J. Foley, Hatboro, PA
W3TH, Alvin H. Kent, Washington, DC
W3VAT, William J. Braukus, New Philadelphia, PA
WD4ADD, Hubert B. Herring, Winter Park, FL
K4AEC, George L. McInnis, Sharpsburg, GA
W4CQI, Clifton W. Pittelkau, Warrenton, VA
K4CT, Karl A. Duerk, Tampa, FL
K4CZW, Carlin O. Bandy, Fort Lauderdale, FL
W4FOE, J. Wesley Burnham, College Park, GA
KV4I, William F. Sawyer, Spartanburg, SC
K4JLG, Ernest P. Chace, Newington, CT
W4JZA, George M. Christiana, Lumberton, NC
KA4LCJ, Susan Cox, Casselberry, FL
W4NJD, Carl Wilcoxson, Greensburg, KY
WB4PYN, John T. Chidester, Cape Coral, FL
W4RU, E. Earl Pearson, St. Augustine, FL
WD4SGJ, John L. Keating, Springhill, FL
AA4TT, John B. Hannon, Warner Robins, GA
KA4VLB, Carl V. Backlund, Charlotte, NC
*K4WS, Joe Keagy Bair, Oak Ridge, TN
WB4ZBK, Kenneth H. Allfrey, Oneida, NY
K5AJM, Aubrey A. Woodall, Little Rock, AR
K5DA, Paul A. Ramey, Prentiss, MS
KB5DB, LeRoy Green, Sr., Tupelo, MS
K5DMD, John L. Cooper, Purvis, MS
K5EYC, E. Carl Jones, Starkville, MS
WA5FDO, Ray W. Evans, Marmaduke, AR
W5MMD, Tom C. Wherry, Independence, MO
K5PPC, John A. Silva, Jr, Albuquerque, NM
W5PYD, Leonard H. Gilbert, Utica, MS
W5QKA, Daniel A. Apple, Carlsbad, NM
*W5QVZ, Thomas J. Boyd, Jr., Los Alamos, NM
KE5UB, Clarence K. Lambert, Jr., Los Lumas, NM
W5VDE, Joseph F. Michael, Magnolia, TX
KC5XK, John M. Harris, Fort Smith, AR
W6AYI, William H. Yaeger, Hacienda Heights, CA
W6ESP, Raymond Goelitz, Ontario, CA
W6IPE, Theodore "Ted" R. Klages, Irvine, CA
K6NS, Martin C. Cornell, Jr., Oceanside, CA
K6OWN, Selwyn L. Monroe, Lafayette, CA
W6PCO, Mary Anne R. Shepherd, Del Mar, CA
WB6POP, Robert S. Kain, Simi Valley, CA
W6QUE, Lon M. Hildebrand, Stockton, CA
W6TYH, Harry D. Hooten, Lincoln, CA
W7CEA, John D. Herbert, Seattle, WA
N7HMI., Ruth E. White, Bellevue, WA
K7INV, Hugh T. Saffel, Jr., Sumner, WA
*WA7QGR, Howard E. Short, Kearns, UT
W7SXP, Donald H. Cooper, Mesa, AZ
KB7VY, Donald K. Reichling, Yuma, AZ
W7WBJ, George B. Westenhoefer, Carson City, NV
WB7WRH, Cletis Payne, Spokane, WA
*W8AZI, Donald W. Brown, Morrice, MI
WD8CQL, Roland Shafranek, Garretsville, OH
W8CSD, William E. Roberts, Toronto, OH
W8CVD, Roger G. Bermingham, Birmingham, MI
*K8EAJ, Robert D. Kleinhen, Fostoria, OH
W8FZC, Walter W. Rogers, Cincinnati, OH
WB8IJK, Marvin E. Collins, Redford, MI
K8NHU, Kinley D. Tracy, Shaker Heights, OH
W8NRI, Howard S. Heller, Shaker Heights, OH
WB8TEH, Paul R. Deitrick, New Philadelphia, OH
K8VRM, Stanley H. Byquist, Vaughnsville, OH
W8ZGT, Lillian Kelly, Ann Arbor, MI
W9CLX, Mary Ellen Lung, Fremont, IN
KA9GRK, August J. "Gus" Palmisano, Elmwood Park, IL
W9KNN, Melvin Sykes, Pontiac, IL
K9KPC, Robert Rowings, Danville, IN
KA9LSD, Emanuel J. Neiditch, Berwyn, IL
W9PD, Raymond C. Anderson, Mason, WI
WB9SEU, Robert H. Gisseler, Chicago, IL
*WBØBGV, Gilbert E. Whitten, Fairfield, IA
*KØBN, James S. Clagett, Littleton, CO
KAØCIN, Grover W. Taylor, Gilbert, MN
AJØD, William R. Laitinen, Minnetonka, MN
WDØEIZ, Robert Sandford, Kingman, AZ
WØEN, Bert R. Baumgardner, Omaha, NE
WØGNI, Robert W. Merrill, Mesa, AZ
WØKPN, Arnold L. Kish, Arvada, CO
RØMAL, Ralph T. Kontos, Minneapolis, MN
KAØMBQ, Carl A. Frahn, Minneapolis, MN
KAØRGR, John N. Hanson, Decorah, IA
WBØTMI, Thomas L. Mulick, Omaha, NE
VE3AIU, Fred H. Bisset, Goderich, ON
VE3CXK, George S. Pringle, Windsor, ON
VE3WK, Frank Kelly, London, ON
VE7ALX, Thomas D. Birrell, White Rock, BC
VE7DUZ, Les N. Hawker, New Westminster, BC
VE7FOO, Ray Goulet, Victoria, BC
W5ABY, T. Kenneth Montgomery, Michoacan, Mexico
9Y4NP, Nick Percival, Vancouver, BC

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys are confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from HQ.

Note: All Silent Key reports sent to HQ must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

June 1936

☐ The problem of broadcast interference is becoming more acute with growing public interest in listening to foreign programs on "all-wave" receivers. Even though truth and justice may be on our side because of poor receiver design, Editor Warner urges us to be pleasant and cooperative with neighbors, else public outcry may force regulatory imposition of quiet hours in severe cases.

☐ George Grammer outlines the features of "beam power" tube design, specifically the new 6L6; high electron density at the plate effectively forms an electronic barrier that acts as a suppressor grid—even more efficiently than that in a pentode. W1DF illustrates these features with the design of a 50-watt amplifier-modulator.

☐ W2DIY finds the new tube suitable for relatively high output in a crystal oscillator circuit, getting as much as 35 watts to drive an amplifier. He says leaving the metal tube shell floating, rather than grounded, seems to improve stability as well as power output.

☐ Seeking to reduce the number of (doubler) stages in a typical rig for multiband coverage, W1JPE decided to try feeding out-of-phase energy to the suppressor grid of a pentode oscillator. This modification of the popular Tri-tet circuit provided medium-power output on four bands with only three stages and a single crystal.

☐ League Directors at the annual Board meeting chose veterans Eugene C. Woodruff, W8CMP, and George W. Bailey, W1KH, as president and vice-president, respectively, to fill the deep void from the passing of Messrs. Maxim and Stewart. Another action was to approve plans for a Hq. memorial station with Mr. Maxim's old call sign, W1AW.

☐ Trapped miners as well as Florida and Mississippi tornadoes were the background for more heroic actions by amateurs in providing emergency communications, following epic performances during the Ohio River floods. Kudos for the latter work poured into Hq. from federal and municipal authorities.

☐ TBTOC (Three Band Trans-Oceanic Contact) is now a bit easier to attain with 10 meters well outperforming 80 as the third band.

☐ Unable to rotate his Mims beam antenna mechanically as originally described, W5EOW had a brainstorm—a fan motor mounted on the tower and geared down for slow beam rotation *electrically*. This concept may have possibilities!

☐ Automatic gain control is a highly desirable receiver feature—the r.f. gain is always high for weak-signal reception, yet promptly reduced in the presence of strong/local signals. W1DF shows us how this feature can be added to our own receivers.

25 Years Ago

June 1961

☐ Correspondence to Hq. indicates that well over a hundred amateurs have built W6TC's "HBR-16" receiver design. Ex-4HP used one of the elaborate Eddystone dials for his version, shown on the cover of this issue.

☐ W8TBZ and W8PIL made a study of noise factors affecting v.h.f. communication. In addition to receiver and transmission-line noise, cosmic radiation is a major factor in that portion of the spectrum. The authors provide a table of times of day for each month of the year when this source of interference peaks from different directions.

☐ This year's Board meeting was held in Anaheim, California, the second time in history the sessions convened on the West Coast (San Francisco in 1939). A major action was furthering the work of the Housing Committee in choosing a new location for an expanding Headquarters operation.

☐ Four 811As in parallel produce the maximum legal power in K6SNO's compact linear—Class B, of course, and grounded-grid.

☐ Now to the workshop. W1ICP takes the newcomer by the hand through basic construction techniques, with tips on what tools to get, how to lay out a chassis and good wiring practices. And even the old-timer will find a hint or two in W6RET's extensive dissertation unraveling the infinite variety in size, shape and type of fastening devices—screws and nuts, that is.

☐ A quarter-wavelength of coax cable makes a good weatherproof transformer for matching a coax line to an end-fed antenna. W2JTJ uses it to feed a half-wave beer-can vertical on 20 meters.

☐ When the Coast Guard's training bark *Eagle* heads for a tour of European ports this month, W1CGA/MM on board will add to the extensive use of ham radio as a recreational activity in the "semper paratus" service.

☐ K9ARA's low-pass filter designed for 6-meter operation not only suppresses harmonic TVI but also eliminates spurious signals from a nearby Channel 2 transmitter.

☐ The V.H.F. Sweepstakes looks more like its lower-frequency counterpart every year. More than 1500 logs were submitted, and QSO total records smashed by a number of participants.

☐ The Federal Communications Commission is getting tough on flagrant amateur rules violations. License suspensions are being ordered in cases of running power well over the legal limit, and for the use of obscene or indecent language.

☐ 25 Years Ago noted the (perennial) complaint in 1936 that ham radio was getting much too complicated technically. The Editor added parenthetically, "No doubt the amateur of 1986 will look back on 1961 as the days when the technical side of ham radio was *really* easy to master!"—*W1RW*

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
P.O. Box 177, Warwick, NY 10990

Introducing Japanese Amateur Satellite Number One (JAS-1)

In nature, a sign of a healthy, prosperous species is often proliferation. It's true in Amateur Radio satellites as well. The latest to appear on the scene is JAS-1. The specifications below were provided by Tak Okamoto, N6MBM/JE2PKI, and Harold Price, NK6K.

JAS-1 is a joint effort of many organizations. Besides JARL (Japan Amateur Radio League) and NASDA (Japanese national space agency), the Nippon Electric Company (NEC) built "system" units (space frame, power supply etc). JAMSAT (Japan AMSAT) designed and built the "mission" units (transponders, telemetry/command and housekeeping microcomputer) and ground-support systems.

JAS-1 Mission Objectives:

- Provide reliable worldwide Amateur Radio communications.
- Enable radio amateurs to study tracking and command techniques.
- Offer an in-space "proving ground" for radio amateur developed and built transponders and subsystems.
- Provide NASDA an opportunity to carry out a "multipayload" launch using their new "H-1" launcher. (NASDA has never engaged in a multipayload launch, thus the JAS-1 project will offer NASDA an excellent opportunity by providing them with an active payload having its own telemetry-beacon and transponder for ranging.)

Form and General Dimensions: The spacecraft is a 26-facet polyhedron, which measures 400 mm × 400 mm × 470 mm (15.75 in × 15.75 in × 18.5 in) and weighs 50 kg (110.2 lbs).

Launch and Orbit: JAS-1 will be launched into a circular low-earth orbit, which will be non-sun synchronous and non-polar.

Launch vehicle: H-1 2-stage rocket
Launch number: Test Flight 1
Launch site: Tanegashima Island, Japan
Launch date: August 1986
Estimated inclination: 50 degrees
Estimated altitude: 1500 km
Estimated period: 120 minutes
Estimated window per pass: 20 minutes/pass
Estimated passes per day: 8 passes/day

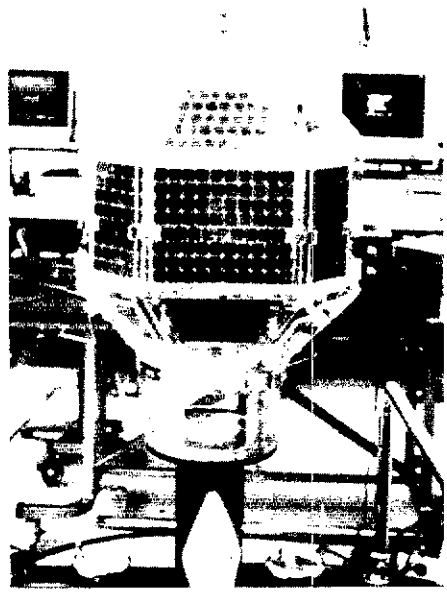
Designed Life: Estimated lifetime is three years.

Special Features of JAS-1: JAS-1 will carry two separate Mode J (2-meter uplink, 70-cm downlink) transponders. One is a linear transponder, and the other is a digital "store-and-forward" transponder mainly for non-real-time communication between stations located in different time zones. The digital transponder will provide "error-free" information exchange.

Transponders:

a) The linear transponder: Mode JA

The passband is 100 kHz wide. The transponder has an output of 1-W PEP. Ground stations will need an uplink power of 100-W EIRP. The sidebands are reversed, ie, the uplink is LSB and the downlink is USB. There



is a 100-mW CW beacon switchable to PSK when needed.

Uplink passband: 145.90 MHz-146.00 MHz.
Downlink passband: 435.80 MHz-435.90 MHz.
Beacon frequency: 435.795 MHz.
Translate frequency: 581.80 MHz.

b) The digital transponder: Mode JD.

There are four 145-MHz-band input channels using Manchester-coded FM for the uplink. Ground stations will need 100-W EIRP. There is one downlink channel in the 435-MHz band using PSK; the output is 1-W RMS.

Channels are:
Uplink channel 1: 145.850 MHz.
Uplink channel 2: 145.870 MHz.
Uplink channel 3: 145.890 MHz.
Uplink channel 4: 145.910 MHz.
Downlink channel: 435.910 MHz.

The data format is HDLC. The protocol is AX.25 Level 2 Version 2. The data transfer rate is 1200 bit/s for both uplink and downlink.

JAS-1 will be a store-and-forward system but not a real-time digipeater. Digipeating is ineffective in low orbit.

JAS-1 has four uplink channels for one downlink channel. This is attributable to the differences in channel efficiency between uplink and downlink. An uplink channel will be shared by several ground users. Since the ground users won't hear each other, the uplinks will be subject to packet collisions. This "Pure ALOHA" system has maximum channel throughput of 18.4%. But the JAS-1 downlink will be 100% efficient since only JAS-1 transmits there. To balance capacity and add redundancy, four uplink channels are used. The combined uplink efficiency will then be 4 × 18.4% or 73.6%. The remaining downlink time will be used for general messages and telemetry data.

Digital Hardware: The microprocessor is a MIL-STD-883B screened NSC-800. It controls the digital transponder and is the IHU (Integrated Housekeeping Unit). The memory is 1.5 megabyte (Mbyte). Forty-eight 256-kbyte NMOS DRAMs are used. A hardware-based error-detection/correction circuit is incorporated to protect the entire 1.5 Mbyte and provide a 1-Mbyte error-free memory area. The system program occupies some 32 kbytes. The rest will be used for message storage.

The memory unit is physically divided into four identical 256-kbyte memory cards, any one of which can be assigned as the system area. Up to three cards can be turned off. This design provides system redundancy and allows command stations to control power consumption without a total loss of service.

JAS-1 has five hardware HDLC controllers: Four of them are for the uplink channels and one is for the downlink channel.

Power System: Twenty-five of JAS-1's 26 faces are covered with a total of 979 solar cells and will initially generate 8.5 W. JAS-1 employs 11 NiCd battery cells with a capacity of 6 Ah. These supply an average 14 V to the JAS-1 main power bus. The 14 V is converted and regulated to +10 V, +5 V and −5 V.

Antenna System: JAS-1 has three antennas.

2-m receive antenna: slant ¼-wave monopole; isotropic; −4 dBi gain 70-cm transmission antenna.

Mode-JA: slant turnstile LHCP +Z axis +3 dBi gain.

Mode-JD: slant turnstile RHCP −Z axis +3 dBi gain.

Attitude Control: Forced shaking using the earth's geomagnetic field. JAS-1 has two 1 TAm^2 permanent magnets in its Z axis.

Telemetry: The analog system telemetry has 12 analog channels and 33 system status flags. The telemetry is sent on the 100-mW beacon on 435.795 MHz in CW, switchable to PSK.

The digital system telemetry has 29 analog channels and 33 system status flags. This software-driven telemetry can be sent in any format and can include short text messages. This telemetry can be sent on either the Mode JD downlink channel (435.910 MHz) or the Mode JA CW beacon (435.795 MHz).

Command: A simple three-channel telecommand system is used for global control functions. An additional 37 channels are available, mainly for controlling the digital transponder. On-board command from the NSC-800 is also available.

Ground Stations:

Mode-JA: A station with a 10-W 2-m SSB transmitter and a 10-dBi beam for uplink will

(continued on page 73)

Coming Conventions

OREGON STATE CONVENTION
June 6-8, Seaside

The Oregon Tualatin Valley ARC and the North Coast Repeater Association are sponsoring the 1986 ARRL Oregon State/Sea-Pac Ham Convention at the Seaside Oregon Convention Center from 5 PM-8 PM Fri, 8 AM-4:30 PM Sat and 9 AM-2 PM Sun. Preregistration is $5 per single ($7 at the door); $2 for teens with a parent; children 12 and under are free. Seminars include antennas, DXpedition, packet, computers, and much more. Several women's programs are offered. The banquet speaker will be Col Gordon Fullerton of NASA. VE testing, a repeater owner/operator forum and other programs will be seen. Talk-in on 52 and 144.85/5.45. For added information or registration, write to Doc McClendon, W7GWC, PO Box 920, Seaside, OR 97132.

WEST VIRGINIA STATE CONVENTION
July 5-6, Weston

The 28th Annual West Virginia State ARRL Convention will be held at the Jackson's Mill 4-H Camp near Weston. This weekend convention features net meeting, DX forum, ARES/RACES meetings, technical forum, MARS meetings, amateur gear auction, flea market, and much more. This year, FCC exams will be offered to the extent that the VE program allows. For information on registration and lodging, write to: WV State Amateur Radio Council, 103 Cleveland Ave, Nitro, WV 25143. For camping information, write to: Chuck McClain, K8UQY, Rte 4, Box 161, Grafton, WV 26354. FCC examination requests, write to: R. E. Robinson, KU8C, Rte 2, Box 302, Fairmont, WV 26554. Send a completed 610 form, SASE, copy of license and a check for $4.25 made payable to ARRL-VEC. Exam requests must be received by June 7, 1986. Enclose an SASE when requesting a blank Form 610. For general information about the convention, contact general chairman Albert H. Hix, W8AH, 860 Alta Rd, Charleston, WV 25314 or call 304-344-1215.

July 5-6
West Virginia State, Weston
July 11-13
Texas State, San Antonio
July 19-20
Southeastern Division, Atlanta, Georgia
August 1-3
West Gulf Division, Oklahoma City, Oklahoma
August 9-10
Delta Division, Shreveport, Louisiana
August 10
Rocky Mountain Division, Denver, Colorado
August 23-24
Roanoke Division, Virginia Beach, Virginia

ARRL NATIONAL CONVENTIONS
September 5-7, 1986—San Diego, California
July 10-12, 1987—Atlanta, Georgia
August 19-21, 1988—Portland, Oregon

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.]

Alberta (Milk River)—Jul 18-20: The 52 Waterton-Glacier International Hamfest will be held at H. Q. Waterton Homestead Campground, just north of Waterton National Park entrance on Hwy 6. Activities include a bunny hunt, technical sessions, entertainment, swap tables. For more information and preregistration, write to PO Box 148, Milk River, AB T0K 1M0, Canada.

Alberta (Red Deer)—Jun 20-22: Central Alberta Radio League Picnic will be held at the Benalto Fairgrounds. Registration fee $15, includes family camping, activities and Sunday breakfast. Sat night beef barbeque $5. Talk-in on 146.52 or 147.00. For information, contact Clarence, VE6BHR, 2 Odstone Green, Red Deer, AB T4N 5J1, Canada.

British Columbia (Maple Ridge)—Jul 12-13: The Maple Ridge ARC is sponsoring their hamfest at St Patricks Center, 22589 121 Ave. Hams $6, nonhams $3, under 12 free. Two hams in family $9. Activities includes commercial displays, flea market, food, and women's and children's programs. Close to shopping and recreation center. Camper space, no hookups. Talk-in on 20/80, 34/94. For more info, contact Bob Haughton, VE7BZH, Box 292, Maple Ridge, BC V2X 7G2, or phone 604-467-4915.

Manitoba (Peace Gardens)—Jul 11-13: Keep this date in mind for your holiday travel. This particular hamfest is getting bigger and better every year with many types of entertainment and flea market. Nominations for "Ham of the Year" must be postmarked before Jun 30 and sent to Dave Snydal, VE4XN, 25 Queens Dr, Brandon, MB R7B 1G1. Also contact Dave for any correspondence. See you there!

†**Colorado (Loveland)—Jun 7-8:** The Northern Colorado ARC is sponsoring their Superfest VIII at the Larimer County Fairgrounds 9 AM-4 PM. Admission $3. Activities include ARRL meeting, VE testing, code-speed contest, best installation for an RV unit, packet seminar, bulletin-board meeting, computer clubs, women's activities, flea market and commercial vendors. Services include snack bar, night security, RV camping with limited facilities. Talk-in on 146.25/85 and 147.195/795. For more information and reservations, contact Clifford Baker, 2623 52nd Ave, Greeley, CO 80634, or call 303-330-3548.

Connecticut (Newington)—Jun 8: The Newington ARL will hold its third annual flea market 9 AM-2 PM at the Newington High School, Willard Ave, Rte 173. All types of new and used ham gear as well as computer equipment will be featured. Admission $2 at the door; tables $10 indoors, $5 for tailgaters (weather permitting). Guided tours of ARRL HQ and Amateur Radio exams will be offered. Talk-in on 52 and on 144.85/145.45 and 223.24/224.84. For exam information or table reservations, contact Les Andrew, KA1KRP, 23 Grove St, West Hartford, CT 06110, or call 203-523-0453. Enclose SASE for reply or confirmation.

Georgia (Rossville)—Jun 7: The Fourth Annual North Georgia Hamfest will be held at the Lakeview Fort Oglethorpe High School. There will be forums, dealers, flea market and VE exams. Donation $1 at the door. Dealers tables $10, flea market inside $6, tailgate $2 per space. Go toward north on I-75, take exit 140 at mile marker 350, turn west on St Rte 2. We are located just 4 miles from Chattanooga. Doors open 8 AM. For more information or reservations, contact John Ross ARC, PO Box 853, Rossville, GA 30741, or call Murel Winans, KA4LMG, 404-867-7739.

Idaho (Twin Falls)—Jun 14-15: The Idaho Society of Radio Amateurs is sponsoring their Swap Meet at the Moose Lodge, 835 Falls Ave from 10 AM-5 PM Sat and 8 AM-12 PM Sun. Free registration at the door. Swap tables downstairs. Talk-in on 16/76. Food available with Sat lunch and Sun breakfast. Two shopping centers in vicinity; motels and restaurants nearby. RV parking available. Packet radio demonstration. ARRL, MARS and ARES. Women's activities also available. For more info, contact the Idaho Society of Radio Amateurs, Magic Valley Chapter, PO Box 294, Twin Falls, ID 83303.

†**Idaho (Rathdrum)—Jun 14:** The Kootenai ARS will sponsor "Hamfest 86" at the Kootenai County Fairgrounds in Coeur D'Alene 8 AM-4 PM. Admission and swap tables are free. Setup at 7:30 AM. Plenty of free parking, and RVs welcome. Food available and exams will be given. Talk-in on 38/98. For tickets or more information, contact Jim Monroe, N7ESU, W 2455 Hidden Valley Rd, Rathdrum, ID 83858, or call 208-687-0136.

Illinois (Granite City)—Jun 8: The Egyptian Radio Club will hold their 57th annual Hamfest at the Egyptian Radio Club clubhouse 8 AM-3 PM. Flea-market spaces available on a first-come basis, with first space free (approx 10 ft). Additional spaces $5. Food and refreshments available. Free parking and shaded rest area also available. Tickets: $1 in advance, $2 each or 3 for $5 at the door. Talk-in on 16/76 or 52. Directions: I-270 to IL Rte 3 South. Turn right at Chain of Rocks Rd and then follow the signs. For more information or advance tickets, please send an SASE to Egyptian Radio Club, PO Box 562, Granite City, IL 62040.

†**Indiana (Crown Point)—Jun 15:** The Lake County ARC will sponsor its 14th annual Father's Day Hamfest at the Lake County Fairgrounds Industrial Building, located just inside the east gate. Free parking. Tables available upon request. General admission $3, with no advance sales. Setup at 6 AM. Hours 8 AM-2 PM. MARS, ARRL, ARES information. Refreshments, including home baked goodies. Overnight accommodations are close by. Talk-in on 84/24 or 52. For further information, write to Bill DeGeer, W9TY, 3601 Tyler St, Gary, IN 46408, or call 219-887-5413 evenings.

†**Indiana (Muncie)—Jun 8:** MAARC is sponsoring their hamfest at the Memorial Building Fairgrounds from 8 AM-3 PM. Advance tickets $2; $3 at the door. For more information, contact Larry Vrooman, WB9DFD, 3513 N Linden, Muncie, IN 47302, or call 317-282-7698.

Kentucky (Louisville)—June 11-14: The Antique Radio Club of America will hold a convention to which all interested people are invited. The Club has about 1000 members who collect and restore antique wireless and radio equipment and who study and record the history of early radio. During this year's convention there will be speakers, tours of radio collections and tours of the Louisville area. As usual, there will be a program for women. Major events will be a massive flea market, where the collectors will be looking to buy or sell sets, parts, tubes and associated literature. There will also be a large auction of similar equipment. The recreational and vacation opportunities in the Louisville area provide endless choices for those family members whose interests do not include old radios. For more information, write to ARCA, 81 Steeplechase Rd, Devon, PA 19333, or call 215-688-2976.

†**Louisiana (New Orleans)—Jun 21-22:** The Jefferson ARC will hold their annual hamfest at the Rummel Catholic High School in Metairie (6 blocks southwest of I-10 and Causeway intersection). Free admission. VE

†ARRL Hamfest

exams Sat, starting at 9 AM. Preregistration preferred. Send Form 610 and a check for $4 payable to Jefferson ARC/VEC, PO Box 73665, Metairie, LA 70033. Limited number of walk-ins available. General inquiries with an SASE to AMACOM-86 at the above address. Phone inquiries to Bill Bushnell, WA5MJM, 504-887-5022. Swap tables, forums and new-equipment dealers. Open-air seafood dinner at the hamfest Sat night. Adults $10; children $5.

Maryland (Frederick)—Jun 15: The Frederick ARC will hold its 9th annual hamfest at the Frederick Fairgrounds 8 AM-4 PM. Admission $3; tailgaters $2 extra. YLs and children free. Gates open for exhibitors 8 PM Jun 14, with overnight security provided. Overnight parking welcomed. Exhibitor tables: $10 for first one; $5 each after. For additional information, write to Jim Kasunic, KA3LPC, 9419 Highlander Ct, Walkersville, MD 21793.

†**Michigan (Chelsea)—Jun 1:** The Chelsea Communications Club is sponsoring their 9th annual Swap 'n Shop at the Chelsea Fairgrounds 8 AM-2 PM. Talk-in on 147.255. Table space $8/8 ft; trunk sale $2/space. Campgrounds in area; plenty of parking with special handicapped parking. Gates open 5 AM for sellers. Donation: $2.50 in advance, $3 at the door. YLs, XYLs and kids under 12 free. Women's tables welcome. Breakfast and lunch available in service center. For more information, write to William Altenberndt, 3132 Timberline, Jackson, MI 49201, or call 517-764-5785.

Michigan (Grand Rapids)—Jun 28: The Independent Repeater Assn is sponsoring the Annual IRA Hamfest 8 AM-4 PM in the 44th St Armory. Admission $3.50. Free tables. Take US 131 south from Grand Rapids to 44th St, then west on 44th St 1 mile. Talk-in on 765/165. For further information and table reservations, call or write to Abe, W8HVG, IRA, 562 92nd St, Byron Center, MI 49315, tel 616-455-3915.

†**Michigan (Monroe)—Jun 8:** The Monroe County Radio Communications Assn is sponsoring their hamfest at the Monroe County Community College. Admission: $2.50 in advance, $3 at the door. For more information, write to Leroy Keck, KA8LAR, 4773 Bluebush Rd, Monroe, MI 48161, tel 313-242-0627.

Michigan (Petoskey)—Jul 12: The Straits Area ARC is sponsoring their Swap and Shop 9 AM-2 PM at the fairgrounds. Talk-in on 52 and 07/67. Free RV parking Fri night (for self-contained RVs) and camping at Magnus Park or Petoskey State Park available. Lunch served 11 AM-1 PM; refreshments also available. Donation $2.50 at the door. Tables 8 ft/$3. Splits allowed. For further information, call 616-347-8693.

Montana (Wolf Point)—Jun 14: The Prairie Radio Club will host the annual Eastern Montana Father's Day Picnic at the Frontier School, 3 miles east of Wolf Point on Hwy 13. Talk-in on 26/86. Electric hookups available. For more info, contact WB7QDN, Box 249, Wolf Point, MT 59201, tel 406-695-2322.

Nebraska (Chadron)—Jun 1: The Pine Ridge ARC will hold its hamfest at Camp Norwesca, 10 miles south of Chadron. Coffee and soft drinks furnished. Please bring a covered dish and your own table service. Activities include games. For more information, write to Jim McCafferty, KØYIY, RR, Whitney, NE 69337.

New Hampshire (Manchester)—Jun 21: Fly in to New Hampshire's second largest Amateur Radio/electronic flea market, to be held at the Manchester Municipal Airport, sponsored by the New Hampshire FM Assn. Rain date is Sun, Jun 22. Starting time 9 AM. Admission $1 per person, sellers $5. Sellers should bring own table, or tailgate. Commercial displays welcome. Talk-in on 52. For further information or preregistration, call Doug Aiken, K1WPM, 603-622-0831, or write to Pete Henriksen, WA1RCF, 123 Woodlawn Cir, Portsmouth, NH 03801, 603-431-5432.

New Jersey (Dunellen)—Jun 21: The Raritan Valley Radio Club will hold its 15th annual hamfest at Columbia Park starting 8 AM. Sellers spots: $5 for one space or $10 for multiple spaces; no tables supplied. Lookers pay $3 donation; spouse and children free. Plenty of food and drinks available. Talk-in on 025/625 and 52. Advance tickets may be purchased from any club member. Further information may be obtained from any club member or by calling Dave, KA2TSM, at 201-763-4849 or Bill, N2AZX, at 201-467-7342 (8 AM-5 PM).

New York (Cortland)—Jun 14: The Skyline ARC is sponsoring the SARC 4th Annual Hamfest and Flea Market. Location is between Syracuse and Binghamton off Interstate 81 at exit 12. Follow signs to the Cortland County Fairgrounds. Hours are 8 AM-5 PM. Admission $3; under 12 free. Inside display tables $5 each (we furnish the tables). Dealers welcome; overnight camping (no hookups); acres of free parking. Food available. Electric power at the indoor flea area. Outside flea-market selling space $1 per car. Talk-in on 145.49, 147.03, 444.000 and 52. For table reservations, send check payable to Skyline ARC, c/o Billy E. Williams, 74 S West St, RD 5, Cortland, NY 13045, or call Bud Jackson, 607-749-3766 (days) or 607-753-3994 (eve). In case of rain, some outdoor flea-market space will be available under pole barn.

†**New York (Blossvale)—Jun 1:** The Rome Radio Club, Inc is sponsoring Ham Family Days at Becks Grove, 8 miles outside of Rome. Opens 9 AM. Dinner at 5 PM. Activities include QRP contest, flea market, tech talks, ARES and RACES, and women's and children's programs. Coffee, lunch and beverages available. Talk-in on 28/88 and 34/94. For information and reservations, contact Rome Radio Club, Box 721, Rome, NY 13440, or call William Effland, 315-853-5700.

†**Pennsylvania (Meadville)—Jul 5:** The Firecracker Hamfest sponsored by the Crawford ARS will be held at the Meadville Recreation Center, just off Rte 27E. Activities include electronics, radios and computers. All indoors; no rainout. One Olympic- and two child-size deluxe swimming pools with lockers and showers and other sports available in Center. Free indoor flea-market space; bring own table. Dealers: free indoor space and table(s) available by preregistration. Reserve early! Admission: $2 adults; children free. Swimming for small extra charge. Talk-in 144.53/145.13. For information, write to CARS HAMFEST-86, PO Box 653, Meadville, PA 16335, or call Ben Ferer, KF3F, 814-724-2432.

†**Pennsylvania (Wrightstown)—Jun 8:** The Warminster ARC is sponsoring their 12th Annual Hamfest at the Middletown Grange Fairgrounds, Penns Park Rd. Gates open 7 AM (vendors at 6 AM). Donation $3 per person; women and children free. Spaces at $5 each, indoors and outdoors. Activities include hamfest, computerfest and ARRL table. Refreshments available. Talk-in on 69/09 and 52. Tables and power available along with unlimited outdoor and tailgate spaces. About 80 indoor spaces, too. For more information, write to Chuck Dunn, 1414 Bradley La, Warminster, PA 18974, tel 215-674-8567.

Washington (Wenatchee)—Jun 14-15: The Apple City RC is sponsoring their hamfest at the Rocky Reach Dam (7 miles north of Wenatchee on Hwy 97). Registration fee: amateurs $5; others $1; under 12 free. Banquet dinner $7 per person. Free camp and trailer space with power available at the park after 2 PM Fri. Talk-in on 07/67 or 146.49. Events include equipment displays, swap shop, ARRL VE license tests, visitors center information booth, fish-viewing room, little theater, films on request, arts and crafts, and snack bar. Banquet Sat 6:30 PM at the Masonic Temple. For motel/dinner reservations, contact any Wenatchee ham, or write to ACRC, 1002 N Surry Rd, Wenatchee, WA 98801.

[*Note:* Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.]

QSL Corner

(continued from page 57)

Alaska: all calls*—Alaska QSL Bureau, 4304 Garfield St, Anchorage, AK 99503.

Guam: AH2, KH2, WH2 and KG6 calls—MARC, Box 445, Agana, GU 96910.

SWL—Mike Witkowski, WDX9JFT, 4206 Nebel St, Stevens Point, WI 54481.

CRRL DX QSL BUREAU SYSTEM

QSL Cards for Canada (VE, VO and VY) may be sent to CRRL Central Incoming QSL Bureau, Box 51, St John, NB E2L 3X1. Or, QSL cards may be sent to the individual CRRL Incoming QSL bureaus.

VE1*—L. J. Fader, VE1FQ, PO Box 663, Halifax, NS B3J 2T3.

VE2—A. G. Daemen, VE2IJ, 2960 Douglas Ave, Montreal, PQ H3R 2E3.

VE3—The Ontario Trilliums, PO Box 157, Downsview, ON M3M 3A3.

VE4*—Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5—B. J. Madsen, VE5FX, 739 Washington Dr, Weyburn, SK S4H 2S4.

VE6*—N. F. Waltho, VE6VW, General Delivery, 9714-94th St, Morinville, AB T0G 1P0.

VE7*—Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8*—Rolf Ziemann, VE8RZ, 2888 Lanky Ct, Yellowknife, NT X1A 2G4.

VO1, VO2—Roland Peddle, VO1BD, PO Box 6, St. John's, NF A1C 5H5.

VY1—QSL Bureau, W. L. Champagne, VY1AU, PO Box 4597, Whitehorse, YT Y1A 2R8.

*These bureaus sell envelopes or postage credits. Send an SASE to the bureau for further information.

Amateur Satellites

(continued from page 71)

suffice. A 70-cm receiver (with low NF) with a 15-dBi beam for downlink should be adequate.

Mode-JD: In addition to the Mode-JA setup, FM mode will be required for the 2-m transmitter.

Since JAS-1 uses the standard AX.25 protocol and 1200-bit/s data rate, ground stations will be able to use a TAPR-style TNC, a 2-m FM transmitter and a 70-cm receiver without modification.

The JAS-1 modem and a special interface board will be made available. [Additional information and a schematic diagram of the JAS-1 modem circuit appear in the *5th Computer Networking Conference* publication (see "Outline of Satellite JAS-1" by Fujio Yamashita, JS1UKR). See page 140, this issue, for ordering information. Ed.] It will contain the Manchester modulator and an audio PSK demodulator, allowing connection to the "modem disconnect" connector of a TAPR-style TNC. The modem also connects to the audio input and PTT of the 2-m FM transmitter and to the audio output and frequency control (option) of a 70-cm SSB receiver. Although JAS-1 will be available to individual access, the general amateur community will benefit from "JAS-1 gateways." Messages relayed through gateways can be sent worldwide and will be as easy as sending messages to distant stations via a WØRLI HF gateway.

Watch for word on the launch of JAS-1 this August on AMSAT nets and on ARRL bulletins from W1AW.[1-3]

[This column will not appear in July and August, but will return in September.—Ed.]

Notes

[1]A list of active AMSAT nets is available from the author for a business-sized SASE.

[2]Information about getting started on OSCAR, the AMSAT Software Exchange and AMSAT membership can be obtained for a business-sized SASE to the author.

[3]Help in getting on OSCAR may be as close as your nearest AMSAT Area Coordinator. For his name and location, call Jack Somers, WA6VGS, at 800-421-6621.

Affiliated Clubs in Action

Conducted By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

MORE GREAT IDEAS FROM KB9UM

Details on Stanley W. Henson's booklet, 14 Ideas for More Radio Club Fun, *were given in the December 1985 column. Here's the fourteenth idea, from the Contests and Activities section.*

Summertime can be a slow time for Amateur Radio with most of us getting outside to enjoy the warm weather and to work on our antennas. In July and August, our club replaces its regular meetings with a family picnic and a hamburger fry, both held in a local park. To add a little fun to the lazy days of summer, an Outrageous Antenna Exhibition was proposed to go along with the picnics.

The Outrageous Antenna Exhibition uses club members' 2-meter hand-held transceivers. When club members go to the summer get-togethers in the park, have them bring along the most outrageous contraption they can build to serve as an antenna for a 2-meter hand-held rig. Anything goes as long as it actually works as an antenna and is portable enough to carry around while making a demonstration QSO via the repeater. Some possible designs might include: a fat vertical dipole made by stacking two empty chamber pots or perhaps a hi-gain dish made from an umbrella and some aluminum foil (see the movie *ET* for design details). Let your imagination run wild, brush up on your antenna tuning skills and get together your contribution to your club's summertime activities.

At their annual dinner meeting in January, the Pymatuning ARC (Greenville, Pennsylvania) honored Larry Smith, W3LNA (right). Club President Darryl Pinney, KA3CQS, presented Larry with a plaque for being an ARRL member for 50 years. Larry, who has been active in Amateur Radio since 1931, spoke on the changes he has seen in Amateur Radio over the years.

The Rocky Point (New York) Schools ARC recently became ARRL affiliated. ARRL President Emeritus Harry Dannals is shown here presenting the ARRL Charter of Affiliation to Andrew Atkin, KA2ITS, the club president. The club meets every Thursday from 2:15 to 3:15 PM, and the members would be glad to work you on the air. *(N2FCZ photo)*

New Special Service Clubs

Becoming a Special Service Club (SSC) is not for every Amateur Radio group. It takes commitment, planning and, mostly, a membership that sets the highest standards for itself. A number of your fellow clubs have recently undertaken the commitment and become SSCs. Here's a rundown of each of these special groups, their city, state and number of members:

Canton ARC, Canton, OH (157)
Jessamine Amateur Wireless Society, Inc., Nicholasville, KY (24)
Mankato Area Radio Club, North Mankato, MN (37)
Miracle Strip ARC, Inc., Panama City Beach, FL (20)
St Charles ARC, St. Charles, MO (56)
Sandusky Valley ARC, Fremont, OH (40)
Santa Fe ARC, Santa Fe, NM (69)

Renewing Special Service Clubs

After completing a year of Special Service, SSCs go through a review process with their respective Affiliated Club Coordinators (ACCs). With successful programs behind them, they plan their next 12 months of activities. Recently renewing SSCs are presented here, each club name followed by the city, state and number of members:

Crystal Radio Club, Valley Cottage, NY (29)
Portsmouth ARC, Portsmouth, VA (58)

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." 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.

Which Question Pool(s) to Use: FCC revises the four written element question pools on a staggered basis, with one of the four pools revised every three months. The 1986 scheduling calendar that the ARRL/VEC will be using for putting into use the question pools revised by FCC is as follows:

Question Pool	*Revised by FCC*	*ARRL/VEC Tests Will Change*	*ARRL/VEC Tests Good Through*
Element 2 (Novice)	Jul 1985	Jan 1, 1986	Dec 31, 1986
Element 3 (Tech/Gen)	Oct 1985	Apr 1, 1986	Mar 31, 1987
Element 4A (Advanced)	Jan 1986	Jul 1, 1986	Jun 30, 1987
Element 4B (Extra)	Apr 1986	Oct 1, 1986	Sep 30, 1987

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 hamfest 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.

How to Become an ARRL-Accredited Volunteer Examiner: Qualified Advanced or Extra Class licensees (see Section 97.31 of the FCC Rules) are invited to notify the ARRL/VEC of their interest in becoming an accredited VE. Send us your name, call sign, license class and full mailing address.

Registering an Upcoming Test Session with the ARRL/VEC: Complete a Test Session Registration Form and submit it to the ARRL/VEC office *at least 30 days in advance of your session. We need four weeks or more advance notice of a session* to serve you in the most cost-effective and accurate way.

Public Service

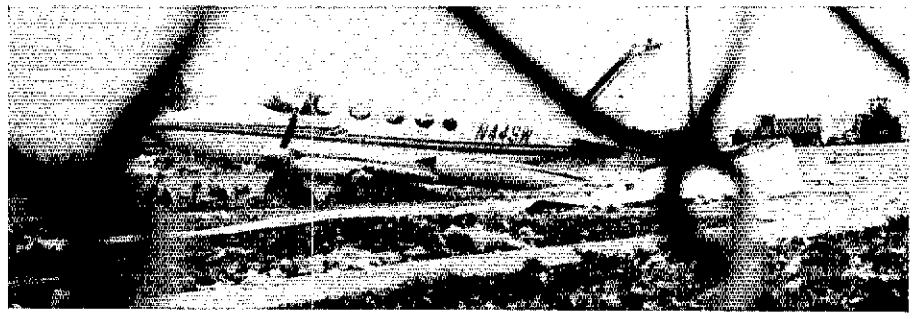
Conducted By Michael R. Riley, KX1B
Public Service Manager, ARRL

March Roars; Northern Kentucky Responds

March 10, 1986, started out as a typical Monday—negotiating rush-hour traffic and wondering how much paperwork would find its way to my in-box during the day. I remember hearing a local radio announcer mentioning the possibility of high winds and property damage later that day. That weather forecast could not have been more accurate. At about 4:15 PM, I remember walking down the hall of our 11th-floor high-rise office building in downtown Cincinnati, and from my vantage point, I could see extremely dark clouds starting to roll in, making their way across the Ohio River, just a mile away. Covington, Kentucky and other areas of northern Kentucky were about to meet the full destructive winds of a tornado!

After leaving the office at the end of my workday, I turned on my auto radio to pass the time while the slowly moving traffic crossed the bridges spanning the Ohio River between Cincinnati and Covington. Only then did I hear the startling news—severe high winds (later to be called tornadoes by community officials) had caused heavy property damage throughout the greater Cincinnati area. I reached for my 2-meter hand-held radio on the seat, dialed up the Northern Kentucky Amateur Radio Club's (NKARC) VHF repeater, hit the on switch and heard N4GNL operating as net control under emergency-net conditions. Also, KI4LA and N4GNL were coordinating when and where amateurs could best be put to use. For the next hour I heard several members of the NKARC reporting to locations throughout northern Kentucky to assist police, fire and city officials with emergency communications. A command post was already on the air at the mayor's office in Covington. This communications link was invaluable, as many Welfare messages were later relayed via Amateur Radio from this office to various law-enforcement officials throughout the community.

Volunteers assist in the cleanup operations following the tornadoes.



Property damage wasn't limited to buildings. This airplane's landing gear collapsed during the high winds at the Greater Cincinnati Airport. *(photos courtesy Boone County, Kentucky, Recorder, Inc)*

All through the night, hams from NKARC as well as other amateurs from the greater Cincinnati area provided communications assistance to several disaster-related agencies. Most of the amateurs were assigned to provide communications for the police who were guarding against looting, as well as local building inspectors and the fire marshall who were ensuring that unsafe buildings were declared condemned and kept unoccupied. Kentucky Governor Martha Lane Collins was helicoptered from Frankfort and assessed the damage with an Amateur Radio operator as a member of her entourage. N4GNL "shadowed" the governor while keeping the command post advised of her whereabouts for security purposes. As the evening progressed, Emergency Coordinator WD4PBF and his assistants set up shop in other affected areas throughout the Boone, Kenton and Campbell tri-county area. These amateurs provided backup communications with the central command post set up at the Covington City Building, among other tasks.

Tornadoes had struck the cities of Covington, Newport and Villa Hills, Kentucky. The Greater Cincinnati Airport located in Boone County also suffered damage; the windows were completely blown out of their 130-foot-tall control tower, and a local aviation company had two hangars and several aircraft destroyed by the whirlwinds. The community of Villa Hills had several houses damaged, and a local radio station lost one of its three towers—it was bent completely in half at the 100-foot level.

Tuesday night was not as hectic as Monday, but the hams kept working. WA4WNF spent several hours at a time as net control throughout the day. Several amateurs took part in this emergency, which proved again that Amateur Radio is a valuable national resource capable of providing emergency communications in a time of need. The following amateurs provided assistance during this emergency: N4GNL, WD4PBF, WA4WNF, KA4RKS, WD4MZV, KI4LA, WD4CEX, WA4YVW, W4OWM, KB4AUF, K4BLC, KB4ANA, WB4ZMK, KI4QG, KJ4EY, WM4T, KA8MOE, KA8MRG, W8IIO, N8FBE AND WD8JAM (I apologize if anyone was inadvertently missed).

The amateurs who took part in this emergency received several letters of thanks from Covington Mayor Thomas Beehan and Boone County Judge Executive Bruce Ferguson, as well as complimentary comments in the local press. Amateurs from the NKARC provided the backbone of communications in the northern Kentucky area. This was only possible because of the club's history of participating in various mock drills held throughout the area. It was through these planned predisaster exercises that the club and its potential benefits to the community were known by various city and county personnel. Without advance planning this job would have been more difficult. The moral: If you are in a club and do not have an emergency communications plan, get one started today! It takes months of work to build up the trust of various officials, but it is well worth it when the times comes. All the amateurs in this area now walk with a greater sense of pride realizing that they assisted in making their community a better place in which to live. Be prepared; it could happen to you!—*John Thernes, WM4T, Assistant Director, Great Lakes Division*

SPOTLIGHT ON SERVICE ...
Toledo's Winterfest 1986

The value of Amateur Radio was proved over the weekend of February 7, 8 and 9, 1986, during Toledo, Ohio's first Winterfest Weekend. More than 1850 people actively took part in 35 different activities. These activities varied from golf and softball in the snow to ice sculpting. Events were held throughout the metropolitan area, and radio amateurs played an important part in coordinating hot-air balloon events, cross-country-skiing demonstrations, classes and races as well as the Triathlon.

The Lucas County Amateur Radio Emergency Service was first contacted to provide Amateur Radio communications for Winterfest. Most of the members of the Lucas County ARES are drawn from the three radio clubs in the Toledo area. Volunteers came from the rosters of the Toledo Radio Amateurs Club, Inc, Greater Toledo Amateur Radio Association, Inc, Toledo Mobile Radio Association, Inc, Lucas County ARES, Inc, and unaffiliated hams from the metro-Toledo area.

Amateur Radio communications at the hot-air ballooning events were coordinated by Steve Warren, WA8RLT. Ballooning is very dependent upon the weather, and in order to fly, wind velocity must be less than 8 to 10 miles per hour. Initial plans were to fly out of Ottawa Park in the center of Toledo since winter-wind directions usually would have favored that spot. The Lucas County ARES van was parked there late Friday afternoon to provide an on-site communications center for all ballooning events.

On Saturday at 7 AM, however, the prevailing wind blew all of those plans out over Lake Erie, and the balloonists decided that landing on the ice was not their idea of a good time. An alternate launch site was chosen. By 8 AM, WA8RLT had his first launch team assembled at the substitute site at the parking lot of the Masonic Auditorium in Southwest Toledo. Steve and the Balloonmeister orchestrated the launches from atop a 60-foot bucket truck. His assistants on this launch were Steve Jackson, WD8QCN, Charlie Oman, WD8DYX, Steve Schwab, WA8MJP, Jeff Raetzke, KA8SNG, Dave Lavec, N8BOY, Mike Weaver, KG8H and Joe McBride, KC8PS. As a bonus, Jim Fenn, N8DST and Dave Prueter, K8NIW, two ballooning hams, also assisted. This was the easiest and most spectacular launch. All the balloons were bunched in one rectangular area. The average hot-air balloon is about 80 feet high and 60 feet wide. That's taller than a six-story building! And they came in a rainbow of colors and designs. It was a breathtaking sight!

None of the hams knew in advance that there would be a lot of noise at the launch site. Hot-air balloons are first cold inflated using gasoline-powered fans. When the balloons are about two-thirds inflated, the pilots ignite their propane burners. The burner shoots an 18-foot flame into the balloon, and those burners and fans are loud. In addition, there was a public-address announcer describing what was happening. It was almost impossible to hear the hand-held radios. But the launch went off without a problem. Afterwards, WA8RLT aptly described the ballooning events as "The Great Mystery Project: We don't know what time it will happen, if it will happen or where it will happen."

Due to continuing wind conditions, the second launch on Saturday was supposed to take place from the Middlegrounds in downtown Toledo. Everyone was so sure of the location that the Lucas County ARES van was moved downtown. Then the wind shifted to the north, thereby blowing out over the lake. With the last-minute wind shift, the officials decided to launch out of Secor Metropark, located about 15 miles west of the Middlegrounds. Event officials just assumed that hams would be there when they were needed.

The Balloonmeister directs the launch from atop the bucket truck with communications assistance from Steve Warren, WA8RLT. Radio amateurs helped ensure a safe, quick launch from the Masonic Auditorium at Toledo's Winterfest '86. *(Jo Taylor photo)*

WA8RLT's second launch team delivered. Participants included Larry Ross, WD8PKI, Mike Gormley, WA8VEC, WD8QCN, KA8SNG, WA8MJP and a father and son duo, Rob, N8GSK and Phil Dale, N8GSL. The team didn't just function as launch assistants. They proved their worth as traffic directors, launch directors, and pushers of stuck cars and trucks.

With 10,000 spectators, Winterfest and Metropark officials were overwhelmed. People were everywhere. Cars were in ditches, and helicopters, hovering at low altitudes, blew snow. The snow made it difficult for balloon-team vehicles, and even emergency trucks and vans were spinning their wheels. Balloons were launched from a meadowland studded with trees and split by a park road. Radio amateurs were hard pressed to keep up with the launch directors as they zigzagged on-the-run across snow-covered fields. In all the chaos and crowd, 50 balloons were safely launched in 17½ minutes. Special commendation belongs to Charlie Verdon, KA8PWP, who drove the 35-foot ARES van out to the park which was no small feat.

Sunday morning was Triathlon time. Most people don't usually think of a triathlon as a winter sport. During the Winterfest, it includes a 5-kilometer (km) skating race, a 5-km run and a 5-km cross-country skiing race. Here's where Mary Verdon, KA8TLM, shone. Although Winterfest planners assured Mary that only two operators would be needed, Mary recruited extra operators. Her team consisted of Carl Fry, W8ZOL, Patti Smith, KA8GVZ, Don Smith, WD8DYN, WD8DYX and KA8PWP. Dallas (Tex) Crider, N8FPH, coordinated communications for the cross-country skiing events that were held in addition to the Triathlon. His events were held on Saturday and Sunday at the Secor Metropark. The team included Paul Davenport, WB8TTQ, Kermit Whitmell, KA8BNQ, Chuck Stammen, N8FVG, Nick Dilorenzo, WB8YEN and WA8VEC. On Sunday, more than 100 cross-country skiers raced for 10 km without a hitch, thanks to Tex and his crew.

The wind and weather continued to play havoc on balloon events on Sunday. Both scheduled morning and afternoon launches were cancelled. Radio amateurs continued to assist throughout the day. Bruce McLaughlin, W8FU, Greg Gentry, N8FZH, Ed Sieler, W8UXU, and Don Sollman, WB8JJU, were also involved in the ham-radio effort. Winterfest 1986 provided Amateur Radio another opportunity to respond to a variety of situations while practicing communications under changing conditions. *—Robert F. Solon, Sr, WD8LKI, PIA, Lucas County, Ohio*

IN SERVICE ...

☐ Palo Alto, CA—Feb 14-18. Heavy rains this week created potential flooding conditions. Radio amateurs were assigned to report rising creek levels and to maintain communication between the local Red Cross chapter headquarters and evacuation shelters and the city's emergency-operations center. Twenty-three radio amateurs volunteered their services during two emergency periods on Feb 14 and Feb 17-18. W6ASH repeater carried the emergency net.—*James Lomasney, WA6NIL, EC, Palo Alto*

☐ Garrard County, KY—Feb 21. A natural-gas line exploded in the early morning hours, destroying two houses, severely injuring six persons and leaving 400 homes without fuel and electricity. State Highway 52 was also blocked.

The Kentucky State Disaster and Emergency Service requested Amateur Radio assistance from DEC KB4FDD, who in turn notified ECs of the eight-county 14th District. KA4ADF and KB4FYE, assisted by KA4ADF and WB4MAV, set up a VHF station at the disaster site and maintained contact with KB4FDD, who was operating from the Emergency Operation Center in nearby Lancaster. WB4MAV also relayed details on the Morning Kentucky Traffic Net.

The 14th District ARES Net was in emergency session during the morning hours while 20 radio amateurs passed priority, welfare and informal messages over the Jessamine Amateur Wireless Society repeater (WB4CWF) in Nicholasville. The ARES net secured at 1 PM after the situation was declared under control. *—Arlon Click, WB4MAV, EC Jessamine County*

Field Organization Reports March 1986

ARRL Section Emergency Coordinator Reports

Thirty-eight SEC reports were received, denoting a total ARES membership of 19,207. Sections reporting were: AB, AZ, BC, CO, EMA, ENY, EPA, GA, IA, ID, KS, LAX, MD, MI, MN, NFL, NLI, NNJ, NTX, NV, OH, OK, ONT, ORG, PAC, SCV, SD, SDG, SFL, SJV, SK, SNJ, VA, WI, WMA, WNY, WPA, WV.

Transcontinental Corps

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	114	91.9	606	1243
TCC Central	83	89.0	324	736
TCC Pacific	115	92.7	534	974
Summary	312	91.2	1464	2953
Cycle Four				
TCC Eastern*	222	89.5	705	1395
TCC Central	58	93.6	415	842
TCC Pacific	119	99.0	659	1248
Summary	399	94.0	1779	3485

*TCC Eastern operates both cycles three and four.

TCC Certificates issued: (Cycle 3) W1CE WA1FCD K1GRP KN1K KA1T W2AET AA4AT N4GHI VE3FAS VE3GSQ. (Cycle 4) W1EFW K1EIR W1ISO KN1K W1QYY KA1T KW1U WA2FJJ W2FR W2GKZ W2RQ N3COY WB3GZU W3PQ KQ3T WA4CCK N4GHI N4KB WB4PNY W4UQ K4ZK W8PMJ AF8V N8XX VE3AWE VE3FAS.

TCC Roster

N1BHH W1CE N1DMU W1EFW K1EIC K1EIR WA1FCD K1GRP W1ISO KN1K KT1Q W1QYY KA1T W1TN KW1U W2AET WA2FJJ W2FR W2GKZ KB2HM N2IC W2RQ N2XJ W2YGW N3COY KK3F WB3GZU W3PQ KQ3T KB3UD AA4AT WA4CCK N4EXQ WD4FTK N4GHI W4JL K4JST WA4JTE N4KB WB4PNY WB4UHC W4UQ K4WJR K4ZK N5AMK N5BB N5BT WB5CIC W5CTZ N5DFO N5DT W5GHP K5GM AJ5K W5KLV KD5KQ K5OAF KD5RC WB5SRX ND5T N5TC W5TFB W5TNT K5TL KS5V KB5W KV5X WB5YDD KU5D K6LL K6UYK W6EOT WF6O W7EP KB7FE W7GHT KR7L KA7MUL K7OVK KF7R W7TGU W7VSE WB8O KA8CPS W8PMJ AF8V N8XX WB8YDZ W9FC KW9J W5JOV W9JUJ WB9UYU NJ0B AD0D KA0EPY K0EZ KJ0G W0HI N0IA KS0U WA0OYI VE3AWE VE3FAS VE3GSQ VE6CHK

National Traffic System

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	991	34.50	.710	94.6	
CAN	31	843	27.19	.570	100.0	
PAN*	62	602	10.03	.502	94.1	
Region Nets						
1RN	62	761	12.27	.470	98.6	100.0
2RN	56	293	5.20	.352	69.4	100.0
3RN	31	323	10.40	.500	98.0	100.0
4RN	62	849	14.00	.494	76.0	100.0
RN5	62	781	12.60	.466	91.0	100.0
RN6	53	198	3.74	.310	100.0	93.5
RN7	62	547	8.80	.361	81.6	95.2
8RN	60	378	6.30	.320	93.0	100.0
9RN						100.0
ECN						
TEN	62	480	7.70	.400	90.0	100.0
TWN	60	180	3.00	.264	100.0	93.5
TCC						
TCC Eastern	114	1395				
TCC Central	83	736				
TCC Pacific	115	974				
Cycle Three						
Area Net						
EAN	31	342	11.40	.692	96.2	
Region Nets						
1RN	31	122	3.94	.280	93.0	100.0
2RN	29	200	6.90	.543	90.3	83.9
3RN	27	27	1.00	.144	75.3	100.0
4RN						93.5
8RN						100.0
ECN						100.0
Cycle Four						
Area Nets						
EAN	31	1387	44.74	1.368	98.4	
CAN	31	1023	33.00	1.060	100.0	
PAN	31	857	27.70	.955	98.4	
Region Nets						
1RN	58	403	6.90	.470	94.5	100.0
2RN	60	296	4.90	.406	88.0	96.8
3RN	60	205	3.42	.329	96.1	96.7
4RN	62	792	12.77	.470	100.0	100.0
RN5	62	728	11.74	.556	84.2	100.0
RN6	62	520	8.40	.730	100.0	100.0
RN7	60	345	5.60	.665	90.8	100.0
8RN	57	343	6.02	.362	91.0	96.8
9RN	62	609	9.82	.571	94.3	100.0
TEN	62	386	6.20	.476	84.1	100.0
ECN	61	200	3.28	.358	76.0	100.0
TWN	62	293	4.72	.334	88.3	100.0
TCC						
TCC Eastern	222	1395				
TCC Central	58	842				
TCC Pacific	119	1248				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.

ARRL Section Traffic Managers reporting: AB, AL, AR, AZ, DE, EMA, EPA, GA, IA, IN, KS, KY, LAX, MD, ME, MI, MN, MO, NC, ND, NFL, NH, NLI, NNJ, NTX, OH, OK, ONT, OR, RI, SB, SC, SFL, SJV, SNJ, STX, TN, UT, VA, WA, WIN, WMA, WNY, WPA, WV, VT.

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 points or more. 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.

213
K5CXP
171
N8EFB
153
KK1A
150
WB5SRX
143
W7LRB
142
N4GHI
138
W6PW
137
K2YQK
136
K4NLK
131
K4SCL
127
KA9FFO
124
WB2EAG
122
WA4QXT
WX4H
121
WB2OWO
119
WF60
WA2FJJ
KB4WT
118
KA0EPY
117
VE4AJE
W4PIM
KW1U
WB1HIH
115
WB1CMQ
114
KB1AF
113
KK3F
KA1ON
W7VSE
112
K4ZK
W2MTA
W9CBE
N4EXQ
KD7ME
111
WA2ERT

W2PKY
WB2VUK
110
KA4TLC
KA8VOZ
W9YCV
AA4AT
KB0Z
KT1Q
WB7WOW
109
WA4PFK
N4KFU
WA4JDH
108
W9JUJ
107
W0IKT
WB1GXZ
106
VE4IX
WB8RFB
NJ8R
NN2H
WB2UVB
104
WF4X
103
K4VWK
WB6DOB
WD8LDY
102
KT5Y
KA2MYJ
WA2JBO
101
N0GCC
W3FA
N6AWH
WD8KQC
AG9G
K4JST
N4KSO
KB5UL
KA2MYJ
KA1ON
100
WA4CCK
WB0TED
99
W4ANK
WD8OUO
N3EMD
98
N7BHL
KA0ARP
WA7VTD
97
N5AMK

WA1FCD
KC2TF
KA1GWE
96
WB0AVW
KJ9J
WA1TBY
WD5GKH
N1DMU
WB8JGW
95
WA6ZUD
W7GHT
K2ZVI
KA8CPS
KD0CL
NO0A
94
WB1CBP
AA4HT
K6UYK
K0SI
W4CKS
93
KC4VK
W0OYH
N1DDC
KA2DQA
AE5I
92
K3JL
WA4EIC
WB2IDS
N9BDL
AJ5K
KA8TNT/T
91
WB2RBA
90
KA0KPY
VE3DPO
W9DM
W6VOM
K8UQY
89
N0BKE
WD0GUF
K6AGD
KA7AID
WA2SPL
88
W4TAH
WB2MCO
87
WA1YNZ
N4PL
WB4RUJ
K5OAF
WB4WII
WD8PAF

W8JMD
86
KA0DQ
K4JUM
KF8J
85
WD4KBW
WB4HXS/T
WB4ADL
N3EGF
KC3Y
WB0WNJ
W6RNL
84
KF4U
KB4OGR
VE3GT
W5CTZ
NF8B
83
W1RWG
ND0N
WA0TFC
WD4NYL
82
KB4OLT
WA4RUE
KA4YEA
KA8SLD
WB4HRR
W0KK
KA1KTH
K8JDI
81
K3RXK
KB7FE
N8AEH
80
WF4Y
W9HBI
79
K2YAI
KA5SPT
78
VE4RO
N0CLS
N8GJO
77
WA6QCA
K4MOG
N6HYM
N1CVE
KI4YV
VE3WM
AC5Z
KQ3T
76
W0FRC
K0ZBJ
KV5X

75
W6INH
AI0O
NJ4L
WD0BOX
KA8KHS
74
WB9PFZ
KB4JPN
AA4MP
KG2D
W7LNE
WD4ALY
W7LNE
73
W4SME
WB6QBZ
K0ERM
N1BGW
WD8RHU
N7BGW
72
WB4TZR
WA6WJZ
K4EV
KA0BCB
NK8B
KS7I
71
W3YVQ
WD6BZQ
W9FZW
K7OVK
NI6A

KN1K
KD8RD
70
K4ZN
W0YMB
ND2S
WA3UNX
69
VE2EDO
W4FMZ
W2ZOJ
KC8UZ
WB7WVD
AE1T
68
KB4LB
KA4FZI
KB4BZA
K6YD
KB1PA
WA4RNP
KR7L
67
K9ZBM
N4JRE
NN4I
WB5YDD
W5KLV
KA1MDM
66
WA4EYU
N2FQP
VE2FMQ

WB8KWC
KF7R
65
K0PCK
KI4MQ
N8AHA
WA8DHB
WD8KBW
N1DHT
64
W3DKX
KA4YHS
KF4FG
63
WA3GYW
KA6HJK
KA4HHE
W2GJ
KA9RII
NT4S
N8FWA
N0DZA
62
K3NNI
WB4DBO
VE3GSQ
KZ3E
W8EK
61
KA4RSC
60
W4UIO
KA4GUS

K4SWN
WA4MNR
AA4GL
K8ND
59
KA8TIK/T
56
N2EVG/T
55
W1YOL/T
52
N4MMM/T
N6FWG/T
47
WA2MGV/T
KA9RNY/T
43
KA2CQX/T
41
KA7RFD/T
40
KB4MHH/T

Brass Pounders League

The BPL is open to all amateurs in the United States, Canada and US possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in the standard ARRL form.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	842	907	1572	81	3402
N0BQP	32	1269	70	781	2151
WD4IIO	605	56	605	56	1322
W3VR	227	419	596	39	1281
WA0HJZ	0	756	30	47	1233
WB9YPY	0	689	53	448	1190
WA4JDH	0	557	496	3	1056
N4PL	15	327	441	33	959
KT1Q	4	468	477	9	958
WD4KBW	432	23	467	4	926
W9JUJ	2	451	446	7	906
W4NVU	403	10	403	0	816
K4EUK	28	326	435	17	806
KW1U	1	427	348	16	792
N4GHI	42	338	335	31	746
K6UYK	116	343	301	5	765
N4GHI	42	338	335	31	746
WX4H	0	368	333	12	713
N4EXQ	23	334	306	48	711
W1PEX	1	237	434	15	687
WF4X	16	348	291	20	675
KA8CPS	11	290	334	36	671
K0RXK	0	321	14	307	642
WA4OXT	71	221	300	26	618
KA7MUL	0	252	305	5	592
WA4PFK	10	321	243	13	587
N1BGW	0	303	269	14	586
N1DMU	2	270	313	0	585
KA9FEZ	---	---	---	---	567
N0GCC	4	300	215	46	565
KA0CZW	31	245	26	250	552
W6INH	23	239	243	19	524
W4TJM	255	11	255	0	521
WB0WNJ	0	245	270	11	521
W8BO	5	222	273	5	505

BPL for 100 or more originations plus deliveries:

K0JAN	142
K5CXP	137
WB2UVB	132
W0FIR	110
KA0TXX	110
KK1A	104

Independent Nets

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	54	314	283
Central Gulf Coast Hurricane Net	31	159	3561
Clearing House Net	31	418	426
Early Bird Net	31	899	403
Empire Slow Speed Net	31	72	473
Golden Bear Amateur Radio Net	31	228	2047
IMRA	26	1033	1788
Midwest RTTY Net	30	27	259
Mission Trail Net	31	125	1017
NYSPTEN	29	53	658
Southwest Traffic Net	31	249	1484
West Coast Slow Speed Net	31	107	472
20ISSBN	28	1592	285
75 Meter Interstate SB Net	31	424	1401
7290 Traffic Net	47	459	2795

Results, 1986 ARRL VHF Sweepstakes

K1JX operating W1VD, Multiop N2SB and Pack Rats Cop Top Honors in January.

By Michael Kaczynski, W1OD and Billy Lunt, KR1R
Contest Manager, ARRL HQ Assistant Contest Manager, ARRL HQ

It's the dreaded "Ides of April" as we reflect on the January VHF Sweepstakes, so it is only fitting that we draw on the Pack Rats' Cheese Bits for our opening inspiration. Therein, Rat Prez WB2RVX suggests that this is our last chance to dream up reasons to deduct last year's radio purchases.

But if you couldn't figure out a way to beat the tax man, perhaps the satisfaction of making many QSOs in the annual VHF SS brawl was justification enough for plunking down your "greenmail" for shiny new radios. Just don't tell H & R Block.

And many QSOs there were! The VHF SS, conducted this year on January 11-12, annually features the club competition—brandishing an appropriate length of 9913 to implore each club member to get on "for the good of the order." No matter the size of the club or where it's located, it works. There's lots of activity—from Shaftsbury, Vermont to Boring, Oregon—as evidenced by the 889 log entries.

Typically, the poor conditions of January are offset by the sheer numbers of contacts available (at least in megalopolis). A check of the score listings shows what even a small to medium-sized club can do to muster activity: Western Massachusetts with 53 entries, Western New York with 103 and Minnesota with 50 total entries. You don't have to be able to speak Minnesot'n (accent on the "so") to recognize that a good club organizational effort can turn this winter VHF activity from dullsville to delight-city—even in the provinces. Methinks there's a lesson in there somewhere to promote future VHF contest participation. If all the 10-watters and handhelds in East Overshoe turn on their radios during the contest, presto, there's activity. The score listings reveal many sections showing a sparsity of entries —fertile ground for future exploitation. VHFers of Toejam, unite! Of course, as the club tabulation indicates, the Mt Airy VHF Radio Club has this down to a science ... Gavel-city, here come the Rats again.

Top Ten

Single Operator		*Multioperator*	
W1VD (K1JX)	231,295	N2SB	426,624
WA3AXV	171,820	WA2OMY	194,266
WB2WIK	142,695	W2SZ/2	148,702
KC2PX	121,605	W1NY	133,548
WA2FGK (K2LNS)	116,718	W1QK	97,216
WB3JYO	93,060	VE3LNX	94,031
N2BJ	86,130	WB2PSI	65,000
K2SMN	85,376	W3KKN	61,600
KA1ZE	80,948	WB3LJK	61,536
K3HP	77,024	W1XX	60,588

Conditions weren't a total wipeout, however, as KA6PYA noted: "Texas on six meters the last 45 minutes of the contest was a delight!" Kent, WA5VJB, did not observe any openings in Texas, but found meteor scatter much to his liking. WA6IJZ thought it was the "best contest from the home QTH in over 10 years." K1ISW "got a real kick out of working WBØISW when 6 meters opened." N4EJW in southern Florida experienced some very good, though short-lived, 50 MHz propagation. NØLL found himself in a '60s time warp working Novice-type calls WNØ and WN5 on 2 meters, while noting good E_s to the East Coast on 6 meters.

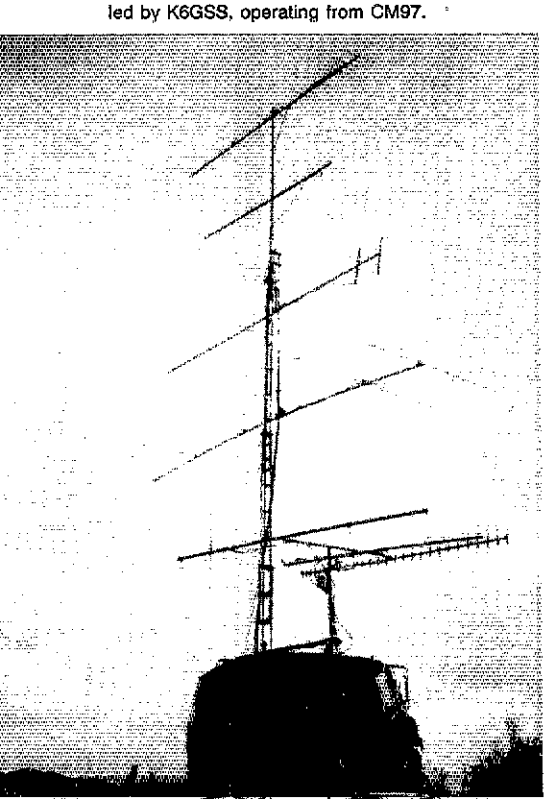
A quantum leap in activity seems to have been achieved on 220 MHz, with WB2IEY noting "it was the first time I needed a dupe sheet for that band." An increased amateur presence on 220 can only bode well for its continued preservation. Any semiserious VHF contester can no longer afford to give away the multipliers and contacts to be made here. Your tax rebate should be just the ticket to put you behind the wheel of a new 220 transverter in time for the June VHF QSO Party. You'll be pleasantly surprised, and your score will be amply rewarded.

Our newest UHF band, "Nine-Oh-Two" is starting to generate some sparks. WB1FKF made his first 902 contact during the contest and is looking for more in June. For AF1T, "902 MHz was the highlight of the contest." Keep your eyes and pocketbooks open for the 902 paraphernalia starting to find its way to the shelves of the VHF emporia. The numbers aren't impressive yet, but this report for the first time includes 902 box scores. What will the numbers look like for June?

Thanks to Data Base Manager II®, let the score listings and an abundance of boxes for the stat freaks do the rest of the talking.

Re certificates: our apologies and thanks to the deserving faithful in 1985 for your patience while awaiting the newly designed sharp certificates. We're back on track now for a July 15 VHF SS mailing. And while we await the June bash with anxious anticipation, we'll wrap this one up with the help of WA6OSX, who summarized the contest this way: "No skip, spent money, no sleep, not funny, no sun, had fun." See y'all in June!—*W1XX*

The Northern California Contest Club effort was led by K6GSS, operating from CM97.



SOAPBOX

Saturday activity was great, but Sunday activity was so bad, I wonder why I bothered to turn the equipment on (K1FO). Propagation to the east was so bad, I had to send my call and grid square in CW using the mic button to answer W1XX in Rhode Island (KA1KOJ). Contest operating is wild at

NKØP used this setup to cop single-op honors in the Rocky Mountain Division in January '86.

Affiliated Club Competition

Club	Score	Number of Entries	Single Op Winner
Unlimited Category			
Mt Airy VHF Radio Club	1,796,383	59	WA3AXV
Medium Category			
Rochester VHF Group (NY)	424,104	48	N2WK
Delaware Valley VHF Society	408,929	17	K3HP
Hampden County Radio Assn	263,089	31	KA1ZE
Suburban ARC	105,892	7	WA3LBI
South Jersey Radio Assn	86,057	17	N2FY
Northern California Contest Club	72,512	4	K6GSS
Warminster ARC	41,855	26	WB3EPU
Mt Tom ARA	33,743	22	WB1HAB
Six Meter Club of Chicago	28,727	22	WD9EXD
Granite State ARA	20,406	11	AC1J
Mobile Sixers RC	8,302	13	AE3J
Rochester (MN) ARC	7,142	47	WØVB
West Jersey Radio Amateurs	2,911	5	KD2JT
Local Category			
S.C.O.R.E.	326,239	6	WB2WIK
Murgas ARC	134,963	7	WA3YON
Steel City ARC	99,240	3	WA3FYJ
Crystal RC	87,577	6	N2BJ
Anne Arundel RC	27,708	3	WA3UJE
Wheaton Community Radio Amateurs	20,109	10	KR9K
Gloucester County ARC	8,038	6	K2JF
TRW ARC	4,246	6	WA6RAY
Penn Wireless Assn	3,487	4	AA3B
Central Michigan ARC	2,534	6	WB8AAX
Huber Heights ARC	1,562	6	N8CCC
Dutchess County VHF Society	1,224	3	W2AWX

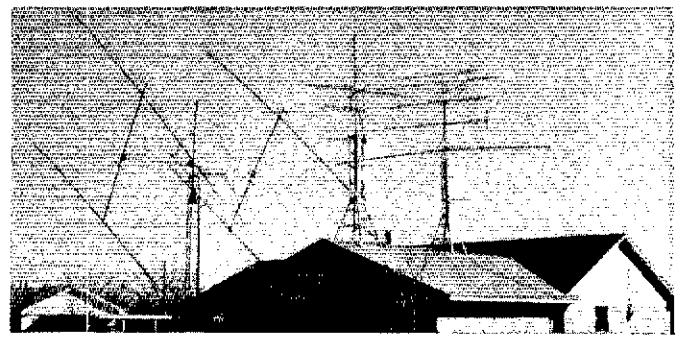
Multiplier Leaders By Band

50 MHz		*220 MHz*		*902 MHz*	
N2CEI	68	W1VD (K1JX)	25	WB1FKF	2
W1VD (K1JX)	60	WB2IEY	21	WB5RFH	2
WA1OUB	59	K2OS	20	AF1T	1
WB2WIK	55	WB2WIK	20	KA3EEO	1
W9OEH	54	WA3AXV	19	W1JR	1
K1TOL	50	WA2TEO	19	WA3YON	1
WA3FYJ	48	VE3BFM	19	WD8ISK	1
KB3QM	46	K4LHB	18	KQ3R*	4
WA4NJP	44	KB8ZW	18	W1XX*	4
WB3JYO	43	WA3FYJ	18	N2SB*	2
N2SB*	74	W2SZ/2*	26	WB2PSI*	2
W2SZ/2*	53	VE3LNX*	22		
WA2OMY*	52	N2SB*	21	*1296 MHz*	
144 MHz		*432 MHz*		KD5RO	11
NJØH	60	NI8O	33	W1VD (K1JX)	10
KA8IFC	57	K1FO	32	K2SMN	10
W2DRZ	57	WA3TTS	28	WA3JUF	10
K2TXB	51	W1VD (K1JX)	27	K2TXB	9
WA8TJL	50	WD8ISK	26	N2BJ	9
KT8W	49	WD5BKV	24	NF2P	9
K1RZ	47	N2WK	23	WA3AXV	9
VE3DDW	47	W9UD	23	WB3ESS	9
W9OEH	46	WA2FGK		WB0DRL*	12
WB3CHS/8	46	(K2LNS)	23	N2SB*	9
WBØDRL*	57	WA3FYJ	23	KE5EP*	8
N2SB*	52	W2SZ/2*	33		
VE3LNX*	46	N2SB*	30		
		VE3LNX*	30		

*Multioperator station

Division Leaders

Single Operator		*Division*	*Multioperator*	
WA3AXV	171,820	Atlantic	N2SB	426,624
VE3BFM	19,765	Canada	VE3LNX	94,031
W9OEH	60,515	Central	WB9MSV	41,623
KØGJX	4,056	Dakota	NOØT	8,926
K5UR	22,310	Delta	WA5OOE	8,128
WD8ISK	43,625	Great Lakes	KU8Y	12,025
WB2WIK	142,659	Hudson	W2SZ/2	148,702
WØRT	16,320	Midwest	WBØDRL	59,079
W1VD (K1JX)	231,295	New England	W1NY	133,548
NF7X	4,264	Northwestern	—	—
K6GSS	44,992	Pacific	WB6WLE	1,792
W3IY/4	65,190	Roanoke	W4BFB	34,112
NKØP	20,160	Rocky Mountain	KDØGT	8,463
WA4NJP	24,346	Southeastern	—	—
W6CPL	16,400	Southwestern	NØKV	45,198
KD5RO	38,622	West Gulf	KE5EP	22,242



WA5VJB maintains a low profile while operating the VHF SS.

Single Operator Call Area Leaders—QSOs Per Band

Call	50 MHz	144 MHz	220 MHz	432 MHz	902 MHz	1296 MHz and up
W1VD (K1JX)	274	543	69	151	—	30
WB2WIK	250	347	79	111	—	28
WA3AXV	174	340	142	141	—	69
W3IY/4	99	172	41	75	—	28
KD5RO	55	126	—	57	—	35
K6GSS	58	295	53	86	—	18
K2DNR	30	39	—	20	—	7
WD8ISK	65	138	22	47	1	1
W9OEH	116	155	23	65	—	2
NKØP	41	99	15	47	—	12
VE3BFM	—	95	38	42	—	9

Multioperator Call Area Leaders—QSOs Per Band

Call	50 MHz	144 MHz	220 MHz	432 MHz	902 MHz	1296 MHz and up
W1NY	231	402	81	141	—	—
N2SB	345	757	168	214	3	70
WA2OMY	203	393	134	141	—	56
W4BFB	80	184	8	24	—	—
KE5EP	46	91	13	47	—	20
NØKV/6	59	142	140	100	—	12
KU8Y	39	146	—	—	—	—
WB9MSV	86	155	12	62	—	—
WBØDRL	112	141	11	40	—	16
VE3LNX	93	286	50	86	—	12

times, and I like the activity (KX1C). The 6-meter amp blew out, the 6-meter VFO quit and the 2-meter Yagi feed line fell off the antenna. Great contest! Lots of fun! (WA2SLY). My first VHF contest (WA2ZNT). Great winter activity. I can't wait for real tropo! (WB2ZSY). Even W1AW was active (KC2CP). My first VHF operation from the new QTH, unfortunately the same old equipment (K4BNC). Multipliers were down but activity surprisingly high (KA2IVS). Glad to see a lot of activity (W2HRW). No snow, rain or icing. Everything ran just the way it was supposed to (WB2KIW). Murphy visited the shack Sunday afternoon and decided I did not need the power supply for the 6- and 2-meter amps (N3BBI). I enjoyed the chance to polish my rusty contest skills; it's been almost 10 years since I submitted a score (WA3ELQ). It was fun. Hope to do it again (KA3OKO). First contest! Enjoyed it very much (N3EQC). Conditions appeared better than normal although I missed most of the good stuff (W3ZZ). Bands were rather dead, but kW output does make up the difference (W3AUN). Already looking forward to the June contest (WA3FYJ). It was funny, more QRN on the horizontal beam than on the vertical (WB3EUM). Six meters was terrible! (KA4BLN). Oh well, there is always June (WB4NXY). I was on 2304 but nobody to exchange with (W4ODW). Operating from central Florida was quite a change this year from the 6-foot snow drifts in West Virginia last year (N8FCJ/4). All I can say is that I gave it a try! (W1WLE/4). Absolutely horrible conditions (K5UR). Lots of QSB and weak signals (K5YY). See y'all in June (WD5BJT). No openings, but the meteor scatter sure seemed good! (WA5VJB). Lots of noise, bad conditions, bah humbug, etc (AB5T). Did N5HHS ever sleep? (KC5GB). Where were all the 6-meter people? (KA6ZVP). Line noise horrendous. Conditions only fair. Not enough participation. (K6CH). Great contest! (WF6J). Nice to see the usual contesters come out of the woodwork and see a few new ones, too! (WA7ECY). Best DX in any contest so far! (WB7ATP). Good weather brought out several grid hoppers, really helped the score (WA7KYM). Great fun! I picked up a few new grid squares (K8NWD). Lots of activity, but I had bad line noise (NE8I). No tropo on 6 meters, E nothing! (WA8TJL). I haven't been in a VHF contest in 17 years; it was fun! (WA8SAJ). Poor conditions during days, picking up at night made for a rather slow contest. Heard a W2 only once on 2 meters. Really wore out the rotor! (WD9IJX). If these are winter conditions, I can't wait for summer conditions (KU9L). FB contest! (N9DUW). First contest. Guess the bug has bitten me! (K9GVN). Jan 12 was my birthday, and I couldn't think of

a better way to celebrate it (N9EOM). Where did everybody go on Sunday? (N9FIB). Contesting is alive and well in the Rocky Mountains. More activity this year than last (NKØP). What a great bunch of operators! (WAØDCB). The 6-meter E_s to the East Coast was a highlight (NØLL). Wish we could get more people interested (KØTS). Slow going this year (KCØRV). Lots of fun (KAØPIC). Bought new rig just to get in this contest! (NJØC). The bands were very good to us this year. We set some new highs for QSOs. It must be the weather that kept everyone inside (VE3LNX).

Scores

Call, score, QSOs, multipliers, bands operated (A = 50 MHz; B = 144 MHz; C = 220 MHz; D = 432 MHz; 9 = 902 MHz; E = 1296 MHz; F = 2.3 GHz; G = 3.4 GHz; H = 5.7 GHz; I = 10 GHz; J = 24 GHz; K = 48 GHz; L = light).

1

Connecticut

W1VD (K1JX, opr) 231,296- 106/4- 167-ABCDEIJ
KA1ZE 80,948- 662- 38-ABCD
WA1STO 74,938- 667- 89-ABCDEIJ
KA1BXB 23,140- 381- 62-ABD
AB1U 16,497- 267- 47-ABCD
K1FO 14,454- 226- 32-D
K1GX 8,242- 317- 26-B
WA1HYN 7,540- 141- 28-BD
K1ZJH 4,800- 240- 20-B
W1WHL 3,400- 136- 25-A
K1ZKR 3,168- 144- 22-AB
WA1ZNT 2,972- 137- 21-AB
W1FAJ 2,432- 46- 19-CD
KB1U 2,380- 108- 20-BD
K1EM 1,584- 88- 18-AB
WB1AAG 848- 48- 16-ABCD
K0IR 595- 117- 5-B
KA1MZC 470- 94- 5-BD
K1WVX 141- 47- 3-B
WA1GTP 120- 20- 6-B
K1KI 75- 15- 5-B
KA1KQJ 36- 3- 4-BC
KM1P 28- 14- 2-B
W1GK (+K1EFI, KA1ECL, N1ABY, WA1WXV, KF6AJ/1) 97,216- 765- 98-ABCDE
W1CGA (WD4ELG, NU0L, oprs) 505- 55- 11-B

Eastern Massachusetts

W1JR 24,662- 265- 59-ABCD9E
K1KG 17,437- 265- 53-ABCDE
WA1JOF 16,575- 217- 51-ABCDE
K1SRL 10,212- 209- 37-ABCD
W1GXT 9,621- 158- 37-ABCDE
WB1FKI 6,226- 135- 34-ABCD9E
K1TO 5,778- 92- 32-ABCD
KB1KM 3,724- 73- 19-ABD
K1VZ 3,166- 116- 18-ABCDE
KX1C 3,322- 129- 22-ABD
AJ1E 3,096- 102- 18-BDE
KA1SU 3,050- 114- 25-ABCD
K1GVM 2,415- 65- 21-ABDE
W1YN 2,286- 127- 18-B
KA1HVG 1,400- 100- 14-B
W1IS 1,300- 100- 13-B
K1CHY 949- 61- 13-ABCD
N1CPK 730- 73- 10-A
N1BZF 504- 46- 11-A
W1FM 430- 29- 10-ABD
NB1B 160- 32- 5-B
WA1OSJ 125- 25- 5-A
W1XV 12- 3- 3-ABC
WA1MZC (+K1KFC, KV1E, N1BRM) 15,795- 275- 48-ABCD
W1XM (N1s CPK, DAM, DFM, DPU, W1GSL, N2CUV, N8GSZ, oprs) 5,750- 148- 25-ABCDE

Maine

W3HQT 10,282- 148- 53-ABCDE
K1TOL 6,300- 126- 50-A
WA1TRE 3,960- 105- 33-ABD
K1RSA 1,702- 74- 23-AB
K1GPJ 90- 15- 6-A

New Hampshire

WA1OUB 43,864- 462- 91-AB
AF1T 13,377- 187- 49-ABCD9EI
AC1J 12,685- 236- 43-ABCD
W1ENE 3,570- 170- 21-B
K1TR 1,652- 118- 14-B
W1USM 1,050- 68- 14-BD
KA1CDZ 1,003- 55- 17-ABCD
WA1RWP 621- 69- 9-BC
N1DNV 270- 45- 6-B
WH1AA7 144- 24- 6-A
N1DNC 140- 28- 5-B
WA1TDA 108- 18- 6-B
W1BDC 60- 12- 5-AB
KA1JDJ 24- 8- 3-B
KA1NEK 16- 8- 2-B
KA1CYG 10- 5- 2-B
KB1NX 6- 3- 2-B
KA1GOY 4- 2- 2-B

Rhode Island

K1DS 2,415- 115- 21-AB
kb5sb/1 1,110- 74- 15-B
W1XX (+N1CNV, WB1ONL, KB9NM) 60,588- 587- 81-ABCD9EI

Vermont

W1AIM 2,937- 80- 33-ABCD
KA2MSM 854- 61- 14-B
WA1TBV 686- 49- 14-A
WA1WIF 434- 31- 14-A

Western Massachusetts

W1GGI 44,616- 403- 76-ABCDE
W1RIL 29,479- 408- 48-BDE
WA1MBA 16,146- 302- 39-BDE
NC1B 10,290- 323- 30-ABD
K1ISW 9,030- 202- 35-ABCD
WB1HAB 7,770- 195- 35-ABD
KA1KPH 5,700- 208- 25-ABD
KA1KRJ 5,676- 258- 22-B
K1BE 5,018- 174- 28-ABD
KA1BLV 3,278- 134- 22-ABC
W1CJK 2,628- 126- 18-BCD
W1JP 2,544- 173- 24-AB
WA3EEC 2,000- 125- 16-AB
NA1W 1,911- 147- 13-B
K1KNQ 1,638- 87- 14-BD
NA1X 950- 95- 10-B
WB1HJP 946- 82- 11-ABCD
W1NMQ 912- 53- 16-ARC
WA1JUJ 810- 72- 10-BD
WA1CCK 806- 89- 7-BCD
W1GWX 714- 75- 7-BCD
K1YOU 696- 49- 12-BC
WA1HFF 657- 67- 9-BD
KA1CRX 648- 72- 9-AB
WB1EMG 630- 74- 7-BC
WB1GLZ 630- 70- 9-AB
K1JDI 564- 94- 6-B
N1ABJ 534- 89- 6-BC
KB1JW 515- 103- 5-B
KA1MPS 492- 69- 6-ABCD
WB1DBY 480- 71- 6-BC
N1DOP 460- 85- 6-BC
KA1MEY 320- 80- 4-B
K1MAL 320- 80- 4-B
WB1DLH 292- 73- 4-B
NA1V 264- 88- 3-B
KB1MU 249- 83- 3-B
KB1TH 207- 69- 3-B
AC1T 204- 43- 4-BD
KB1AZ 195- 65- 3-B
KX1F 176- 44- 4-BC
KA1MPA 156- 52- 3-B
KA1JDY 138- 46- 3-B
N1CDR 102- 51- 2-B
W1VNE 86- 43- 2-B
WA1EYF 84- 42- 2-B
KA1LXT 62- 31- 2-B
KA1CQL 56- 28- 2-B
N1CQT 34- 17- 2-B
N1AEH 30- 15- 2-B
W1NY (AC1T, K1DH, KA1KBN, N1DPM, NC1I, W1KK, WA1UQC, oprs) 133,548- 855- 124-ABCD
WB1ETS (+N1AEH) 1,547- 105- 13-ABCD
W1ALL (+KA1MYW) 210- 42- 5-B

2

Eastern New York

N2BJ 86,130- 566- 90-ABCDE
WA2TEO 76,000- 612- 100-ABCDEF
WA2TIF 23,320- 343- 53-BD
WA2ALV 1,760- 84- 20-ABD
KA2JUV 1,634- 86- 19-B
KD2IX 1,034- 94- 11-B
N2EK 980- 70- 14-B
NB2R 962- 74- 13-B
WB2JVY 900- 55- 12-BD
W2KHQ 696- 64- 11-B
WA2WX 680- 37- 16-ABCDE
W2AWF 612- 51- 12-B
WB2IKA 336- 42- 8-B
KU2Q 220- 32- 10-AB
AB2J 264- 33- 8-B
WA2RUW 110- 11- 5-C
AB2I 60- 15- 5-B
WA2MEE 76- 19- 4-B
K2GIB 75- 14- 5 BD
WB2NEC 60- 15- 4-B
K5NA 24- 6- 4-AB
W2S7/# (KA1D2V, NC1J, K2s TR, UF, N2BNY, W1ARQ, WA2AAU, WB2KMY, AK4L, oprs) 148,702- 817-149-ABCD

New York City and Long Island

K2GVS 6,426- 150- 34-ABD
WA2SLY 5,964- 206- 29-B
WB2ALW 880- 43- 16-ABCDE
WA2ZST 870- 87- 10-B
WB2ZSY 455- 65- 7-B
AC2P 440- 44- 10-B

Northern New Jersey

WB2WIK 142,658- 815-131-ABCDE
KC2PX 121,806- 773-121-ABCDE
WA2FGK (K2LNS,opr) 116,718- 812- 98-ABCDEF
KT2B 24,766- 290- 56-ABCDE
WA2VUN 23,940- 309- 60-ABCDE
N2CEI 21,692- 319- 68-A
WB2OQQ 15,300- 425- 36-B
KC2TJ 13,780- 234- 53-ABD
NJ2R 11,514- 270- 38-BD
WB2ONA 4,114- 140- 22-BDE
K4BNC 3,926- 151- 26-AB
KC2TS 3,502- 206- 17-B
N2EOC 2,784- 67- 16-C
KA2VVS 2,100- 150- 14-B
AN2F 1,755- 135- 13-B
WB2BPY 1,440- 96- 15-AB
N2DXP 549- 73- 13-A
KD2JT 312- 39- 8-B
WA2UDT 264- 33- 8-B
N2WM (+WA3WUJ0I) 39,516- 438- 74-ABCD
K2BJG (+WB2RFB) 28,592- 292- 64-ABCDE
W2GDV (KA2TKH, W2KR, oprs) 225- 25- 9-B

Southern New Jersey

K2SMN 85,376- 648- 92-ABCDE
K2TXB 56,945- 630- 67-BCDE
N2AHN 47,520- 500- 80-ABD
W2EIF 41,477- 436- 59-ABCDE
WB2YEH 36,554- 426- 49-ABCDEF
N3GYS 31,142- 505- 46-ABCDE
N2FY 26,166- 396- 48-ABCD
KA2IKI 26,040- 289- 60-ABCDE
W2HRW 24,738- 378- 62-ABCD
KS2T 21,369- 343- 51-ABCD
W2PAU 18,450- 358- 46-ABD
WA2GTJ 18,396- 404- 36-ABCD
W2BV 8,800- 200- 44-AB
KP2AL 8,250- 250- 33-B
WB2VLA 7,826- 223- 26-ABCD
W2EA 7,657- 247- 31-AB
KA2HWA 6,371- 234- 23-ABD
W2EKB 5,082- 201- 22-ABCD
WB2DGJ 4,029- 201- 17-BD
NF2P 3,520- 66- 11-EF
WA2WJL 3,060- 240- 14-B
N2RF 3,120- 208- 15-B
KX2W 2,944- 128- 23-AB
K2JF 2,730- 130- 17-BCD
KB2GW 2,145- 104- 15-BC
N2FJM 1,469- 104- 13-ABC
W2FGY 1,242- 138- 9-B
W2BLV 1,240- 62- 20-B
WB2ODD 1,008- 84- 12-AB
WB2EYX 871- 67- 13-B
N2FET 846- 47- 9-D
KA2VAD 748- 68- 11-B
W2GGB 676- 136- 4-BC
WB2DKB 540- 27- 5-BCD
K2KMO 472- 100- 4-BC
WA2RCB 368- 184- 2-B
N2FIZ 294- 42- 7-B
K2LOO 200- 100- 2-B
KM2C 172- 86- 2-B
WB2EFL 161- 23- 7-AB
WB2ERI 142- 71- 2-B
N2EWX 132- 66- 2-B
KA2DGF 128- 32- 2-C
KA2KFO 98- 49- 2-B
N2DJY 98- 49- 2-B
N2EWW 84- 42- 2-B
WB2YZS 33- 10- 3-BC
N2AWC 32- 16- 2-B
N2GB (+WA2VYA, WB2s NPE, RVX, YHA KM3T, WB8ZAR) 426,624-1557-192-ABCD9EFI
K2AA (WA2s IMJ, ONM, RCB, WB2QNH, oprs) 9,840- 279- 30-ABD
WA2NPL (+KA2DGF, N2FHL, WA2RUG) 5,280- 220- 16-ABCD
WA2HHJ (+N2ERI) 2,350- 94- 25-AB

Western New York

N2WK 72,921- 501-109-ABCDE
W2DRZ 50,924- 386-116-ABCD
K2OS 38,532- 405- 78-ABCDE
K2YCO 32,782- 350- 74-ABCDE
K2AN 28,676- 360- 67-ABCD
WB2KIW 19,350- 320- 50-ABD
W2PGC 18,340- 197- 70-ABCDE
KC2GZ 10,998- 277- 39-ABD
WA2BPE 10,759- 203- 53-AB
KW2T 10,101- 243- 37-ABDG
WA2ZNC 9,951- 280- 31-ABCD
WA2LAO 9,472- 268- 32-ABCD
WB2ELB 8,738- 240- 34-ABC
WA2MSA 7,672- 249- 28-ABD
NM2J 6,696- 207- 28-ABCD
W2UAD 6,322- 218- 29-B
KA2ENE 6,302- 244- 23-ABD
KA2DOA 6,187- 239- 23-ABD
AF2K 5,313- 259- 21-AB
W2VO 4,961- 121- 41-AB
KS2Z 4,574- 160- 6-BD
WA2YTM 4,455- 99- 35-ABCFG
KA2MRP 4,439- 149- 23-BCD
NA2A 4,344- 112- 32-BD
WB2MKN 3,875- 130- 25-ABCD
KB2ES/2 3,570- 105- 25-ABD
WB2JFL 3,298- 194- 17-AB
W2ERF 2,940- 196- 15-AB
KJ2Q 2,750- 120- 23-B
W2VVG 2,448- 133- 18-AB
WA2MYG 2,338- 146- 14-BCD
W2WGL 2,322- 86- 27-B
W2EOW 2,244- 187- 12-AB
K2GMZ 2,232- 93- 12-AB
WB2IEY 2,142- 51- 21-C
W2SNI 1,776- 147- 12-ABD
W2AV 1,650- 75- 22-B
KC2JO 1,600- 51- 25-ABCD
KA2KDA 1,562- 135- 11-BCD
WB2USB 1,530- 101- 15-BD
WA2EKJ 1,309- 187- 7-B
K2JA 1,290- 129- 10-AB
KX2J 1,288- 139- 8-ABCD
WA2YPT 1,280- 128- 10-AB
NM2V 1,074- 179- 6-B
WA2UBD 1,071- 142- 7-ABD
N2F6N 1,064- 142- 7-ABD
K2GXT (N2TW, opr) 1,020- 102- 10-AB
WB2WBT 1,020- 51- 20-AB
K2MP 962- 72- 13-ABD
KC2AW 891- 99- 9-AB
W2SRP 832- 64- 13-B
WA2URE 786- 131- 6-AB
N2TW 736- 92- 8-AB
W2SNF 702- 101- 6-BD
KA2VCW 700- 140- 5-B
W2SAW 693- 99- 7-B
KD2KQ 692- 173- 4-B
W2DHV 605- 121- 5-AB
KA2QNT 588- 147- 4-B
N2EZS 574- 78- 7-BCD
N2JC 574- 82- 7-B
KA2AIC 572- 143- 4-B
W2PHT 550- 110- 5-B
WB2FBP 528- 48- 11-B
KB2CM 520- 104- 5-B
K2WW 512- 128- 4-B
KA2FHN 505- 101- 5-B
KA2EFC 496- 62- 8-B
KA2JRK 485- 89- 5-BD
K2QR 468- 18- 13-CD
KA2VYW 396- 36- 11-B
KA2J 384- 96- 4-B
WD4SGU 380- 95- 4-B
W2YGW 340- 68- 5-B
KA2VZH 332- 83- 4-B
WB2UIH 308- 77- 4-B
KB2UIW 297- 99- 3-B
NK2M 295- 59- 5-BC
WA2ENW 291- 97- 3-B
N2CSY 280- 70- 4-B
WB2FRG 272- 68- 4-B
KC2NU 264- 88- 3-B
KA2OMX 260- 63- 4-BC
N2AL 256- 64- 4-B
KA2NME 228- 57- 4-B
W2IOF 200- 50- 4-B
AB2F 180- 45- 4-B
K2AED 180- 60- 3-B
KA2HYY 171- 19- 9-B
N2EYL 165- 31- 5-BD
N3CKH 150- 50- 3-B
K2PEY 75- 25- 3-B
NF2Z 58- 58- 1-B
KA2YBX 48- 24- 2-B
K2OEQ 44- 11- 2-D
WB2PSI (N2s AJK, AJX, AJY, W2AV, WA2s YMS, ZKD, ZON, WB2s KAO, QCU, WA3VRE, W6VU, oprs) 65,000- 489-100-ABCD9E
K2SPO (+KC2NG, KG2F, W2EK) 22,736- 334- 58-ABCD
W2RCX (NA2O, WB2ODH, oprs) 18,040- 307- 55-ABD
KE2T (+KC2OW, N2CMF, WB2SUN) 2,093- 146- 13-ABCD
K2JO (K1JUL, KA2s NME, PJN, VZH, WNF, YMZ, N2FTO, oprs) 1,768- 185- 6-BD
WA2AAZ (KA2s JGV, LXM, WA2SOK, oprs) 270- 27- 10-B

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Delaware

KB3QM 56,680- 402-104-ABCDE
AG3T 3,829- 149- 19-BCD
KA3KHZ 3,297- 157- 21-B
KA3B 3,288- 137- 24-A

Eastern Pennsylvania

WA3AXV 171,820- 866-121-ABCDEF
WB3JYO 93,060- 641- 99-ABCDEF
K3HP 77,024- 635- 83-ABCDE
WA3NUF 76,080- 541- 80-ABCDEF
WA3LBI 55,388- 567- 61-BCDEF
AK3O 47,880- 518- 56-ABCDEF
N3BBI 45,948- 426- 84-ABDE
WA3NWL 43,065- 502- 55-ABCDE
K3LOM 35,072- 488- 64-ABC
K3IUV 32,016- 452- 46-ABCDE
WA3YON 29,565- 271- 61-ABCD9EF
WA3JUF 29,295- 312- 45-BCDEF
N3CX 27,176- 302- 43-BCDEF
W3HFY 26,520- 311- 60-ABCDE
K3AOR 24,336- 399- 52-ABC
W3IIT 24,295- 422- 43-ABCD
N3EAX 24,244- 285- 78-ABD
WB3IGR 20,748- 410- 38-ABCD
KB3IB 20,253- 369- 43-ABCD
WB3ESS 19,737- 181- 43-BCDEF
K3UZ 17,945- 364- 37-ABCD
WR3LNZ 17,672- 107- 47-ABD
W3CL 17,490- 358- 33-ABCD
K3BPP 15,360- 268- 30-ABCDEF
WB3ONI 14,880- 163- 31-BCDE
N3AOG 13,650- 287- 30-BCDE
N3ADC 13,028- 295- 39-ABD
K3ESJ 11,975- 358- 24-BCD
WB3EPU 11,451- 298- 33-BC
WA3AQA 10,750- 306- 25-ABCD
K3DMA 10,055- 318- 24-ABCD
KU3A 9,006- 209- 38-ABCD
KB1ZS 8,796- 271- 28-BD
WA3IWT 8,225- 189- 25-ABCDE
W3CJU 8,210- 214- 22-ABCD
W3NSI 6,612- 224- 19-BCD
WB3FKQ 6,164- 123- 31-ABCDE
KA3EEO 6,116- 115- 44-ABCD9E
K3EBZ 5,768- 208- 28-AB
KA3FBP 5,453- 198- 19-BCD
W3RSJ/3 4,818- 122- 27-BDE
WB3LGO 4,767- 197- 21-BC
W3GXB 4,600- 201- 20-BC
K3MXM 4,539- 221- 17-ABC
K3VYG 3,750- 185- 16-ABC
W3CXU 3,296- 110- 16-ABCDE
WA3ETR 2,640- 80- 33-AB
AF3U 2,430- 135- 18-AB
K3LYB 2,353- 131- 17-AC
AA3B 2,316- 193- 12-B
W3HK 2,175- 103- 15-ABCD
K3GAS 2,123- 128- 11-ABCDE
W3BRW 2,100- 150- 14-AB
WA3EYD 2,002- 123- 14-ABC
WA3YDZ 1,792- 93- 14-BD
N3CJH 1,703- 101- 13-BCD
KA3OAK 1,602- 89- 18-B
K3EPB 1,590- 129- 10-ABC
WA3LYF 1,540- 166- 7-BC
K3PHY 1,508- 201- 6-BC
K3RTU 1,495- 108- 13-ABC
KB3QI 1,449- 87- 24-ABC
K3KEL 1,392- 58- 24-AB
WA3JMM 1,232- 119- 7-ABC
WI2AA 1,206- 134- 9-B
K3VIT 1,179- 84- 9-BCD
N3CFE 1,170- 81- 9-BDE
N3AHP 936- 93- 8-ABC
KY3T 920- 160- 5-BD
WB3HHO 816- 152- 4-BC
W3GJC 696- 150- 4-BC
K3ZIG 764- 146- 4-BC
W3AWA 624- 76- 8-ABC
WA3IMT 584- 73- 8-AB
WA3HIT 552- 94- 4-BC
KA1MDA/3 550- 48- 11-BC
KA3LIN 468- 163- 3-B
WB3LIR 420- 60- 7-AB
WA3TOJ 400- 100- 4-B
W3AJF 395- 54- 5-BC
W1GGM 319- 29- 11-B
WA3ELQ 315- 50- 5-BC
KC3OG 288- 48- 3-C
WA3IAC 272- 68- 4-BC
K3KT 268- 67- 4-B
KA3LIM 252- 131- 2-B
KC3LE 217- 54- 4-AB
K3DLS 208- 52- 2-C
N3EJS 206- 103- 2-B
KA3OKO 200- 100- 2-B
N2AJJ 198- 99- 2-B
N3EQC 140- 70- 2-B
W3MXN 132- 66- 2-B
WA3VFM 124- 62- 2-B
N3BPJ 108- 54- 2-B
KA3BBU 100- 50- 2-B
N3DKD 100- 50- 2-B
N3EQB 98- 49- 2-B
KA3OFF 82- 41- 2-B
KB3GL 78- 39- 2-B
N3ELQ 70- 35- 2-B
KC3IE 69- 21- 3-BC
KA3BET 36- 9- 4-B
KA4IXQ 32- 32- 1-B
KA3MGB 27- 9- 3-B
WB3ISF 16- 5- 2-B
WA3NAO 6- 3- 2-AB
WA3UNF 5- 5- 1-A
WA3GMY (+AA2Z) 114,286- W2/1-137-ABCDEF
W3KKN (+W3CXU) 61,600- 593- 70-ABCDE
WA3YUE (+K2EVW) 52,063- 593- 69-ABCDE
KU3H (+KJ3Y, WB3FYT) 50,875- 405- 91-ABCD9EFI
KA3HTY (+KA2TIB, N3DFV) 53,198- 621- 67-ABCD

WB3EAA (+K3MKZ, WB3CAI)
29,784- 343- 68-ABCDE
K3JFL (+ oprs)
28,220- 361- 68-ABD
KB3HF (+KB3NO)
25,400- 410- 50-ABCD
WJ3CCX (K3ss EOD HW DLS, WA3FUF, WB3CTP, oprs)
13,369- 386- 29-ABC
WA3OTI (+KA3ISN)
7,992- 263- 26-ABC
N3ENA (+KA3ILE, W3KUA)
4,914- 159- 26-ABCD
WB3INO (+W3KM)
3,660- 183- 20-AB

Maryland-DC

K3HZO	46,458-	367-	87-ABCDE
W3IP	20,658-	214-	73-ABCDE
K3ZO	17,898	314-	57-AB
W3ZZ	14,820-	235-	52-ABCD
WA3UJE	14,728-	251	56-ABCD
K1RZ	14,100-	300-	47-B
K3IVO	13,161-	269-	41-ABDE
N3DOU	10,296-	232-	39-BCD
WA3NZL	9,680-	156	44-ABCDE
W3IFM	5,207-	127-	41-A
W3XO	4,589-	113-	31-ABCD
K3TC	3,570-	170-	21-B
KB3HH	2,684-	100-	22-BD
N3AM	1,204-	86-	14-B
N3COB	1,065-	71-	15-B
KE3A	1,040-	65-	16-B

WB3LJK (K3s ONW, UHY, oprs)
61,536- 441- 96-ABCDE
W3AUN (+N3DUE, WA3FAE, WB3KYX)
7,072- 208- 34-B
W3PGA (K3PHH KA3CUW, KB3EL W3s JDF VRD, WA3s HZJ, LAW, WB3s BIT, KJH, oprs)
3,840- 134- 26-ABD

Western Pennsylvania

WA3FYJ	57,534-	362-	129-ABCD
WA3TTS	21,660-	209-	76-ABCDE
W3HOH	2,040-	68-	30-AB
KA3KZF	2,025-	75-	27-B
KA3JMM/3	1,474-	67-	22-B
KB3V	1,380-	60-	23-B
WB3EUM	1,260-	60-	21-B
W3KJM	360-	30-	12-A

W3KWH (AK3J K3RYA, KA3s ITM, MUO, N3EQP, W3HH WB3EML WN3VAW, oprs)
20,046- 213- 78-ABD

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Alabama

WA4LIT	8,784-	116-	61-ABD
KA4BLN	1,275-	42-	25-ABD
KA4VEY	1,078-	58-	22-ABD
WA4VUG	36-	9-	4-B

Georgia

WA4NJP	24,346-	200-	94-ABCDE
KD4LT	3,737-	90-	37-BD
K4CFS	3,026-	86-	34-ABC
N3AHI	2,629-	61-	41-ABC
W3EPI/4	2,538-	47-	27-B
WB4NMA	1,440-	24-	14-AC
K4KAC	585-	33-	15-ABD

Kentucky

WB4NXY	10,050-	121-	67-ABDE

North Carolina

K4JQU	3,930-	100-	39-B
N2CJP	1,980-	60-	30-ABD
WA5DJJ/4	1,140-	80-	19-AB
KA4HKK	576-	36-	16-B

W4BFB (AA4ZZ, K4s LVV, MQG, KA4WYC, KD4IL, KU4V, WA4s UNZ, VCC, oprs)
34,112- 296-104-ABCD
W4IY/4 (K4FWG, KA4CKI, KB4EUZ N4JNL oprs)
7,089- 121- 51-ABDI

Northern Florida

W4ODW	7,897-	111-	53-ABCDE
N4FCJ/4	3,150-	102-	25-ABD
WA4JNF	442-	34-	13-AB
WD4FAB	336-	28-	12-AB

South Carolina

WA4LDU	3,234-	65-	42-ABD
PE1AHX/W4	496-	31-	16-B

KJ4BF (+AJ4N, K4ADI, KJ4X, WB4BVF, WQ4V)
11,247- 133- 69-ABCDE

Southern Florida

N4EJW	2,860-	80-	28-ABD
WD4AHZ	1,501-	62-	19-BD
K4DZP	795-	41-	15-ABDE
W1WLE/4	240-	24-	10-AB
K1FJM/4	21-	7-	3-B
W2SDB/4	10-	10-	1-B

Tennessee

WB4CTW	11,564-	190-	49-ABCD
WB4JGG	7,112-	127-	56-AB
W2GU	4,084-	85-	41-BD
N4MW	1,456-	45-	26-ABD

Virginia

W3IY/4	65,190-	425-105-ABCDE	
K4LHB	32,307-	275-	89-ABCDE
WA4HHG	10,128-	151-	53-BD
K9OYD/4	6,608-	164-	37-BD
WA4SBC	6,747-	126-	39-ABD
AA4KP	4,810-	185-	28-B
K4FTD	4,785-	134-	33-ABD
KC4IH	3,838-	81-	38-BD
W4CKD	3,648-	98-	38-A
WA4MMP	2,756-	52-	26-ABD
N4MM	2,436-	84-	29-AB
N4KEO	2,288-	84-	27-AB
WA1YTV/4	1,530-	90-	17-B
KJ4KW	1,414-	101-	14-B
KB4CMF	1,386-	91-	15-AB
N4BG	900-	45-	20-B
WD4GSM (+KB4DFK)	3,145-	66-	37-ABCD

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Arkansas

K5UR	22,310-	192-	97-ABCD
K5YY	7,572-	109-	52-BD

WA5ODE (+N5DL, WD5s CAN, CAP)
8,128- 108- 64-ABCD

Louisiana

N5BHC	5,618-	103-	48-ABCD
W5FYZ	1,518-	66-	23-B
WB5YDE	1,026-	57-	18-B
KA5RDA	782-	46-	17-B
WD5BJT	726-	38-	14-ABCD

New Mexico

KA5EBL	1,566-	58-	27-AB
W5FF	1,274-	45-	26-ABD
W5HM	340-	34-	10-B
N5ACP	216-	16-	12-ABC
KD5HP	136-	17-	8-B
K5MAT	84-	9-	6-ACD
W5IXR	50-	10-	5-AB

Northern Texas

KD5RO	38,622-	273-	82-ABDEF
WA5VJB	37,157-	289-	73-ABCDEFIJL
WB5RFH	5,054-	102-	38-ABD9
NW5E	3,393-	108-	29-BCD
WB5AFY	2,052-	34-	19-DEF
WB5KYK	1,456	47-	26-ABD
WB9CGH	1,045-	55-	19-AB
K7CW	510-	22-	15-BDE
K5UGM	176-	11-	8-C

KE5EP (+N5GSA)
22,242- 217- 66-ABCDF
WB5KTC (+AD5i)
5,733- 138- 39-ABD

Oklahoma

WD5BKV	23,763-	219-	89-ABD
K5SW	22,098-	199-	87-ABCD
W5NZS	2,696-	101-	52-ABCDEF
AB5T	2,432-	65-	32-BD
WB5DSH	2,403-	89-	27-A
KA5PUB	1,533-	73	21-B
WN5LUI	855	45-	19-B
KA5WBX	836-	44-	19-B

Southern Texas

N5HHS	5,615-	128-	45-ABD
W5UWB	836-	34-	19-ABD
W5OZI	108-	12-	9-A
KC5GB (+KC2EE)	4,921-	102-	37-ABD

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East Bay

W6NV	1,474-	55-	22-ABCD
WE6G	80-	16-	5-AB

Los Angeles

W6CPL	16,400-	249-	41-ABCDE
KA6ZVP	5,338-	123-	34-ABCD
WB6FCS	4,071-	136-	23-BD
WA6RAY	1,470-	96-	14-ABD
W6PFE	1,360-	72-	15-ABCD
WA2KDL	1,170-	69-	13-BD
W6GPE	936-	50-	14-ABCD
K9AKS	832-	52-	16-B
K6AWO	632-	74-	8-BD
W6DV	605-	48-	11-ABC
N6DZM	16-	8-	2-B

N6KV/6 (+K3FWD, AJ6F, N6DBS, W6YLZ, WA6s HXM, NKL)
45,198- 453- 82-ABCDE

Orange

K6PVS	8,446-	148-	41-ABDE
K6CH	6,800-	136-	34-ABDE
K6IBY	3,045-	69-	29-ABCD
WB9AJZ/6	1,479-	77-	17-BD
KB6HCX	870-	87-	10-B
N6HUX	845-	44-	13-BD
K6PFW	676-	41-	13-BD
KX6X	550-	55-	10-B
KG6QR	20-	10-	2-B

KA6PYA (+KA6RIK KB6DDV, N6s KLB MEJ, NK7W)
5,162- 146- 29-ABD

Pacific

KH6HME	224-	26-	8-BD
W1QXX/KH6	108-	17-	6-BC

Santa Barbara

NS6X	1,350-	68-	20-AB
WA6IJZ	1,320-	88-	15-B
W6HDO	152-	19-	8-B

Santa Clara Valley

K6GSS	44,992-	510-	64-ABCDE
W6RXO	21,930-	311-	51-ABCDEF
WA6QAK	13,550-	171-	50-ABCDE
K6LMN	4,446-	78-	39-ABCDE
KA6ING	4,116-	160-	21-ABD
WA6MGZ	2,094-	95-	22-B
WA6QDP	1,261-	97-	13-B
KF6GL	620-	31-	10-D
N6NM	432-	48-	9-B

San Diego

WA5BNH	5,504-	133-	32-ABCD
W6OYJ	1,005-	52-	15-BCD
WA6OYS	64-	8-	2-E

San Francisco

WA6LLY	240-	14-	12-ABD

San Joaquin Valley

NR6E	20,923-	222-	61-ABCDE
WB6DTA	8,142-	128-	46-ABCDE
WB4AYE	4,681-	127-	31-ABC
N6EJG	427-	53-	9-B

WB6WLE (+N6FF)
1,792- 54- 28-ABCDE

Sacramento Valley

WB6YIY	1,500-	100-	15-B
KI6O	1,328-	78-	17-AB
WF6J	948-	79-	12-B
WA6OSX	780-	60-	13-A
K6FO	330-	23-	11-BCD

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Arizona

K2DNR	4,495-	96-	31-ABDEI
WA7JTM	836-	44-	19-A
WB7OHF	748-	44-	17-A
K7RDH	286-	24-	8-ABDE

Idaho

KD7IY	242-	21-	11-ABD

Nevada

W7KYT	720-	39-	18-ABD
W7LQV	410-	41-	10-B
WA9YPL/7	200-	21-	8-ABD

Oregon

W7JXU	2,037-	79-	21-ABCD
W7TYR	1,854-	71-	18-ABCDE
WB7UNU	549-	38-	11-ABCDE
KE7CX	371-	53-	7-B
N7DB	162-	18-	9-AB
WA7ECY	33-	11-	3-B
N7FCA	18-	9-	2-B

Utah

WA4GPM	310-	29-	10-ABD
NJ7A (DN40)	9-	3-	3-B
NJ7A (DM49)	8-	4-	2-B
WA7PXD (DM49)	8-	4-	2-B
WA7PXD (DN40)	6-	3-	2-B
NJ7A (DM39)	1-	1-	1-B
WA7PXD (DM39)	1-	1-	1-B
WA7TIX	1-	1-	1-A

Washington

NF7X	4,264-	145-	26-ABD
WA7SOU	312-	52-	6-B
WB7ATP	132-	22-	6-B

Wyoming

WA7KYM	2,775-	81-	25-ABCD
W0KJY/7	210-	21-	6-BDE

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Michigan

KU8P	11,151-	184-	59-ABD
K8NWD	8,778-	231-	38-B
KM8U	7,080-	177-	40-B
WB8OOA	3,400-	100-	34-B
W4SMIL	2,880-	74-	36-BD
N8DEJ	2,280-	76-	30-B
WB8AAX	2,262-	78-	29-B
NE8I	2,112-	70-	22-ABCD
KB8JI	912-	34-	24-ABCD
N8CKH	858-	33-	13-D
W8CAP	700-	25-	14-D
N8FUJ	648-	36-	17-B
W8TP	108-	18-	6-B
WR/WY	72-	24-	3-B
KB2JU	69-	23-	3-B
W8FSZ	16-	8-	2-B
W8EGI	7-	7-	1-B
KU8Y (+NQ8A)	14,025-	185-	65-AB

Ohio

WD8ISK	43,625-	274-126-ABCD9E	
KA8IFC	20,217-	293-	69-AB
WA8TJL	17,982-	217-	74-ABD
KB8ZW	16,898-	176-	71-BCD
KC3CL	13,668-	175-	67-ABCD
K8DIO	12,474-	142-	63-BCD
WD8CTX	8,260-	130-	59-ABD
WA8SAJ	5,840-	148-	40-B
K8TL	5,593-	96-	47-BD
NI8O	4,950-	75-	33-D
WB8TCZ	4,674-	114-	38-BD
WB8CCL	4,636-	122-	38-B
WA8RCN	2,592-	54-	24-AB
W8HBG	2,275-	74-	25-BD
WA8TTE	1,682-	58-	29-AB
N8FEZ	1,656-	69-	24-B
N8CGC	1,386-	64-	18-ABCD
K8LMN	1,368-	57-	24-B
KC8PS	1,344-	56-	24-AB
K8CQA	495-	33-	15-B
K8WW	80-	5-	4-E
KC8OZ	57	19-	3-B
KA8QKY	55-	11-	5-B
W8ML	52-	22-	2-BC
W8FPA	40-	20-	2-B
WB8SWJ	22-	8-	2-BC
NO8I	5	5-	1-B

West Virginia

K8UC	10,920-	166-	56-BD
KT8W	9,751-	199-	49-B
WB3CHS/8	8,004-	174-	46-B
KA8UIE	2,511-	93-	27-B
N8DKI	1,736-	42-	31-ABD
W8TN	520-	23-	20-ABD

WA8DOR (+K8s JF, LG, N8DIR, WD8AFJ)
7,884- 146- 54-AB

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Illinois

W9UD	40,238-	287-	118-ABCDE
WD9IIX	16,878-	254-	58-ABD
KR9K	12,997-	251-	41-ABCD
WD9EXD	12,222-	236-	42-ABCD
AA9D	11,319-	201-	49-ABCD
WA9FIH	10,413-	216-	39-ABCDE
KC9x	8,968-	174-	38-ABCD
K9MBX	8,136-	177-	36-BD
KA9LDS	6,300-	150-	42-AB
W9JGV	6,109-	149-	41-B
KU9L	5,580-	155-	36-B
N9DUW	4,389-	191-	19-BC
WA9VPR	3,996-	111-	36-B
KD4PS	2,508-	68-	33-BD
KA9CAI	2,128-	111-	19-BC
WD9HSY	2,106-	96-	18-BD
KA9QIK	1,760-	68-	22-BD
WD9GJK	1,419-	129-	11-AB
KA9QPG	1,391-	80-	13-BD
WB8PDD	923-	71-	13-AB
K9ENZ	770-	77-	10-AB
K9KBD	754-	58-	13-B
K9JAU	708-	109-	6-BD
W9IPO	570-	82-	6-BC
K9KPM	480-	60-	8-B
WA9RIJ	376-	94-	4-B
W9NHX	360-	120-	3-B
K9EED	351-	117-	3-B
K9ZWU	332-	83-	4-AB
K9ZWV	332-	83-	4-AB
KA9LFD	305-	57-	5-BD
K9QYT	300-	66-	5-BD
K9IOG	280-	70-	4-AB
KS9V	275-	46-	5-BC
K9USW	265-	53-	5-AB
WA9QYX	255-	51-	5-AB
KA9RZG	222-	74-	3-B
KR9G	210-	15-	7-D
K9GVN	201-	67-	3-B
N9ECM	189-	21-	9-B
W9RVG	189-	22-	7-ABCD
W9XK	141-	47-	3-B
W9BUW	128-	37-	3-BC
WA9GOB	111	37	3-B
WA9GIZ	108-	36-	3-B
W9AVB	105-	35-	3-B
WA9CCQ	102-	34-	3-B
N9DEX/M	80-	40-	2-B
K9GZI	28-	14-	2-B
WA9MJJ	24-	9-	2-BC

WB9MSV (+KA9DLP)
41,623- 315-107-ABCD
N9EDT (+KA9CKI)
7,560- 114- 54-ABCD

Indiana

WN0EH	60,515-	361-133-ABCDE	
KA9QFL	9,486-	151-	51-ABCD
K9DZS	5,280-	103-	48-ABD
W9NSZ	2,967-	129-	23-B
KA9RSL	1,360-	68-	20-B

KA8MRI/9 (+KE8AW, KA9DZM, N9DOK)
19,040- 246- 70-ABD
W9YB (DF6XB, KA9s OCR, HOH, KC9RG, KS9J, N9FIK, oprs)
3,200- 98- 32-ABC

Wisconsin

WB9JC/9	12,792-	144-	78-ABCDE
K9VGE	10,176-	194-	48-BD
WD9HOZ	6,040-	151-	40-B
W9UB	5,610-	170-	33-B
K9RRS	2,668-	80-	29-ABD
W9YCV	2,580-	76-	30-BD
KA9HKL	2,236-	86-	26-B
WA1UUU/9	1,140-	57-	20-B
N9KS	1,100-	50-	22-AB
N9EEE	432-	36-	12-B

N9FIB (+N9EOZ)
1,632- 76- 22-B

0

Colorado

NK0P	20,150-	214-	63-ABCDEI
WBETT	2,700-	67-	25-ABD
AA0P	1,296-	61-	16-BD
KA0NNO	432-	36-	12-A
W0KEA	112-	16-	7-B
W9MHL	52-	13-	4-A
KA7TYU	30-	10-	3-A
WA7WDJ	12-	6-	2-A

KD0GT (+W0OZL)
8,463- 128- 39-ABCDEF
N0GEL (+WB0ZCN)
248- 31- 8-B

Iowa

WB0ZKG	14,158-	164-	77-ABD
WB0YWW	7,191-	119-	51-BD
K0CQ	6,832-	94-	56-ABDE
K0UJA	1,888-	45-	32-ABD

WA0DCB (+AB9W, WD9FSA, N0CIH)
33,025- 297- 98-ABCD

Kansas

W0RT	16,320-	174-	80-ABD
N0LL	12,936-	147-	77-ABD
WB0VZW	3,192-	79-	38-ABD
K0VUA	756-	42-	18-B
KC0ZR	544-	34-	16-B

WB0ORL (+N0UU, WA0TKJ)
59,079- 320-141-ABCDE
KE0M (+KB0DW, N0FUJ, WA0WJF)
37,152- 308- 96-ABCDE
WB0ZCV (+N0GEL)
300- 25- 12-B

Minnesota

K0GJX	4,056-	89-	39-ABD
W0WB	1,794-	78-	23-B
WD0GBU	1,530-	85-	18-B
W0OHU	654-	48-	14-BDE
WB0XGM	525-	31-	15-ABD
K0TS	342-	53-	6-BD
KA0TAT	234-	39-	6-B
WD0ETA	200-	24-	8-BD
WD0GNK (NM0Q, opr)	195-	39-	5-B
KC0P	144-	36-	4-B
K9ØS	126-	42-	3-B
WD0HEB	111-	36-	3-BD
N0GHG	90-	45-	2-B
KA0KTY	78-	39-	2-B
WA0ULE	78-	39-	2-B
N0AVB	76-	38-	2-B
KC0A	74-	37	2-B
KC0ZC	72-	36-	2-B
KC0RV	68-	34-	2-B
WD0EOI	64-	32-	2-B
KA0PIC	62-	31-	2-B
KB0YI	62-	31-	2-B
KD0AB	62-	31-	2-B
NJ0C	62-	31-	2-B
KA0UZZ	60-	30-	2-B
K0XL	54-	27-	2-B
WA0WTV	50-	25-	2-B
N0BSG	48-	24-	2-B
KA0GAD	46-	23-	2-B
KC0Z	46-	23-	2-B
WB0LSG	42-	21-	2-B
N0DOS	40-	20-	2-B
N0CET	38-	19-	2-B
N0GHD	38-	19-	2-B
NM3O/0	38-	19-	2-B
N0BTU	36-	18-	2-B
W0MN	36-	18-	2-B
N0EUC	34-	17-	2-B
WB0JCL	30-	15-	2-B
WB0YEE	30-	15-	2-B
WA0VHX	24-	12-	2-B
KA0KAW	13-	13-	1-B
N0EKJ	12-	12-	1-B
W0MXW	10-	5-	2-B
KA0GMH	8-	3-	2-BD
W0UAA	3-	3-	1-B
N0DJB	1-	1-	1-B
N0DJC	1-	1-	1-B

NO0T (+W0XG)
8,964- 144- 54-ABCD

KA0CRO (+KC0P)
26- 13- 2-B

Missouri

W0VD	15,880-	166-	80-ABD
NJ0H	12,420-	207-	60-B
K0TLM	12,075-	147-	69-ABCDE
W0URP	7,344-	124-	54-ABD
W0RWH	6,760-	113-	52-BD
KM0A	2,604-	62-	42-AB
N0GRS	416-	26-	16-B

NI0V (+KA0PGN)
8- 4- 2-B

Nebraska

KC6QR	6,120-	85-	51-ABCDE
KA0JGH	4,850-	94-	45-ABE
K0US	4,645-	89-	46-ABD

VE

Maritime-Newfoundland

VE1UT	372-	24-	12-BD

Quebec

VE2DUB	714-	32-	17-ABDE

VE2CUA (VE2s EWH, HAK, oprs)
779- 41- 19-AB

Ontario

VE3BFM	19,768-	184-	87-BCDEF
VE3CDN	11,424-	185-	51-ABCDE
VE1DUW	10,622-	226-	47-B
VE3NXK	1,988-	71-	28-B
VE3NPB	1,530-	41-	17-ABD
VE3OCQ	1,102-	58-	19-B
VE3OSG	1,092-	39-	21-BCD
VE3EZP	920-	46-	20-B
VE3AQG	645-	43-	15-B

VE3UOT (VE3OHG, opr)
56- 10- 4-BD

VE3LNX (+VE3s ADJ, KZJ, NSQ)
94,031- 627-133-ABCDEF

Alberta

VE6AFO	455-	23-	13-BD

British Columbia

VE7ASI	324-	20-	12-ABCD

VE7VHF (VE7s ACI, BPB CER, CIM, COM, FYC JOB, oprs)
2,860- 92- 20-ABDI

DX

XE2MX (+N6CW, WA6s OYS, TBO)
2,346- 74- 23-ABDE

Checklogs

N2BUL KF4KI/2, WZ4K, KB/O W9ZZU, KA0KUY

Results, 1986 Novice Roundup

"After 30 years as a Technician, the NR sparked my interest. Four days after the contest, I upgraded to Advanced."

By Michael B. Kaczynski, W1OD
Contest Manager, ARRL HQ

The above quote, compliments of W9SID, was echoed by many who participated in the 1986 running of Amateur Radio's friendliest contest, Novice Roundup. NR is one of the few chances during the year when Novice and Technician operators get a chance to break into the exciting world of contesting.

Whether you're a Novice in Nashville, a Technician in Teaneck or even an Extra in Egegik, Novice Roundup has something to offer. Are you frustrated by the "599 QSL" 'sure'itis of 20 meters? Or the 25+ WPM bursts of CW (or is it RTTY?) on the low end? Try NR—it might just be the cure you're looking for. There's a good reason for the long list of non-Novice and Checklog entries that appear year after year in the NR writeup—Novice Roundup is fun!

NR 1986 was an unqualified success. Scores were up slightly from last year. A total of 246 reports were received: 177 from Novice and Technician class licensees, 35 from non-Novices and 34 in the form of checklogs.

Four Novices from 1985's top ten are back again! KA7HBK, last year's first-place entrant, upped his score by almost 10,000 points for this year's number-one spot. Rhode Islander WB1DEU squeezed past KA8JBK (number 2 in 1985) for the runner-up position. KA9MON and KB4EXX were numbers 4 and 5, respectively. KA7ICF, who placed number 5 last year, slipped to sixth place.

Plenty of new faces make up the Technician top ten. Eastern Massachusetts' own KA1JJR topped the list, followed by KA5SPO, who finished number 4 last year. KA8SDE, KB4LTQ and KA8YDY round out the Tech top five.

This year, all Novice and Technician class entrants will be receiving certificates. These are scheduled for a late July/early August mailing. CU in '87!

Novice Top Ten

Call	Score
KA7HBK	50,080
WB1DEU	43,275
KA8JBK	41,976
KA9MON	41,820
KB4EXX	38,624
KA7ICF	37,398
KA2ZPD	37,275
KA8YKF	35,156
KA9TQF	35,070
KA0SIX	34,782

Technician Top Ten

Call	Score
KA1JJR	32,160
KA5SPO	28,424
KA8SDE	27,671
KB4LTQ	24,765
KA8YDY	22,050
KA0UMC	19,278
KB4OSD	19,200
KA0REN	19,089
KA0TWR	19,034
KB6KKH	18,872

Division Leaders

Novice Call	Division	Technician Call
KA3JHZ	Atlantic	WA3BZT
KA9MON	Central	W9SID
KA0UJG	Dakota	N0GQK
KA0KHV	Delta	—
KA8JBK	Great Lakes	KA8SDE
KA2ZPD	Hudson	KA2TFV
KA0SIX	Midwest	KA0UMC
WB1DEU	New England	KA1JJR
KA7HBK	Northwestern	KA7VIN
KA7ICF	Pacific	KB6KKH
KA8YKF	Roanoke	WD8QNJ
KA0VSD	Rocky Mountain	N5EMR
KB4EXX	Southeastern	KB4LTQ
KA6TNN	Southwestern	KB6HKG
KA5QLO	West Gulf	KA5SPO

SOAPBOX

Thanks for the great opportunity to work my first Novice Roundup. I received my Novice license in December 1985 and would like to thank all the Advanced and Extra Classes for the fine patience in sending and receiving the code of slower Novices. They really helped me to obtain most of my QSOs (KA1NSE). This was my first contest on my own, and I loved every minute of it! (KA1MMC). If the Super Bowl and the Novice Roundup coincide again next year, I think they should cancel the game. Please establish closer ties between ARRL and the NFL (KA1NJS). I would like to extend my thanks to the General, Advanced and Extra Class license holders who participated in the Novice Roundup. They all had the patience and understanding to adjust their code speed for those of us who are still trying to master the art of CW (KA1LDS). Novice Roundup is a great excuse to break out the ole straight key and have some good old-fashioned low-tech fun (KO1R). This was my third contest. Now I know why we use contest dupe sheets (KA2YMZ). I've only had my license two months, and this was an excellent way to improve my skills. I hope to participate next year as a General or Advanced! (KB4QKT). Next year, I'll have to participate as a higher-class licensee. I passed my 13 WPM code test the Saturday after NR. The fast contest code sure helped. FB Roundup! (KB4LTQ). By the end of the week I had 47 states and three DXCC countries. Not bad for two weeks as an amateur. On the Monday after NR ended, I was able to pass my General code and written tests as well as the 20-WPM CW for Extra. Thanks, NR! (KB4RFQ). The high point of the contest for me was being contacted by W1AW. Wow! (N5IMW). I like the fact that in NR everyone is equal: no fancy equipment, and all operate in the "Novice Jungle" (KA7HBK). The Novice Roundup was one of the most exciting things I have done in a long time. CW is truly an art and a science (KA7WAN). Thanks for a wonderful contest! If the ARRL can take the time and effort to sponsor this contest, the least I can do is become a member (please find my application enclosed) (KA8TGQ). It was fun and hectic. I lost a multiplier when we had the earthquake—we're not used to them in Michigan. CU next year (KA8WVE). Thanks, ARRL! (W9SID). This is the last year I will be participating in NR as a Technician because I intend to upgrade in April. I in-

KB4OSD and the station used to work 400 QSOs for top Technician in Virginia.

Melissa, KA8WSQ, was one of the eight entrants from the Michigan Section.

KA7WRG finished first in the sought-after Washington Section.

tend to be there in the upcoming years to give my support to those who are to follow. Novice Roundup has been great fun and a learning experience for me. I hope that it will be around for a long time (KA9NOH). There is still a tendency to send the RST and then "IN" followed by the Section. This is very confusing when you're on the receiving end and realize that the QTH is something other than Indiana. Thank you for giving us the opportunity to get our feet wet in the world of contesting (KAØTWR). C'mon folks, use "QRL?" instead of just assuming the frequency is clear. Also, find out what section you live in (KAØUMC). What a fantastic contest! Not only did I meet 74 new ham friends on the air, but I have built up my CW speed to the point where I feel I'd have no trouble at all passing the code test for my General. This happened in just 23 hours of operation. What an experience! 73 to all of you from the flatlands of Nebraska (KAØUEA).

Illinois is the home of 14-year-old KA9MON, number 4 Novice finisher in NR '86.

Score Listings

Score listings indicate call sign, score, number of QSOs, multipliers (number of ARRL Sections + DXCC countries) and total hours.

1

Connecticut

KA1LLX/T 10,290-245-42-22
KA1MTK/N 2,590- 64-35-14
KA1LHJ/N 1,430- 60-22-13
KA1MCX/N 1,152- 48-24-24
KA1NTB/N 325- 25-13- 7

Eastern Massachusetts

KA1JJR/T 32,160-480-67-29
KA1NSE/N 10,530-234-45-30
KA1NNI/N 792- 36-22-16

New Hampshire

KA1MMC/N 3,356- 99-34-20

Rhode Island

WB1DEU/N 43,275-577-75-25
KA1MPF/N 6,544-178-48-28
KA1NJW/N 5,400-150-36-21

Vermont

KA1NJS/N 31,262-406-77-28
KA1LDS/T 2,001- 69-29-16

2

Eastern New York

KA2ZPD/N 37,275-526-71-30
N2FZJ/T 88- 11- 8-11

New York City-Long Island

KA2JJJ/T 5,805-135-43-24
N2EZP/T 585- 39-15- 8
WB2VBV/T 418- 22-19- 2
KA2ZUH/N 275- 25-11-15

Northern New Jersey

WA2FEH/N 13,915-253-55-30
KA2TFV/T 13,076-244-54-30
KA2UGR/N 10,800-206-50-19
KA2YYV/N 3,150- 90-35-15
KA2VHB/N 2,828-101-28-16
KA2PZD/N 1,817- 79-23-11
KA2RLN/N 216- 18-12- 5

Southern New Jersey

KA2ZOO/N 7,585-205-37-27
KA2YKN/T 204- 17-12-20

Western New York

KA2RWL/N 25,254-398-61-30
KA2WIK/N 25,134-354-71-25
W2CXM (KA2ZOO/N, opr) 12,788-218-56-28
N2CZL/T 11,220-204-55-26
KA2SJG/N 8,888-202-44-30
KA2YMZ/N 7,020-195-36-30

3

Delaware

KA3LNA/N 24,768-387-64-30
WA3BZT/T 13,860-210-63-27
WB3LCP/N 8,211-161-51-30

Eastern Pennsylvania

KA3JHZ/N 30,615-471-65-30
KA3MYF/T 11,280-235-48-26
KA3NFS/N 7,942-209-38-25

Maryland-DC

KA3IKJ/N 26,496-398-84-27
KA3NZV/N 20,040-334-60-29
KA3NWB/N 13,420-200-61-24

4

Alabama

KB4EXX/N 38,624-544-71-24
KB4PFS/N 840- 42-20- 7

Kentucky

KB4DOV/N 22,080-345-64-12
KB4QKT/N 5,280-110-49-24

North Carolina

KB4NYO/N 11,024-212-52-19
KB4OEN/N 9,016-196-45-30
KB4FWU/N 6,903-177-39-10
KB4ONY/N 3,914-103-38-11
KB4NIC/T 861- 41-21- 8
KB4NMD/T 702- 39-18-12
N4GLA/T 36- 6- 6- 4

Northern Florida

KB4LTQ/T 24,765-381-65-30
KB4MHH/N 20,398-309-62-29
KA3LOC/N 8,379-133-63-28
KB4LCC/N 3,828- 87-44-18
KB4FOS/N 508- 32-19- 6

South Carolina

KA4OTH/N 5,461-127-43-27

Southern Florida

KB4RFQ/N 14,742-234-60-30
KA1NSB/N 16- 4- 4- 2

Tennessee

KB4MSB/N 14,535-285-51-29
KB4MKY/N 11,286-198-57-15
KB4PZX/N 3,706- 99-34-20

Virginia

KB4MUZ/N 34,352-452-76-30
KB4FAS/N 30,600-435-68-30
KB4OSD/T 19,200-400-48-29
N4IXV/T 16,472-232-60-30
KB4MRH/N 6,357-153-39-23
N4LKB/T 6,018-118-51-30
KB4OMD/T 5,704-124-46-24
KAØLXJ/N 3,400-100-34- 8
KB4RDI/N 2,508- 66-38-10
KB4RDH/N 713- 31-23-16
KB4RBA/N 252- 21-12-20
KB4NVD/N 234- 18-13-12
KB4RBH/N 4- 2- 2- 1
KB4QPU/N 1- 1- 1- 1

5

Arkansas

KA5KHV/N 19,215-305-63-29

Louisiana

KA5UOR/N 42- 7- 6- 1

New Mexico

N5EMR/T 16,128-252-64-30
N5IMW/T 14,016-219-64-29

Northern Texas

KA5SPO/T 28,424-416-69-29
KA5QLO/N 16,128-256-63-30
KA5YMH/N 14,022-246-57-30

Oklahoma

KA5PGV/N 13,020-207-60-15
N5HIB/T 1,426- 46-31-20

Southern Texas

KA5VMA/T 11,685-205-57-25
KA5VKC/T 9,400-200-47-29
KA5VOU/N 6,480-160-53-23
KA5YCZ/N 4,386-102-43-20
N5HUH/T 2,516- 68-37-25
KA5VDX/N 1,080- 40-27-21

6

East Bay

KB6KKH/T 18,872-212-56-30
KB6JOH/N 15,500-250-62-28

Orange

KA6TNN/N 10,498-161-58-19
KB6ANC/N 3,690- 90-41-23

Santa Barbara

KB6HKG/T 2,940- 84-33- 8
KA2IOO/N 903- 43-21-30

Santa Clara Valley

KB6IRO/N 2,400- 75-32-14
KA6TRV/N 1,668- 49-32-10
KA6ING/T 323- 19-17- 4

San Joaquin Valley

KB6ETA/T 63- 9- 7- 7

7

Alaska

WL7BFE/N 858- 39-22- 6
KL7YY/T 714- 34-21- 5

Idaho

KB6ORW/N 17,877-303-59-30
KA7VIN/T 3,672-102-36-20

Montana

KA7HBK/N 50,080-626-80-30
KA6SVY/N 945- 35-27-28

Nevada

KA7ICF/N 37,398-522-69-30
KA7VIQ/N 4,573-117-39-10
KA7WAN/N 315- 21-15-15

Oregon

KA7VRW/N 6,700-134-50-28

Utah

KA7QHY/N 4,305-105-41-25
KA7SWA/N 30- 6- 5- 4

Washington

KA7WRG/N 12,312-216-57-26
KA7TPB/N 11,600-200-58-26

Wyoming

KA7WOZ/T 153- 17- 9- 7

8

Michigan

KA8JBK/N 41,976-583-72-29
KA8WVE/N 25,088-392-64-30
KA8YDY/T 22,050-294-75-30
KA8WAG/N 14,365-221-65-27
KA8WON/N 13,860-220-63-21
KA8WSQ/N 8,815-205-43-28
KA8VQS/N 3,403- 83-41-28
KA8UNZ/T 825- 33-25-10

Ohio

KA8SDE/T 27,571-413-67-30
KA8NNA/N 20,608-322-64-22
N8GFK/T 17,073-271-63-30
KA8WRT/N 15,895-289-55-26
KA8TNT/T 13,160-235-56-25
KA8TEW/N 12,036-236-51-17
KA8WSP/T 12,036-204-58-28
KA8HSO/N 11,440-220-52-27
WD8IFH/T 10,750-205-50-28
N8HCG/T 9,729-207-47-18
KA8WTZ/N 6,388-138-47-17
KA8VVE/N 2,880- 96-30-18
KA8TGQ/N 2,496- 88-32-23
KA8VAL/N 266- 19-14- 3
KA8TJQ/N 255- 17-15-23

West Virginia

KA8YKF/N 35,156-517-68-30
KA8RLD/N 16,885-267-65-30
WD8QNJ/T 6,223-127-49-18
KA8VAU/N 1,118- 43-26-30

9

Illinois

KA9MON/N 41,820-615-68-30
KA9TQF/N 35,070-486-70-30
KA4EDF/N 20,700-335-60-22
W9SID/T 4,921-118-37-16
KA9RRF/T 1,485- 55-27-13
KA9TYZ/N 609- 29-21- 2

Indiana

KA9RLW/N 29,106-441-66-28
KA9THW/N 13,104-234-56-28
KA9UJE/N 9,198-219-42-27
KA9UHT/T 4,440-111-40-28
KA9NOH/N 3,182- 66-37-27
N9FMA/T 1,000- 40-25-30
N9FNU/T 130- 13-10- 8

Wisconsin

KA9TIB/N 7,056-147-48-18
KA9TBV/N 560- 28-20-23

0

Colorado

KAØVSD/N 13,166-217-58-30
NØGOA/T 2,074- 61-34-19
KAØJJK/T 132- 12-11- 2

Iowa

WA3TJH/T 14,552-214-68-30
KAØSTB/T 800- 40-20-16

Kansas

KAØSIX/N 34,782-527-66-30
KAØREN/T 19,089-303-63-29
KAØTA/N 17,174-277-62-29
NØFYO/T 10,317-181-57-26

Minnesota

KAØUJG/N 16,287-267-61-30
KAØTQY/N 15,438-239-62-26
KAØJVS/N 10,088-194-52-29
KAØQOK/N 8,729-203-43-30
KAØRVW/N 8,084-152-47-13
NØGQK/T 7,450-139-50-21
KAØUZG/N 4,500-100-45-30
KAØREC/N 246- 22-12-13

Missouri

KAØUMC/T 19,278-306-63-30
KAØTWR/T 19,034-307-62-30
WDØBBL/N 11,368-203-56-14
KAØSOH/N 9,460-215-47-28

Nebraska

KAØUEA/N 2,170- 70-31-24
KAØVYA/N 195- 15-13- 2

South Dakota

KAØRBN/N 2,660- 71-36-14

Non-Novices

KP4FI 22,317, KA5GIS/1 12,688, AI8U 8,742, HP1AC 8,215, KO1R 7,709, WA7HHX 7,124, K3TX 7,003, W3ADE 6,808, K8GXU (WA8LIS) 6,800, W7HO 5,290, W5UA 4,455, K1KI 3,720, KA1MZC 3,570, KU7G 3,531, KY3M 3,293, N3DPV 2,813, KC9OH 2,800, WD8DZE 2,592, W1SE 2,070, W1OD 1,909, KA1DTU 1,767, KR1R 1,700, WA3VIL 1,272, K4IX 1,272, AA3B 1,045, KM8R 546, WA2OTX (+N2ADF) 510, VE3NYT 464, KA9LPN 360, W2EA 333, KZ1A 254, WN4KKN/5 182, NM3O 140, KE7JR 90, WA2VYA 84.

Checklogs

AK2H, K2JLD, K4EJQ, KAØTUV, KA1DWX, KA1LYO, KA1MAD, KA1NWY, KA2JLC, KA3CHY, KA3MBC, KA3NVZ, KA9AKS, KA9NBU, KA9RSL, KV8U, NØBKE, NØFMR, N3CZB, N5HTX, N6ESV, ND9X, NN2P, VE7ETW, WØPA, W2KTF, W3ARK, W3SOH, W6UQF, W8CZR, W8VUV, W9CUN, WB1EKY, WD5BQS.

Announcing The First ARRL 10-GHz Cumulative Contest

Objective: To promote amateur microwave activity.
Region: USA and Canada.
Eligibility: Licensed amateurs operating in the above region.
Introduction: Of the currently available US/Canadian microwave bands (1000 MHz and above), 10 GHz is second in activity only to the 1296-MHz band. Although homebuilt equipment does exist, commercially available components have made simple, trouble-free operation possible. Such equipment costs approximately the same as a good 2-m FM mobile unit.

The primary example of this is Microwave Associates "Gunnplexer" transceiver. It is estimated that as many as 1000 of these transceivers are in service. Unfortunately, a large number of amateurs are not actively experimenting with their units, simply because they do not know of another amateur to work! A scheduled contest activity would do much to promote activity.

Propagation on the 10-GHz band is essentially line of sight. The typical range (without enhanced propagation) between two 15-mW Gunnplexer transceivers and simple antennas is 25-50 miles. This may be significantly increased by using more power, larger antennas and/or operating from hilltop locations. An optimized hilltop station should be able to make 100-mile QSOs. Enhanced propagation, which normally occurs over water, can bring DX of 200 miles or better. The current world's record is held by Italians—1000 miles between a pair of 50-mW stations!!

Because of the propagation characteristics and very small antenna beamwidths normally encountered on 10 GHz, calling CQ will *not* usually lead to a contact. The standard mode of operation is to establish schedules in advance. Therefore, a contest for 10 GHz must radically differ from the typical VHF/UHF format.

A "cumulative" style contest is best suited for this band. Two days of operating, separated by a weekend off, would enable entrants to operate from a variety of remote locations. Since schedules must be made in advance, ARRL is asking interested parties to provide their addresses, telephone numbers and type of equipment used. A list of 10-GHz operators will then be provided to all applicants, along with their contest-log forms. Sufficient time will be allowed for the participants to make their schedules prior to the contest.

Compatible equipment is encouraged to maximize the number of contacts. For narrowband work, 10.368 GHz is the usual frequency. When using 30-MHz IFs, 10.250 and 10.280 are the most common operating frequencies. There are also some people with 100-MHz IFs operating in the 10.2-10.3-GHz region. Of course, contacts on any frequency in the band are okay.

The VHF/UHF Century Club Award (VUCC) is available with SHF endorsement for 10 GHz. The minimum number of grid-locator squares needed to qualify on this band is 5. An inquiry with an SASE to the ARRL Awards Desk will bring you the complete rules and application forms.

Rules

1) *Object:* To work as many amateur stations in as many different locations as possible from as many locations as desired on the 10-GHz band.

2) *Contest Period:* Begins 1800 local Friday and ends 2100 local Saturday for the weekends of September 27-28 and October 10-11.

3) *Categories:* Entries are not broken down into any categories.

4) *Exchange:* Six-character Maidenhead Locator (see Jan 1983 *QST*, p 49, or write Special Requests at HQ for a reprint). Signal report is optional.

5) *Miscellaneous:*

A) Scheduling contacts is both permissible and encouraged.

B) Stations are encouraged to operate from more than a single location. For purposes of the contest, a change of location is defined as a move of at least 16 km (10 miles). A station may be reworked for additional credit by either end of the contact moving to a new location.

C) Contacts may not be duplicated on the second weekend (that is at least one end of the QSO must be from a different location).

D) Contacts must be made over a minimum distance of 1 km.

E) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period. The intent of this rule is to prohibit "manufactured" contacts.

F) Contacts with aeronautical mobiles do not count.

6) *Scoring:*

A) Distance points. The distance in km between stations for each successfully completed QSO is calculated. Distance points = distance in km.

B) QSO Points. Count 100 QSO points for each different unique call sign worked. Portable indicators added to a call sign are not considered as making the call sign different and unique.

C) Total score = Distance points + QSO points.

D) There are no multipliers.

E) In making the distance calculations, a string (or ruler) and a map may be used. However, calculations by computer program are preferred. Several such programs are available in the commercial market, including *The ARRL World Grid Locator Atlas* ($4). For purposes of making calculations, stations are defined as being located in the center of the 6-character locator subsquare (most computer programs make this assumption).

F) Scoring example. On the first weekend, KB9NM operating from Mt Greylock, MA, works W1VD (distance 97 km) and W1LJ/1 (distance 107 km).

On the second weekend, KB9NM/1 operating from Pack Monadnock, NH, works the following stations: W1VD (154 km); W1XX/2 (205 km); W1LJ (157 km); and AA2Z (147 km).

Distance points = 97 + 107 + 154 + 205 + 157 + 147 = 867

QSO Points = 100 × 4 = 400 (W1VD, W1LJ, W1XX, AA2Z)

Final Score = 867 + 400 = 1267

7) *Registration and Reporting:*

A) Prospective entrants are encouraged to register their intent in advance with ARRL. Send or phone ARRL HQ with your name, call, address and home telephone number, type of equipment and operating frequencies, with an SASE. A few weeks prior to the contest, you will receive the official log forms plus a printout of all those preregistered. This will facilitate the arranging of schedules. Schedules may also be set up by use of the VHF calling frequency of 3818 kHz on the evenings of Tuesday, Wednesday and Thursday before the contest weekends starting at 7 PM local. Also 144.230 and 146.55 MHz can be monitored during the contest to arrange schedules with other stations. Paired stations should move off these frequencies once contact has been made.

B) Logs should indicate the exchange information plus distance of contacts in km.

C) Logs must be submitted no later than 30 days after the end of the contest to ARRL, 225 Main St, Newington, CT 06111.

8) *Awards:* Suitable awards will be presented.

9) *Disqualifications:* See Jan 1986 *QST*.

Top Scores, ARRL 80/75-Meter Midnight Special

Here are the top scores for the most recent Midnight Special, held January 4, 1986.

K9RS	222	K6LL	159
K5MR	218	AI9X	158
K9ZO	208	N6TR/7	153
AC9C	201	NØCIB	152
KU8E	184	KD8NS	151
K5MM/7	179	N6RO	148
KS9O	168	W7CB	147
K5NA	162	N7BG	141
AI7B	160	KMØL	140
NA2N	160	W2CS	137
K3MD	132	VE3VN	122
W2XL	131	W2FOE	115
N5CT	131	N4ZC	114
K3NA	130	K2GBH	111
KI3L	127	W2IHY	107
KT7G	127	K2YGM	105

All participants have been sent the complete results. Others may obtain a copy by sending an SASE to the ARRL Contest Branch.

Another Midnight Special is presently in the works. Keep an eye on Contest Corral for details. GL!—*W1OD*

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

May 31-Jun 1

National 6-Meter Invitational Net Activity Day Contest (SIN), from 1400Z May 31 until 2400Z Jun 1. Open to all 6-meter operators. Exchange call, SIN number and grid square. Count 3 points per QSO with SIN member and 2 points per QSO with nonmember. Final score is sum of QSO points times number of different grid squares worked. Certificates. Send logs by Jul 1 to Lisa Lowell, KAØNNO, PO Box 547, Hugo, CO 80821 (new address).

World Telecommunications Day Contest, phone and CW, sponsored by Liga Amadores Brasileiros De Radio Emissao (LABRE). CW from 0000Z-2400Z May 31 and phone from 0000Z-2400Z Jun 1. 160-10 meters. Single op/single transmitter/all bands, Multiop/single transmitter/all bands and club competition. Work stations once per band. Exchange signal report and ITU zone. Contact your own country for zone credit, not QSO points. For stations between different continents, count 2 points for each QSO on 10/15/20 meters and 4 points contacts on 40/80/160. For QSOs with different countries on the same continent, count 1 point on 10/15/20 meters and 2 points on 40/80/160. Multipliers are ITU zones on each band. The final multiplier is the sum of multipliers worked on each band. Total QSO points from all bands times the final multiplier equals the claimed score. Awards. Keep a separate log for each band/mode and include a summary sheet. Entries must be postmarked by Jul 31. Include SAE and 5 IRCs for results and mail to LABRE, ITU Contest Committee, PO Box 07-004, 70000, Brasilia, DF, Brazil.

JUNE

3

West Coast Qualifying Run, 10-35 WPM, at 0400Z Jun 4 (9 PM PDT Jun 3). 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 to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

10

W1AW Qualifying Run, 10-40 WPM, at 0200Z Jun 11 (10 PM EDT Jun 10). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Jun 3 listing for more details.

14-15

ARRL June VHF QSO Party, May *QST*, p 88.

World Wide South America CW Contest, sponsored by *Antenna-Eletronica Popular* magazine, from 1500Z Jun 14 until 1500Z Jun 15. CW only, 80 through 10 meters. No crossband QSOs. Single operator, single band or multiband; and multioperator, single transmitter classes; SWL. Exchange signal report and serial number. Work stations once per band. QSO with own country—0 points (multiplier credit only); QSO with same continent—2 points; QSO with different continent—4 points; QSO with South American station (only for DX stations)—8 points. Multiply total QSO points by total number of DXCC countries worked plus total number of different South American prefixes worked on each band. Separate logs per band. Mail logs (with SAE/IRC for results) by Aug 31 to WWSA Contest Committee, PO Box 18003, 20772 Rio de Janeiro, RJ, Brazil.

21-22

9-Land CW Contest, sponsored by the Joliet ARS, from 1700Z Jun 21 until 1700Z Jun 22. Everyone works everyone. Work stations once per band. Entry classes: single op, single transmitter; multiop, single transmitter; multiop portable, maximum two transmitters. Exchange serial number and state/province/country. Suggested frequencies: 1.805 and 60 kHz up from lower band edges of 80, 40, 20, 15 and 10 meters. Novices: 25 kHz up from lower band edges. Count 2 points per 9-land QSO (IL/IN/WI), 1 point for others. Multiply by total states, provinces and countries worked. Add one bonus multiplier for each group of 20 9-land stations worked. Awards. Mail logs by Jul 31 (include large SASE for results) to Paula Franke, WB9TBU, PO Box 873, Beecher, IL 60401.

All Asian DX Contest, phone, sponsored by the Japan Amateur Radio League, from 0000Z Jun 21 until 2400Z Jun 22. (CW contest will be Aug 23-24). 160 through 10 meters. Entry classes: single op, single band; single op, multiband; multiop, multiband. No crossband QSOs. Single ops may have only one transmitted signal at any given time. Multiops may have a maximum of one signal per band. Exchange signal report and a two-digit number denoting the operator's age. YL stations may send 00. Count one point per QSO with Asian stations on 7 through 28 MHz, 2 points on 3.5 MHz and 3 points on 1.9 MHz. Multiply by the number of different Asian prefixes (WPX Rules) worked per band. Note: JD1 stations only on Ogasawara count for Asia. Use separate logs for each band. Mark multipliers the first time worked. Provide a complete summary. JARL Asian Countries list: A4 A5 A6 A7 A9 AP BV BY EP HL/HM HS HZ/7Z JA-JS JD1 JT JY OD S2 TA UA/UN/UV/UW-UZ/RA/RN/RV-RW/RZ9-Ø UD UF UG UH UI UJ UL UM V85 VS9M/8Q VU XU XV 3W XW XX9 XZ YA YI YK ZC4 5B4 1S 4S 4W 4X/4Z 7O 9K 9M2 9N 9V and Abu Ail. Enclose SAE and IRC for results. Mail logs to arrive by Jul 30 (Sep 30 for CW) to JARL, POB 377, Tokyo Central, Japan.

23

W1AW Qualifying Run, 10-35 WPM, at 1300Z (9 AM EDT). See Jun 3 and 10 listings for more details.

28-29

Field Day, see May *QST*, p 79 for rules. Please note: Field Day is the fourth full weekend in June.

JULY

1

Canada Day Contest, sponsored by the Canadian Amateur Radio Federation, 0000Z-2400Z Jul 1. Everybody works everybody. 160-2 meters, phone and CW. Entry classes: single op, all bands; single op, single band; multioperator. Work stations once per mode on each band. No crossmode contacts. Exchange RS(T), serial number starting with 001 and province/state/country. VE1 stations must also send their province. Count 10 points per VE QSO, 4 points for other countries. VEØ counts as Canada and 1 multiplier. 20-point bonus for working any CARF stations using TCA or VCA suffix. Multiply by total VE provinces worked per band on each mode (VO1/VO2

W1AW Schedule

April 27-October 26, 1986 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300; 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000, TTh: 0200, 1300; TThSSn: 2300, S: 0200
	CW Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	Teleprinter Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM; 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CDT	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM; 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MDT	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PDT	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM; 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	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.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2200 UTC they are beamed south.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1986 *QST*, pages 9 and 85" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 85.

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

On Wednesdays at 2230 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.

On alternate Saturdays at 2230 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45-baud Baudot on the regular teleprinter frequencies. The next date for transmission will be given in regular satellite bulletins.

W1AW CW and voice bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. 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 1500 UTC transmissions, and 2200 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EDT and on Saturday and Sunday from 3:30 PM to 1 AM EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on July 4 and September 1.

VE1-PEI VE1-NB VE1-NS VE2-8 VEØ VY1; max 26/band, both modes). Suggested frequencies: 1.810/1.840 3.525/3.775 7.025/7.070/7.155 14.025/14.150 21.025/21.250 28.025/28.500 50.040/50.110 144.090/146.520 MHz. Suggest phone on the hour and CW on the half hour. Awards. Summary sheets available for an SASE. Mail logs within 30 days (include SASE or SAE/IRC for results) to CARF Contest, c/o N. Waltho, VE6VW, Box 1890, Morinville, AB T0G 1P0 Canada.

2

West Coast Qualifying Run, 10-35 WPM, at 0400Z Jul 3 (9 PM PDT Jul 2). See Jun 3 listing for more details.

9

W1AW Qualifying Run, 35-10 WPM, at 0200Z Jul 10 (10 PM EDT Jul 9). See Jun 3 and 10 listings for more details.

13-14

IARU HF Championship, Apr *QST*, p 78.

19-20

CQ World-Wide VHF WPX Contest, sponsored by *CQ* magazine, from 0000Z Jul 19 until 2400Z Jul 20 (48 hours). Use all authorized bands from 50 MHz through 1296 MHz (6 meters through 23 cm). Use all modes, except no repeater or satellite contacts. Exchange call sign and grid square. A station in a call area different from that indicated by his call sign is required to sign portable. Multipliers are the prefixes worked per band. Count 1 point per QSO on 50, 70 or 144 MHz; 2 points per QSO on 220 and 432 MHz; 4 points per QSO on 902 and 1296 MHz. Work stations once per band, regardless of mode. Multiply total QSO points times the total number of prefixes worked (the sum of the prefixes worked per band). Classes are: single operator, single band; single operator, multiband; single operator, single band, low power; single operator, multiband, low power; single operator, portable (with temporary power source); multioperator, single band; multioperator, multiband; multioperator, portable (with temporary power source); FM only. Low power is defined as 30-W PEP output or less. Trophies and certificates. Send entries before Aug 31 to SCORE, PO Box 1161, Denville, NJ 07834, or to *CQ* magazine, 76 North Broadway, Hicksville, NY 11801.

25

W1AW Qualifying Run

26-27

Armadillo Run, Apr *QST*, p 73.

County Hunters Contest, CW

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

Lewis, Kansas: The Wichita ARC will operate WØSOE **Jun 6-8** as the Milestones of Memories operation to celebrate their centennial. Suggested frequencies: 3.875 7.250 14.250 21.325. QSL via Wichita ARC, WØSOE, 707 N Main, Wichita, KS 67203.

Portsmouth, Virginia: The Portsmouth ARC will operate W4POX from the *Lightship Portsmouth* at the Portsmouth Seawall Festival **Jun 6-8,** 1500Z-0800Z. Suggested frequencies: 7.230 14.290. For special commemorative QSL, send QSL and SASE. For commemorative certificate, send QSL and 9- × 12-in SASE (39 cents) via W4POX, 4800 Manor Ave, Portsmouth, VA 23703.

Grand Marais, Manitoba, Canada: The Manitoba DX Club will operate VE4CAT **Jun 6-8** for the 4th annual Catfish DXPedition from the east shore of Lake Winnipeg. Suggested frequencies: phone—14.225; CW—7.045 7.125. For QSL and certificate send SASE via Manitoba DX Club, VE4CAT, PO Box 28, Group 322, RR 3, Winnipeg, MB R3C 2E7, Canada.

Hopkinsville, Kentucky: The Pennyroyal ARS will operate a special-event station 1400Z-2200Z **Jun 7** to commemorate the birthday of Jefferson Davis, first and only president of the Confederacy. Suggested frequencies: phone—3.940 7.240 14.240; CW—7.110. QSL and SASE for certificate via PARS, PO Box 1077, Hopkinsville, KY 42240.

Fair Lawn, New Jersey: The Fair Lawn ARC will operate W2NPT 1300Z-2200Z **Jun 7** and 1400Z-1500Z **Jun 8** to commemorate the 25th anniversary of their club. Suggested frequencies: phone—7.285 14.285 21.385; CW—7.050 7.110 14050 21050. For an attractive QSL certificate, send QSL and SASE via Frank Leonard, W2NPT, 17-12 Well Dr, Fair Lawn, NJ 07410.

Madison, Ohio: The Wireless Institute of Northern Ohio sponsored by the Lake County ARA will operate KO8O to commemorate Ohio Wine Month. Operation will be 2300Z **Jun 7** until 0300Z **Jun 8** on 7.235 and 14.235; and 1500Z-1900Z **Jun 8** on 7.235 and 14.235. For an 8.5- × 11-in certificate send SASE via WINO Weekend, KO8O, 7126 Andover Dr, Mentor, OH 44060.

England: The Marconi Radio and Electronics Society of Portsmouth will operate GB4OH from Osborne House, the royal home of Queen Victoria, and GBØIOW from the Royal Needles Complex **Jun 7-14** to commemorate the 89th anniversary of the Marconi Early Experiments. Both stations will have vintage backup artifacts, courtesy of the National Wireless Museum, G3KPO and Marconi.

Haddonfield, New Jersey: The South Jersey RA, the oldest radio club in the USA, will operate K2AA from 1200Z **Jun 7** until 0400Z **Jun 16** to celebrate their 70th birthday. Suggested frequencies: phone—3.890 7.240 14.280 21.360 28.600; CW—3.590 7.050 14.050 21.090 28.150; 2 meters; Novice bands. For a commemorative QSL, send SASE and QSL or log info to South Jersey RA, PO Box 1026, Haddonfield, NJ 08033.

Cape Hatteras, North Carolina: The Raleigh AS will operate W4DW **Jun 8** and **Jun 10,** 1500Z-2100Z each day, in celebration of the 400th anniversary of the Roanoke Voyages to the New World, organized by Sir Walter Raleigh. For commemorative QSL, send no. 10 SASE and QSL via RARS, W4DW, PO Box 17124, Raleigh, NC 27619.

Brookfield, Illinois: The Chicago Suburban RA will operate N9BAT 1500Z-2300Z **Jun 14** from Brookfield Zoo as part of the West Suburban Council BSA annual Scout-O-Rama. Operation will be 7.250 and 14.250. For a full-color QSL, send QSL and no. 10 SASE via N9BAT Special Event, PO Box 88, Lyons, IL 60534.

Gonzales, Louisiana: The Ascension ARC will operate N5INK from 1200Z **Jun 14** until 0300Z **Jun 15** and 1200Z **Jun 15** until 0600Z **Jun 16** to celebrate the 20th anniversary of the Jambalaya Festival. Suggested frequencies: phone—7.230 14.280 21.375 28.585; CW—40 and 15-meter Novice bands. For certificate, send QSL and 9- × 12-in SASE via Freddy Keller, KA5VZP, PO Box 278, Sorrento, LA 70778.

North Platte, Nebraska: The North Platte ARC will operate WØCXH 1700Z-2300Z **Jun 14-15** from the home of Buffalo Bill Cody during Nebraska Land Days. Suggested frequencies: phone—7.250 14.290 21.400; CW—7.125; RTTY—14.090. Certificates via NPARC, Box 994, North Platte, NE 69103.

Argonne, Illinois: The Argonne ARC will operate W9QVE 0500Z-1000Z **Jun 21** to commemorate the 40th anniversary of the establishment of the US National Laboratory System, of which Argonne is the first. Operation will be 20-meter General phone band and 144.59/145.19. Send QSL and SASE to AARC, PO Box 275, Argonne, IL 60439.

Denton, Texas: The amateurs of Denton will operate a special-event station **Jun 23-25** from a "prairie schooner mobile" traveling about 4 mi/h in a horse-drawn covered wagon as part of the Texas Wagon Train on a 3000-mile journey around Texas to commemorate the Texas Sesquicentennial. Bands to be used will depend on propagation. Send QSL and SASE via George Lindley, WA5HKW, 3305 Heather La, Denton, TX 76201.

Twin Valley, Minnesota: Local hams will operate KEØDJ **Jun 27-30** to commemorate the centennial of Twin Valley. Operation will be in the 15, 20 and 40 General phone bands, OSCAR 10 and other available satellites. Satellite operation will also be held on **Jun 21-22,** primarily OSCAR 10 Mode B. Send QSL and SASE to Dale Cary, WDØAKO, 1318 34th Ave S, Apt 301, Moorehead, MN 56560.

Hodgenville, Kentucky: The Lincoln Trail ARC will operate W4BEJ **Jun 28-29** from the Abraham Lincoln Birthplace National Historic Site during Field Day. For a commemorative certificate, send QSL and SASE via LTARC, PO Box 342, Vine Grove, KY 40175.

Vancouver, British Columbia, Canada: The Vancouver ARC will operate VE7EXPO and VC7ØØ **Jun 28-29** during Field Day to celebrate the centennial of Vancouver and their club's 50th anniversary. Send QSL via Vancouver ARC, 5861 Willow St, Vancouver, BC V5Z 3S7, Canada.

Macomb, Illinois: The Lamoine Emergency ARC will operate WB9TEA 1500Z-2300Z **Jun 28-29** in celebration of Macomb Heritage Days. Suggested frequencies: phone—3.860 7.235 14.235. Certificate for QSL and SASE via LEARC, Scott Miner, NC9S, 373-1 Eggers Dr, Macomb, IL 61455.

Knoxville, Tennessee: The American Council of the Blind (ACB) Radio Amateurs will operate KW4U from 0000Z **Jun 29** until 2400Z **Jul 5** from the Hilton Hotel in conjunction with the ACB's silver anniversary convention. Operation will be 80-10 meters: 30 kHz from bottom of CW bands and 5 kHz from bottom of General phone bands. For an attractive commemorative certificate, send QSL via John McCann, KW4U, 2105 N Illinois St, Arlington, VA 22205.

New Deadline: The deadline for receipt of items for this column is the 1st of the second month preceding the publication date. For example, your information would have to reach HQ by July 1 to make the September issue. Please include the name of the sponsoring organization, the location, dates, times(Z), frequencies and call sign of the special-event station. Requests for donations will not be published.

QSLing Special-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: Roy Ellis, VE6XC. OO: VE6TY. STM/NM/DEC: VE6ABC. Hinton amateurs provide communications to cover major train accident near Hinton on Feb. 8th. Rose City Amateur Radio Club of Camrose provided communications for cross-country ski event on Feb. 9. Volunteers were George VE6AMM, Fred VE6IU, Barry VE6BNY, Jim VE6BCI. Northern Alberta Radio Club to provide communications for Canadian National Old-Timers Hockey Mar. 28/29/30. Band conditions improving. Traffic: APSN, QNI 1116, QTC 18, informal 65. ATN, QNI 211, ATC 65. Personal totals: VE6CHK 124, VE6BLY 106. VE6CPE 35, VE6ABC 12, VE6CPP 5.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Net, meets nightly on 3729 kHz. Time 0130 UTC, NM Ford VE7DDF his Ast. Fred VE7ECF. March report High 218 Low 147 Total 5525. B.C.E.N., 3650 kHz. Ast Net Manager Tom, VE7BNI, reports net very busy many new members checking in. Pacific North-West Amateurs 2nd Annual Bash, was just that, food was excellent the dance band sure kept the guests on the floor South Sea Girls did a enjoyable show of their native dances. Eric, VE7EM, is in hospital with heart problems. Hammy, VE7HM, is again active. I was roasted the other day because I did not use a hearsay report of emergency work. We need a letter giving us the facts and call signs, please. Clearbrook Senior Amateur Radio Club. President John, VE7AYS; Vice. George, VE7BMJ; Secretary, Tom, VE7ADP; Treasurer Ernie, VE7BYB. Traffic: VE7BNI 187. VE7CDF 93, VE7EJW 77. VE7EJU 48, VE7FME 38, VE7CCJ 38, VE7XA 26, VE7FB 18, VE7DJ 6, VE7BZI 8, VE7EIR 3.

MANITOBA: SM, Jack Adams, VE4AJE—ASM: VE4IX. SEC: VE4ANR. STM: VE4OO. TC: VE4ALO. ATC: VE4ADP. OO: VE4FK. PIO: VE4ALO. NMs: VE4AFO, VE4IX, VE4VJ. I am pleased to announce that Kelly, VE4ALO, has taken on a very important aspect of Amateur Radio Public Function, Kelly will be our Public Information Officer effective immediately. "Thank you, Kelly," for your help. Lets all work together to increase our membership in CRRL/ARRL. Nice to hear more 2 meter SSB activity. Section Net Reports: MTN (CW) 31 sessions, 383 QNI, 96 QTC. MMN 31 sessions, 729 QNI, 33 QTC. MEPN 31 sessions, 1201 QNI, 12 QTC. Traffic: VE4RO 96, VE4IX 45, VE4LB 41, VE4AJE 40, VE4AFO 39, VE4TE 34, VE4BI 29. See you at the International Hamfest, July 11, 12 and 13.

MARITIME-NEWFOUNDLAND: ASM: Aaron Solomon, VE1OC—White Cane *Contest Winners*—VE1YA and VE1BEW; Sighted operators—VE1AKO, VE1GM and VE1RV. *Congratulations* to VO1NP on Appointment Atlantic Director, C.A.R.F.; VE1BEM on passing Adv. license. On *vacation* to Las Vegas—VE1UC, VE1XG, & VE1ALT. *Silent Keys*—VE1AYU, VE1BGQ. New VE-1 *Call Book* should be available at Halifax— Dartmouth Flea Market, Saint Mary's University, Halifax, N.S. 30th. - 31st. May. Hope to see you there.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3CYR. TC: VE3EGO. NMs: VE3AJN VE3BUO VE3GSQ VE3LBU. VE3LFV has initiated a monthly formal traffic/emergency net the first Sunday following the regular Essex County VHFSSNN session on repeater VE3WIN. Congratulations to VE3BBM on being honored with a plaque by the Ottawa ARC for Ralph's many contributions in serving the amateur community. A number of amateurs, including VE3DCX, in Tweed, participated in the recent Girl Guide Jamboree on the air. The new board of directors of the North Shore ARC are: Prez, VE3KQE; V-Prez, VE3KSP; Sect'y, VE3NIP; Treasurer, VE3CEU. A number of amateurs and prominent guests were present at Queen Elizabeth Hospital when Dot, VE3QEH, celebrated a 60th anniversary. Dot received a number of wishes as well as a spring trip to Ottawa. If you attend EXPO in B.C., look for the amateur radio display, with VE7EXPO on the air. Many aspects of our hobby will be available to everyone to see, such as computers, OSCAR, amateur TV, RTTY, message handling, DX and much more. Welland Co. ARCs annual dinner and dance was a success and already they are gearing up for another one next year. Add Timmins to the list of those municipalities that have the 911 emergency assistance telephone number. Windsor area amateurs VE3LA VE3BJK and VE3EBY are life members of SOWP. VE3GSQ is the new NM of OQND at 1600 hours local on 3667 kHz daily. If you're free at that time, why not take a listen. VE3PJC is the new EC for Wallaceburg. Due to a new job opportunity VE3LCZ has resigned as EC for Bruce Co. Welcome to new amateurs VE3PJK, VE3PFZ, VE3PPE and congrats to VE3OGM, VE3KQN, VE3OQQ on obtaining their advanced. The ARES has a total of 526 members registered in the Section. For Field Day Co-ordinators, don't overlook the bonus points that can be earned for originating a message to me during the annual event later this month. Good luck to all participants. Traffic: VE3FAS 416, VE3GSQ 229, VE3GT 192, VE3CYR 177, VE3GNW 122, VE3DCX 105, VE3ORN 79, VE3DPO 72, VE3BUO 65, VE3GOL 46, VE3AJN 40, VE3EAM 34, VE3WG 34, VE3BAJ 26, VE3KCZ 22, VE3GFN 21, VE3WV 20, VE3IFP 13, VE3WM 13, VE3EWD 7. (Feb.) VE3FPI 6.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. TC: VE2ED. A/TC: VE2CP. NM: VE2EDO. Field Day 28-29 of June, this is the 50th ARRL Field Day, let's make it the best ever. VE2BYO and VE2BNR are active on RTTY. With regret I have to report, VE2WH, a Silent Key. Prompt retablissement a VE2EC qui est toujours a l'hopital. VE2WH, un membre fondateur de reseau des "Joyeux Copains" est decede le 18 mars. Traffic: VE2EDO 123, VE2BP 60, VE2EKC 47, VE2JN 38.

SASKATCHEWAN: SM, W. C. Munday, VE5WM—SEC: VE5CU, EC: VE5AQ, VE5FF, VE5HG, VE5WM, VE5ACI. STM: VE5HG. NM: VE5EE, VE5EX, VE5HG, VE5AEM, VE5BAF. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. SK Hamfest to be held in Prince Albert beginning of August. SK Nets.

NAME	FREQ	TIME	QNI	QTC	SESS
SATN	3695	0400Z	117	12	29
SPN	3753	0100Z	1777	24	31
ARES	3780	1500z S	215	—	5
PWXN	3780	0200Z	729	—	31
RAR2	146 46/7 06	0330Z	589	—	31
SKTN2	146 04/ 640	0300Z	542	—	31

Traffic: VE5BAF 26. See you at Field Day June 28 Weekend and good luck.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: W3DKX. SEC: K3PFW. EC: KC3TI, KC3JM, KA3LNK. PIO: WB3DPJ. SGL: AF3R. PSHR K3JL W3DKX. AWARE upgrades WB3LPC to general, new call for KA3GTM to N3ETJ. Sad to report W3EDY is a SK. DARC says Del. QSO party may be moved to a weekend in Sept. First State ARC is talking about moving meeting day to avoid conflict with holidays. There will be a Del. Hamfest Aug. 17 at Del Tech college. Georgetown Del. They will have VE exams. Anyone wishing to upgrade should have no problems in the state as there are exams quite regularly. DTN QNI 382, QTC 29 in 21 sessions. DEPN QNI 74, QTC 15 in 5 sessions. SEN QNI 32 in 4 sessions. Traffic: W3QQ 59, WB3DUG 39, W3DKX 35, KA3IXV 28, K3JL 25, KC3JM 7, W3FEG 6, KC3FW 6, N3AXH 4, WA3WIY 4.

EASTERN PENNSYLVANIA: SM, James B. Post, KA3A—ASM: KC3LM, K3ZFD. ACC: KA3A. OOC:N3CWD. PIO: W3AMQ. SEC: WA3PZO. STM: KB3UD. TC: W3FAF. Please direct SM correspondence to KC3LM. Congratulations to District 1 ARES's outstanding 1985 SET! York ARC's annual dinner honored Fred Link W2ALU for contributions to radio and welcomed KC3LM as guest. Lehigh Valley ARC published reminders of on-air no-no's related to business. "Pack Rats" Homebrew Night was a big success as usual. Mid-Atlantic ARC's 1986 officers are WD3DZI, KC3BP, WA3PZO, and KA3NKP. Phil-Mont MRC makes their comm van available for many groups' hamfests. Delaware-Lehigh ARC's newsletter boasts a catchy new multi-color look. Has any non-school club a younger president than Perkiomen Valley ARC's KA3FXX, age 16? Reading Radio Club's winter tests led to upgrades by KA3's OVF, KTH, OKL, MUM, LJT, LPZ, and MXC, plus K3ERJ, K3CBE, N3BPK, KC3ON, N3EJF, and N3BRL. May the sun spots smile on your group's Field Day! Upstate Novices, check into the Pocono ARK's CW training net on 28.150, Mondays at 2030R for fist practice and friendly advice. W3AMQ, Public Information Officer, has been working with Rep. Gregory Snyder towards Amateur Radio Week in Pennsylvania. Technical Coordinator W3FAF spoke on propagation to Holmesburg, Mid-Atlantic, and David Sarnoff clubs. We need more assistant TCs, especially upstate. Contact W3FAF to apply. EC for Lancaster Co. is now WA2OOB, but AA3C remains the DEC. We still have a few counties without EC's and WA3PZO welcomes volunteers. Thanks to all participants in March 14's Skywarn Drill and April 3's Limerick nuclear power plant exercise. DEC's please send regular reports to WA3PZO so your good work can be recognized. Your club, ARES group, etc., can borrow excellent ARRL videos to add zing to the next meeting. Novice class, training session, or public demonstration. KC3LM has the list and the how-to. We'd like more Official Observers, including some with packet capability. Contact N3CWD or KC3LM. We sadly note the passing of K3BHU, a fine traffic handler for many years. Please direct traffic reports to the STM. Section Net frequencies/daily times: EPA 3160, 0000/0300Z; EPAEPTN 3917, 2300Z; PTTN 3610, 2330Z. Local and district net frequencies/times/days: D2ARES 145.45, 2000R, Thu; D3ARES 145.37, 1930R, Mon; D5ARES 146.865, 2100R, Sat; D5 TnCounty 146.655, 2100R, 1st Wed; D6ESN 147.00, 2000R, Tu/Th; D8ARES 147.30, 1900R, Tue; PWA/ARES 147.715, 2000R, Sun; MARC/ARES 147.06, 2030R, Sun; MARCTN 147.06, 2030R, MWF. February traffic: N3AZW 686, KA3IME 201, N3COY 145, N3CD 126, KA3DLY 125, N3AIW 114, KB3FW 105, KU3R 104, W4UQ 52, WA3WQP 43, W3JKX 42, KA3JOI 42, WA3CKA 27, K3TX 27, W3TWV 19, N3EFW 19, W3CL 16, W3ADE 16, W3VA 10, W3FAF 5.

MARYLAND-DC: SM, John A. Barolet, KJ3E—"HANDS ACROSS AMERICA" has requested amateur radio communications support for their planned linkup across the nation on May 25, about the time you read this column. Our effort will be to establish a radio network along a 165-mile "HANDS" route through MDC. This network, with HF connections for the longer distances and to other ARRL sections, will confirm that the "HANDS" are linked across the MDC section. Quite a challenge! Speaking of communication networks, there is none more dependable for moving formal traffic than MDD, the MDC/DE CW sections net, meeting on 3643 kHz every evening of the year at 7 PM and 10 PM. W3FA leads this faithful group of brasspounders at about 20 wpm, plus or minus 10 wpm. Check in, and YOU set the speed! A big welcome to the latest ARRL affiliated clubs, Bay Area Amateur Radio Society and Harford Amateur Radio Emergency Management Team. Eleven 1986 annual reports of ARRL affiliated clubs have been received from ARRL HQ by April 1. The benefits of affiliation are many, and free, so don't let your club affiliation lapse. Summary reports of amateur radio activity in the lost helicopter search in the Baltimore to Frederick area were sent by W3YVQ, WA1OAA and K3RXK. Sixty to eighty amateur radio operators from Baltimore, Howard, Carroll and Frederick Counties were active in a communications network supporting the search. KY1T, SM/EMA, sent KJ3E much information on packet radio utilization by NTS traffic folks in New England and the problems associated with integrating packet radio and the National Traffic System. STM K3NNI and KJ3E are working on the same problems in MDC, but, hopefully, not re-inventing the wheel, hi! The packet bulletin boards are so busy during prime time that some of us, used to moving traffic during the evening hours, think separate bulletin boards for formal traffic on dedicated traffic frequencies may become necessary. WA3TOY, EC for Anne Arundel County says ARES there now has access to airplane and helicopter assistance when necessary. And WA3UJE has something going in Kent County, an organized club/RACES/ARES group. Many newsletters were received, far too many to list. Thanks to all of you. KT3T in Frederick has been appointed an ORS and with W3UT provides a good CW connection into that area. I am sorry to report that W3OMN and WA3EUI have become Silent Keys. With the nets: Net/Manager Sessions/Traffic/Average checkins: MDD/W3FA 62/2229, MEPN/WA2ERT 28/140/23, MSN/KC3Y 31/67/18, PONS/WB3BFK 22/12/13, FRED-CARES/K3RXK 5/6/15. MDCPON/W3OYY 4/5/15, WaCty2MN/KC3DW 4/0/81, PSHR: KK3F 113, W3FA 101, KC3Y 85, N3EGF 85, K3NNI 62. Traffic: KK3F 323, KC3DW 191, KC3Y 182, KJ3E 125, W3FA 121, N3EGF 111, K3NNI 74, N3DE 55, KA3IID 51, W3LDD 42, WA3GYW 40, W3UT 33, W3ZNW 32, W3DQI 28, WB3BFK 26, N3RO 17, KT3T 17, WA3VPL 12, WA2WDT 6.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QJ. STM: WB2UVB. ACC: K2IXE. TC: VACANT. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATCs: N2BQT, K2JF and KA2RJA. I wish to both congratulate and thank Jim McNally, KA2RJA, of Dennisville for taking the position of Assistant Technical Coordinator (ATC) in the area of Packet Radio. Jim is located in the southern part of our section (Cape May County), and is ready and willing to give support where needed. His address is: POB 177, Dennisville 08214. It's June again, and with June comes our annual Field Day exercise. For those of you planning to operate FD remember, you can earn an easy 100 bonus points by having your club president or FD leader send to me a formal message (standard ARRL format only) detailing your club/group's name, operating class, FD location and the number of ARES operators participating. As usual, I will be on the NJ Phone Net on 3950 kHz at 6:00 PM local and on Sunday at 9:00 AM local and also the NJ Morning CW Net at 10 AM local on 3695 kHz and the NJ CW Net on 3695 kHz at 7 and 10 PM. BCNU FD es GL. 73. Traffic: WB2UVB 316, WA2MGV 29, KA2CQX 15, WA2HEB 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—ACC: N2EH. SEC: KB2KW. STM: W2ZOJ. BM: W2GLH. PIO: WA2PUU. OOC: W2AET. SGL: KO2X. TC: K2QR. Welcome back to W2ZOJ as Section Traffic Manager, now that the vocation allows more time for the avocation. A THANK YOU to SEC KB2KW, the host for the LO meeting on April 5 with some 33 in attendance. Ability and liability were among the many topics covered at this leadership meeting. CONGRATS: K2GXT made BPL; KA2VEG ATC for FB solution to a TVI problem; N2ABA newly appointed as assistant manager of the Western District Net (WDN); and WDN for its continuing superlative performance as a VHF FM Local Net.

NYSEMO 3993	101-005-05	NYSR 3530	040-005-05
NYS/M*3677	410-268-32	NYS/E*3677	428-234-31
WDN/M*04/64	431-136-31	JCARC 10/70	336-004-28
Mike Farad	330-244-30	LCARES /015	054-000-05
NYPON*3913	713-395-31	OARCN 25/85	040-004-04
NYSPTEN 3925	658-053-29	NYTN 3720	082-006-17
ESS 3590	473-072-31	BRVSN /655	378-010-31
Q Net 31/91	358-007-31	CNYTN*90/30	236-042-29
OCTEN/E*/94	781-111-31	OCTEN/L*/88	254-053-31
STAR* 13/73	180-053-30	Mohawk VTN	016-035-07
BlueLine /33	311-038-31	VHF THIN /64	061-000-05
WDN/E*57/17	633-219-31	WDN/L*04/64	550-146-31
CVARCSEN	155-003-05	NYS/L*3677	362-204-31

*NTS Net. Western New York EC Net 3rd Sunday at 8 PM on 3955 kHz. Southern District EC Net 3rd Sunday at 7:30 PM on 146.13/73 Central District EC Net 3rd Sunday at 8:30 PM on 146.40/147.00. Public Service Honor Roll: KG2D KA2DQA N2EVG WA2FJJ VE2FMQ N2FQP W2GJ NN2H WB2IDS W2MTA WB2OWO WB2RBA ND2S KA2UBD K2YAI W2ZOJ. HAMFEST CALENDAR: Rome June 1, Cortland June 14, Batavia July 13, TRAFFIC HANDLERS PICNIC at Verona August 9, Trumansburg August 23, Ham-O-Rama September 6, Chemung September 27, Syracuse October 18. Reports: (OBS) WB2DSR WA2ZPE. COMMS: Oneonta ARC ran Charlotte Creek Classic. APPTS: (PIA) K2KLV; (STM) W2ZOJ; (ORS) W2AE, W2AET, W2FR, W2GJ, AF2K, W2MTA, K2KIR, WB2QIX, KC2QQ, W2TZ; (NM) K2KIR; (EC) WB2MVX Cayuga, N2BQV Madison, N2EH Monroe, K2VTT Otsego. THANKS: KA2DQA has restarted the New York Training Net on 3720 kHz for CW message/net training. This has been a continuing need since the loss of Clara W2RUF in 1980. Continuing dedication by both Lou and others is needed to help others develop code speed and message handling abilities. The NYTN meets at 8:30 PM daily. Thanks to KA2DQA, and other experienced operators who will be needed to help the net succeed. Traffic: WB2OWO 427, WA2FJJ 398, WB2IDS 340, VE2FMQ 310, W2MTA 274, WB2QIX 204, KA2UBD 174, N2ABA 137, ND2S 131, NN2H 105, N2EVG 100, KG2D 83, WB2IJH 79, KB2KW 76, K2YAI 76, WB2RBA 70, KA2DQA 69, KA2DBD 66, W2ZOJ 58, W2GJ 50, N2FQP 41, AF2K 40, WA0PTV 27, N3DPE 26, W2PPS 19, K2QR 12, KC2SJ 8, K2GXT 6, WA2OEP 4, K2VR 3. (Feb.) K2GXT 613.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—ASM, STM: WN3VAW. SEC: WA3UFN. OOC: KJ3Q. PIO: WB3IZJ. SGL: K3HWL. TC: K3LR. BM: KR3P. ACC: AK3J.

Net	QNI	QTC	SESS	kHz	T/D	MGR
WPACW	305	146	31	3585	7:00P	WA3UNX
WPAPTN	572	167	31	3983	6:00P	WA3HLN
KFN	250	76	22	7235	1:00P	N3EMD
WPA2MTN	601	125	31	146.28/88	8:00	KA3BGC
NWPA2MTN				143.13/53	1499Z	KC3NY
PFN	251	300	31	3958	3958	WA3THT

I regret to announce the following Silent Keys: WA3HRJ, K3CA, Ex K3KDP. W3GNR who was to receive the Ham of the year award from the Quad Cty ARA who passed away the night before the dinner and the plaque was sent to his mother, he was only 44 years old. Our sympathy is extended to all the families. Crawford ARC officers for 86-87 are pres. WB3JDI, V.P. K3TLP, Sec. KA3NSX, Treas. KA3ITM, Directors KF3F & WA3ZSV. They report a new general Matt. KA3NTA, only 13 yrs old Congrats. Members of the Two Rivers ARC report giving a gift of ARRL publications to the McKeesport Lib. A worthy gift by any club. On March 14, a drill was conducted in conjunction with the NWS in Penna. The Weather Bureau considered it a great success. In the WPA Section, 35 amateurs aided the operation. The KFN was called up by N3EMD. Two meters was used between the Pgh NWS, Erie NWS, the AMRCross, the RACES Station in ally Cty. Not to scare any one the drill was kept to heavy storm warning this worked out very well. I thank all who participated especially having the drill on a working day. Traffic: W3EGK 642, KQ3T 358, N3EMD 279, W3OKN 101, WA3UNX 91, W3KMZ 79, W3RUL 75, WA3DBW 62, K3SMB 59, W3KUN 54, WN3VAW 50, WB3DWL 46, K3NPW 39, W3NGO 37, N3CZW 36, N3ECV 25, N3EKJ 18, KC3JQ 16, W3SN 14, K3LTV 13, WA3QNT 11, KA3EGE 11, WB3CIS 11, W3TTN 5, W3KY 4, KB3NV 3. Congrats to W3EGK BPL again.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: KB9X. OOC: W9TT. BM: SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: K9ORP. Morgan Co. EC W9OES reports that he and six of his ARES members are completing a Red Cross damage assessment training course. Division Director W9PRN was the featured speaker at the March meeting of the Okaw Valley ARC. Tnx to WB9YVE for the newspaper clipping. Kane Co. EC AA9D presented SKYWARN programs to the Joliet ARS on March 4 and to St. Charles ESDA on March 27. KN9G reports that the Metro East ARES Repeater System is now operational on 145.11 from

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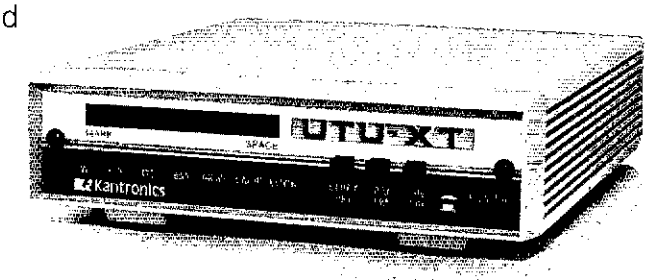

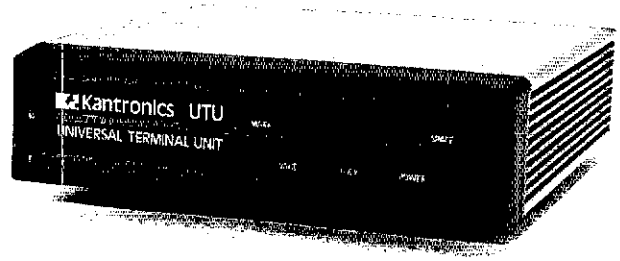

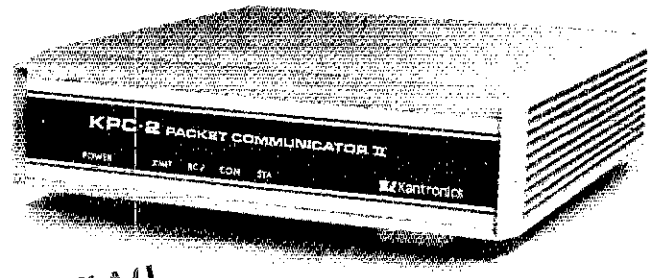

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Belleville. The system uses a Micro-Control Specialties MARK 4 repeater running 100 watts with autopatch and emergency power. On Tuesday March 4th, the Schaumburg ARC and the Northwest Cook County ARES came through for their community when an electrical utility truck working on cables for a road widening project severed 600 phone lines serving Humana hospital in Hoffman Estates. The autopatch on the Northwest Area Public Service Repeater was used extensively for emergency and priority calls. Area amateurs volunteered their phone lines for incoming calls and relayed the info via two meters to the hospital. Communications between floors and wards at the hospital, routine when the phones work, became emergency traffic in cases involving instructions for medication and treatment. For over nine hours until a temporary phone cable was installed it was Amateur Radio that provided the indispensable communications that most of us take for granted. At its March 17th board meeting, the Village of Hoffman Estates proclaimed Tuesday March 18th to be ARES day and specifically recognized EC WB9URA, AEC KA9NPT, SARC President N9EXS, WA9YOY, WD9EIC, and N9BHU for their parts in the operation. In addition to doing a great job, NWARES and SARC remembered to "put out the word" on a job well done and did so in a press release by N9EWA. OOs please note, send the HQ copy of your monthly report to SM WD9EBQ for forwarding to HQ, and send the SM/OOC copy to OOC W9TT. Traffic: KA9FEZ 567, W9HLX 281, WB8RFB 175, K9BVE 164, W9EHS 161, W9HOT 161, W9HBI 107, KJ9L 93, W9NXG 79, W9LWH 78, W9KR 57, KD9K 56, W9LNQ 28, WD9HQW 19, K9CNP 16, K9EUI 16, N9DIX 16, K9WMP 14, W9RTD 12, WB9JTK 12, W9DBO 10, KD9TK 9, W9VEY/M 8, KA9USG 6, WA9RUM 5, WB9TVD 5, AA9D 4, W9OES 2.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WB9ZQE. STM: W9JUJ. ACC: K9TUS. TC: K9PS. GLC: WA9VQO. OBC: KC9TA. PIO: K9DIY. SRC: N9WB. OOC: KJ9G. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, VHF W9PMT, IWN KA9ERC. March Net Reports:

Net	Freq	Time Daily UCT	QNI	QTC	QTR	Ses.
INT	3910	1330/2130/2300	3532	672	2668	93
QIN	3656	1430/0000/0300	686	374	1733	92
ICN	3708	2315	72	12	471	23
IWN	3910	1310	1574	0	336	31
IWN VHF Bloomington			1003	0	310	31
IWN VHF Kokomo			1203	0	223	31

Hoosier VHF Nets for March QNI 5786, QTC 130, Bulletins 107, QTR 5250 in 144 sessions for 18 nets. CAND 843 messages in 31 sessions. D9RN 100%. Stns. W9JUJ, N9DWU, K9CGS. D9RN report for February 1986 542 messages in 1089 minutes for 55 sessions. IN 89% Stns. W9JUJ, K9CGS, N9DWU, KA9EIV, WB9MDS, WA9QCF, KD9PK. 9RN Cycle 4 Report for March QNI 372, QTC 609, QTR 1065 in 62 sessions. IN 100% Stns. S9CSJ, W9FC, N9HZ, KJ9J, W9JUJ, WA9QCF, WB9UYU, K9WWJ. Appointments: ORS W9EI Andrews, W9QLW New Haven, W9RTH Seymour, W9VAY. Silent Keys W9ENU Silver Lake In. WD9JUR Mt. Vernon In. Congratulations to KD9QQ on his appointment as HF awards manager for the Madison County ARC. N89L, EC for LaGrange County suggests that the way to get an ARES program going is to train them yourself. He has trained 9 novices, six are now tech, one general and two advanced. N9DGQ, KD9HB, and KA9MRK are doing the same in Rush County. I wish to commend WB9ZQE and all amateurs that assisted on March 10, 1986 during the 15 tornado touchdowns in Indiana. Served agencies thought we made a significant contribution. Traffic: W9JUJ 906, KJ9J 337, W9JZV 253, W9FC 157, WD9DWD 139, WA9YIF 136, KA9FFO 126, W9UMH 115, WD9JAA 112, WA9QCF 105, KB9HH 100, KA9EIV 62, WB9IHR 26, KW9D 42, N9AEI 42, N9DOK 38, N9HZ 35, W9PMT 31, KD9ER 31, K9KTB 27, KW9D 25, WA9OKK 24, KD9CC 21, K9ZBM 20, WA9JNC 14, K9BRF 14, N9DTG 14, WB9PFZ 13, WD9HII 12, W9BUO 11, WB9OZZ 10, K9SBW 9, W9BTZ 8, K9DIY 6, W9KT 6, W9RTH 5, WD9CIV 5, W9BDP 5, W9ZGC 4, K9OUP 4, KA9RNY 3, W9XD 2, W9EI 2, W9KMY 2.

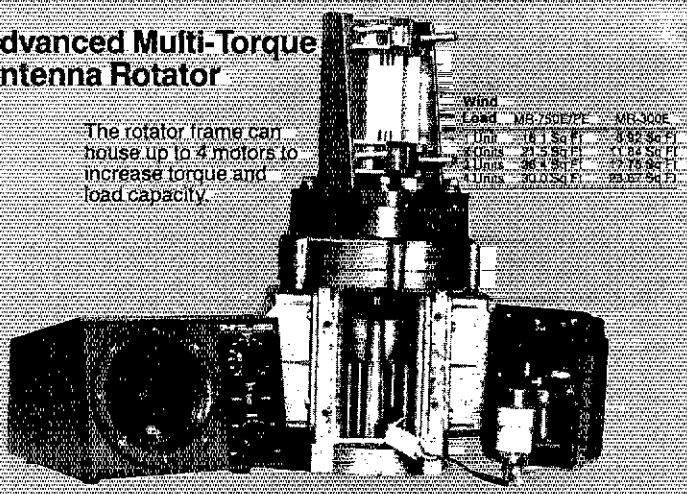
WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Congratulations to the Green County ARA of Albany, Wisconsin, which has qualified as an ARRL affiliated club. You can easily spot the Green Fox ARC members by their beautiful new name and call badges; they gave my wife, N9DIJ, and me badges as honorary members. Kettle Moraine Radio Amateurs have adopted a member activity point system and rewards high scorers with ARRL publications purchased by the club. New ATC is WD9DHI in Cedarburg, working hard on Ozaukee RC repeater. See you June 7th when the Wisconsin Chapter of QCWA meets for dinner and auction, Port Washington Fish Shanty, social hour begins 11 AM, guests and visitors are definitely welcome. June 15th, CWRA Swapfest at Stevens Point with free admission, ARRL booth, exams at 9:00 AM coordinated by N9JW, and Wisconsin Nets Association will hold its meeting at 1:00 PM. June 21, Milwaukee City of Festival's Parade needs more ham communicators, contact EC WB9SMM for details on how you can assist. June 28 and 29, earn 100 bonus points by sending a proper message to me or SEC W9OAK during Field Day. Volunteer Examiner, WD9JKZ, and assistants give tests for all amateur license classes, including tests in Braille for the blind. The Madison Swapfest was a tremendous success and had 54 candidates take license exams. KA9RII has been appointed new NM for BEN, giving WB9ESM a chance to relax after many years of capably handling the job. W9CBE once lost a spelling bee on the word *prairie*, that's why he now has no trouble relaying messages to *Sun Prairie* on CW these days. Traffic: WB9YPY 1190, KA9RII 397, W9YCV 251, K9GDF 249, WA9WYS 225, W9CBE 197, WD9IID 147, N9AUG 145, W9DND 127, WB9ICH 127, KA9OBP 125, N9BDL 105, W9UCL 107, K9UTQ 97, N9BCX 66, W9LDO 58, WB9RGO 50. (Mar.) W9YCV 236, KA9OBP 68.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. Hello Again! On March 22nd, an ARRL Dakota Division On-The-Air Forum was held. It featured Howard Mark, WØOZC, Dakota Division Director, who fielded questions from amateurs throughout the three state division. As you might recall, we had a similar forum a year ago, however, the interest seems to be in having these forums on a more frequent time table. Stay tuned to our public service nets and other sources for updates on when the next forum will be. They certainly could prove to be a very beneficial means of keeping the lines of communications open between the ARRL leadership and radio amateurs. A reminder that the Dakota Division Convention is coming up during September in Fargo, ND. Also, the election for Section Manager will be in August. Tornado Awareness Day in Minnesota did not pass unnoticed by radio amateurs. Drills were held statewide, as were simulated emergency nets. The Minnesota Statewide Emergency Net on 3929 kHz drew 41 checkins during the 1 hour and 19 minutes it was in session. NET NEWS: MSSN has embarked on an ambitious training program for its participants. KAØSBY contributed the necessary material for this

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	16.1 Sq Ft	9.42 Sq Ft
2 Units	21.5 Sq Ft	11.84 Sq Ft
3 Units	26.9 Sq Ft	14.26 Sq Ft
4 Units	30.0 Sq Ft	16.67 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.

The main frame and reduction gear train have been designed to withstand maximum wind loading.

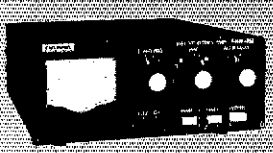
Specifications

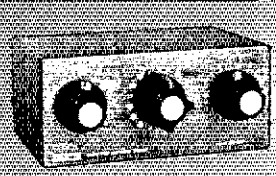
■ Rotator Unit

		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





Frequency Range:	CNW-518	CNW-419	CL-680 (no metering)	CNW-919
	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 10–280ohm
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10-280 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

ELECTRONIC KEYER **DK-210**

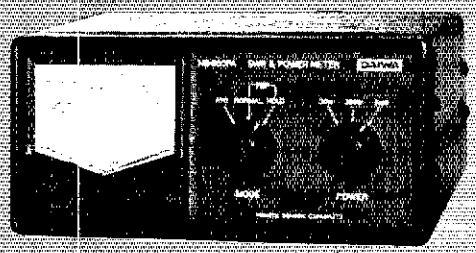
Sharpen your "fist" with Daiwa precision!

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				

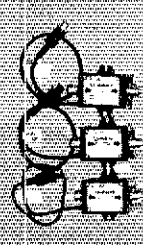
New Cross Needle SWR/Power Meters for All Bands



15° angle face for easy reading and operation

Model*	Freq. Range	Forward Power	Tolerance Full Scale	Connectors
660A	1.8-150 MHz	30/300 W/3 kW	±10%	SO-239
860PA	1.8-150 MHz	30/300 W/3 kW	±10% Av Pwr ±15% PEP	SO-239
663A/N	140-525 MHz	30/300 W/3 kW	±10%	SO-239/N Type
666	900 MHz-1.3 GHz	1.5/15/60 W	±10%	N Type

*Optional sensors adapt each meter for use on other bands.

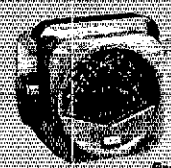


External Sensors (For indoor/outdoor use)

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-66S1, 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	3 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

POWER SUPPLIES

*Sub-DC Outlets: 5.6A/5A, 3-14.6 VDC
**Sub-DC Outlets: 10.6A/1-15 VDC

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program, and I for one will be anxiously awaiting the results. If anyone of you are interested in learning about message handling, here's your big chance. Due to propagation problems and other factors, MSN/RTTY has changed its schedule. The net will remain on 3620 kHz, but take note of the time change to 6:30 PM local. The net operates on Sunday, Tuesday and Thursday evenings. Tnx to the Mankato ARC for contributing their newsletter to our growing list of input. Amateur Fair is coming up, look and listen for details. I understand it is going to be a two-day extravaganza this time. The Wadena rptr is now operational at 147.93/.33...Two meter SSB activity is starting up in the Mille Lacs Lake area. K0DUM, WAØONJ and yours truly have been active on 144.235 mainly on weekends. While we are not polarized properly antennawise yet, we hope to be before too long. Yes folks, there ARE other modes on two besides FM repeaters! With deep regret, we report that Larry Norgrant, WBØOFO, and Orville Braaten, WØNYI, are Silent Keys. Congrats to Tom Ware, WØCF, who is our "Amateur of the Month" for March. After working for the FCC for years, Tom is enjoying himself in retirement as an amateur radio enthusiast as well as helping others in the hobby. Keep up the fine work, Tom! In closing, I know many of you were dissapointed to hear that the Steger North Pole Expedition could not be worked on the amateur bands. Many of you with general coverage receive capabilities were able to listen in on their efforts on 5281.5 kHz. My personal thanks to Chuck Lilligren, WØRNA, who provided me with most of the info concerning the expedition. 73 de KDØCI.

NET	FREQ	TIME	QNI/QTC/SESS	MGR
MSN/RTTY	3620	6:30P	62/7/13	WAØLUT
MSN/1	3685	6:30P	375/105/31	KAØEPY
MSN/2	3685	10:00P	226/35/31	NCØE
MSSN	3710	6:00P	309/31/31	KAØODQ
MSPN/N	3929	12:00P	534/161/31	WBØWNJ
MSPN/E	3929	5:30P	1112/166/31	WDØBGS
MNAMWXNT	3929	6:15P	496/288/27	KAØLZA
PICONET	3925	9:00a	4375/405/162	WDØBAC

EMERGENCY NET: 3929, BULLETINS: 3685 & 3929 kHz. MN/MSO: 3620. Traffic: WBØWNJ 521, WAØTFC 308, KAØEPY 258, KDØCL 205, KT9I 172, KAØODO 114, KAØLZA 110, KDØCI 96, NØCLS 88, WDØHDD 88, WØGRW 79, KAØARP 59, WAØONE 57, KØOGI 53, W9DM 48, NEØD 41, KTØR 40, NIØX 40, WDØGUF 36, NØJP 35, WBØUKI 32, WDØBGS 31, KCØT 31, KAØBFP 25, WØKYG 25, KBØCD 21, WØHZU 20, KAØAJF 19, WAØZTU 28, KAØCDC 12, NØEWA 10, KCØNL 10, KØBDD 9, KDØNH 9, KAØPDM 7, WAØONJ 5, NØFOO 2. (Feb.) NIØX 40, KTØR 39, KDØNH 8.

NORTH DAKOTA: SM, Michael Mankey, WBØTEE—SCHEDULE CHANGE! Mayville Hamfest will be held on June 14, 15 and not 7, 8. Congratulations to NØODS, Rick, and Rod, NØFBE, for upgrading to Extra Class licenses both with "twin" perfect scores. They also happen to be brothers. NØFXN, Charles, got his General and KEØEI, Jason, got his Extra. Upcoming events include: Mayville, Field Day, Peace Gardens, Dakota Division Convention in Fargo. The permanent 100-watt repeater should arrive sometime between now and the end of this month for the Superlink. It is a GE Master II. Good luck to everyone this summer with their SKYWARN activities. Check in on your local repeater or 3883 kHz. In case you missed it last month, WBØVHW is the frequency coordinator. 73s. Net Summary for March:

Net	Freq	Mgr	Sess	Qni	Qtc
GOOSE RIVER	1990	WØCDO	5	125	160
ND WX NET	3883	WAØRWM	23	114	83
DATA	3883	KAØFSM	29	514	36
NORTH FORTY	04/64	KEØEI	5	42	0

Traffic: KAØFSM 73.

SOUTH DAKOTA: SM, R. L. Cory, WØYMB—STM: Ole Johnson, NØABE. SEC: Warner Muns, KAØKPY. South Dakota CW net has been passing a lot of Traffic to and from the NTS and would like more checkins on 3650 at 0100Z Mon. thru Fri. S. D. Hams start making plans for the Dakota Division Convention at Fargo/Moorhead on Sept. 21-22 Mobridge Area radio Club had a station at the Farm and Home show to give Ham radio exposure to the general public. The Dakota Div. Directors on the Air Forum held March 22 was a very successful venture. Pierre radio club is working on a plan to Link 2 meter repeaters for coverage across state. Details on this as they become available. Traffic: KAØUEH 68, KDØYL 15, WØMZI 22, KØAIE 109, KØERM 69, KAØKPY 42, KØZBJ 57, WAØVRE 66, NØABE 9, WØRWE 14, WBØOMF 32, WØYMB 17, NØCTK 2, WØHOJ 2.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. SEC: N5BPU. STM: W9OK. TC: W5OK. ACC: NI5D. BM: W5HYW. SGL: W5LCI. Repeater Coordinator: WB5FDP. The Arkansas DX Association Net now meets at 8 PM local time Sunday on 3815 kHz. Ralph, KB5KJ, in Pine Bluff is now active on OSCAR 10 and can be of assistance to those interested in that area. K5UR has set a new United States record on 160 meters in the 1985 CQ World Wide WPX DX Contest on SSB. Congratulations, Rick! Joe, W5QFU, is the new Net Manager of the Razorback Net and Billie, WB5YLJ, is the new Net Manager of the Mockingbird Net. Congratulations on your appointment. A very big thank you to outgoing NMs KA5RRL and WA5ZWZ. Congratulations to W5RIT and XYL W5UGD on being licensed 55 years and 35 years respectively. Both are active ORS and QCWA members.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—For many years the Louisiana Emergency Net met on 3910 kHz at 8 PM Mondays. Seasonal propagation and QRN were constant problems leading to breakup of the net. During this past year the W5VAS repeater at Slidell on 146.64 and the KD5SL repeater at Baton Rough on 145.49 have been linked on Sunday & Wednesday evenings for a wide area net and swap session. During a recent hurricane these repeaters proved the capability of a 2-meter emergency net when they connected with the Gulf Coast Hurricane Net and provided instant track, velocity and damage reports as the hurricane transited the coastal areas of Ala., Miss. and La. This same capability can be used equally effective statewide for tornadoes, floods, disasters and other emergencies. At an early April meeting Hank—W5VAS and Shelton—KD5SL agreed to designate their repeaters as ARRL Official Emergency stations and link one evening each week to conduct a 2 meter emergency net. They also made plans to extend the linking capability across So. Louisiana and eventually statewide. At the same meeting Russ-N5ADF accepted ARRL State Emergency Coordinator at our Capital in order to liason with the state emergency officials. Just think of the possibilities with nearly everyone on 2 meters fixed, mobile and portable.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: K4HKD. SGL: AL7GQ. ACC: KC5VD. STM: KB5W. PIO: KA5VBE. OOC: W5VMC. VHF Coord: N5DWU. BM: AJØX. TC: WB5SXK. Packet activity is blooming in the spring: north-south link now complete through Hattiesburg ARCs new digipeater, and Vicksburg folks coming on strong; come join the fun! Amateur radio recently lost two long-time hams who will be missed: W5NRU and W5WMQ; our condolences to their families. If your club or group hasn't geared up for Field Day,

it's not too late; if you're not taking part, you don't know what you're missing! Affiliated Clubs: if you haven't filed your Annual Report, DO IT NOW (it only takes a couple of minutes, and you'll avoid jeopardizing your affiliation). K5IJX is new Treasurer of Hattiesburg ARC. Has YOUR club looked into the ARRL's Special Service Club program? It's worth investigating...contact the ACC for details. New appointments: KA5AGD and KB5PB as OOs. MTN seeing some new participation: N5IOH, N5HGN and W5YRX. MTN and MSN still need your support. Jackson ARC recently completed another novice class; congrats to instructors KT5Z and KW5T. North Mississippi hams planning special events station this summer in observance of the chartering of the original 12 counties; keep an eye our for it. We still need more Assistant Technical Coordinators; contact WB5SXK and volunteer your expertise. KA5ROA now WJ5P. CAND(W5KLV) Sessions 31 QTC 843; DRN5 represented 100% by N5AMK. DRN5(WB5YDD) Sessions 62 QTC 781; Mississippi represented 100% by N5AMK, KT5Z, W5HKW and KB5W. MSBN(W5HKW) Sessions 31 QNI 2114 QTC 49. MTN(K5OAF) Sessions 31 QNI 135 QTC 70. MMN(KF5GK) Sessions 31 QNI 675 QTC 7. HAEN(KA5ROA) Sessions 4 QNI 53 QTC 2. MLEN(WD5O) Sessions 5 QNI 106 QTC 1. Traffic: N5AMK 471, KB5W 250, K5OAF 237, KT5Z 122, W5WZ 48.

TENNESSEE: SM, John C. Brown, NO4Q—ASM & ACC: WA4GLS. OO/AA: W9FZW. PIO: N7EJI. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. It is good to be getting so many reports of the many CLUBS that are making a concerted effort to increase their ARRL membership. Also the other Clubs really pressing down to bring their membership in the League to become qualified for affiliation with ARRL. This status has many benefits as would be expected. The hamfest season is now in full swing and your Section Manager and other section staff will attend as many as possible and will be looking forward to discussing any subject matter that is appropriate about the operation of the TENNESSEE SECTION as you may want. We want to just have an eyeball QSO also if you have nothing of a business matter to talk about. Would like to remind all amateurs in the section to keep a watchful eye and ear to local government actions relative to ordinances that might have detrimental effects on our hobby. This is in relation to the PRB-1 applications. The proposed Electronics Communications Privacy Act is still much in the active hopper and also bears a very watchful eye and attentive ear as to how your Representative stands on these issues. Don't let them unknowingly take away our hobby gains that have been hard to come by. Be sure of your facts before contacting these busy persons. I have been contacted relative to the Hands Across America. It will be crossing the Tennessee area on the western portion from South Fulton to Memphis into Arkansas. The Memphis Area Council of Amateur Radio Clubs as it only affects that part of the State. I failed to mention the CW net honor roll for last month. NG4J and W4DOK were the winners. Keep up the good work. No winners for this month. The section traffic for this period is as follows: LF—Sessions 72, QNI 4081, QTC 147; VHF—Sessions 52, QNI 1329, QTC 466; CW—Sessions 40, QNI 191, QTC 40. Traffic: KA4RSC 156, W9FZW 124, WA4FMR 117, K4WWQ 110, W4TYV 53, NN4S 41, W4PFP 26, WA4HKU 19, WB4TDB 17, KE4LS 12, KA5KDB 11, KB4UQ 9, K4WOP 8, W4PSN 6, KA4BSG 5. (Feb.) NG4J 188, KA4RSC 172.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—On May 25, Hands Across America will touch Western Kentucky. Hams in Western Kentucky are asked to help. The route will be from Wickliffe, Bardwell, Arlington, Clinton, Crutchfield, and Fulton. Anyone in the vacinity wishing to help contact WA4JTE or W4OYI. Traffic: (February/March) WB4ZDU 84/85, W4WQV 62/48, KB4QZ 52/51, KC4WN 34/47, KI4QH 33/35, KA4MTX 32/23, WA4SWF 31/18, KA4BCM 23/51, K4VHF 17/18, K4HOE 16/41, KA4GBZ 16/, AA4FQ 14/, WD4CQF 12/10, WA4AVV 10/10, WA4NOG 5/7, K4AVX 4/.

MICHIGAN: SM, James R. Seeley, WB8MTD—There have been some recent leadership changes in the Detroit metro area. SEC WB8BGY announces the appointment of Lee Onkka, KZ8V, to the post of EC for Wayne County, taking over from Bill Antel, WBJEJ, retiring after many years of excellent service—and after agreeing in March of 1980 to fill in on the job "for just a few months!" Thanks, Bill, for those few months, and the many more that went on and on. The new EC is no stranger to leadership. Among the posts he has held is that of the Metro area's first DEC and in that position was one of the prime movers in the founding of SEMICO. Welcome back, Lee! Other recent EC appointments elsewhere: KA8VOZ, Alger Co.; WD8AKF, Marquette Co.; WB8YZL, Houghton Co.; WB8EBS, Dickinson Co.; and KD8YX, Lapeer Co. Since my last reporting on the development of the Asst. Technical Coord. program in MI, TC W8YZ has made five more ATC appointments: WD8PAF in the U.P.; W8VWY in DeWitt; W8LCU in Portland; WD8LHR in Westland; and NE8I in Dearborn. This brings the total of "local technical wizards" (YZ's words) to ten, each highly qualified by training and experience in one or more of the technical aspects of modern electronic life, with particular emphasis on EMI, which includes the ever-present and growing problem of cable TV interference, going and coming. My hat is off to the folks who work diligently in this area, both technically and politically—it is, after all, as much of a political problem as it is technical. Progress is being made. The efforts *are* worthwhile. Silent Keys, with deep regret: W8JLD, W8ZGS, W8ZGT. Net summary (QNI, tfc., sessions): QMN 1110, 299, 91; MITN 691, 226, 31; MACS 494, 111, 31; UPN 1223, 152, 36; MNN 255, 52, 60; GLETN 620, 30, 24; VHF nets 1135, 11, 74 (13 reports). This is the 29th consecutive month for record QNI for the UPN. Traffic: KA8CPS 671 (BPL), W8QHB 311, WD8KQC 155, NJ8R KA8VOZ 138, W8RNQ 77, K8GXV 72, WA8DHB WD8RHU 65, WD8OUO 56, K8HAP 48, N8CNY WD8MJB WB8YDZ 45, WB8MTD 43, N8EXS 41, W8EOI K8UPE 36, W8IHX 33, WB8SYA 32, WB8WJV 29, WD8EJB K8OCP W8SCW 27, K8MJK 24, W8IHX 23, W8YIO 22, WB8WJV 20, W8URM 18, W8VIZ 17, WD8PAF 15, K8ZJU 14, WA8MVH 8, WA8PIM 5, KF8M 4.

OHIO: SM, Jeffrey A. Maass, K8ND—

NET	QNI	QTC	Sess.	Time (Local)	Freq.	MGR
BN(E)	235	117	31	1845	3.577	W8JMD
BN(L)	198	106	31	2200	3.577	W8BO
BNR	322	149	31	1800	3.605	W8EK
BSSN	421	231	60	0945,1900	3.873	K8OZ
ONN	134	25	29	1825	3.708	WD8KBW
OSN	324	129	31	1810	3.577	N8AEH
OSSBN	2319	801	93	1030,1615 & 1845	3.9725	WB8MZZ
OSSN	194	133	31	0645 M-F	3.577	KA8GJV
				0800 S-S	3.577	KA8GJV
O8MN	81	8	13	2100	50.16	WD8CTX
Ohio Section ARES Net				1500 Sun.	3.875	WD8MPV

Hamfests for June: Columbus, June 1; and Goodyear (Akron), June 8. Don't forget that June is Field Day month: see last month's QST for rules and information, and don't forget to send a message to your Section Manager! Belated congratulations to the Buckeye Belles organization on their 25th an-

niversary! Congratulations also to Bob Adams, W8BKO, District Emergency Coordinator of the Central Ohio area, on his tenth anniversary at the helm of the very active Central Ohio ARES organization. On March 15, your SM, Vice Director AB8P, Asst. SM N8AUH, STM KF8J, SEC WD8MPV, and ACC KJ3O attended the Lucas County ARES Banquet on March 15, and the Toledo/Maumee hamfest on the following day: good to see all the Northwest Ohio folks out in force! Congratulations to Pat Smith, KA8GVZ, on her selection as the 1985 Lucas County Ham of the Year! In Southwestern Ohio, KD8IF is OH-KY-IN's Ham of the Year for 1985. OH-KY-IN received a 650-watt Honda generator from the Cheviot Kiwanis Club to aid in their emergency preparedness program. On March 10, we had our first taste of tornado season, with 11 separate tornadoes causing three deaths and significant property damage. We showed that the changes that have been put into place in the past two years have made us somewhat better organized to respond to disasters, but we still have room for improvement! How about joining the effort: contact your Emergency Coordinator! In March, we had about 3000 registered ARES members in Ohio, with over 20,000 amateurs in our State. According to the FCC, Ohio has the fifth largest number of amateurs, after CA, NY, FL, and TX. Ohio is still the largest of all ARRL sections in terms of League members. Congratulations to Dick Lockhart KA8VYS on his upgrade to Technician! Dick is Deputy Director of the Ohio Disaster Services Agency (DSA). On Saturday March 8, a group from the Dayton ARA (DARA), lead by DEC W8ILC, toured the Emergency Operations Center (EOC) at Ohio State DSA Headquarters northwest of Columbus. If your group would like to tour this important facility, contact W8BKO or K8ND for information. The Columbus ARA is sponsoring a booth at the Ohio State Fair, August 1-17. CARA is providing an opportunity to have any club sponsor a day and have club members man the booth in return for a full-day admission and parking permit. The purpose of the booth is to demonstrate ham radio and to provide educational materials to fairgoers who may be interested in "joining in", and some radiogram traffic will be sent for visitors. Contact N8EFB for details. New appointees this month: KA8RBQ ORS and OES; WB8YFD ORS and OES; WA8DYS ORS and OES; AND N8FWA ORS. Congratulations! September will be Ohio's "Traffic Month": please make a point of checking into a net and sending at least two messages during the month! (...and bring a friend!) Traffic: W8BO 505, KV8Q 331, W8PMJ 328, N8EFB 256, K8JDI 244, K8TVG 238, W8QZK 227, WB8JGW 226, WB8DMF 210, KD8KU 204, K8ND 197, WD8MIO 193, WD8KFN 189, K8ZOL 184, WD8RAO 156, W8JMD 152, KA8KHS 144, K8OZ 137, N8FWA 128, NF8B 121, WB8MEK 120, KF8J 118, WD8RIB 108, KA8OQF 102, W8EK 100, WA8HED 92, WB8HHZ 89, NJ8P 89, N8FPH 88, N8AEH 85, WA8SSI 85, NE8X 79, KA8CGF 76, KE8BE 73, WD8JYE 70, N8AKS 61, WA8DYS 57, NM8I 56, K8CMR 55, N8HBI 54, KA8GJV 53, N8XX 52, WD8KBW 51, K8DXZ 50, KD8IZ 50, WB8KWC 50, N8FBE 48, WA8HGH 48, NC8Q 48, N8HAZ 44, KA8TNT 42, KD8XL 40, KC8UZ 38, KA8UYM 36, WB8BWY 33, W8FPA 33, KA8RIX 33, NK8B 26, N8CJS 26, N8FNP 26, KD8FW 26, KC8WH 24, K8LQM 22, W8BHL 19, W8IQ 19, N8GOB 18, WB8KWD 17, WB8RSM 16, N8AJU 12, W8SGT 12, KD8WH 12, KC8YV 12, WB8AWM 11, K8CKY 11, NQ8K 11, W8SWM 11, NK8C 10, WD8CKK 10, KA8DRR 10, K8NJQ 10, N8BHF 9, WD8CTX 8, N8CW 8, N8DIY 8, W8MVE 8, K8VOY 8, W8ZM 8, W8FUP 7, W8HBK 7, KA8RBQ 7, KA8SON 7, KD8WI 7, N8AUH 6, N8GIO 6, W8RG 6, WD8IKC 5, WB8NHV 4, WD8ATN 3, WD8EKI 3, WB8GDM 3, N8GST 2, WB8YFD 2, W8LZE 1, KA8MFG 1, KA8MFH 1, WD8NED 1, WA8NKU 1.

HUDSON DIVISION

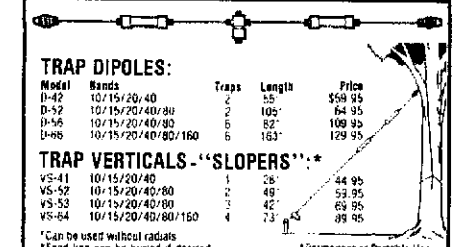
EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2MCO. SEC: AK2E. ACC & SC: N2BFG. BM: WB2EAG. 6GL: KB2HQ. TC: KC2ZO. ATC: WA2VGM. NET LISTINGS (ANI/ATC) March-AESN 60/0 ATEN 18/8 CDN 549/64 ESS 473/72 HVN 262/73 NYPON 713/395 NYSM 410/268 NYSE 429/242 NYSL 362/204 SDN 339/102 Feb. CDN 528/71. CLUB NEWS: Albany ARA had its annual dinner with Hudson Division Vice Director WA2DHF speaking and Hudson Division Director N2YL presenting 50 year ARRL certificate. New members include WB2WUS KC2AE KA2VZW. CCNR heard WA2DHF talk about antennas and towers and problems with zoning boards. Overlook Mtn ARC also heard WA2DHF on antenna ordinances. Rip Van Winkle ARS heard N2YL speak on current happenings in amateur radio particularly ARRL items. They are getting ready to celebrate their 35th anniversary. Saratoga RACES had N2AYY speak on BBS. WARA heard W2AO speak on Yagi Antennas. WECA heard Harry Juris of Westchester REACT tell how ham radio and REACT can work together. New ORS Appts from WB2MCO: WA2AWG N2AWI N2EGS N2EPT N2FRZ N2FTR NB2H NB2I K2LBG KB2MK W2PCV KA2TQW. Please note—there are still positions open in ENY cabinet staff including OO Coordinator PIO and others. Please contact me if you would like to volunteer. We need the help!!! Let's all help out with upcoming Public Service Activities. Feb. PSHR: WB2EAG MAR. PSHR: WB2EAG W2PKY WB2VUK WA2JBO KA2MYJ KC2TF K2ZVI WB2MCO. Traffic: WB2EAG 476, KC2TF 231, W2PKY 214, WB2VUK 189, KA2MYJ 165, WB2MCO 149, WA2JBO 70, K2ZM 66, N2AWI 65, K2ZVI 60, K2HNW 45, KA2TQW 42, WB2VVS 32, N2FJR 12. (Feb.) WB2EAG 397, WA2YBM 19.

NEW YORK CITY—LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. ASM/VE: W2NL. SEC: KA2RGI. OOC: NB2T. TCC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYA. The following are traffic nets in and around the section:

*NLI	3630kHz	1900/2200	WB2EUF mgr
NCVHF	6.745rpt	1930 m-f	K2MT mgr
BAVHF	6.67rpt	2000 m-f	K2YQK mgr
SCVHF	5.37rpt	2030 m-f	W2GZD mgr
ESS	3590kHz	1800	W2WSS mgr
NYS/M	3677kHz	1000	WB2EAG mgr
NYS	3677kHz	1900/2200	WB2EAG mgr

*Denotes section net, all times are local, please try and help out by checking in whenever possible. It is with deep regret that I list K2RPZ, Stu Goodman, as a Silent Key, Newsday, Sunday March 30, 1986, wrote a very nice article about Stu, anyone reading this column from out of state that would like a copy of the article please write to me, or directly to Newsday. Steve Mendelsohn, WA2DHF, Vice Director Hudson Div., was the guest speaker, along with K2IZ and WB2IAP, at the Knickerbocker RC. Steve had a very nice slide show, along with tape, on some of his travels with his work and with the President. LIMARC will continue to sponsor 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 your 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. I'm sure most of you read the article that appeared in Newsday the last week in March about the FCC fining a person on Long Island for use of radio where they weren't suppose to be and the subsequent fine for complaining about it on the air. Anyway,

MULTI BAND TRAP ANTENNAS



TRAP DIPOLES:

Model	Bands	Traps	Length	Price
D-42	10/15/20/40	2	65'	$59.95
D-52	10/15/20/40/80	2	105'	64.95
D-56	10/15/20/40/80	6	82'	109.95
D-66	10/15/20/40/80/160	6	163'	129.95

TRAP VERTICALS - "SLOPERS":*

VS-41	10/15/20/40	1	26'	44.95
VS-52	10/15/20/40/80	2	49'	59.95
VS-53	10/15/20/40/80	3	42'	69.95
VS-64	10/15/20/40/80/160	4	73'	89.95

*Can be used without radials
*Feed line can be buried if desired

*Permanent or Portable Use

ALL TRAP ANTENNAS are Ready to use - Factory assembled -Commercial Quality -Handle full power - Comes complete with: Deluxe Traps, Deluxe center connector, 14 ga Stranded CopperWeld ant. wire and End Insulators. Automatic Band Switching - Tuner usually never required - For all Transmitters, Receivers & Transceivers - For all class amateurs - One feedline works all bands - Instructions included - 10 day money back guarantee!

SINGLE BAND DIPOLES (Kit form):

Model	Band	Length	Price
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D-20	20	33'	19.95
D-40	40	66'	22.95
D-80	80/75	130'	25.95
D-160	160	260'	34.95

Includes assembly instructions, Deluxe center connector, 14 ga Stranded CopperWeld Antenna wire and End Insulators.

COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

DELUXE CENTER CONNECTOR

- ★ NO RUST Brass Terminals
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- ★ With SO-239 Receptacle
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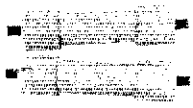

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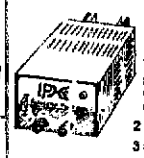

These are solid state, fully regulated 13.8 vdc power supplies. Both feature 100% solid state construction, fuse protection, and L.E.D. power indicator. U.L. listed.

2 amp constant, 4 amp surge $18.00 each
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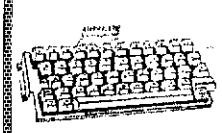

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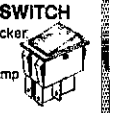

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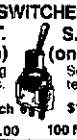

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31,000 mfd. 15 Vdc 1 3/4" x 4" high	$2.50
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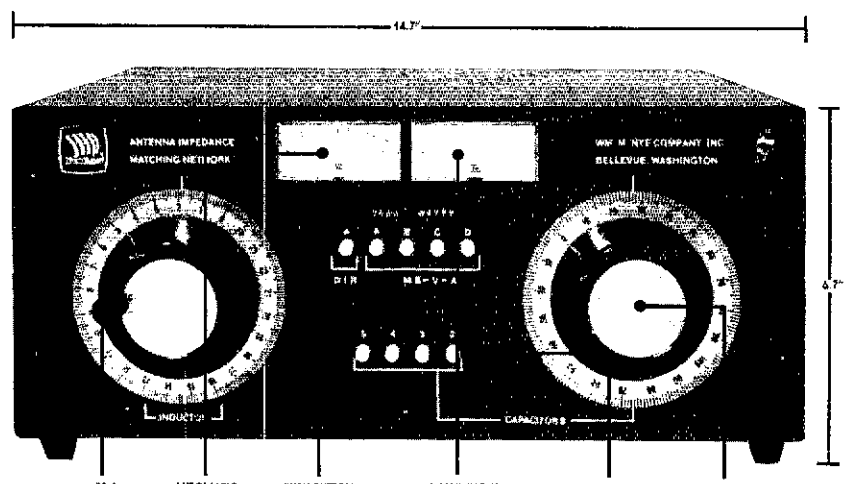

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Newsday first listed the person as an "Amateur Radio Operator," even though this person had no license. I feel that a few letters to the Editor would be quite appropriate, and let these reporters get their facts straight and not "lump" amateur operators in with people who knowingly break the law by operating on bands where they're not suppose to be. The following stations upgraded at the LIMARC VEC test: KA2NJC to Tech., KA2ZNW to General, WB2VGD, N2FIG, N2GBC, WA2GMC to Advanced, and KD2OX to Extra. Traffic: K2YQK 272.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison): N2XJ. SEC: KB2ZM. STM: KA2HNQ. OO/AAC: N2WM. ACC: KY2S. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. I am pleased to announce the section leadership appointment of Kenneth Hampton Jr, KY2S, as Affiliated Club Coordinator (ACC). Ken had previously served as an assistant in this functional area. Contact data is: 1119 Grassmere Ave, Wanamassa, NJ 07712. Phone 531-0791. March 1986 station appointments are: OBS WB2GWD (PBBS), OO W2WCE and PIA KD2JC. If you as an ARRL member of the NNJ section are interested in a field organization appointment, please contact me, or the applicable leadership official listed above. Need more info? Contact me for a copy of a new ARRL booklet describing the ARRL field organization (FSD 300). Please note SM phone number change to 337-9644. The first NNJ section field organization meeting was held May 3rd at Somerset. All leadership and station appointees were invited to attend. Reports from leadership appointees, subordinate leadership appointees, and the section manager were presented. Our NNJ PIO WB2NQV is the national communications coordinator for "Hands Across America". Our ARES organizations in the counties of Bergen, Hudson, Essex, Union, Middlesex, and Somerset are participating in providing communications along the route. Many others have volunteered. Our Hudson Division Vice Director Steve Mendelshon, WA2DHF is at the eastern national command post. Congratulations to the following who were newly licensed or upgraded during March sessions conducted by: Sussex ARC, Bayonne EM, NNJ VE Board, Ramapo Mountain ARC, Ocean/Monmouth ARC, and Bergen ARA. Novice: E Gold, D Yetkow, D Steinhauser. Technician: KA2KJL, KA2WWW, KA2ZKX, KB2ABC, KA2WEU, KA2ZJS, KB2ADZ, KA2CET, KA3DPZ, KA2YKM, KA2ZNC, KA2ZYO, KA2ZUT, J Williams Sr, and KA2ZMB. General: KA2EMZ, KA2KMO, KA2TTG, WA2VMH, KA2ZUQ, KA2VZO, KA2WLE, KA2KJM, WA2PNI, KA2YZO, KA2ZVU, and F Gasparini. Advanced: N3EHG, N2FGY, W2GKJ, N2EJQ, N2FSM, WA2YWA, WA2ZKT, KA2IVS, K2GYH, WA5NPQ, K2PFS, KA2SAS, WA2JHS, WB2UJD, N2DHP, W2JEK, and KA2TTG. Extra: W2OPE, KA2YJT, W2ESW, KD2QR, H Murken, KA2VSX, and W2TVK. March Data:

Net	Mgr.	Freq	Time	Sess	QNS	QNI	QSP
NJM	W2RRX	3695	1000	Dy	31	212	101
NJPN	W2CC	3950	1800	Dy	36	392	87
NJNE	AG2R	3695	1900	Dy	31	215	164
NJNL	AG2R	3695	2200	Dy	31	099	954
OBTTN	WB2QMP	147.12	2000	Dy	31	315	157
TCETN	(Open)	146.685	1930	Dy	31	060	045
NJVN	WB2ANK	146.49	2230	Dy	31	213	244
NJPTN	(PBBS)	145.01	WA2SNA-1 and WB2GWD				

UPLINK Amateur Radio News call 201-735-8550
Traffic:KA2SPH 154, WB2QMP 136, W2RRX 125, N2DXP 89, K2VX 88, W2NKD 41, W2XD 31, W2CC 16.

MIDWEST DIVISION

IOWA: SM, Rollin Sievers, WBØAVW—SEC: KDØBG. BM: KØIIR. ACC: WBØQAM. PIO: NQØW. OCC: KDØRT. TC: KØDAS. SGL: AKØQ. The Des Moines Register annual AGBRAI is starting July 19th from Council Bluffs, another opportunity to increase third party traffic. KAØJRQ will operate mobile packet for this event. Congrats to Connie Pitts of uscatine for upgrading to General. She is 10 years old. There are 140 6th graders of James Madison Middle school in Burlington that are studying code. It will be interesting to know how many will become novices. Cherokee hams are gearing up to join the list of affiliated clubs. "Ottumwa Command Center" now Fridays on 145.41 MHz.—WBØVYV repeater. Please note Bill Bishop's new call, NQØW (formerly NØEBA). Your SM intends to attend all hamfests and conventions in the state this year, if possible, to meet as many hams as possible. A meeting at each site is planned.

NET	QNI	QTC	FREQ	Time	Day	Mgr.
75 mtr noon	1083	62	3970	1830	Dy	WBØJFF
75 mtr eve	775	46	3970	2330	Dy	NØAEF
ITEN	127	12	3970	2330	Sun	KDØBG
ICN (2 sess)	16	1	3705	8 PM	M-W-F	NCØJ
TLCN	326	123	3560	0030-0400	Dy	WØYLS

KDØBG-ED reports that the State Disaster Services are very pleased with the capabilities and cooperation of amateur radio. Traffic: WØSS 145, WDØFWB 115, WØYLS 100, KØGP 70, KAØADF 69, W4JL 39, WBØAVW 30, KCØXL 28, WBØJFF 24, KØBRE 14, KAØSNL 13, WØFQ 12, WØBW 10, KDØBG 8, KØJGI 5, NQØW 3. (Feb) NQØW 2.

KANSAS: SM, Robert M. Summers, KØBXF—SEC: NØBLD. STM: WØOYH. ACC: KØBXF. TC: WBØNQM. BM: KØJDD. SGL: NØBLD. NMs: CW-WBØZEN. fone-WØFRC. RTTY-KAØCUR. Slow Speed CW-WØMYM. WX Net-WAØHOZ. PKT R. WDØBRK. DECs WØOAG, WØEB and WDØCFZ. It is with deep regret I must report another Silent Key for Kansas—WAØPMS of Onaga. Net activity for February was as follows: KSBN QNI 1443 ATC 205. KPN QNI 384 QTC 45. KWN 863/695. KMWN 672/613. CSTN 2216/94. QKS 219/54. QKS-SS 29/6 and Ks RTTY 67/5. Tnx again goes to NØFNL, KX0I, WØOYH, KSØU, NBØZ and WBØZEN for TEN Representation CW and to NØGCC, WØQMT, WAØCFX and KCØHF for DTEN representation. KAØPVY is back as an NCS on QKS-SS, new QTH is Sharon Springs. NØGCC now retransmitting ARRL OFFICIAL BULLETINS on RTTY—freq is 3605 at 1330Z Mon - Fri. He is also holding a daily sked at 7093—1730Z for the bulletins. Rick, WBØNQM our state TECHNICAL Co-Ordinator is requesting each club to select a person who is qualified to act as an Assistant Technical Co-Ordinator. Full ARRL membership is required for the appointment as ATC. Let us build up our resources to help us all. Either drop Rick or myself a line for more details or your selection. Traffic: NØGCC 565, WØQBK 291, WØFIR 220, WØFRC 191, KSØU 147, WØOYH 100, WØHI 94, WØFDJ 85, KØBXF 83, WAØHOZ 79, WØQMT 57, WBØZEN 39, WØKL 27, WØPB 18, WØMYM 10, NØBDG 9.

MISSOURI: SM, Ben Smith, KØPCK—The Southwest ARC hosted a Severe Weather Seminar March 15. Fifty two amateurs from 12 counties attended the seminar at the Springfield Regional Airport. The Kansas City area has a packet radio club. With around 80 members, the officers are: Pres. KØJPR, VP. WBØEZR and Sec-Tres. WBØKSI. Contact any of these officers for information. The Hannibal ARC has a new repeater on the air. It is on 146.625. The Heart of America Radio Club gives an award to the local Novice or Technician who scores the highest points in the ARRL Novice Roundup. The high scorer on the local level was KAØUMC. We are happy to announce the new Net Manager of MTTN is NØBKE. MTTN meets Monday-Saturday at 6:30 PM on 3.730 kHz. It is a great place for Novices to meet other amateurs, learn how to handle traffic and help get their code speed up. The Callaway Amateur Radio League operated a special event station at the Winston Churchill Memorial in honor of the 40th anniversary of the Churchill speech at Fulton. Even with the bands in bad shape they made 105 contacts. A special QSL will be sent for all contacts made on request. Silent Report for March—KØBTJ. Nets reporting:

NET	Ses	QNI	QTC	Day	Time PM	Freq MHz	Mgr
MON	62	340	162	Dly	7:00/9:45	3.585	KØSI
MOSSB	31	840	103	Dly	6:00	3.963	KT5Y
NEOW	31	555	44	Dly	5:30	3.983	KØDSQ
HBN	21	348	30	Mon-Fri	12:05	3.880	KØDSQ
MTTN	21	87	28	Mon-Sat	6:30	3.370	NØBKE
PHD	5	165	13	Mon	9:00	146.43	WAØKUH
ZAEN	5	92	11	Tue	8:00	147.84/.24	NOØE
RRABN	31	431	9	Dly	8:00	146.36/.76	KAØLLN
TCN	4	58	6	Thu	9:00	147.09/.69	KAØLLO
MOFON	4	36	4	Wed	8:15	222.42/4.02	AIØO
QMEN	5	97	1	Wed	9:00	146.16/.76	KØPCK
ARESN	5	66	1	Sat	9:00	147.855/255	NØFQW
JCCN	5	54	1	wed	8:00	146.40/7.00	WBØOZK
LOZBC	25	384	0	Mon-Sat	6:00AM	146.13/.73	WØRTL
LOZFM	4	86	0	Fri	9:00	146.13/.73	WØRTL
LARES	4	33	0	Wed	8:00	146.10/.70	WBØRHC
SARN	4	29	0	Thu	9:00	146.43/7.03	WØENW
LOZCW	4	13	0	Sat	9:00	3.707	WØRTL

Traffic: WØBMA 158, KØSI 145, NDØN 145, AIØO 137, NQØG 88, KT5Y 87, KDØUY 84, WAØYJX 67, KØPCK 58, NØBKE 51, KØDSQ 41, WØOUD 36, KØORB 31, NØSS 26, NIØR 26, K9OCU 18, NCØE 9, WBØCJB 9.

NEBRASKA: SM, Vern Wirka, WBØGQM. STM: Jerry Kohn, WDØEGK. The AK-SAR-BEN Radio Club of Omaha has established a digital communications committee with Frank Wolczak, WAØIWF, and Scott Persson, WBØQPP as Co-Chairman. The AK-SAR-BEN Club now has a message center bulletin board system accessible by phone line 402-289-4658, 300 baud, no parity, 8 data bits and 1 stop bit. One of the AK-SAR-BEN digital committee's goals is the marriage of packet radio and the message center. The PineRidge Amateur Radio Club of Chadron will hold their annual hamfest and picnic Sunday, June 1 at Camp Norwesca, one mile south of Chadron State Park. On the evening of May 31, the Pine Ridge Club will serve a light meal for anyone in the area at the Red Cloud camp ground which is two miles south of Chadron State Park. The Northeast Nebraska Radio Club was recognized for being an ARRL affiliated club for 50 years at the 1986 Nebraska ARRL Spring Convention in Kearney. Chuck Carey, WAØOXY, of Norfolk, the Northeast Nebraska Club Secretary for 20 years, accepted the 50-year plaque from Midwest Division Director Paul Grauer, WØFIR. Congratulations to Roger Ghormley, WØKK, of Lincoln, for being a licensed amateur for 50 years. Also, congratulations to the Grand Island Amateur Radio Society Ham of the Year, Carol Thavenet, WBØMST of Grand Island. Traffic: KØDKM 145, WBØTED 103, WØKK 94, WAØBOK 18, KAØBCB 16, NOØA 8, WDØBOX 4, WDØCRD 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	3840	1900/2000	238	279	K1EIR
CPN	3965	1800 M-S	153	282	KA1BHT
NVTN	22/88	2130	26	265	WB1GXZ
RTN	13/73	2100	51	253	KA1JAN
WCN	78/18	2030	253	539	WB1GXZ

Field Day is upon us. I think that Mark, KA4NME, said it very well in the TRI CITY ARC FEEDBACK and I quote, "Think Field Day is a bunch of claptrap, a weekend contest that fouls up the bands? Think again. How many major disasters occurred in '85? Those hams in hurricane-affected areas, The West Virginia Flood disaster, Mexican Earthquake and Colombian volcano disaster set up portable, mobile and base with generators and hastily erected antennas. They got the job done in difficult circumstances. Field Day prepares us for what can and as of late does happen. One amateur alone does not constitute a net, but hundreds, even thousands need to participate. Likewise, the club needs more than a few good operators. Whether your bag is Fone or CW, lend a hand. Like Mister T says; Be there!" Well said, Mark. I hope to see record numbers operating on Field Day. News from John Ronan, K3ZJJ, BM: 1. SARA is installing a new 440 MHz repeater on 447.125. 2. FARA, SARA, WHARA and GNARC are developing preliminary plans for a Fairfield County hamfest. 3. FARA is producing a TV program "This is FARA" which will be telecast in May or June on all Connecticut Public television channels together with the ARRL's second Ham in Space program. The FARA program will emphasize DX, public service and emergency communication and how newcomers can get into Ham Radio. I attended the CQ Radio club meeting in March where everyone was treated to an interesting talk by Brad Field, WV1T Channel 30 meteorologist. That is the news for this month. If there is some more that any of you would like to see in this column, please let me know. This is your column, so if there is something you would like to appear here, send it to Robert Koczur, K1WGO: 84 Whetstone Rd., Harwinton, CT, 06791. 73s. Traffic: WB1GXZ 386, KA1MKJ 208, KA1MDM 204, W1EFW 157, KA1GWE 142, N1DMV 131, KA1KTH 131, N1BOW 83, KY1F 67, W1YOL 61, N1DNA 49, W1BDN 47, W1WP 46, KA1BHT 64, KA1KAG 41, K1AQE 39, WB1ESJ 23, WA1NLD 17, W1QV 8, W1CUH 3.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: K3HI. SGL: K3HI. OO/AA: KA1KF. SEC: KB1PA. STM: KW1U. ACC:K1AZE. TC: KA1IU. PIO: K1HLZ.

NET	MGR	FREQ	TIME(LOC)	/DY	QTC	QNI
EMRI	N1AJJ	3658	1900/2200	DY	236	349
EMRIPN	N1BGW	3880	1730	DY	308	285
EM2MN	KA1AMR	145.23	2000	DY	188	374
NEEPN	K1BZD	3945	0830	SN	12	65
HHTN	WB1CMQ	04/64	2230	DY	177	445
EMRISS	N1CVE	3715	1600/2030	DY	152	229
CITN	KB1AF	745/045	1930	DY	180	250

A warm "Welcome Aboard!" to State Government Liaison K3HI of Cambridge. Shawn will be helping us to keep abreast of legislative proposals and actions that affect the Amateur Radio Svc here in the EMASS Section. Welcome also to new Emergency Coordinators W7RCP of Pepperell and K2AJY of Swampscott, as well as to new Official Emergency Stations WA1BLG and KT1K. Does your town have an EC? Do you know for sure? Are you interested in emergency communications? Why not contact SEC KB1PA or myself for information and applications - do your community a favor; put something back into Amateur Radio for a most welcome change! TCC Director KN1K reports visit to Wang ARC where he spoke about packet radio & the ARRL's National Traffic System. KB1DJ is looking for ARRL certified Volunteer Examiners to assist with Boxboro Convention exams. They need examiners for 4 sessions from Fri. Oct 17 thru Sun. Oct 19th. Contact Alan Kline at 598-6010 or 595-0873 if you can help out. PIO K1HLZ and SEC KB1PA worked with Sharon ARA as well as

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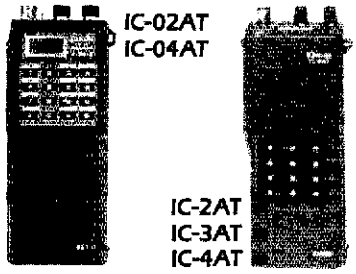

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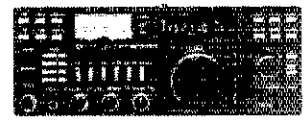

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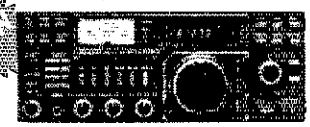
IC-471A/H 430-450MHz



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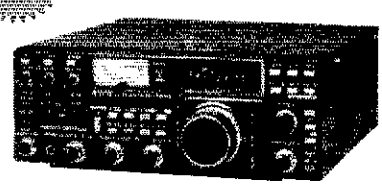

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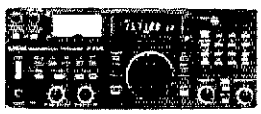

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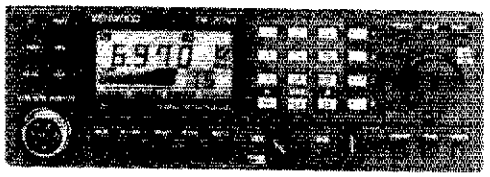

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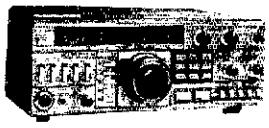

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Sharon CD and the Civil Air Patrol in conducting a search on March 22nd. Amateur Auxiliary Coordinator KA1KF reports a large increase in number of Amateurs applying for OO positions. Be sure to contact him if YOU've got what it takes! March traffic: KW1U 792, N1BGW 586, KN1K 430, WA1FCD 388, KB1AF 370, WA1TBY 324, W1ZHC 260, N1BHH 233, WB1CMQ 220, KY1T 139, N1CVE 137, N1DDC 132, KA1ON 128, KA1AMR 125, N1AJJ 110, KA1EID 91, K1SEC 85, K1ABO 68, K1GRP 66, W1CE 56, KA1LIH 50, W1DMH 39, WA1FNM 37, WA1SNH 24, K1BZD 20, N1DVI 12, KT1K 9, K1LCQ 9, KA1KCU 3. HAVE YOU EXPRESSED YOUR OPINIONS TO YOUR DIVISION DIRECTOR AND YOUR SECTION MANAGER LATELY?73.

MAINE: SM, Cliff Laverty, W1RWG—ASM: W1KX. SEC: (vacant). STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. Larry, W4PAT, with many roots in Maine, Moosehead Lake and Bath, over past 23 yrs became a Silent Key Apr 3. Aroostook ARA elected President Ivan, KA1KAO; Vice President Roger, AD1G; Secretary Don, KA1HIW; Treasurer Ron, KA1KME; Tech Mgr Mac, KA1ETN. Ellsworth AWA elected President Bill, WB0YJP; Vice President Dave, KA1BC; Secretary/Treasurer Evie, KA1BRA; Trustee Elmer, W1CCN. Congrats Ellsworth on new newsletter, Ground Wave. Androscoggin ARA elected President Sal, W1CUW; Vice President Nate, WA1SAZ; Secretary Ed, W1OKS; Treasurer Roger, N1CWG. Congrats to Andy Club on their successful March 1 Poland hamfest. On-the-air cabinet meetings of the Maine ARRL leadership occur the first Sunday each month on 3940 kHz at 9:30 AM. Everyone is invited to participate in the forum at the end of the meeting. PSHR: WB1CBP, WA1YNZ, W1RWG. NETS: (Sess/QNS/QTC/Mgr) SGN 26, 923, 160, K1GUP; PTN 31, 316, 132, K1MZB; LPTN 19, 66, 17, WA1YNZ; MPSN 5, 81, 8, KL7IJG; RACES 5, 70, 10, W1RWG; AEN 4, 65, 1, WA1YNZ. Please send in traffic reports. Traffic: WB1CBP 180, AK1W 167, W1ISO 120, ND1A 66, W1RWG 63, W1BMX 50, N1BJW 49, KA1AVU 45, WA1YNZ 30, W1JTH 26, W1OTQ 25, KA1FTL 13, W1VEH 12, N1BME 10, W1GCB 8, K1NIT 6.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—TC: W1JY. SGL: N1AIX. March was a busy month across the state with a fleamarket, preparations for fleamarkets and planning for public service activities in process. I operated the ARRL booth at the Interstate Repeater Society fleamarket in Hudson and saw many section volunteers and league members. Thanks to Ken, WA1DXO, for helping with the booth. The Nashua club sponsored a VE on March 15 and the CVFMA sponsored a VE on March 8. Both were well attended with pass rates of 61% and 58% respectively. New appointments in the section include—Ken, K1SHR, and Don, AJ1T, as awards managers and Dale, AF1T, as ATC. Dale reports that he was active on 902 MHz during the VHF contest, and suggests that activity on the new band will have to increase significantly if we are to justify the allocation. The GSARA in Manchester is running Monday night CW training nets on 15M to assist local Hams who want to increase their code speed for upgrade. Ed, KI1R, has relocated to N. Carolina. Ed held office in both the CVFMA and KARA and was NCS of the Twin State Emergency Net. Good luck in your new endeavors, Ed!

NET	TIME	FREQ	MGR
GSPN	5:30pm	3870	N1AKS
NHN	7pm	3547	N1NH
GSFMS	8:30pm	146.94	K6UXO
GSFMN	8:30pm	146.655	K6UXO

Traffic: GSFM 194, NHN 161, GSPN 58. MSOVTP 23. W1PEX 687, WB1DSW/P 441, N1CPX 314, N1NH 248, W1QYY 166, KI1M 129, N1AKS 107, K6UXO 99, W1TN 96, KV1S 74, K1PQV 70, WB1GXM 55, KK1E 50, KB1XI 45, W1ALE 38, KA1HPO 36, K1TQY 30, WA1YZN 24, KA1LBW 23, KA1LBH 18, W1MHX 17, W1HJF 10, N1ALM 8, W1LQQ 6, N1DQA 4.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Tnx to the No. Prov. Amateur Radio Club and the other clubs in R.I. for the work put into the Annual No. Prov Memorial Day Parade and Muster, another job well done. Tnx all. The Ocean State Amateur Radio Group will be the Official Radio Club for the States 350th Anniversary, and they with the help of other clubs will run a special Event station for this event. The N.P.A.R.C. had a Special Event station on the air May 25, and had a good time with it. VE Exams still going strong in R.I. Most clubs have test sessions planned. No news letters this month—come on, help me out. Traffic: KA1JXH 287, PS 139, W1EOF 154, KA1KML 197, WA1CRY 32, KA1DYD 176. Enjoy your summer and good luck to all on Field Day.

VERMONT: SM, Ralph T. Stetson, KD1R—Good news from BARC. Rumor has it that this year's hamfest will be held at the Essex Fair Grounds on August 9 and 10. Please write to Roger, WA1OZE, c/o BARC, P.O. Box 312, Burlington, VT 05402 for further information regarding camping and set-up access times. Look forward to seeing all of you there. Congratulations to the Northern VT Repeater Assoc. for their new machine on St Albans Hill. Freq is 145.15 input -600. I understand the repeater is running 50 watts with excellent coverage of the northern Champlain Valley to Montreal. The call is K1CQ. I wish to all Graduates of the "Class of '86" best of luck in their future endeavors. Some calls to watch for from the BARC classes KA1MIG, KA1NPN, N1DXX, KA1NUK, N1DZX, KA1NRR, KA1NWF, KA1NUL. From CVARC N1DZO, N1DZP. Green Mtn Wireless Soc. KA1's NZB, NYX, NYZ, NZI, NWB, NQI, NUZ, NYW plus 8 more that haven't received their calls yet. I expect that there are more new hams out there that I didn't recognize this month. As soon as I know your call, it will get listed here. I hope that all of these new hams get their feet wet in FD 86 later on this month. Don't let the idea of a contest scare you away. Field Day is a lot more than a contest; it is time to renew and make friends, see how the other guy gets the job done, and an excuse to get out and have fun in our hobby. To all of you who took the time to return the ballots for the recent election, a hearty thanks from those of us running for SM in VT. Getting some really good participation on the traffic nets for the first time since I have been involved in NTS activities. We had 2 folks earn BPL: KT1Q and WA2SPL. THANKS for all that hard work, gents. The VTN annual Picnic is to be at the QTH of W1KRV, the weekend of July 26, 27. The exact date hasn't been resolved yet, so set aside the time and check in on 3.539 MHz at 7 PM daily for updates. KT1Q NM assures me all newcomers are very welcome, so join in the fun when you can. Traffic: KT1Q 958, WA2SPL 223, W1KRV 64, AE1T 61, N1DHT 54, W1OAK 16. Net reports: VTN 31/211/99. CAR: 26/712/45. GMN: 26/364/35. VTPHN 5/80/5. CVFM 5/126/8.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—PIO/ACC: K1BE. SEC/SGL: WB1HIH. OO/RFI: N1CM. STM: W1UD. TC: KA1JJM. NOBARC has created new Coordinator positions for Media, Welcome wagon, Special Event Recruiting, Training, and Public Service. Sounds like a good way for a club to be sure it is focusing on a wide choice of activity for the members. Many thanks to WB1DZK for his gift of a Stationmaster and hardline for the installation at National Weather in Worcester. New ARES net on Sunday mornings at 9:00 on 449.175. June is here and time for warm weather activities. HCRA Annual Banquet is on June 6. Yankee Rowe test is on June 11. And Field Day is just around the corner.

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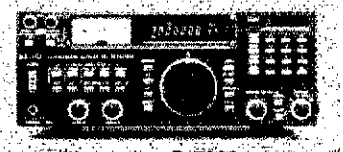

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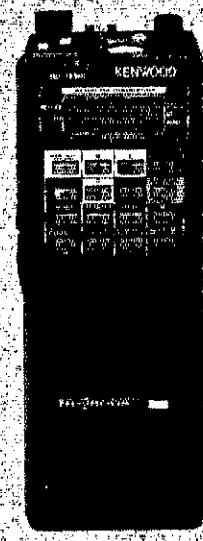

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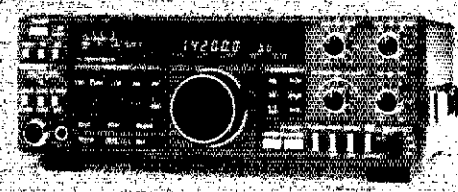

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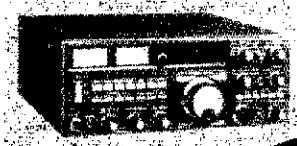

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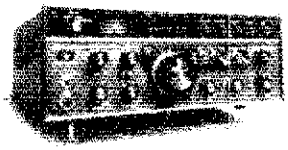

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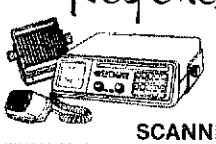

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A bit further out, New England Division Convention is October 17-19 at Boxboro. KB1DJ is already lining up VE help for the exams. Contact Alan if you can assist. Congrats to N1DMU for Brass Pounders for second consecutive month. PSHR: WB1HIH, N1DMU. Traffic: N1DMU 585, KA1EKQ 146, KA1T 119, W1UD 115, W1KK 62, WB1HIH 61, K1JHC 45, K1IJV 42, WA1OPN 12, W1ZPB 11. (Feb.) WB1FSV 12.

NORTHWESTERN DIVISION

ALASKA: SM, Jim Moody, Jr., NL7C—I missed writing last month's column due to a call for extra amateurs to provide communications on the Iditarod Trail. An educational experience was had by all who participated! Congratulations to the Kodiak amateurs for conducting the first ARRL VEC tests in March. They are scheduling tests monthly, contact KL7AF for more info. The Arctic Amateur Radio Club is preparing for their public service event of the year, which is held on the same times as Field Day each year. All other clubs are preparing for the annual Field Day event. The Juneau clubs calendar is also full of events, too numerous to mention this month.

IDAHO: SM, Lem Allen, W7JMH—*CLUB NEWS:* PARC (Pocatello) sponsoring "Coffee Hour" 9 AM First Sat. each month at Oliver's Rest. on 5th St. across from Fed. Bldg. PARC also has Amateur Exams June 7. Contact N7XS or AK7P. KARS Hamfest at Coeur d'Alene Fairgrounds June 14-15, RV Parking available—no hookups. ISRA Magic (Twin Falls) Swapmeet June 14-15. BCARC (Sandpoint) meets 7 PM at Federal Bldg, 1 mi. W Sandpoint on Hwy 2, First Friday each month—all welcome. *ARRL MATTERS:* ARRL has relaxed their requirement for waiting 30 days after failing an Amateur Exam before retesting. *PEOPLE AND THINGS:* Congrats to N7GIV, WB7PFO new Extras; KA7WIA, KA7ANM, K7DXU new Adv; N7HYY, NL7FG, KA7WYY, KA7WFS, KA7VIN, KA7YGX new Gen's; KA7QMB, KA7TQP and Bill Peterson, new Tek's.
NET REPORTS:

Net	Freq-Time	Ses	QNI	QTC
FARM	3937 Lsb 7P Da	31	2450	19
ID CD	3990 Lsb 810 A M-F	21	826	12
IMN	3635 Cw 8 P Da	31	413	78
NW TFC	146.38/98 FM 730 P Da	31	1011	35

GENERAL: Take a Buddy with you on Field Day. Do not allow Mobile QSO's to distract you from driving safely. Get involved with a new mode. Traffic: N7BHL 197, W7GHT 198, W7JMH 34. N7GTU 15.

MONTANA: SM, Les Belyea, N7AIK—WA7DEO in Missoula reports the following upgrades, to Extra—K7MEA, to Adv.—KA7DUO, to Gen.— N7HXI, KA7VPG, KA7WYU, to Tech.—KA7YCV, KA7SUH. Also upgrading in Libby were, to Gen.—KA7FVQ, to Adv.—WB7FGO, N7HVB. The 1986 officers for the Butte ARC are, pres—WA7FLG, vp—K7KCR, sec'y—WA7FOB. The Butte club was formed in 1936 (50 years old). Plan on attending the annual Fathers Day Picnic (June 15) in Wolf Point, contact WB7QDN for details. Was very nice to have our division director, W7QGP, in our section last April, she made a visit to as many clubs as time permitted, and gave out lots of info on many subjects, also asked lots of questions. Congrats to KB7Q for WAS—on 2 meters (via EME), he is also the first in Montana to get a VUCC award, #81. Also, N7AIK got an award for WAS on 75 meters 2-letter extra-class. PSHR—KF7R, WB7WVD.

NET	*SESS*	*QNI*	*QTC*	*MGR*
MTN	30	2209	185	KF7R
IMN	31	413	78	WA7GQO
MSN	4	117	0	KØPP

Traffic: KF7R 62, WB7WVD 32, N7AIK 20.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. Upgrades: KA7WYW, KA7YIL (Novice); KA7MDC, KA7SKL (Tech); KA7NXH (Gen); NS7D (Extra). W7IMZ retired from Burlington Northern. Congratulations to all. WA7TZW who is working as a missionary in Peru came back to Medford for short visit. His tales of the jungle are interesting. Special note to those who can't make Saturday VE exams, Portland Adventist Radio Amateurs are sponsoring exams on Sundays. Contact KR7P, KA7Z or KT7Y for information. The Eugene Ham Fair Committee found it necessary to cancel the scheduled HamFair due to non-participation of a commercial Amateur dealer. We will sure miss that one! Fire completely destroyed the 449.675 MHz and 144.10/70 repeaters on Mt Scott belonging to the Farmer's Mtn Repeater Group. A spare unit was also destroyed. There was no insurance, so the future is still un-decided at this time. In this line, we must remain alert to increasing amounts of vandalism at some repeater sites. If you have information, contact your local club or Section official to find out who to report to. Your name will be held in confidence. Traffic: W7VSE 451, K7OVK 215, N7ELF 188, W7ZB 103, KA7AID 77, W7FBP 40, N7BGW 38, WA7VTD 33, W7FDU 21, W7LNE 15.

WASHINGTON: SM, Gene Sprague, KD7G—TC: W7BUN. SEC: N7DRT. ASM: KR7L. ACC: KC7PH. OOC: N7IL. STM: KD7ME. June events: SEA-PAC Ham Convention at Seaside OR on June 6, 7 & 8 - Central Washington (Wenatchee) Hamfest at Rocky Reach Dam, Wenatchee WA on June 14 & 15. The clubs that have these hamfests and conventions work hard for our enjoyment, TNX folks! This may be the time to enjoy meeting the guys and gals you have been talking to this past winter or see old friends. June is also Field Day month (June 28 & 29). This is a good time to put your communications skills to work and have fun at the same time. New Amateurs or those who have not been on a Field Day, contact a local club, the above listed Staff or me and we will try to get you in touch with a group that is having a Field Day exercise that you can observe or participate in. Club news: Again, it is great to get news letters from so many clubs, TNX. Also TNX to the WWDX Club for printing the Hamfest Calendar for '86. If you are not a club member, are you missing something? Lots of info, help on whatever, friendships, and a chance to promote our service are some of the advantages. You may wish to inquire, as there are several types of clubs. If you want more info contact the Affiliated Club Coordinator (ACC) or me. Drills/exercises: "Amateur Radio handled a majority of the message traffic passed to and from DES," from an interesting article in the Yakima ARC (W7AQ) news letter about a 4-hour simulated emergency exercise on 2/8/86. Congrats on a good job. General comments: It has come to my attention several times that there are questions about the ARRL field organization. Who does what, how do we relate with the NW Division and Headquarters, etc. If you have questions on what the Section Staff (listed above) jobs entail or what they can do for you etc., please contact us, we are here to serve you. Do you need a speaker at one of your meetings? Contact me and we will try to provide one. Budget limitations restrict unlimited travel, as the section is large, but we will try. March '86. Traffic: WB7WOW 382, K7GXZ 196, KR7F 174, N6EQZ 95, W7LG 81, WA7CBN 60, W7GB 51, K7SUX 51, W7IGC 50, W7IEU 45, N7GGJ 38, KS7I 25, KA7TCE 27, K7AJT 20, KC7PH 15, WA7CTS 10, KD7MW 8, KA7AEF 8, N7FXM 6, W7APS 4. W7AIB 3, KA7IVA 2. (No scores to be listed) KD7G, KR7L & KD7ME Note: Several Traffic Handlers do not wish their totals to be listed, some not their calls, and some do not report, but everyone provides the excellent public service. TNX to ALL! Congrats to all new Amateurs and upgrades. 73.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, N6DHN. SEC: W6LKE. Welcome aboard and thanks to new STM K6APW. I expect Jim will be in touch with all of the EB tfc handlers soon. WA6TGF was awakened by the March 31st, 4 AM earthquake. Ron acted as NCS on Livermore RACES' 147.12 repeater, and checked in 22 stations from San Ramon to Livermore. As there were no damage reports, the net was secured at 4:15 AM. N6DRT is spearheading the drive to have EBARC become a corporation. They recently approved a new constitution and by-laws with KB6P as chair of the Constitution Revision Committee. NBARA members manned club station K6LI during the recent floods in the Napa area. LARK welcomed new member WA6EAR, and NF6S won their coveted Klutz-of-the-Month Award. MDARC is looking for a new editor for their award-winning "The Carrier." HARC club activities are being handled by N6IQX and KA6VHY. Traffic: W6VOM 195, WB6DOB 136, K6AGD 120, NI6A 47, WB6UZX 30.

NEVADA: SM, Joe Lambert, W8IXD—Congrats to newly appointed ASM, Curly Silva, K7HRW. Thanks to those who attended the Nev. Sec. Mtg. May 17. Newly formed So. Nev. club, FARS, officers are: pres. W9RU, V.P.: N7BYZ. Sec: WB5PTO, Treas.: W7IZU. Mtgs. are 1st Sat. at 6:30 PM. Talk in 145.39. Contact N7CXD for Field Day info. W9RU was awarded "Merito Amateuristico" award by LIGA Mexicana de Radio Experimentadores, A.C. for work during Mexican earthquake. W6JBB, WA6JZG & WA7NLC provided PH patches for patients at VA Hosp. Easter using the newly installed ham eqpt. SNARS reports KA7GYX and others are conducting a Novice class on Wed. eves. at Sparks Public Works Shop. WADG elected new officers as follows: Chairman: KC7EE, Co-chairman: WA6ICB, Sec.: N7EQV, Treas.: N7DOD, Board Member: KA7MIP. NARA meets every 3rd Tues. at 1900 in Savings and Loan near Sears in basement. LVRAC meets on second Sun. Talk in on 146.94.

PACIFIC: SM, Army Curtis, AH6P—STM: KH6HIJ. SEC: KH6B. ACC: KH6BZF. PIO: KH6IJ. Aloha and hata adai to all of the Pacific. I am very pleased to announce the appointment of an Assistant SM, KH6BZF. Lee will play a valuable role in providing a local contact on Oahu. Please feel free to contact him. Maui ARES active during Maui Marathon with AH6AM, AH6AZ, WH6BFT, AH6DV, NR6EV, AH6GP, KH6H, KH6HA, KH6HHG, KH6MQ, KH6SQ, K7SS, and WD9DDT all participating. Outstanding! KD6ZV visited Hawaii and met with Oahu hams at Coco's, and with BIARC at special meeting in Hilo. Very nice meeting Rod. I attended HARC and EARC meetings in Honolulu, nice seeing everyone again. Traffic: KH6S 31, KH6H 9.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—STM: WA6WJZ. SGL: N6IG. ACC & TC: W6RFF. DEC NORTH: KF6KJ. DEC Sierra: KA6GHI. There are two new appointments as EC: For Yuba/Sutter Counties: Barry Barnes, KE6LW and PLACER County: John Winans, KB6HRP. SECTION NET: First Sunday each Month, 7:30 PM. Net Control: W6IEW or W6RFF. Held on 146.085 (input + .600) repeater WD6AXM/R. Glenn Koropp, W6YFW, a former Assistant Pacific Division Director, Interim SV SM and the man that initiated the VE test activity in Sacramento has decided to let someone else carry on—henceforth he is just going to sit back and enjoy ham radio. Have fun, Glenn, we really appreciate all you have done! Rich Lawton, N6GG, has been appointed HF and VHF Awards Manager by the Amador County ARC, a Special Service Club. Those wishing to apply for WAS, 5- band WAS or VUCC Awards can have your application certified by Rich probably faster than Newington can. Contact him at 14395 Beavers Way, Pioneer, CA 95666. Phone (209)295-5093. I have just learned that Volunteer Examiners are giving test sessions in Redding. By the time this is printed their first session will be history. The contact there is Riva Bromwell, NT6E. Contacts for sessions in Chico, Jackson, and Sacramento are, respectively: KE6EP, KE6NS, WB6ROS. Traffic: N6LUY 319, WB6CLD 190, WA6WJZ 131, WD6BZQ 111, K6SRF 87, KB6CFX 85, N6CVF 46, W6RFF 30, WD6EEZ 10, WA6ERZ 6, WA6ZUD 6, WB6SRQ 5, KB6FXY 4.

SAN FRANCISCO: SM, Bob Smith, NA6T—The entire section was very active in the FLOODS of 1986 in ARES-RACES operations. We had a good chance to demonstrate AMATEUR RADIO to local city and county govts. DNARC DX AWARD for 1985 was won by W6NAT, congrats! New club is forming in S. Humboldt Co., interested? Contact KE6WC. New officers elected in FWRA, also decision made to limit FWRA RPTR SYSTEM to 3 rptrs. Doug, WA8JRB, is new pres. for REDXA, he will be captain of the REXDA team for the SCRA-REXDA FD CHALLENGE! SFRC is swapping the 10 & 2 mtr net nites—Westlink will be timely, and have more check-ins to both nets. FD at SFRC will be on the JEREMIAH O'BRIEN at PT. Mason, see Greg, WA6DQP, about attending. Don't forget to save the first weekend in October for Pacific Div. convention in San Jose. See you all there!! Traffic: N6FWG 140, K6TP 69, W6PW 162, KK1A 223, K6TWJ 87.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. Appointments renewed: EC WA6KZV, KA6CUJ. WA6EWR: OBS K6RAU. The Sonora Pass Amateur Klub (SPARK) started Feb. 15, 1986. The Club meets the 3rd Wednesday at the CDF Mess Hall in Twain Harte. Officers are Pres KI6AD, VP KI6AA, Sec WA6LOQ, Treas W6FGC. New officers of Central Cal. Amateur Comm. are Pres WB6FWO, VP WB6C, Sec WB6JIT, Treas WA6JII. The Club meets the 2nd Monday in Fresno. W3KGW is Extra. N6JRC is Advanced. N6JQL has a TS 940. WD6CRH is N6NIV. N6MZF is General. KB6LQV and KB6LBT are Techs. KA6OQV is Extra and is now WO6S. N6MKT is Extra and is now WO6R. WB6WXS and KA6VEC have FT 757GXs. KG6WG, WG6Q, WA6KBK, K6LSB, K6HEZ, and WO6S have FT 2700RHs. N6AKJ has an IC O2AT. N6MZH has a TR 2600 and FT 270RH. N6MXG has a Tempo S2 and S4. WB6AEA has a TS 430S. The ARRL National Convention is Sept. 5-7 in San Diego. Contact W6GIC for registration information. The 1986 ARRL Pacific Division Convention is October 3-5, 1986 in San Jose. Contact AE6Z for more information. Traffic: N6AWH 151, K6PMG 33, W6DPD 9, WA6YAB 8, N6MXG 1.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—BM: W6BCY (SK). PIO: (vacant) TC: WA6PWW. SEC: K6TL. ACC: W6MKM. ASM: NS6S & N6JQJ STM: (vacant). If it's not one thing, it's another. On March 26, at 3:55 AM, many of you were awakened by the (not so) gentle motion of the ground 'neath your home. Yer SM lives within 10 miles of the reported epicenter, so you can imagine the rocks rollin' here! Much thanks to all of you who responded and came up on one of the ARES repeaters in the section. SPECIAL THANKS to all of you who came up and just listened without keying up to say "no damage here"... We are saddened to report the passing of our Bulletin Manager, W6BCY. John was an excellent team member and will be sorely missed by all of

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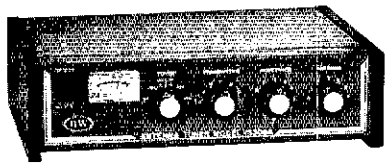

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us...The ARES groups in both Palo Alto and also in Morgan Hill has been praised by city officials for their help during the heavy rains and floods last month. The respective ECs, Jim WA6NIL and Dave N6JQJ, and their ARES groups are a real asset to our community...also, Dave, N6JQJ, is a new Assistant Section Manager with special responsibility for ARES training in the section. If you have any ideas concerning how to go about doing ARES training, give them to Dave...Cyn W6PHT has been very QRL with work, and so has had to resign as STM. Many thanks for a job well done, Cyn...The hams in Foster City (with some assistance from SEC K6ITL) have scored a major victory. Since its inception many years ago, Foster City has had an ordinance prohibiting antennas of any kind. When local hams showed PRB-1 to the city attorney, the wheels were set in motion, and a new ordinance was enacted that allowed towers as tall as the average ham HF tower. Hats off to the Foster City gang for their achievement...PAARA has an interesting version of their club news letter for April, the "PAARAnoid". verrrry interesting...the Gabilan ARC heard talks from KE6DN and K6AEP of fast/slow scan ATV. Congrats to KE6DN on his appointment as ATC for ATV... the Lockheed ARC heard from W6OLO on "Project Moonray"... There are rumors currently circulating that L.W. Yaggy will be mounting a DXpedition to Gilligans Island in May, assuming that his admittance encounters no resistance or reluctance. His call is said to be F0OL. Local plans to participate in the "Armadillo Run" are proceding apace. Participating will be WB6W, WA6PWW, WB6MRQ, WB6MLC, N6KL, and N6BIS, among others...Let's see those club newsletters! It's much easier to report on club happenings when I know what they are. Also, good luck to all Field Day participants this June. OO reports from K6AYB, Traffic: W6YBV 158, W6CF 2.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. OOC: K1PLR. TC: K4ITL. SGL: KE4ML. It's FIELD DAY 1986. This is the time for each amateur to do your thing under emergency conditions. Also send the SM a radiogram of your activity for extra points. Also get publicity of your FD for more points. Make a video recording and play on local cable TV. Nice to see everyone at Charlotte Hamfest. With new VHF awards don't forget the VHF Contest this month. Also the Hollerin' Contest at Spiveys Corner. Congrats to new upgrades: KA4RVS, WD4DDG, N4KSO, K4TST, KB4PZM, KB4KSW, KJ4AX, KB4EFE, KB4FKF, and all those at Charlotte hamfest. KA4DHP now KJ4RT, N4HVG now KJ4RW. Silent Key: AA4PS. Congrats to our newest Affiliated Club, Coastal Carolina Community College Communications Club. To K4HPV new EC Henderson County; To N4MBI new EC Forsyth County. This month the State General Assembly meets for the short session. Please contact your Senator NOW and get the vote in favor of the License Plate Bill—HB 952. DON'T DELAY—WRITE/CALL TODAY. It is now a very dry season and state has alerted the ARES/NTS on callup for help in this volatile situation. Governor Martin will declare Amateur Radio Week leading up to Field Day. FCC exams in Lexington June 21, August 16, October 18, December 20. Walk-ins YES. Contact WA4JVD. WD4ICX has new Jr. Op.

NET	QNI	QTC	TFC	QND	SESS.	MGR.	FREQ.
NCMN	1256	459	387	1420	90	WB4HRR	3927
NCEN	2064	587	508	2189	88	WB4WII	3923
CN	1773	845	835	798	180	NJ4L	3573
CSN	936	210	210	2536	90	N4LST	3715
CNCTN	2724	436	376	1643	90	WA4MNR	6.22/82
PCTN	1602	520	431	1800	90	NE4J	6.28/88
RARS	517	61	80	846	90	K4ABJ	6.04/64
M2MEN	2331	109	109	1869	88	KF4MZ	6.35.23
CFARS	1178	80	59	1350	90	W4EHF	6.31/91
THEN	1371	126	93	1404	88	KB4IVV	3923
PETN	684	159	127	1231	88	WB4HRR	5/75.17

Totals 16,438 3592 3265 18878 983 (Jan, Feb, Mar 86). Traffic: K4NLK 418, NJ4L 282, KA4TLC 200, WB4HRR 164, AB9Y 124, N4JRE 96, KA4EYF 80, AA4MP 80, AK1E 74, KB4IVV 69, N4LST 69, WB4N 67, NT4K 65, K4SWN 62, WB4WII 59, WA4MNR 53, KB4OGR 52, WB4CYN 49, KI4YV 39, N4NOY 38, WD4EQK 33, NE4J 33, W4EHF 30, N4MMM 30, K4IWW 25, N4LUO 25, WD4MRD 20, N4CJJ 19, K4GI 17, KB4OKB 17, WD4RMQ 16, KJ4W 13, N4MQU 12, N4JEO 11, N4UE 9, NV4F 7, WD9DQL 6, N4KYD 6, W4BOH 2, KB4NUH 2, KJ4AX 1. Totals: 41 SARs, 2474 Tlc.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ—I extend my CONGRATS to the Carolina DX Assoc. for becoming a new ARRL affiliated club in our section. A reminder for clubs - the affiliation report for 1986 is now due. If you are a member of the following clubs, please remind your secretary to prepare the 1986 ANNUAL CLUB REPORT and mail to HQs: North Augusta-Belvedere, Islander, Chesterfield, Columbia, Pee Dee FM, Blue Ridge, Florence, Oldfield, Greenwood, Greater Pee Dee, Grand Strand, Lancaster, York, Spartanburg, Sumter, Keowee-Toxaway. A special note to the Special Service Clubs (SSC). To remain a SSC, you must renew your commitment by completing a new set of applications forms and a current membership roster for the next year. Last month was a test for sending SM reports over the phone line via computer to a BBS in HQs. This and all future SC reports will be sent using that mode. Maybe this will eliminate the 'got your report two weeks late' syndrome that has plagued me lately. Nets Jan-Mar: SCSSB 2398/451, Blue Ridge 5218/228, Greater Pee Dee 2400/247, York 1476/213, Lancaster 417/63, Carolina State Line 160/10. Traffic: K4ZN 294, KB4BZA 71, W4FMZ 66, W4ANK 65, KA4LRM 49, WD4KT 47, K4ZB 47, K4FRX 35, WB4UDK 35, KA4YEA 28, WD4HLZ 14.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: WB4UHC. OOC: W4HU. ACC: NT4S. BM: AB4U. TC: WB4MAE.

VTN	1 PM	3907	AA4AT
VSBN	6 PM	3947	K4VWK
VSN	6:30 PM	3680	NN4I
VN (EARLY)	7 PM	3680	N4GHI
VN (LATE)	10 PM	3680	K4AXF
VLN	10:15 PM	3947	N4KSO

It is with deep regret that I report Al Martin, W4THV, as a Silent Key. Al was the SGL, (State Government Liaison), and he held that post for several years. Al was a very active member of the Richmond Amateur Radio Club and served amateur radio in many ways over many years. Welcome to the Chesapeake Amateur Service Club as the section's newest affiliated club. Tnx to the Fauquier and the East River clubs for their newsletters and to the clubs in; Lynchburg, Williamsburg, Sterling Park, Portsmouth, Mt. Vernon, Woodbridge, Roanoke, Va. Beach and Va. Tech for their newsletters they are a great help in keeping abreast of section activity. WB4AXY, DEC, for STARES ARES, reports KH6HI is the new Net Manager. The STARES ARES NET meets 8 PM Tues/Fri on 146.37/97. EXTRA CLASS licensees, ARRL offers you a beautiful diploma type certificate, similar to that formerly issued by the FCC, if interested send $3.00 and a photocopy of your Extra Class license to ARRL Awards Dept. To date I have received info from ARRL HQ that only 16 of the sections 52 affiliated club have submitted 1986 Annual reports. If your club needs report forms, contact the ACC or SM. Reports must be filed to keep

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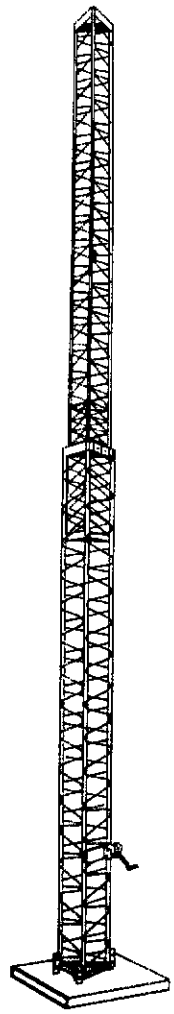

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your club on active mailing from ARRL. Interest in Packet radio continues, ace tfc man N4EXQ, the latest convert with a Pakratt TNC and Commodore computer. KA4NWK is the new EC for Augusta county. STARES ARES supplied communications for the Shamrock Marathon with 36 stns participating. By this time all clubs should have made plans to operate in Field Day, June 28-29. I hope to see many of you at the Manassas hamfest, June 1. Make plans to attend the Berryville hamfest, Aug. 3, and the Roanoke Division Conv, Aug. 23-24 at Va. Beach. Upcoming VE Exams for Tidewater; June 7, contact WB4BAB, Portsmouth; July 12, Va Beach contact KA4UNC; Aug. 2, Chesapeake contact AA4MB. Tfc on the NTS continues to be heavy with both N4GHI and N4EXQ making BPL. Traffic for the month was 4800 with 36 stns reporting. Traffic: N4GHI 746, N4EXQ 711, AA4AT 318, K4JUM 250, K4MTX 215, KB4WT 203, AA4GL 180, WB4PNY 170, W4JLS 168, K4JST 167, W3ATQ 167, WD4OCW 151, KB4NGO 140, WD4ALY 127, K4AXF 119, WD4MIS 80, K4VWK 78, WA4LJI 73, K4JM 66, NN4I 66, N4KSO 53, W4TZC 48, NT4S 45, K4GR 33, WB4KIT 33, WB4UHC 20, WB4ZNB 19, KA4IUM 18, K4MLC 15, KB4PW 11. N3RC 8, W4YE 6, WA4TVS 5.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. TC: K8CG. SGL: K8BS. ACC: WA8CTO. Jax Mill Conv. will be July 5 and 6. A special meeting of interest to repeater trustees will be held. Those interested in rptr coordination should attend. New novices are Debbie, KA8ZDN, and Renee, KA8ZDQ. Chas H.F. will be July 27 at Civic Ctr. Contact WD8OZT for info.

Net	Freq	Time	QNI	QTC	Sess	NM
WVFN	3865	6:00	1259	115	31	W8YP
WVMD	7235	11:45	816	42	31	W8FZP
WVN	3567	7:00	281	69	30	KZ8Q
WVRN	3640	6:30	343	49	31	KD8RD
WVNN	3730	5:15	142	38	30	WD8LDY
Hillbilly	14290	Noon Su	162	20	5	W8YP

Traffic: WD8LDY 285, W8YP 190, N8GJO 156, WA3NUI 114, KA3WNO 103, W8FZP 71, K8UQY 52, KD8RD 51, K8QEW 49, K8TPF42, K8KT 37, KA8TIK 35, NC8G 21, KA8OGF 11, KD8G 11, WB8BMX 7, NJ8J 6.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—SEC: WB0FQB. STM: N0DZA. ACC: WB0DUV. PIO: N0FOE. TC: NC0F. BM: KA0CZW. This month's column is devoted to saying thanks to some Colorado Hams who have worked hundreds of hours on a major international project, "Oscar Phase III C Satellite". Sometime in October, this communication satellite will be launched. Construction has been going on at the AMSAT Lab in Golden, Co., under project manager W3GEY/0. Some of the most progressive and electronic-orientated hams in the section have donated their time and talents to this project. Look for a future article in QST detailing the project. For now lets just say thanks and pass along our respect for the blood, sweat & sometimes tears to these dedicated section amateurs: WB0BTY, KE3D/0, N0FVG, W0FAR/0, W3GEY/0, WD0HHU, KA0HPP, WD5IBS, WA0IQN, K0KE, AA0L, KX0O, AA0P, WB0RLY, K0RZ, KY0S, NF0U, W0VO, WA0VSL, WB0WEB, K0ZRT, and also from other areas N6CA, W6XJ, W4PUJ, DJ4ZC, DJ5KQ, DK1YQ. Further info may be obtained from either of the Area Coordinators for AMSAT, WB0RLY or W0VO. 73, KQ0J. NETS: Col: QNI 813, QTC 43-Inf 89, 27 sess. CWN; QNI 124, QTC 115, 28 sess. CWXN; QNI 3212, QTC 2535, 31 sess. HHN; QNI 1942, QTC 134- Int 406, 31 sess. NCTN; QNI 338, QTC 138, 31 sess. SCTN; QNI 137, QTC 52, 19 sess. Traffic: N0BQP 2152, WA0HJZ 1233, K0JAN 458, WD0AUN 375, K0RXK 642, KA0CZW 552, KA0TXX 220, WA0OYI 210, WD0BSZ 190, KB0Z 142, N0DZA 137, WB0FFV 100, K0CI 58, AIOW 54, W0NFW 34, W5HRS 31, KA0NLI 19.

NEW MEXICO: SM, Joe T. Knight, W5PDY—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 171 msgs with 231 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 53 msgs with 1354 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 109 msgs with 785 stations in. Yucca 2-mtr Net 78/18 handled 18 msgs with 510 checkins. Caravan Club 2-mtr Net 68/06 handled 41 msgs with 178 checkins. SCAT 2-mtr Net 66/06 handled 6 msgs with 561 checkins. W5KWR honored by Santa Fe ARC for his many years of service. Vy sorry to report the passing of WA5RGI in a plane crash near T or C. KN5D packet BBS reports 402 connects. NM QSO Party Aug 16-17, contact KN5D. Traffic: ND5T 514, W5DAD 216, W6SX 12.

UTAH: SM, James R. Brown, NA7G—SEC: NS7K. STM: W7OCX. Davis County hams are forming a new club: K7LGP. Pres: NS7K, VP: KB7XO, S/T. Contact any officer for more info. Packet link now up on 2 meters from the Wasatch Front into Calif. Check WA7UZO mailbox or N7BHC for details. VHF Society held FB swap meet. WA7MEL and KE7LO active on 160. 73 de NA7G. Traffic: K7HLR 224, WA7KHE 57, WA7MEL 48, NS7K 36, NA7G 18, W7OCX 8.

WYOMING: SM, Dick Wunder, WA7WFC—Asst. Section Mgr: KA7AWS, Steve Cochrane. Sec. Emergency Coordinator: W7TVK, Jim Anderson. Sec. Traffic Manager: NS7X, Mary Ann Lenth. Wyoming Hamfest is July 12 & 13 at Wyo. State Fairgrounds in Douglas, Wyo. Representatives from each club and/or repeater should be present and attend the organizational meeting of the Wyo Repeater Coordinating group. This is your group and a new Frequency Coordinator needs to be elected to fill the vacancy. Congrats to KD7CF on upgrade to Extra and KA7USF on upgrade to TECH. KC7AR reports the Wyo Cowboy Net held 21 sessions with 865 QNI & 20 QTC. Traffic: NN7H 221, W7HLA 51, NO7Q 15. Again, many thanks to all the Volunteer Examiners for the fine job you're doing.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. Here are the new club officers of the MARC (Montgomery Club) President KK4A, Jim; Vice President AA4BL, Wayne; and Sec/Treasurer N4LKM, Roger. Two new repeaters are on the air near the center of the state in Dallas Co. One on 145.31 MHz -600 MHz and one on 447.025 MHz -5 MHz. Also on the tall tower of WDBB in Tuscaloosa Co is a pair of repeaters at 2200 ft 146.35 and 444.700. Packet radio is on the move in Alabama with new digipeaters coming on line each month. The latest is "MOB" in Mobile and "W4AP-1" in Montgomery. Who will be next. I have one Silent Key to report this month: KA4YWW, Ernest C. Knight of Roanoke, Ala. He will be missed. Best of seven three, Joe. Traffic for Feb: CAND reports 997 messages in 28 sessions with DRN5 rep 100% by W4CKS. DRN5 reports 1004 messages in 56 sessions with Alabama rep 87.5% by WA4JDH, W4CKS, NW4X, KC4GS, and W4WJF. The AENB "Hi Speed CW Net" reports 240 checkins with 74 messages passed in 28 sessions. The AEND "Slow Speed Novice Net" reports 190 checkins and 91 messages passed in 28 sessions. BPL: WA4JDH PSHR: WA4JDH, W4CKS, WD4NYL, and WA4RNP. Totals: WA4JDH 1018, W4CKS 106, NW4X 85, WD4NYL 69, W4SJF 52, K4AOZ 40, WA4RNP 34, W4DGH 25, and WB4TVY 8. Traffic: (Mar): WA4JDH 1056, W4CKS 119, NW4X 84, WD4NYL 83, W4WJF 54, K4AOZ 40, WA4RNP 39, W4DGH 26, W4CNQ 18.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: W4PIM. ACC: WA4ABY. OOC: NA4I. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. Well Albany kicks off the month with their annual Hamfest on Fri at 5 PM on June 6th & normal hrs on Sat the 7th. Rossville ARC has theirs scheduled for June 7th & 8th. Help support your section affairs. W4PIM, WB4RUJ, K4MOG, KB4JPN, K4EV, KI4MQ, KF4FG, KA4HHE & WB4DBO all made PSHR for the month of March. Club officers see that your annual ARRL affiliated club form is sent into HQ. Tnx to all the amateurs who helped with the tornado that hit the Marietta area. As of this writing, we still don't know what the situation is with the words "AMATEUR RADIO" on the GA STATE tags. I am sure that from now on we'll be more informed with some of the legislature involving amateur radio in the Georgia section. Two of my local legislators have given me their word that I will be informed ahead of time. Get to know yours better, it will help. Remember that they are elected by you. If ur area doesn't have an EC who has set up an Emergency plan for your area, please contact the state SEC, NC4E. There are some areas in the section that still need coverage in case of an emergency. If ur club or group has any information or articles that you desire to have published in QST, it should be sent directly to HQ & not to me. It saves lots of time. Traffic & nets are still a major backbone of this great hobby. Traffic handlers throughout these 50 states devote themselves to handling it. Please originate a message to a friend or relative and put it in the system. Remember the Atlanta Hamfestival coming in July. Traffic: W4PIM 200, W4BKK 182, W4WXA 165, K4MOG 106, WB4WQL 83, N4UZ 55, K4EV 51, WB4RUJ 46, KF4FG 39, KA4HHE 39, WB4DVZ 29, K4BAI 29, W9NXC 24, K4NM 20, W4HON 18, WB4SPB 17, W0MHS 16, N4MWR 13, K4JNL 9, KI4IG 6.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X—ASM, ACC: N4ADI. STM: WB4GHU. SEC: WA4PUP. PIO: WA4PUO. BM: KB4LB. SGL: KC4N. OO: K4JJE. TC: N4KF. Let me remind you to get your SARs and PSHRs to me by the 5th of each month as the new schedule for QST publication compels me to have my reports in the mail on the 6th of the month. Pleased to report that we have a new VOLMON here in Okaloosa County as Slim Petrasek, W3GTN, has moved to Crestview and we are delighted to have him in our OO program! I have received several new newsletters this month, and am impressed with the fine quality and send my thanks to the clubs that sent them. Despite some problems in schedules for ARRL Meetings at the Orlando Hamfest, it was a huge success, and I really enjoyed seeing all of the friendly faces. Let me urge all of our Extra Class members to get qualified as Volunteer Examiners as some of our current VEs are starting to show the strain. This program is here to stay, and we need to start sharing the work load with these hard-working troops. Field Day is June 28-29 and will be on us, so it is time to start getting people and equipment lined up for this important exercise. As many of you know, we had some 22 hams earn citations as a result of discussing prices on the air during a traders net, a questionable practice at best and clearly illegal if the trading is for other than personal equipment. Again, it looks like we will all pay the price for this indiscretion as the word I have is that the rules will now be clarified and stiffened! Traffic: WD4IIO 1322, N4PL 959, WX4H 713, WF4X 675, WA4QXT 618, WB4ADL 426, KB9LT 404, WB4GHU 221, AA4HT 212, WF4Y 196, KD4KK 181, WD4IUI 174, WC4D 163, KC4VK 157, W4KIX 156, WD4MLQ 149, N4GMU 139, KI4PB 118, WA4EYU 115, N4DY 103, N4JAQ 93, KB4MHH/N 93, WB4TZR 71, NF4O 67, KB4LB 64, KF4U 53, KB4FIY 47, WA4SXW 47, KF4TM 44, WD4EQB 43, W4DTV 37, W4LDY 29, KA4KAH 28, KI4CQ 28, W4MGO 27, N2AOX 25, WB4AWG 23, WB4HXS/T 22, KJ4HS 22, N4ENL 16, W8IM 13, WD4FJI 10, N4ADI 10, KF4GY 10, WD4RJI 10.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OO: W4SS. ACC: WA4NBE. KI4T wrote that K4CAG addressed a group of 50 National Guard communications specialists on amateur radio and that it was a great success. I am sorry to report that two well known traffic handlers became silent keys during March—Herb, W4YCL, and Marie, KB4KB. W4TJM, the club station in Lakeland, handled 255 originations for the Sun and Fun Fly In. They reported that there was 97.6% success in message handling as indicated by the number of service messages. There were 381 in attendance at the Fly In and 216 of these were hams. W4WYR reported that there were over 100 amateurs active with the Dade County Youth Fair March 13 through March 30. W1NJM leaves for Connecticut in April and will return in December—Will miss your help on 4RN, George! KA4FZI, manager of QRNS, has come up with an interesting statistic for net managers to consider—QTC/QNI gives an "activity" ratio for the net. QFN, the All Florida CW Traffic Net had a nice compliment—W5TFB in Texas, called the NCS after one of the late sessions and said the net was so well run that someone should write up QFN's procedures and have them published! A tip of the hat to all you guys and gals on QFN! Last month's column was quite long—this month I guess everyone was busy handling W4NVU and W4TJM fair traffic, so this will be a short one. 73 de WA4PFK. Traffic: W3CUL 3402, W3VR 1281, WD4KBW 926, W4NVU 816, K4EIC 806, WA4PFK 587, W4TJM 521, KF4JA 469, WA4EIC 376, K4ZK 323, K4SCL 319, WB4WYG 306, W4DL 267, KA4FZI 250, AA4BN 203, WD4CHO 201, N4KFU 200, WA4RUE 181, W1NJM 180, K4IA 177, KY8Y 120, KA4NXF 118, KA4GUS 109, W4PKP 105, W4TAH 98, N4MXH 90, N4KB 68, KY4U 54, KI4ZW 53, N4ET 53, KB4MON 52, KF4RL 52, KA4YHS 52, W3IJR 51, WA4HXU 40, W4SME 40, WT4F 36, N4IXQ 36, W4WYR 35, K7LCA 34, WB4GCK 31, K4FDU 31, N4MML 30, K4JI 29, WA9VND 28, KY0T 25, KB4KAW 25, K4BLM 25, N4JOA 20, KB4LKT 19, W3TLV 18, WA4HDH 18, WD4NXK 15, KB4LPL 15, KD4GR 13, W4DWN 12, K8BXT 11, W4UIO 10, K9EHP 9, WV4F 9, WA8BQM 9, N2FEL 9, KB4EWO 9, K4IRT 8, K4OVC 6, N4MEO 6, W4MFD 5, KA4GDU 5, KA4SIH 4, KA9AKY 4, KA4KDD 3, WK4F 3, N4ILN 2, W4MCJ 2, AA4IF 1, (Feb) W1NJM 61, N4HAS 36, KY4U 21, K4JI 18, AA4MI 18, KA4KDD 6, AA4IM 3.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, KA7HEV, WB7CAG. W7TB of Oak Creek is touring the So. Pacific and has been operating from South Cook Island as ZK1XU. Lew worked several stns in the Flagstaff area including NN7A, W7YS, N7HQI and KA7WNY. Newly elected officers of Tucson IBM RC are: N7ERG, Pres.; K0TW, VP.; W0GMO, Sec.; and KE7W, Treas. Wonder if N7ERG works QRP? hi.. Congrats to KA7MUL, Mike, who made BPL in March. Your SM enjoyed meeting lots of AZ Sect. members at recent So. Mtn. Swapfest including KE7GP and KA7VTM from Navajo Co., among others. Many Phoenix area hams supported the Phoenix Marathon for benefit of Explorer Scouts, and Am. Cancer Society's "Climb the Mountain" exercise. OPRC sponsored and helped produce an excellent radio show explaining ham radio to the general public. Format used interviews with local amateurs explaining all phases of ham radio. Was aired by KUAT-FM, the Public Service Stn. in Tucson. FB. Received FB Club annual reports from London Bridge ARC, No. AZ DX assn., Green Valley ARC, Arizona


MIRAGE / KLM
REPEATER AMPLIFIERS

ARC, Sun City ARC, and Coconino ARC. Keep up the good work. So. AZ DX Assoc. announces new officers: KC7LZ, Pres.; NN7C, VP.; and WA6NNC Sec./Treas. ARCA members busy at work planning Ft. Tuthill hamfest at Flagstaff July 25-27. And don't forget ARRL National Convention at San Diego Sept 5-7. Many AZ hams already signed up. Congratulations to Walt, K7KYW, and Doris, KC7AQ, who tied the knot on St. Valentine's day! Apparently I was incorrect in previous report about Mt. Lemmon Rptr. being removed from ZIA link. Am informed that 147.75/15 will continue in the system although some of the links are being re-arranged. I goofed! Reminder: Look at expiration date on your license. There are a number of five-year term licenses out there that will be expiring in the next year or two. Send renewal applic. before expiration date or you will have to cease operating while awaiting renewal. Don't get caught short! Tnx for reports, and see you next month. 73 JIM.

LOS ANGELES: SM, Bob Poole, AJ6F—ASM: K6IYK. SEC: AK6Y. STM: W6INH. ACC: KX7Q. OOC: K6BMG. The W6FNQ/R group again handled a phenomenal volume of emergency traffic: 223 vehicular, 18 fire and 5 medical emergencies for a total of 246. Thanks to KA6ZDL for this info. If you see a problem like these, call for an op on 146.82(-) and add to the total. Additionally, mountain rescue efforts were conducted on FNO thanks to WA6VXC, WA6QMW, W6LKN, WA6VXD, KF6QR and N6HOJ. Is your annual affiliated club 1986 report in to HQ yet? W6LS, W6UE, W6BAB, KA6NCR/R, the LAACARC, W6RO, W6YRA, W6SD and WB6KQY have recently filed theirs. Things are rolling on the VOLMON activities here; contact AJ6F regarding how to become involved with this. Hundreds of Hams participated in the Hands Across America project on May 25th. More next month. Six-meter area nets are: 8:00 PM (local) Tuesdays on 50.15 SSB; 8:00 PM (local) Thursdays on 52.28/88 FM. Many section VHF/UHF enthusiasts attended the West Coast VHF/UHF Conference in nearby Fullerton May 2, 3 and 4. Sheriff Bloch of Los Angeles has commended W6ENC for over THIRTY years of continuous RACES service. Congrats, George! The Hughes ARC again pulled off the communications for the Jimmy Stewart Relay Marathon: KN6F, of recent LA Marathon plaudits, did a fine job here too. Rosemary Willis received a very nice plaque from the LAACARC in recognition of twelve years of secretarial duties. Westsiders have formed a radio club and will become affiliated shortly. Contact Rob, WK6Y, for info. The City of Rancho Palos Verdes recently appointed WA6HXM as Chairman of the Planning Commission for 1986; others in the city's government are Mayor Pro-tem K6KSY, and Councilman WD6GBG. Persistence is important in dealing with some problems; N6BTT, for example, endured a saga from June 1981 to December 1985 trying to resolve a CATV leak. Ernie succeeded in having the Century Cable Company remove channel "E" from the system thus eliminating the 2-meter interference in his area. Pre-registration is still open for the ARRL National Convention in San Diego Sept 5, 6 and 7. Speaking of conventions, the DX Convention in Visalia sure was a lot of fun. Our own So. Cal. DX Club hosted the event. Remember to participate in the June VHF QSO party on 14/15; you need not be in the contest. Just learn your grid square and give out a few points! I mentioned about W6ADO sending code practice 24 hours a day. It has come to my attention that he is curtailing his activities to fewer hours since his power bills went up. I suggest that you drop him a line advising your preferred times for this practice so that he can arrange his times on the air to suit the most people. As I mentioned before, the frequency is 7099 kHz all speeds. He would appreciate hearing from you. Still no news on the reorganizing of a new OOTC chapter keep your fingers crossed. SCN net members please get in your monthly reports before the fourth of the month. Don't forget your monthly traffic reports go to the STM. Traffic: K6UYK 765, W6INH 524, WB6VPY 110, N6LHE 105, W6ORF 32.

ORANGE: SM, Joe H. Brown, W6UBQ—*ACC: Phill, KB6FRW.* The League's Executive Committee has approved the affiliation of the Yucaipa Valley Amateur Radio Club and the Norco/Corona Amateur Club. WELCOME ABOARD! The ANZA VALLEY RADIO CLUB has embarked on relocating their repeater to Thomas Mountain. This project has the backing of the Riverside County Fire Dept and the RACES Organization. Site and construction permits now in USES hands. St. Jude Hospital Rehab Administration has nominated the Ladies Amateur Radio Association to the Calif Association of Rehab Facilities Investors Hall of Fame. Good show ladies. Fullerton Radio Club T-Hunt report March winners, WB6YVP/WA6HXD with 18.9 results. The Lee Deforest Radio Club and the VESCOMM RACES groups have successfully petitioned the Hemet City Council to look into the antenna restrictions in effect in Mobile Home Parks. An info letter was sent to Mobile Home Organizations pointing out the vital roll Amateur Radio plays in a disaster. The South Orange Amateur Radio (SOARA) Association will sponsor FCC exams. Test now being given by SOCATT the first Saturday of each Month. SOARA will now conduct exams on alternate months. *SEC: Jim, AE6N.* Section activity, Hands Across America, May 25, at 1200 noon. This will require an Amateur Operator each mile from Blyth, CA. on I-10 to Banning, CA. Down Highway 60 to the LA Co. line. This is the big one. Need all the operators we can get from ours and adjoining sections. For getting involved, contact Jim, AE6N, PO Box 1452, Wrightwood, CA. (619-249-5523). Field Day will be June 28-29 (last weekend of June). Sign up now, an interesting and enjoyable event. *STM: Ernie, WA6QCA.* RTTY/V 145.12 net has been discontinued due to lack of Liason and NCS Stations. PSHR WF6O, WA6QCA, WB6QBZ, KA6HJK. March 1986 NET Rpt.

NET	FREQ	TIME	SES	QNI	TFC	NM
SCN/1 CW	3598	1830	31	254	256	WF6O
SCN/2 CW	3598	2015	29	189	50	WF6O
SCN/V FM	146.645	2100	31	431	327	WA6QCA
RTTY/V	145.12	0900	59	394	103	KA6HJK

RN6/D SSB 7275 Daily 0945 and 1500. Stations unable to use or excess the CW or 2 meter NETS should use RN6/D. *TC: John, KD7XG.* Assistant Tech coordinators are needed, there is much work to be done on this program. Beginning some software development for packet, satellite orbit predictions, and propagation predictions. *OBM: Brooks, K6GGS.* Working on a system to pass on new/bulletins of vital interest thru bulletin stations, net managers and bulletin boards to reach the amateur community ASAP. Traffic: WF60 441, KA6HJK 166, WB6QBZ 162, WA6QCA 155, K6VCE 139, K6DD 80, N6GOT 76, W6RE 47.

SAN DIEGO: SM, Arthur R. Smith, W6INI—STM: N6GW. SEC: W6INI. PIO: KG6LF. TC: N6NR. It's not too late to plan your vacation for the 1986 National Convention, Sep 5-7, in San Diego. Write to ARRL 1986 National Convention, POB 82642, San Diego CA 92138 for info. or call (619)292-7918. Banquet seating limited. Having a technical problem? Contact one of the following ATCs: WA6CFM, KG6CM, K6DQ, N6GZI, WB6HHV, K6JEY, N6JZE, WB6LLO, KB5MU, W6RHV. Blue Ribbon Committee member KG6LF thanks all those who responded with suggestions for the Committee. New ARES members: WD6BKC, KB6DDL, N6DUR, N6HII, WA3HTF, WA3IHV, W6KOM, W6QGD, KG6VQ, KA6YRA. Up-

grades: WA6HYB, W6JBP to Extra; N6ELP, KA0RGQ to Adv; N6MVZ to Gen. Assisting the Red Cross with fire evacuation communications in Vista were N6LYX, W9FQN, N6HKF, KA0RGQ, WB6ZJZ. New call signs: KB6DNR to WQ6V, KB6KUM to N6NEH. A challenge to clubs! Help bring young people into Amateur Radio by adopting a high school or junior high school. Organize Amateur Radio club and/or licensing class for them. North County Tfc Net met 30 times, handled 104 msgs. Traffic: N6GW 46.

SANTA BARBARA: SM, Byron Looney, K6FI—SBARC Emergency Van commissioned on March 28 complete with letter from the White House. It's a beauty and will be on display at the National Convention in San Diego. The flood exercise in Santa Barbara County almost became a reality with many lessons learned. WK6K and his Ventura gang scheduled to put on their packet show at Estero Club in April. That hard-working EC from SYV, KF6OY, is now trout fishing in Argentina. W6MUS reports that 14.1 MHz NCDXC beacons being wiped out by HF packet. Poinsettia Club will be assisting with the Ventura City Beach Party on April 27 and Marathon on May 4th. March earthquake classes at CSTI assisted by N6LFJ, WB6PLZ, W6ZGI, W6GZ, KA6PVG and K6BWJ. Santa Barbara antenna moratorium is now history. Thanks to all who assisted. Traffic: N6HYM 55, K6YD.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM/ACC: NI5V. STM: AE5I. TC: W5LNL. SGL: W5UXP. BM: W5QXK. RFI: WB5JBP. PIO: K5HGL. The Midland swapfest reported to be great this year, with lots of bargains and good fellowship, plus a fantastic turn-out. Sorry I could not get there this year. Let's all put this on our calendars for St. Patrick's weekend next year. The ball has started rolling for West Texas to become the 74th Section in our ARRL organization. I have wondered for a long time why some interested parties did not push for this years ago. It is hard for two Section Mgr's, who live hundreds of miles from El Paso and the Panhandle to do justice to the membership. Even with three sections, each one will still be larger than most states! I have always felt that the leadership in a Section needed to be closer to home, and the Section budget will be better spent by local leaders. I congratulate the members who are spearheading this plan, as it will take a lot of dedicated workers to fill the eight leadership positions that will become available should the new Section be created. I am sure W5KR joins me in pledging our support for a smooth transition when the time comes. PSHR for March: KB5UL AE5I KA5SPT. Traffic: W5TNT 350, N5BT 289, W9OYL 264, KB5UL 182, WB4HML 171, KD5RC 169, KA5SPT 165, AE5I 152, KA5AZK 68, N5IUI 64, N5HEN 30, KA5OYV 12, K5PC 1.

OKLAHOMA: Dave Cox, NB5N—Hamfest season is now in full swing. Just passed, Green Country Hamfest - ARRL State Convention, bigger and better than ever in their new location. Broken Arrow ARC and Tulsa ARC welcome the assistance of the TRO and the Muskogee ARC this year. Next up, Ham-Holiday '86 - ARRL West Gulf Division Convention, August 2-3 in Oklahoma City. CORA has made several changes to what promises to be one of the largest hamfests in the region. If any other groups have hamfests coming up soon, drop me (NB5N) a note. NEW APPOINTEE: EC - WB5SRX, Oklahoma County. Following is a listing of Section net stats for March. Net Managers relay report of your nets activity to the STM, KV5X, and NB5N.

NET	FREQ	TIME/DAYS	QTC	QNI	SESS	NM
OLZ	3682.5	0100Z/Dy	n/a	n/a	n/a	NG5Q
ONON	07/67	0430Z/Dy	135	456	31	W5AS
OPEN	3900	1400Z/Sn	n/a	n/a	n/a	W5ZTN
OTWN	3900	2345Z/M-S	365	375	26	WA5OUV
OCWA	3855	1430Z/Sn	23	205	5	W5AS
STN	3850	2330Z/M-S	90	444	26	WD5IFB
TRO	28/88	0100Z/Tu	n/a	n/a	n/a	K5ENA
EATN	77/37	2330Z/Dy	2	235	31	KD5KV

Traffic (greater than 25): WB5SRX 296, K5CXP 290, W5AS 201, KV5X 92, NX5I 86, W5RB 74, W5REC 71, WA5OUV 66, NQ5W 63, N5IKN 56, NX5E 52, WB5OHK 50, NB5N 44, WD5IFB 43, NR5L 35, K5GBN 32, W5VLW 29, WA5OGC 27.

SOUTHERN TEXAS: SM, Art Ross, W5KR—STM: K5QEW. SEC: KA5KRI. ASM: N5TC. ACC: KS5V. PIO: WA5UZB. OOC: WA2VJL. OBM: W5OVH. Sun City ARC, El Paso, getting some bulletin articles via packet; is initiating action to become affiliated with ARRL (great move); six new Novices emerged from radio classes; W0GOW laying new tile on club house floor. San Antonio ARC looking for equipment donations for use by club station W5SC. PIA/ORS/ATC WA5WCY reports Houston Echo Society provided communications for Pre-Olympic Equestrian Cross Country Event near Bellville; those helping: KA5ZBK, WA5QXE, KA5WVI, WD4PPG, KF5FH, N5IDD, KE5GP, KA5OBI, KE5QX, NI5I, KD5XC, KA5WYB, PIO WA5UZB. Williamson County ARC had a good VE test session; Coordinator AG5C reports 1 Extra, 1 Advanced, 4 General, 2 Technician and 2 Novice type licensees resulted. ORS WD5GKH upgraded to Extra, will keep same call. Great! OBS W5KLV reports 4 bulletins, 31 satellite bulletins, 5 propagation forecasts, 4 DX bulletins, 4 CRRL bulletins given 156 readings on 9 nets. The Blue Ribbon Committee has one Aggie (N5TC) and one Longhorn (K5GM) assigned; good things are sure to happen! CAND Mgr W5KLV reports 843 messages passed in 31 sessions; DRN5 represented 100%; STX stations helping out— WB5YDD, NX5V, KD5KQ, W5KLV, WB5FQU, WB5EPA, N5DFO, N5CRU, W5CTZ. Rio Grande Valley Live Stock Show had help from Amateurs; Coordinator KD5IU reports 44 Amateurs helped out during the four days of the show; lost children kept them busy more than anything else. DRN5 Mgr WB5YDD reports 781 messages passed in 52 sessions; STX represented 100% by W5KLV, WB5EPA, WB5FQU, W5CTZ, KD5CB, NX5V, KD5KQ, WD5Z, N5DFO, AJ5K, W5TUK, WB5YDD. Traffic: W5KLV 418, WB5YDD 414, W5CTZ 296, AJ5K 210, K5GM 159, WB5EPA 113, WB5FQU 87, WD5GKH 61, WD5Z 53, AC5Z 36, K5HZR 28, WA5WCY 11. KC5T 8, WA5UZB 5. (Feb.) K5GM 95, K5CVD 56, W5BGE 42. (Jan.) K5GM 125.

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Every model of handheld 2-meter transceiver advertised today seems to feature some special gimmick or attraction. Some units boast easy use, some highlight complex frills, some include special squelch circuits, and some flash their lights while beeping an enthusiastic "buy me, buy me" from dealers' shelves. ICOM units are not significantly different from competitive units in many of those respects, however, the classic IC-2AT and deluxe IC-02AT include one feature which ICOM is especially proud of...uncompromising quality.

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The unit, however, can also be used in a quite simple and basic manner: enter a frequency directly by pressing its last four digits on the keypad (example: 6.940), or switch to memory mode by pressing "B" on the keypad. Any memory can then be recalled by pressing its respective number. Likewise, full memory scanning is achieved anytime by pressing "C."

Like to monitor one frequency or repeater while conversing on another? Load the "monitored frequency" into memory four, enter the "conversing frequency" directly on the keypad (dial), then press "priority." The unit will operate normally on the "dial frequency" while briefly checking memory four's contents every five seconds.

Want to recall a favorite frequency or repeater regardless of any other transceiver operation? Merely press the "D" on the keypad, and memory three's stored frequency (including subaudible tone and transmitter offset) is immediately accessed. Any of the previous functions can be cancelled by pressing the pad's "A" (clear) button.

If some of the previous operational procedures become confusing, you can merely use the convenient pocket guide supplied with each IC-02AT for reference. The IC-02AT can thus blend and grow with one's needs, calling special features into use when and as needed. Meanwhile you enjoy superb performance from a transceiver including **both high tech RF and microprocessor designs**; not only a cosmetically attractive unit with basic circuits.

The deluxe IC-02AT is complemented by a full line of mating accessories, most of which are also compatible with the classic IC-2AT transceiver. These supporting items include six battery packs and chargers of various ratings, battery separation cables, DC converters and cords, four styles of vinyl and leather cases, plus an all-weather operating bag, shoulder strap, mobile hanging bracket, and a ten watt mobile amplifier. ICOM's especially exciting accessories include the popular speaker mic, and a small headset that can be fitted with PTT or VOX capability. The latter feature is unsurpassed for such hands-free operation as tower climbing/antenna tuning, bicycling, or beach walking. Any way or anywhere you go, ICOM units will keep you communicating in top style!

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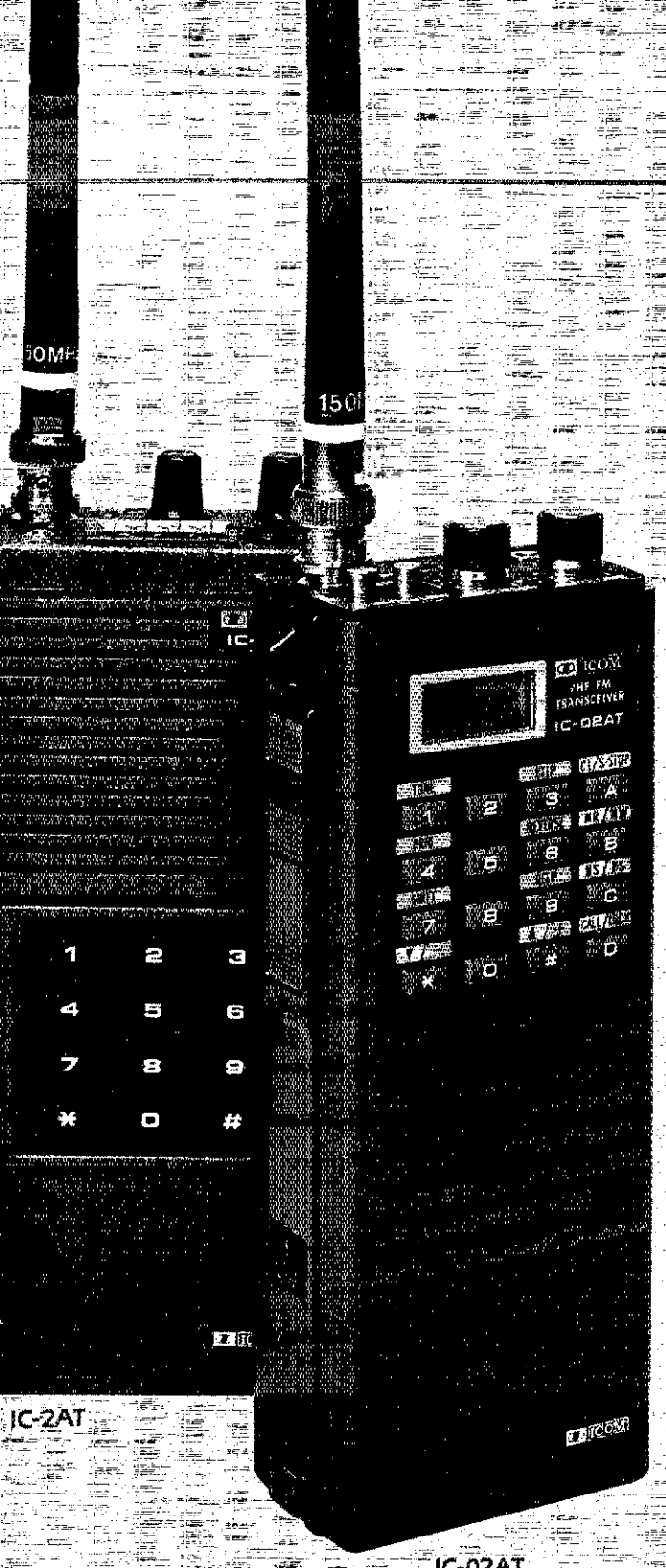

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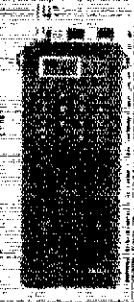

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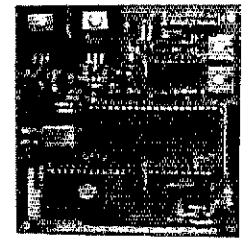

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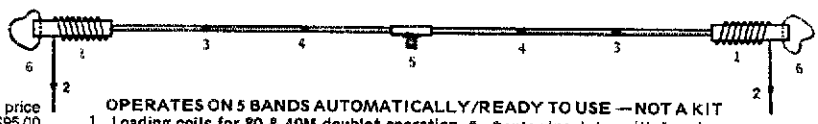

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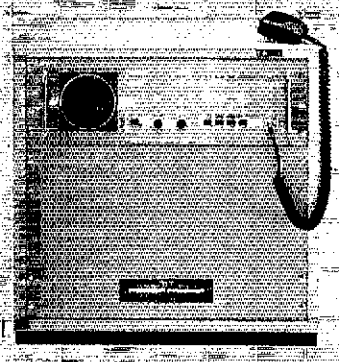
The IC-04AT and IC-4AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. PLUS a wide variety of slide-on battery packs and accessories are available.



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Presented by:

HAM RADIO OUTLET

6071 Buford Highway
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(Doraville, 1 mile North of I-285)

Saturday,
June 14, 1986
10:00a.m. til 5:30p.m.

ICOM

WIN!!

- ★ In-store drawings each hour. Come and register to win!!
- ★ Grand prize for in-store drawing:

IC-02AT 2-Meter Digital Readout Handheld

- ★ No purchase necessary to register for in-store drawings.
- ★ Special in-store pricing.
- ★ ICOM Personnel to demonstrate new equipment.
- ★ Refreshments will be served.
- ★ See the new line of ICOM equipment.
- ★ New equipment available for your inspection and purchase.

Crystal Filters, 8 & 10 Pole for Kenwood, ICOM, and YAESU

NEW 8-POLE CRYSTAL FILTERS FOR KENWOOD TS-440S
NEW TS-440S SSB 2.1 kHz matched filter set: consists of one each 455kHz and one 8.8MHz 8 pole crystal filters - $150.00.
TS-440S/430 2 Crystal Filter Package consists of 2.1 or 1.8 kHz SSB, 400 Hz or 250 Hz CW filters - $110.00; Individual crystal filters - $60.00 each.
TS-940/930 CW 400 Hz 8-Pole matched set, mounted on printed circuit boards - $150.00.
TS-940/930 SSB - 2.1 kHz 8-pole matched set. - $150.00.
930/940 SSB - Electronic Switch Kit - Transmit through original filters - $30.00
TS-430 - SSB 2.1 kHz Cascade Kit - $75.00.

NEW FOR ICOM RADIOS
IR455H1.2X SSB 2.4 kHz EXACT replacement for FL-44A IC-730/740/745/R70 etc. - $99.00
IR455H400X CW 400 Hz EXACT replacement for FL-52A IC-751(A)/745/740 etc. - $85.00.

For ICOM 271/471/720A:
8-Pole SSB 2.1 kHz crystal filter wire in - $75.00. 10-Pole SSB 2.1 kHz crystal filter wire in -$110.00. 8-Pole CW 400 Hz crystal filter wire in - $85.00. ICOM SSB 2.1 kHz wire-in Replaces FL-30 - $60.00. ICOM CW 400 Hz Wire-in Replaces FL-32 - $60.00. ICOM CW 400 Hz Wire-in Replaces FL-45 -$60.00.

We can install any of our crystal filters in your radio at our new headquarters in THREE working days. IRI MONTHLY KENWOOD, ICOM AND YAESU NEWSLETTER AVAILABLE, ALSO 5-YEARS OF BACK ISSUES. SEND S.A.S.E. for FREE brochure. International Radio, Inc., 747 S.W. South Macedo Blvd., Port St. Lucie, FL 33452 Telephone 305-879-6868. Master/Visa orders accepted. When ordering please specify radio and crystal filer ordered. Please add $5.00 shipping and handling USA, $10.00 Air Mail, COD add $1.90, $13.00 overseas. FL resident add 5% sales tax.

INTERNATIONAL RADIO INC.
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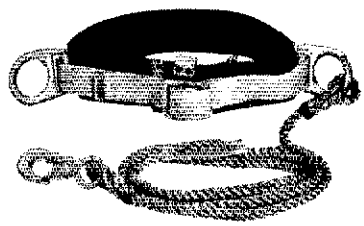
ONV SAFETY BELT



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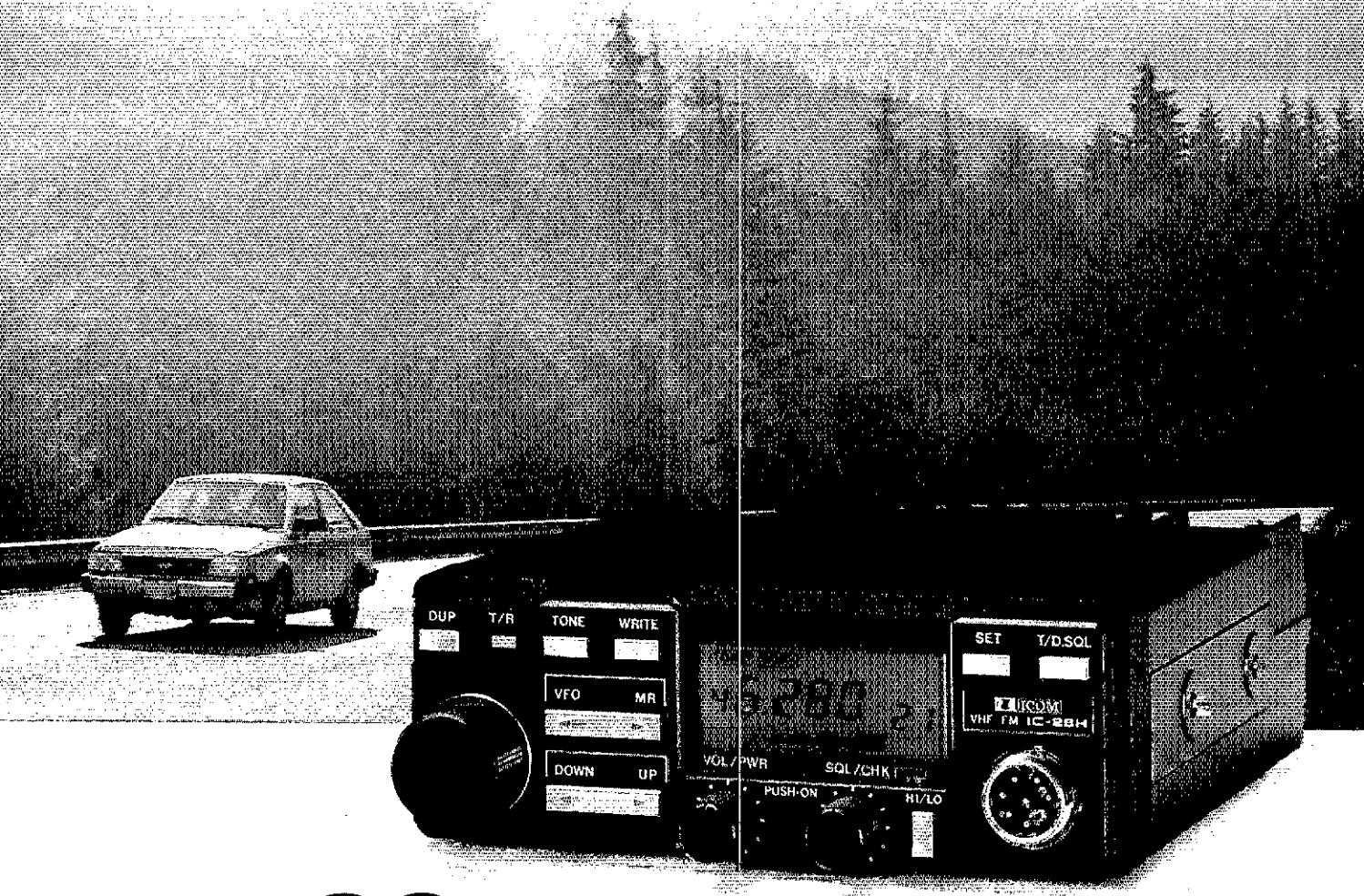


ICOM IC-28H
THE ONE FOR THE ROAD

- **Compact Size**
- **Simple to Operate**
- **Large LCD Readout**
- **25 or 45 Watts**
- **Packet Compatible**
- **21 Memory Channels**

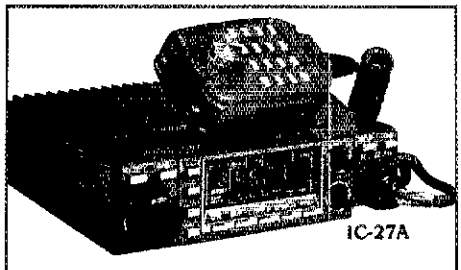
The IC-28H has all the features you need for carefree 2-meter mobile operation. The only thing it doesn't have is a big price.

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.

ICOM
First in Communications

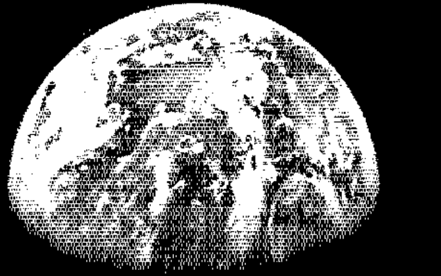
ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3150 Premier Drive, Suite 126, Irving, TX 75063

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 28H486

KDK FM-X40 Series

FM-240 2 Meters
FM-740 70 cm

SPECTACULAR MOBILE SIMPLICITY



- Superior features, simpler to use for 2 meters, MARS, CAP
- Compact size for better fit in today's automobile
- 16 fully programmable memory channels, plus priority call channel, plus 2 VFOs for today's user
- Subaudible encode and decode standard for today's 2 meter bands
- Subaudible frequency programmed by freq, no chart needed
- Speech synthesis option for voice VFO
- Superior man machine interface—one knob and one button—program all of the features easily—alphanumeric LCD prompts
- 16 button speaker/mic with UP/DN lock-out switch
- VFO Steps Size—2.5-40KHz, programmable (× 10 with Speed on)
- Band Scan—Programmable limits and modes: CARRIER, AUTO & DELAY. Scan steps same as set for VFO steps.
- Memory Scan—Programmable modes, SKIP, CARRIER, AUTO & DELAY.

FM-240
Suggested Retail $369

FM-740
Suggested Retail $429

Limited time offer - Free MS-20 external speaker with purchase of FM-240 or FM-740. See your dealer now.

Specifications KDK FM-240 (and FM-740)	
General	
Supply Voltage	13.8v ± 15%, negative ground.
Consumption	Transmit: 1.5A @ 5w, 5.5A @ 25w Receive: .4A @ 0 sig., .6A @ max volume.
Temp. Range	−10 deg. C to 60 deg. C.
Dimensions	40H × 140W × 170D mm (Body only)
Weight	1.0Kg (Body only)
Transmitter	
Freq. Range	FM-240 142.000 - 150.00 MHz (FM-740 440.00 - 449.975 MHz)
Output	High = 25 watts, Low = 5 watts (High = low, (Low = 1W) (FM-740 High = Low)
Modulation	Variable reactance frequency modulation
Max. Deviation	± 5KHz
Spur. Emmis	More than 60dB down from carrier
Duplex Offset	Programmable ± .1 to 12.7MHz (set at ± .6KHz ex-factory)
Tone	Programmable 74-250.3 (34 EIA tones) Encode and Decode
Receiver	
Int. Freq	1st = 10.7MHz, 2nd = 455KHz (1st-21.4MHz 2nd-455KHz)
Sensitivity	Better than 12dB SINAD @ .2uV
Squelch Sens	Better than .15uV
Bandwidth	+ 6KHz @ − 6dB
Selectivity	+ 12.5KHz @ − 60dB
Image Ratio	Better than 70dB
Audio Output	More than 2w, 8 ohms load, 10% THD
Standard Accessories	
Speaker Microphone	Speaker = 8 ohms, Mike = Condenser type. SM-34A: UP/DOWN plus tone encoder.
Power Cable	2 meters, with 7A fuse.

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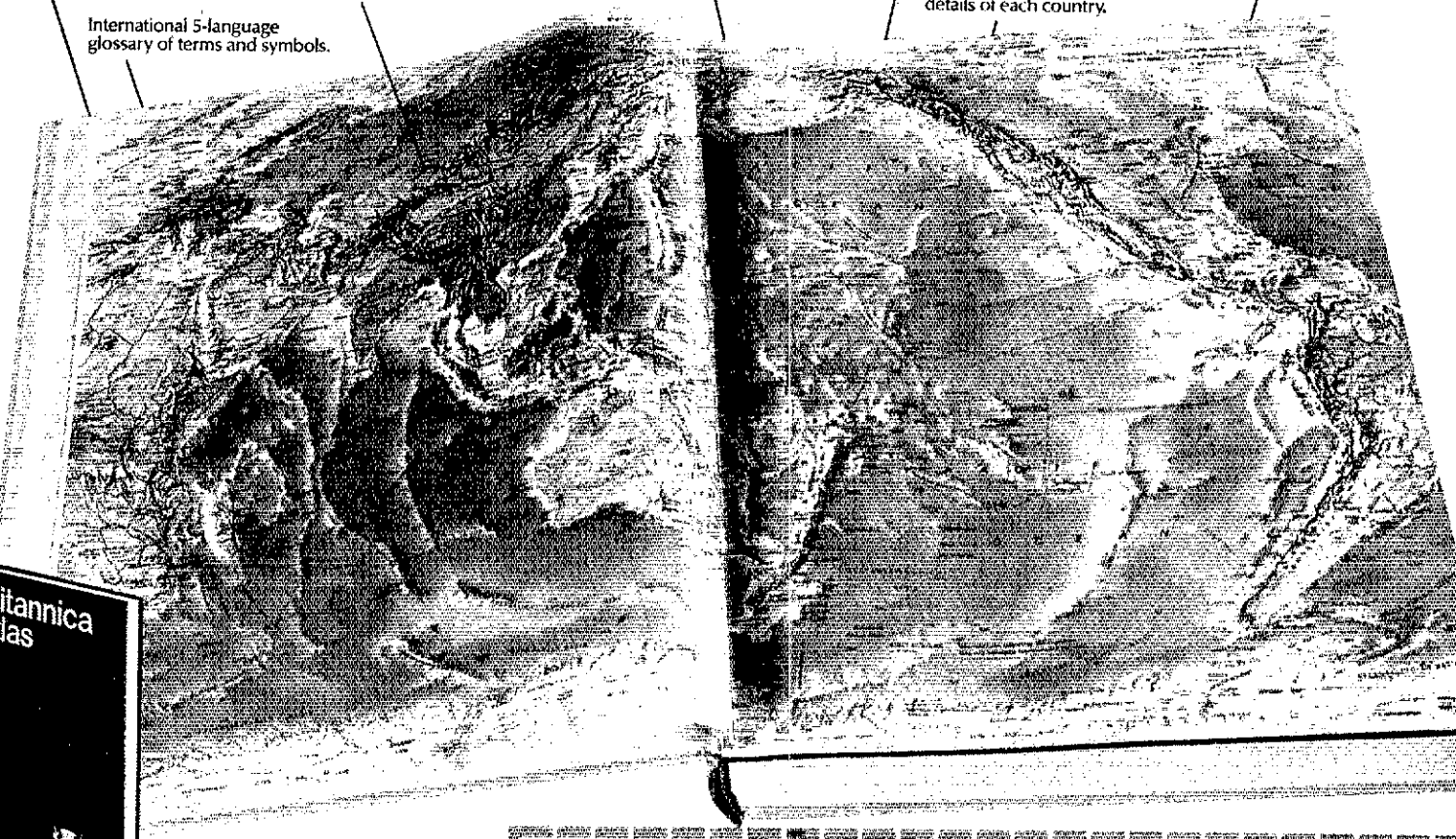

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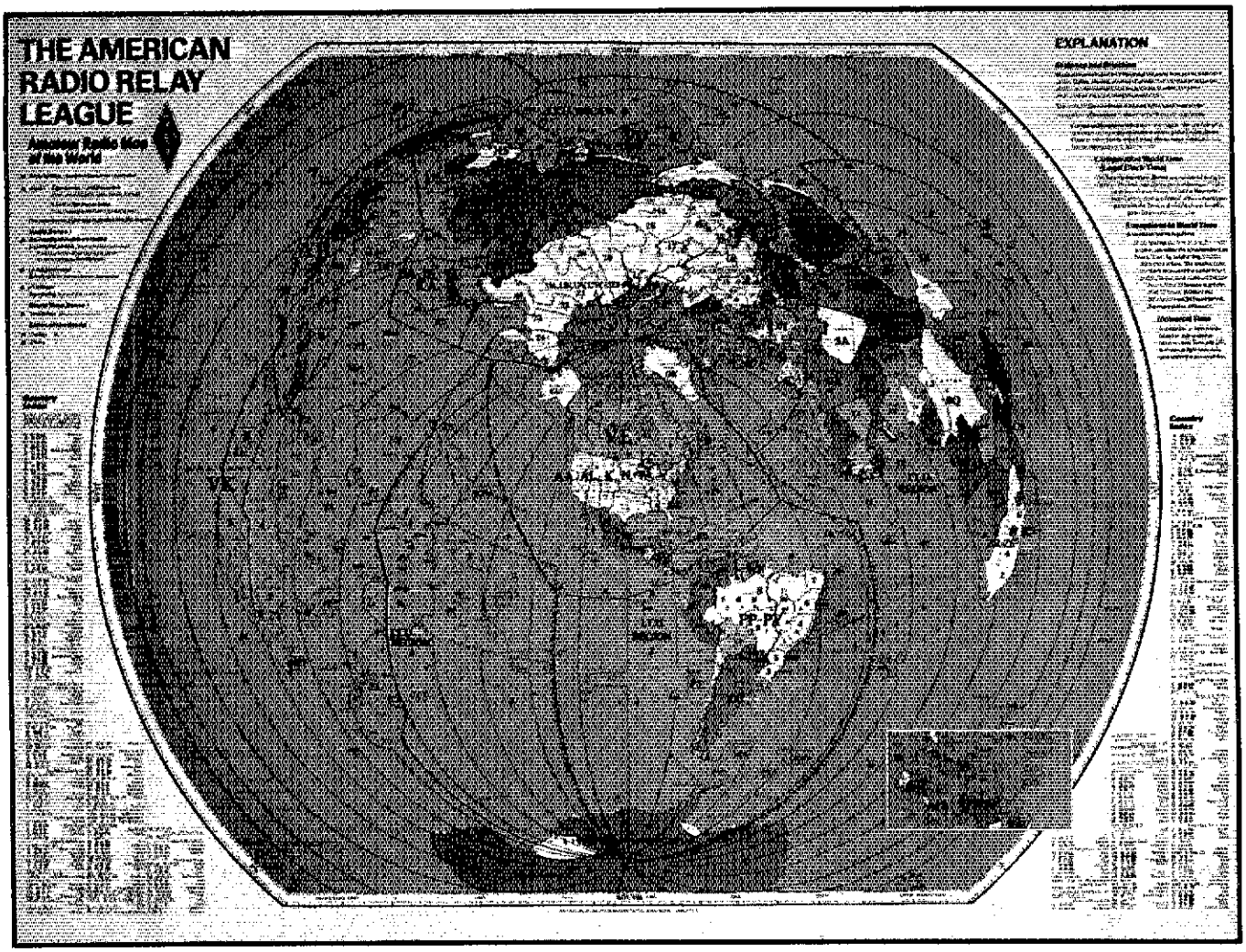

NEW EDITION!

136 CHANGES • A BIG 30"x40" DETAILED CARIBBEAN INSERT

The ARRL Amateur Radio Map of the World has just 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. This new edition will brighten any ham shack wall! Price is $8.00.

The American Radio Relay League, Inc.
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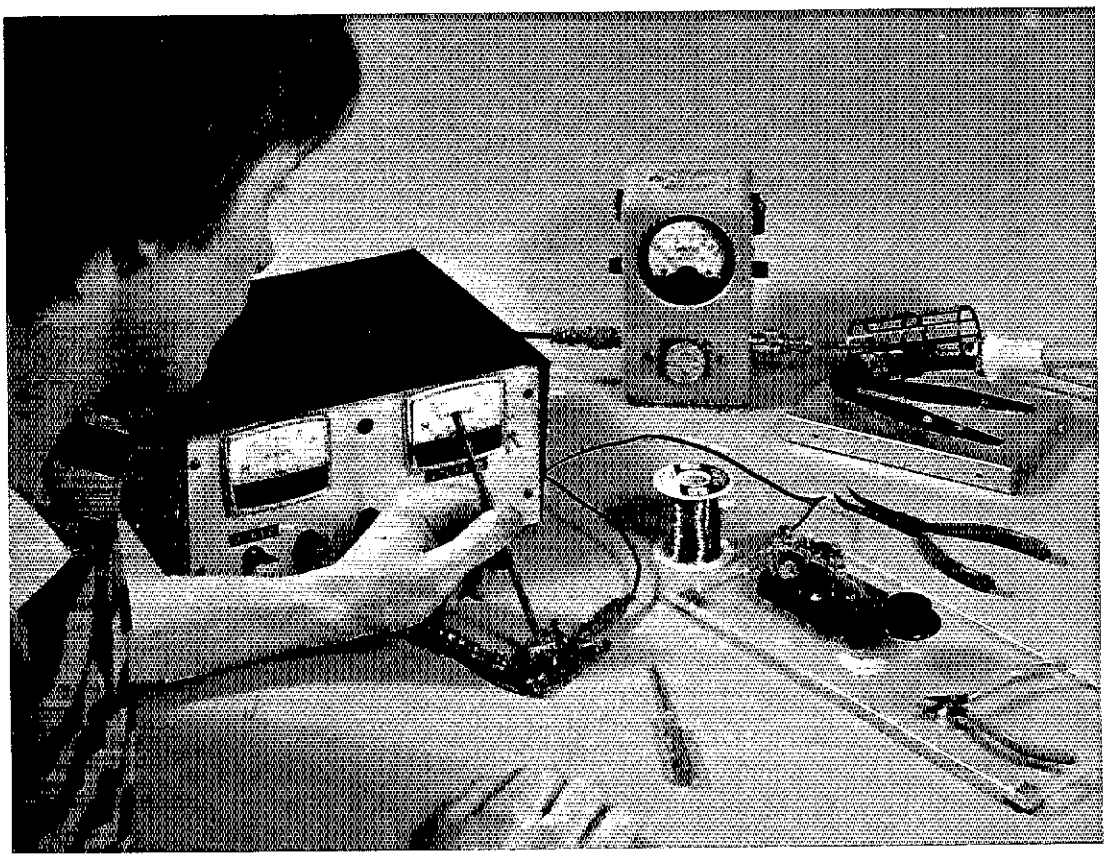
Newington, CT 06111 USA

5^{00}

QRP NOTEBOOK

By Doug DeMaw, W1FB

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE



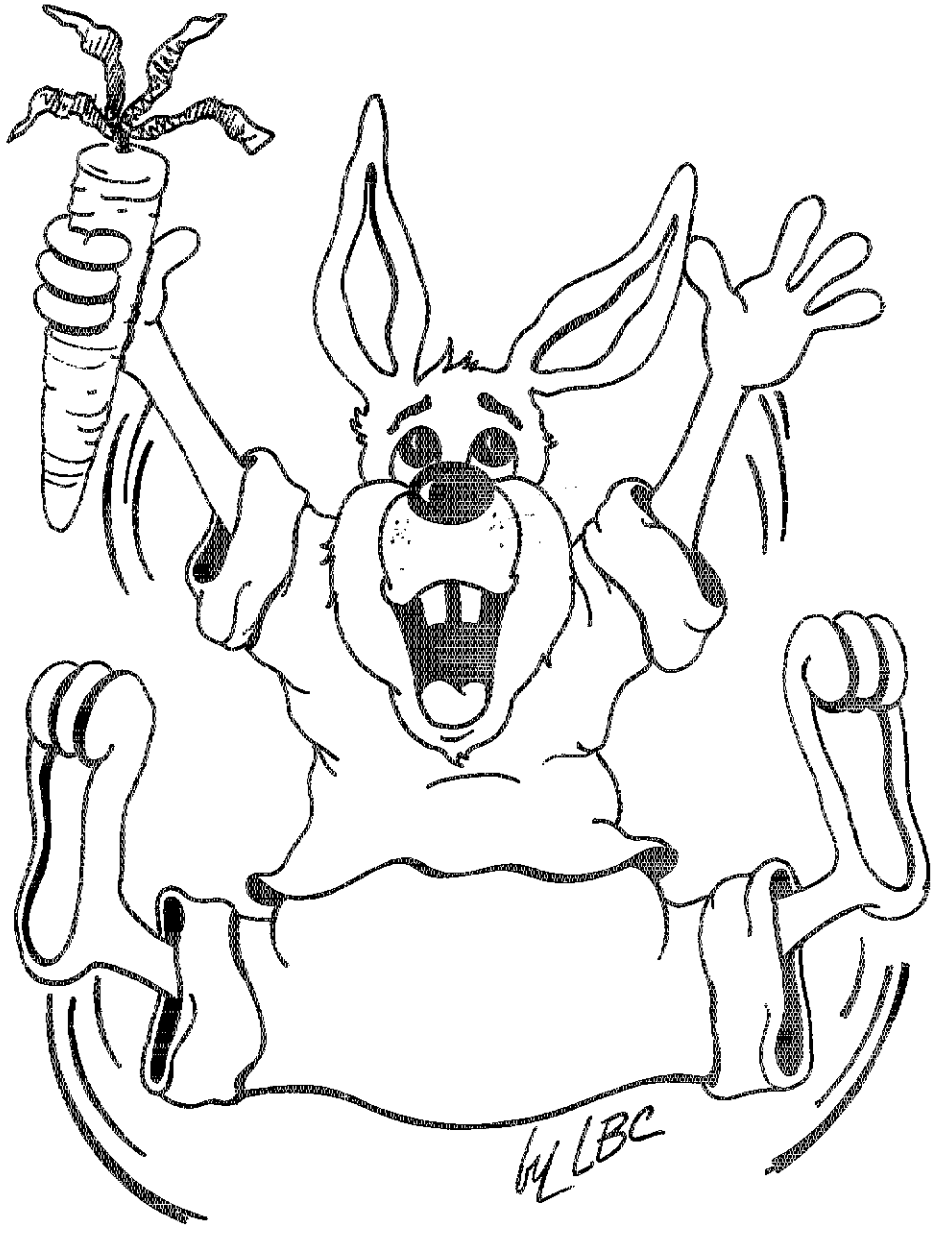
HAPPINESS IS A FRESH CARROT AND...

Doug DeMaw's QRP Notebook!

Doug DeMaw, W1FB, has been writing articles about QRP operating and equipment construction for many years. In this new ARRL publication, Doug presents construction projects for the QRP operator, from a simple one-watt crystal-controlled transmitter to more complex transceiver designs. Rather than simply presenting a collection of completed units, Doug guides you through the project "building-block" style. This way, you gain an understanding of how the circuits operate and learn how the building blocks might be put together in other configurations.

Experimentation and low-power operating go hand in hand. Construction of a complete modern transceiver is a major undertaking, but some of the circuits in this book can be put together in an evening or a weekend from a few dollars' worth of parts. Once built, the equipment can be tested and improved as your understanding and skill grow. Many of the simpler circuits can be used later as parts of the more complex projects.

The QRP Notebook is now available. 112 pages, #0348, copyright 1986, $5.00, plus $2.50 postage and handling ($3.50 for UPS).



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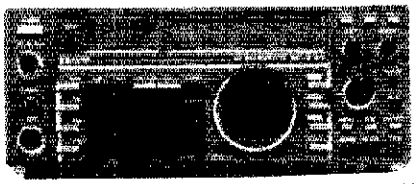
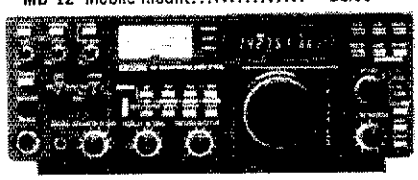


HF Equipment	Regular	SALE
IC-735 HF transceiver/SW rcvr/mic	889.00	769.95
PS-55 External power supply	169.00	149.95
AT-150 Automatic antenna tuner	399.00	359.95
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
UT-30 Tone encoder	TBA	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	799.95
PS-35 Internal power supply	169.00	149.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
FL-45 500 Hz CW filter (1st IF)	59.50	
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44A SSB filter (2nd IF)	159.00	144.95
SM-6 Desk microphone	40.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	21.99	



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	999.00
PS-35 Internal power supply	160.00	149.95
FL-32 500 Hz CW filter (1st IF)	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-33 AM filter	31.50	
FL-70 2.8 kHz wide SSB filter	46.50	
HM-12 Extra hand microphone	39.50	
SM-6 Desk microphone	40.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	21.99	

IC-720A 9-band xcvr • (CLOSEOUT) •	1349.00	689.95
PS-15 20A external power supply	149.00	134.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 kHz AM filter	49.50	
BC-10A Memory back-up	8.50	
SM-5 8-pin electret desk mic	40.00	
MB-5 Mobile mount	21.99	

Other Accessories:	Regular	SALE
PS-15 20A external power supply	149.00	134.95
CF-1 Cooling fan for PS-15	45.00	
EX-144 Adaptor for CF-1/PS-15	6.50	
PS-30 Systems p/s w/cord, 6-pin plug	259.95	234.95
OPC Opt. cord, specify 2, 4 or 6-pin	10.00	
SP-3 External speaker	54.50	
SP-7 Small external speaker	49.00	
CR-64 High stab. ref. xtal (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
SM-10 Compressor/graph EQ, 8 pin mic	119.00	109.95
AT-100 100W 8-band auto. antenna tuner	399.00	359.95
AT-500 500W 9-band auto. antenna tuner	499.00	449.95

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Check the Prices at AES®!

Other Accessories cont.	Regular	SALE
AH-2 8-band tuner w/mount & whip	549.00	489.95
AH-2A Antenna tuner system, only	429.00	389.95
GC-4 World clock • (CLOSEOUT) •	99.95	69.95
GC-5 World clock	79.95	
HF linear amplifier	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1795.00	1389
6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	469.00	419.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	735.00	649.95
EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
IC-271A 25W 2m FM/SSB/CW	735.00	649.95
AG-20 Internal preamplifier	56.95	
IC-271H 100W 2m FM/SSB/CW	944.00	789.95
AG-25 Mast mounted preamplifier	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	839.00	729.95
AG-1 Mast mounted preamplifier	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1149.00	989.95
AG-35 Mast mounted preamplifier	84.95	
Accessories common to 271A/H and 471A/H		
PS-25 Internal power supply for (A)	99.00	89.95
PS-35 Internal power supply for (H)	169.00	149.95
PS-15 External power supply	149.00	134.95
SM-6 Desk microphone	40.00	
EX-310 Voice synthesizer	41.25	
TS-32 CommSpec encode/decoder	59.95	
UT-15 Encoder/decoder interface	12.50	
UT-15S UT-15S w/TS-32 installed	79.95	
VHF/UHF mobile multi-modes	Regular	SALE
IC-290H 25W 2m SSB/FM, TTP mic	549.00	479.95
IC-490A 10W 430-440 SSB/FM/CW	649.00	569.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-27A Compact 25W 2m FM w/TTP mic	389.00	349.95
IC-27H Compact 45W 2m FM w/TTP mic	429.00	379.95
IC-37A Compact 25W 220 FM, TTP mic	449.00	349.95
IC-47A Compact 25W 440 FM, TTP mic	489.00	429.95
PS-45 Compact 8A power supply	112.95	99.95
UT-16/EX-388 Voice synthesizer, 47A	31.00	
SP-10 Slim-line external speaker	31.95	
IC-3200A 25W 2m/440 FM w/TTP	569.00	499.95
UT-23 Voice synthesizer	31.00	
AH-32 2m/440 Dual Band antenna	32.95	
Larsen PO-K Roof mount	20.00	
Larsen PO-TLM Trunk-lip mount	20.18	
Larsen PO-MM Magnetic mount	19.63	
IC-1271A 10W 1.2 GHz SSB/CW Base	1049.00	929.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	41.25	
TV-1200 ATV interface unit	115.00	106.95
UT-15S CTCSS encoder/decoder	79.95	
IC-120 1W 1.2 GHz FM Mobile	499.00	449.95
ML-12 1.2 GHz 10W amplifier	339.00	299.95
Repeaters	Regular	SALE
RP-3010 440 MHz, 10W FM, xtal cont.	1049.00	949.95
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1259.00	1129
Cabinet for RP-1210 or 3010	269.00	

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Hand-held Transceivers		
Deluxe models	Regular	SALE
IC-02AT for 2m	369.00	299.95
IC-04AT for 440 MHz	399.00	339.95
Standard models	Regular	SALE
IC-2A for 2m	239.00	189.95
IC-2AT with TTP	269.50	209.95
IC-3AT 220 MHz, TTP	299.95	249.95
IC-4AT 440 MHz, TTP	299.95	249.95

Accessories for Deluxe models	Regular
BP-7 425mah/13.2V Nicad Pak - use BC-35	67.50
BP-8 800mah/8.4V Nicad Pak - use BC-35	62.50
BC-35 Drop in desk charger for all batteries	74.95
BC-60 6-position gang charger, all batts	SALE 349.95
BC-16U Wall charger for BP7/BP8	19.95
LC-11 Vinyl case	18.49
LC-14 Vinyl case for Dlx using BP-7/8	18.49
LC-02AT Leather case for Dlx models w/BP-7/8	39.95
Accessories for both models	Regular
BP-2 425mah/7.2V Nicad Pak - use BC35	42.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	31.25
BP-4 Alkaline battery case	13.75
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-5 5/8-wave telescoping 2m antenna	18.95
FA-2 Extra 2m flexible antenna	10.00
CP-1 Cig. lighter plug/cord for BP3 or Dlx	10.75
CP-10 Battery separation cable w/clip	19.99
DC-1 DC operation pak for standard models	18.75
EX-390 Bottom slide cap	4.95
MB-16D Mobile mtg. bkt for all H1s	21.99
LC-2AT Leather case for standard models	39.95
RB-1 Vinyl waterproof radio bag	30.00
HH-SS Handheld shoulder strap	14.95
HM-9 Speaker microphone	39.00
HS10 Boom microphone/headset	19.50
HS-10SA Vox unit for HS-10 & Deluxe only	19.50
HS-10SB PTT unit for HS-10	19.50
ML-1 2m 2.3w in/10w out amplifier	SALE 89.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
R-71A 100 kHz-30 MHz, 117V AC	$849.00	689.95
RC-11 Infrared remote controller	59.95	49.95
FL-32 500 Hz CW filter	59.50	
FL-63 250 Hz CW filter (1st IF)	48.50	
FL-44A SSB filter (2nd IF)	159.00	144.95
EX-257 FM unit	38.00	
EX-310 Voice synthesizer	41.25	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	54.50	
CK-70 (EX-299) 12V DC option	10.95	
MB-12 Mobile mount	21.99	
R-7000 25 MHz-2 gHz scanning rcvr	969.00	849.95
RC-12 Infrared remote controller	TBA	
Voice synthesizer	TBA	
AH-7000 Radiating antenna	89.95	(6)

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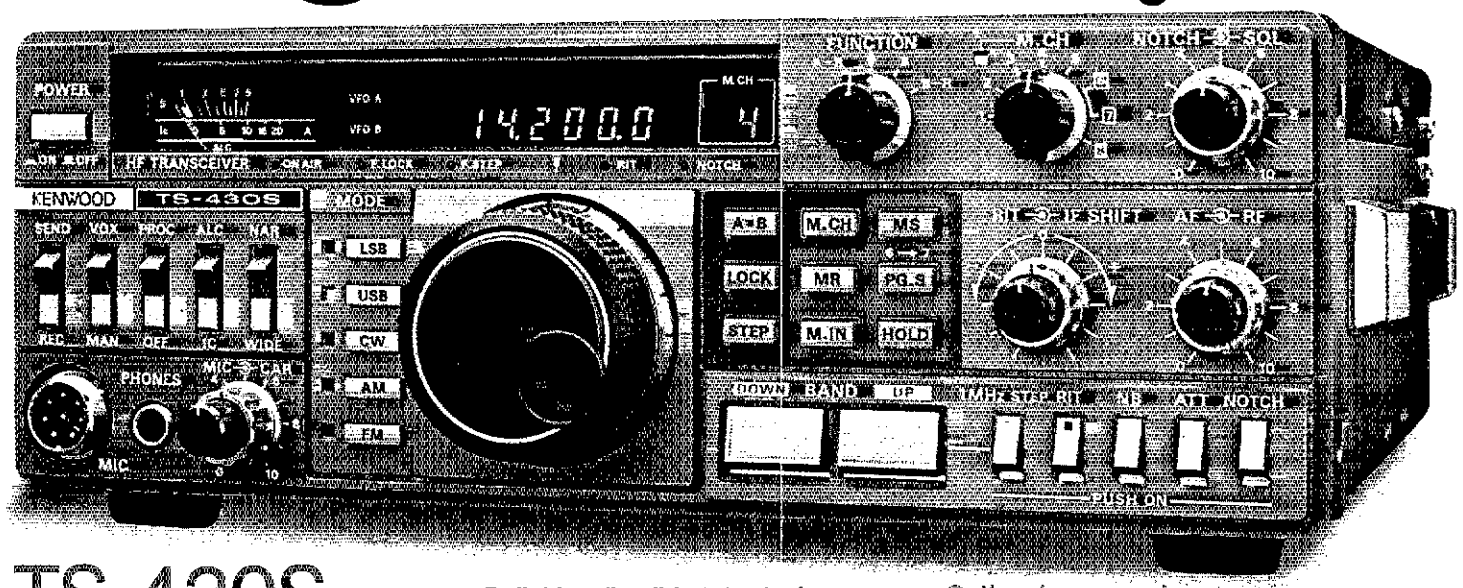
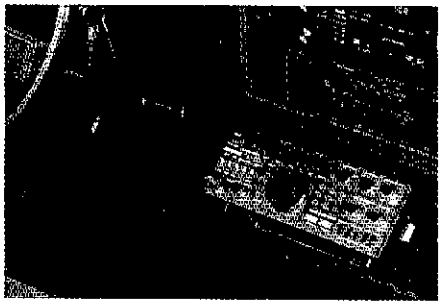
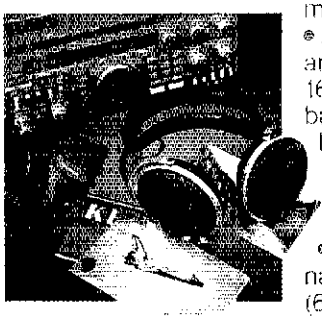


TS-430S

Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



- **Covers all Amateur bands** 160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.
- **Superb interference reduction** Eliminate QRM with the IF shift and tuneable notch filter. A noise blanker supresses ignition noise. Squelch, RF attenuator, and RIT are also provided. Optional IF filters may be added for optimum interference reduction.
- **Reliable, all solid state design.** Solid state design permits input power of 250 watts PEP on SSB, 200 watts DC on CW, 120 watts on FM (optional), or 60 watts on AM. Final amplifier protection circuits and a cooling fan are built-in.
- **Memory channels.** Eight memory channels store frequency, mode and band data. Channel 8 may be programmed for split-frequency operation. A front panel switch allows each memory channel to operate as an independent VFO or as a fixed frequency. A lithium battery backs up stored information.
- **Programmable, multi-function scan.**
- **Speech processor built-in.**
- **Dual digital VFOs.**
- **VOX circuit, plus semi break-in with sidetone.**



Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM unit • YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters • YK-88SN (1.8 kHz) narrow SSB filter • YK-88A (6 kHz) AM filter • MC-42S UP/DOWN hand mic. • MC-60A/80/85 deluxe desk mics. • SW-2000/200A SWR/power meters • SW-100A SWR/power/volt meter • PC-1A phone patch • HS-4, HS-5, HS-6, HS-7 headphones

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Kenwood TS940S, contester's delight	Call
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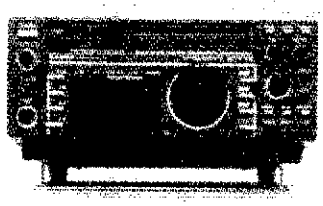
Icom IC3200	489.95
Santec ST20T Handi Talkie	289.00
Icom IC735	799.00
Ten-Tec 2510 (Easy OSCAR)	489.00



ACCESSORIES

B&W VIEWSTAR ANTENNA TUNER	89.95
Heil HC3/HC4/HC5	Stock
Heil BM10 Boom Mike headset	59.95
CSI Private Patch III	469.95
FLUKE 77 auto-ranging digital multimeter	125.00
Bird 43 Wattmeter	Call
Bird Elements	In Stock, Call
Daiwa CN620B, 20-200, 2000W	109.95
Stabylex 20SR, 25 amp 12VDC, 16 amp cont. overvoltage protected	99.00
Alinco ELH 230D- Excellent buy	79.00
Nye MB5-A (for the big boys!)	529.00
Shure 444D	54.95
Wahl 7470 Soldering Station	49.00
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Kenwood IF 232C1 evel translator	49.00
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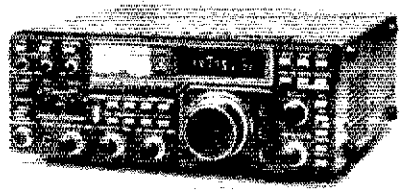
ALPHA DELTA 4
HEAVY DUTY COAX SWITCH

with ground pos. & lightning protection	69.00
Collins KWM2/S line xtals	10.00 each



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3-150MHz, KW+

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AOP-1, Complete Oscar Antenna	149.95
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HF2V, 80 & 40 vertical	119.00
HF4B	189.00
Hustler G7-144	119.95
Hustler 6BTV	139.00
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KLM HF World Class Series Antennas	Call Don
Alpha Delta Twin Sloper	49.00
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Explorer 14	349.00
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2 element 40M	369.00
3 element only	249.00
CD 45-2 Great Tribander Rotor	169.00
V2S (2meter)	59.00
HG52SS 52 ft. crankup tower	1199.00

Prepaid freight when you order other Hy-Gain items with tower

KLM KT-34A	339.00
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OTHER ANTENNAS

Larsen Kulduck	17.00
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Anteco 2M, 5/8, Mag. Mount, Comp	25.00
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Orion 2M 1/2 wave handy Antenna	19.00
Van Gordon SLA-1 160-80-40 Sloper	34.00
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8237 RG8	39c/ft.
8267 RG213	55c/ft.
8000 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 conductr & shield	45c/ft.
100 feet 8214 w/ends installed	54.00
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International Wire RG214, non-mil. good cable . 70c/ft
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International 16 Ga stranded antenna wire 6c/ft

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831SP-PL259 Silverplate	1.25
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831J 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
82-98 N elbow	9.00
31-212 BNC-RG59	1.50
31-2 BNC-RG58	1.50
34025 N Male, RG58	3.00
34125 N Female-UHF male	9.00
3128 BNC Female-PC259	3.00

TOWER ACCESSORIES

1/4" E.H.S. Guy cable, Rohn US, 1000 ft.	250.00
3/16" E.H.S. cable, Rohn US, 1000 ft.	210.00
1/4" Guy Cable, 6100 #7 x 7 strand, import	15c/ft
3/16" Guy Cable, 3700 #7 x 7 strand, import	12c/ft.
3/8 x 6 E&J Turnbuckle	7.95
3/16" Wire Rope Clips	.40
1/4" wire clips	.50
1/4 Thimbles	.45
Porcelain 500D Guy Insulator (3/16)	1.99
Porcelain 502 Guy insulators (1/4)	3.39

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Morse University (Great CW program for C-64)	39.00

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AEA PK-64, does RTTY, ASCII, AMTOR also	199.00
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SERVICES

Alignment, any late model rig	50.00
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STOCK ITEMS CALL

Power Range	Frequency Bands (MHz) 1.8-30	25-60	50-125	100-250	200-500	400-1000
5 watts	—	5A	5B	5C	5D	5E
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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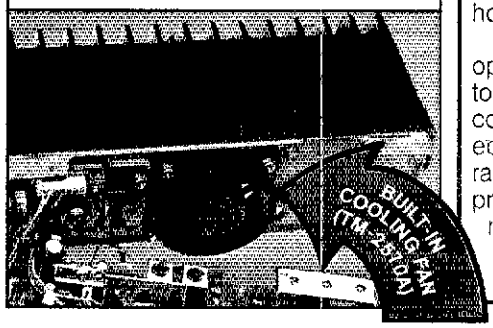
Kenwood sets the pace again! The all-new "25-Series" brings the industry's *first* compact 70-watt 2-meter FM mobile transceiver. There is even an *auto dialer* which stores 15 telephone numbers! There are four versions to choose from: The TM-2570A 70-watt, TM- 2550A 45-watt, TM-2530A 25-watt and the 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 moditiable)
- 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

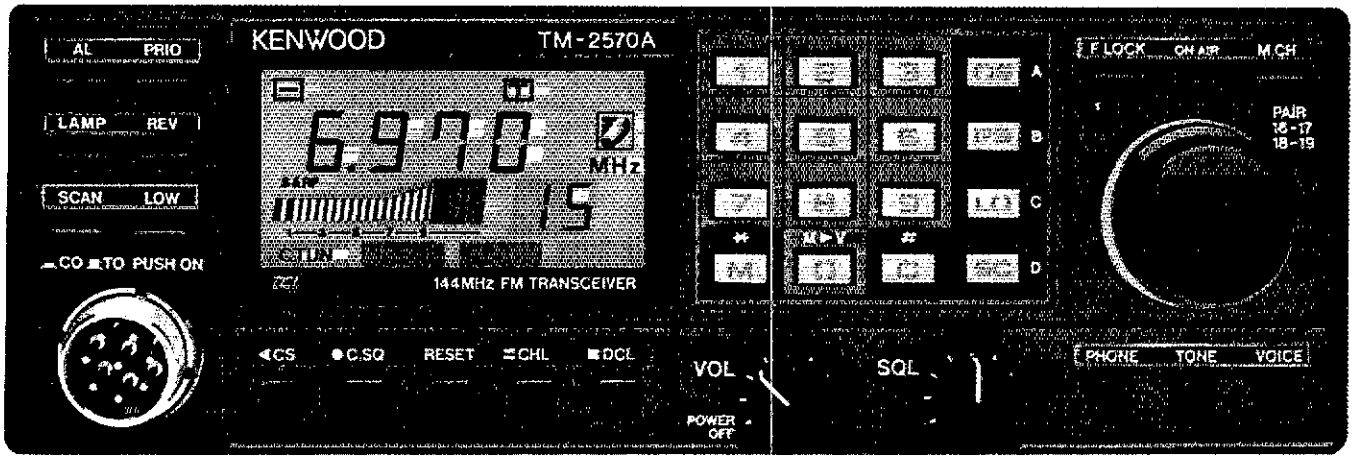
Large heatsink with built-in cooling fan (TM-2570A)



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-2K** extra DC cable
- **PG-3A** 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-48** extra DTMF mic. with UP/DWN switch
- **MC-42S** UP/DWN mic.
- **MC-55** (8-pin) mobile mic. with time-out timer
- **SP-40** compact mobile speaker
- **SP-50** mobile speaker
- **SW-200A/SW-200B** SWR/power meters
- **SW-100A/SW-100B** compact SWR/power meters
- **SWT-1** 2m antenna turner

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories
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Specifications guaranteed on Amateur bands only

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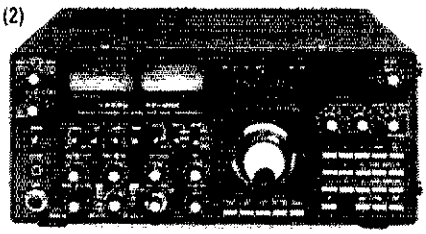
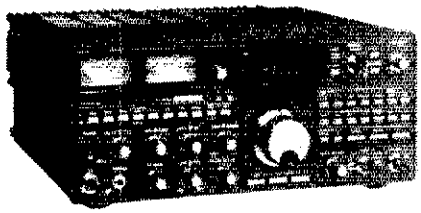
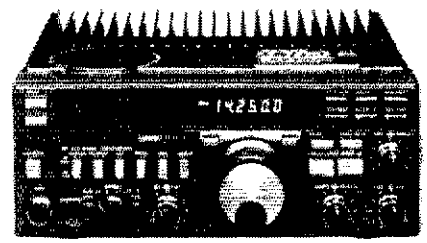


HF Equipment	LIST
FT-ONE Xcvr/Rcvr/4 filters/RAM/FM	$2859.00
KY-ONE Keyer unit	45.00
DC-ONE DC cable for FT-ONE	15.00
SP-102 Speaker with audio filter	59.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	69.00
MH-1B8 Mobile microphone	20.00



HF Equipment	LIST
FT-980 9-band CAT Xcvr/SW Rcvr	$1795.00
SP-980 Speaker with audio filter	89.95
SP-980P Speaker/patch	99.95
FC-757AT Automatic ant. tuner w/memory	289.95
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)	45.95
XF455.8MCN 300 Hz CW filter (2nd IF)	59.95
XF8.9B/XF8.9GA AM filter	45.00
KY-ONE Keyer unit	45.00
MD-1B8 Desk microphone	69.00
MH-1B8 Mobile microphone	20.00
FIF-65 Computer interface; Apple IIe	59.00
FIF-80 Interface; NEC PC-8001	119.00
FIF-232C for VIC-20/TI/most RS-232	69.95
FRB-1 External relay box	19.95
GC-980 General coverage kit	12.95



HF Equipment	LIST
FT-757GX 9-band Xcvr/SW Rcvr/mic	$899.95
FP-757GX Compact power supply	189.95
FP-757HD Heavy duty supply with fan	199.95
FP-700 Power supply	179.95
FC-757AT Automatic ant. tuner w/memory	289.95
FAS-1-4R Remote antenna selector	79.95

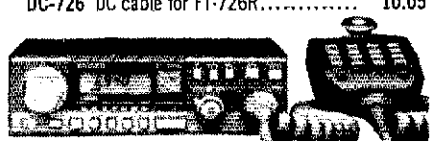
FT-757GX accessories	LIST
SP-102 Speaker with audio filter	$ 59.95
SP-102P Speaker/patch	99.95
MD-1B8 Desk microphone	69.00
FRB-757 External relay box	10.95
MMB-20 Mobile mount	24.00
FTV-707 VHF/UHF Transverter, no module	129.00
2M/FTV 2m module only	189.00
6M/FTV 6m module only	139.00
70 cm/FTV 430 module only	255.00
FIF-65A Interface; Apple IIe	55.00
FIF-232C for VIC-20/TI/most RS-232	69.00

Misc. Accessories	LIST
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	19.00
YH-77 Lightweight headphones	19.00
FF-501DX Low pass filter	34.00

Call TOLL FREE for DISCOUNT PRICES

All items are shown with the Manufacturer's Suggested LIST Prices. On Major items and some accessories, we can offer a Substantial Savings.

VHF/UHF Equipment	LIST
FT-726R VHF/UHF Xcvr w/2m, FTP mic	$925.00
HF/726 10-12-15m unit	225.95
6M/726 6m unit	215.95
430/726 430-440 MHz unit (OSCAR)	299.95
440/726 440-450 MHz unit (FM band)	299.95
SU-726 Satellite duplex module	109.95
XF-455MC 600 Hz CW filter	60.00
MD-1B8 Desk microphone	69.00
SP-102 Speaker w/audio filter	59.95
DC-726 DC cable for FT-726R	10.05

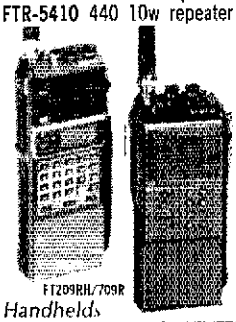


FT-270RH* 45w 2m FM Xcvr w/FTP mic 439.95

* FTS-8 encoder/decoder **FREE** with purchase of FT-270RH or FT-2700RH

FT-2700RH* 25w 2m/440 FM w/FTP mic	599.95
FTS-8* Encoder/decoder	49.00
FVS-1 Voice synthesizer	29.00
FSP-2 4 ohm remote speaker	24.95
SP-55 Compact remote speaker	24.95

VHF/UHF - continued	LIST
YH-1 Headset with boom mic only	$ 26.95
SB Switchbox only	20.00
YH-1SB Headset/mic/switchbox combination	46.95
MF-1A3B Flexible visor mount mic only	25.00
SB Switchbox only	20.00
FTR-2410 2m 10w repeater (special order)	1095.00
FTR-5410 440 10w repeater (special order)	1119.00



FT209RH/709R FT-103R/203R/703R

* FTS-6 encoder/decoder **FREE** with purchase of FT-209RH or FT-709R

Handhelds	LIST
FT-209RH* 5w 2m FM HT/TTP/batt/cgr	$359.95
FT-709R* 4w 440 FM HT/TTP/batt/cgr	349.95
FT-103R/TTP 2.5w 220 FM HT/batt/cgr/TTP	279.95
FT-203R/TTP 2.5w 2m FM HT/batt/cgr/TTP	259.95
FT-703R/TTP 2.5w 440 FM HT/batt/cgr/TTP	299.95

Accessories for 09-series 03-series	LIST
FTS-6* Encoder/decoder	49.00
FBA-5 Alkaline battery holder	12.00
FNB-3 425ma 10.8v battery	49.00
FNB-4 extra 500ma 12v battery	59.00
NC-9B Wall charger for FNB-3	10.00
NC-15 Desk quick charger/AC ps	89.95
NC-18B Wall charger for FNB-4	10.00
MH-12A2B Speaker/microphone	35.00
MMB-21 Mobile bracket	15.00
PA-3 Mobile adapter and charger	39.00
TA-2 2m 19" telescoping whip ant	11.00
YH-2 VOX headset	26.95

Receivers FRG-9600 FRG-8800

Receivers	LIST
FRG-8800 150 KHz-29.999 MHz Shortwave	$599.00
FRA-7700 Indoor active receive antenna	49.00
FRT-7700 Antenna tuner	59.00
FRV-8800 118-174 MHz VHF converter	99.00
FIF-232C Interface; VIC-20/TI/RS-232	69.00
SP-102 Speaker with audio filter	59.95
FF-5 500 KHz low-pass filter (for VLF)	20.00
DC-8800 DC kit for FRG-8800	3.50
FRG-9600 60-905 MHz receiver	679.95
VU-9600 NTSC video unit	25.00
SP-55 Compact remote speaker	24.95

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- **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.

The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

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- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
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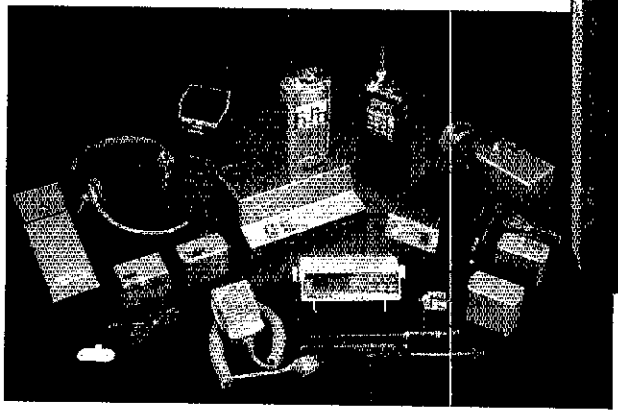
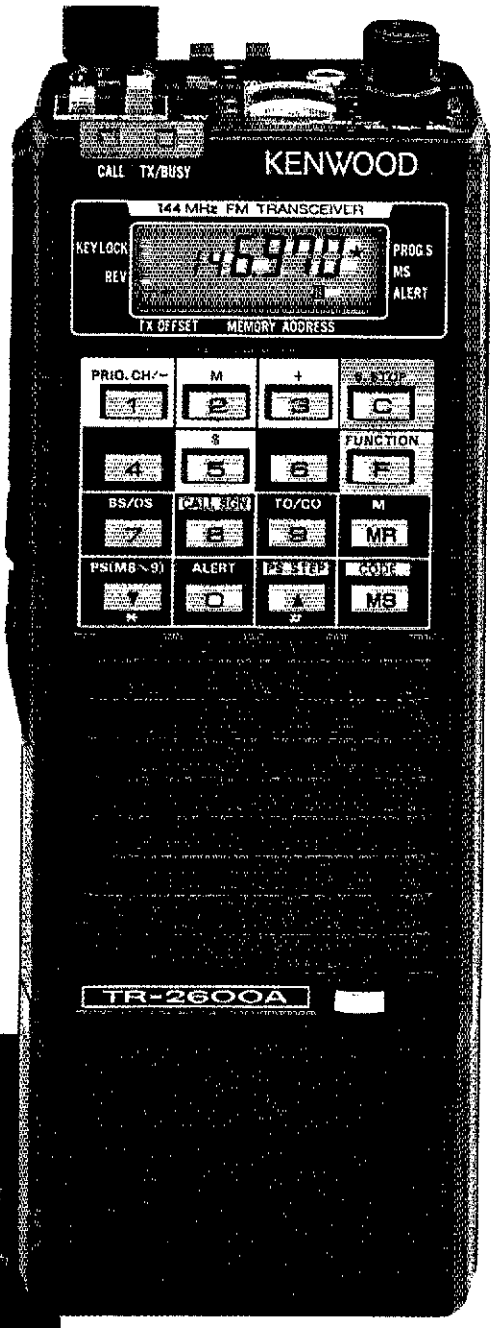
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 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.





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TR-2600A shown. TR-3600A is available for 70 cm operation.
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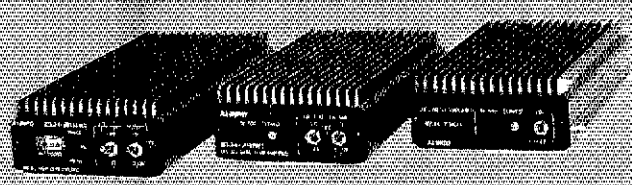

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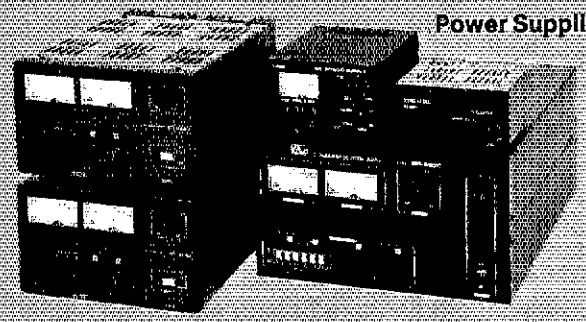

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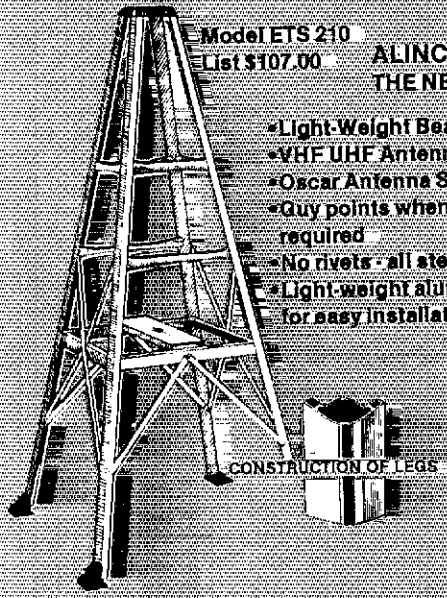

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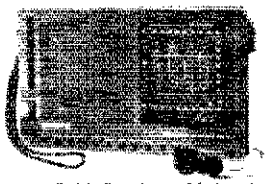

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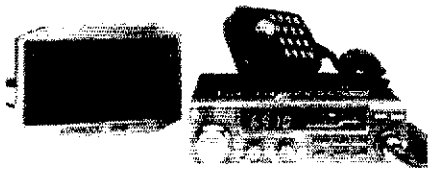

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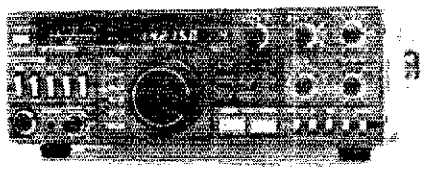

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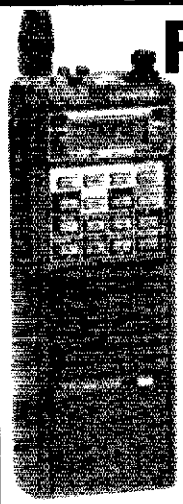

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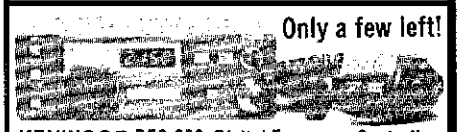

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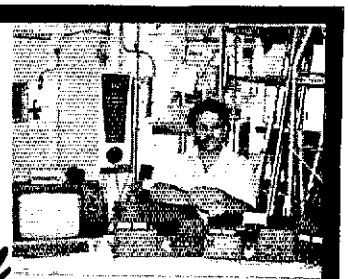

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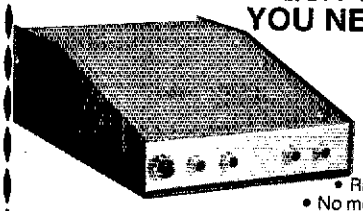

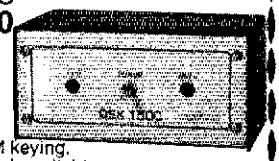

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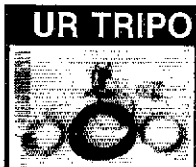

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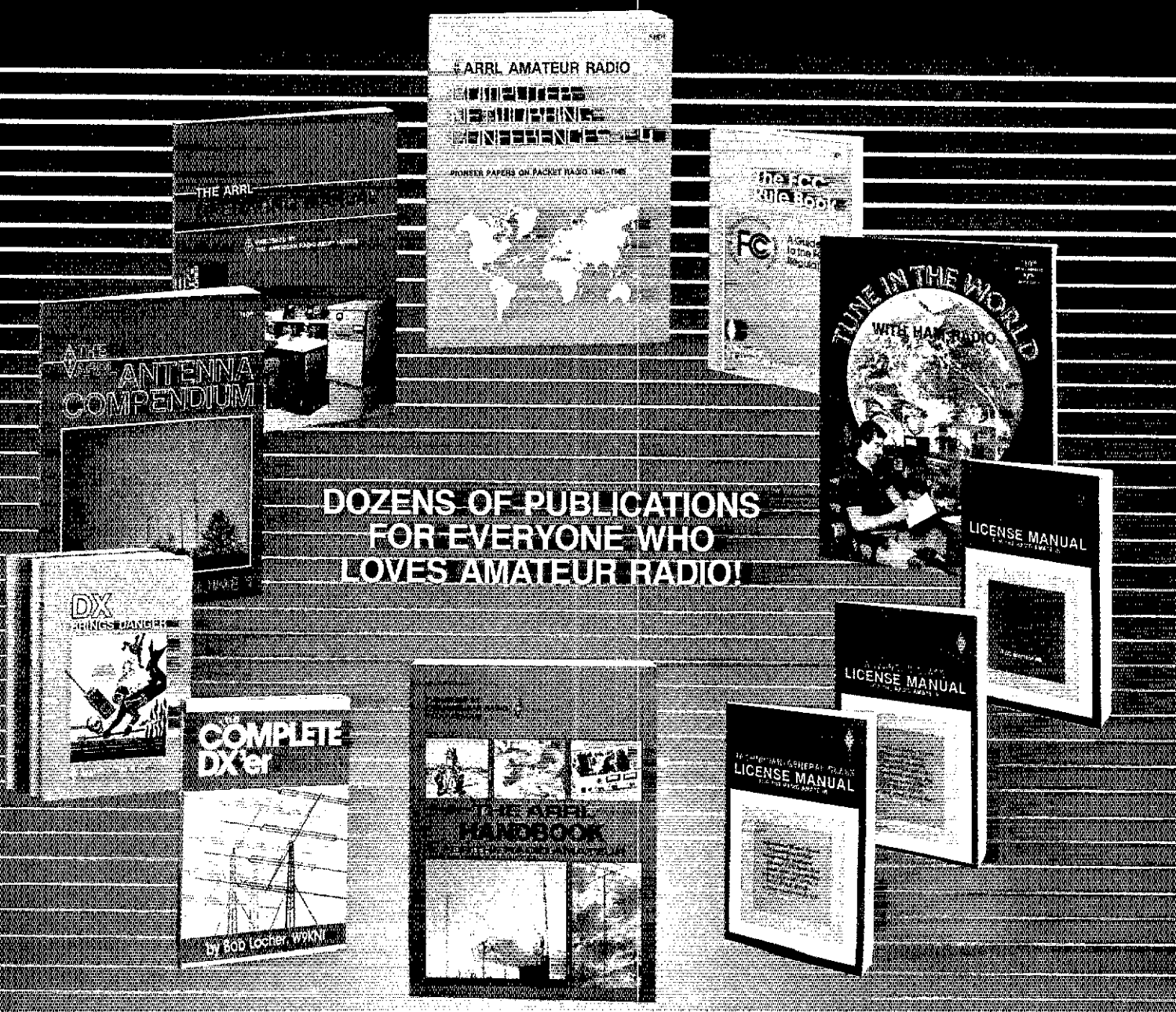

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Tommy Rockford, K6ATX is back on the trail of high adventure! **In Death Valley QTH,** what starts as a typical field day operation becomes a matter of life and death for K6ATX and the Santa Bonita Amateur Radio Club. **SOS at Midnight** finds Tommy up against the Purple Shirt Mob and ham radio saves the day! The beachcomer seemed like a harmless character, but what did he have to hide in **CQ Ghost Ship?** Underwater adventure and ham radio join together to form the exciting conclusion to **DX Brings Danger.** Coming soon is a fifth ham radio adventure, **Grand Canyon QSO.**

The author of this series is Walker Tompkins who is K6ATX in real life. He is noted screenwriter, newspaper columnist, historian and biographer. His knowledge of the areas where these stories take place makes them even more true-to-life. You'll want to read all of these classics in Amateur Radio fiction.

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PACKET RADIO/COMPUTERS

Computer Networking Conferences 1-4 from 1981-1985. Pioneer Papers on Packet Radio **#0224 $18.**

RSGB Amateur Radio Software Contains 86 BASIC programs, 6 in assembly language covering CW, RTTY, Amtor, Packet, Antenna Design, Satellite Predictions, Distances, Bearings and Locators.

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DX

The Complete DX'er by W9KNI covers all aspects of the DX'ers life both in and out of the pile-ups: listening, the chase, capture and quest for elusive QSL cards. **#0283 $10 US, $11 elsewhere**

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MFJ TUNERS

This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP —the power rating you won't outgrow (250pf-6KV caps).

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.

MFJ-989 **$329.95**

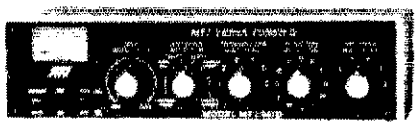
Accurate meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter, MFJ-1312 is available for $9.95.

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.

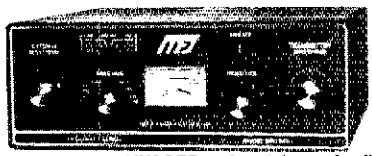
New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 2.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:2 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-962 **$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.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. 6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 in.

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**

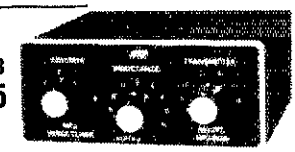
MFJ-1702, $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

MFJ-1701, $29.95. 6 positions. White markable surface for antenna positions.

$29.95 MFJ-1701

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.

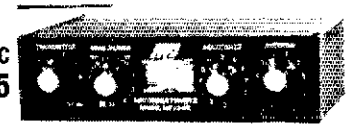
MFJ's Random Wire TUNER

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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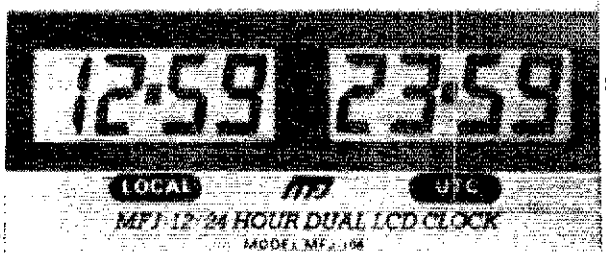
BEST OF MFJ

MFJ 24 HOUR LCD CLOCKS



These MFJ 24 hour clocks make your DXing, contesting, logging and SKEDing easier, more precise.

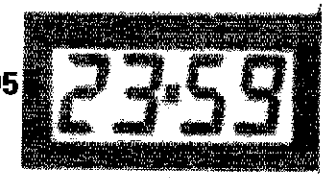
Read both UTC and local time at a glance with the MFJ-108, $19.95, dual clock that displays 24 and 12 hour time simultaneously. Or choose the **MFJ-107, $9.95** single clock for 24 hour UTC time.

Both are mounted in a brushed aluminum frame, feature **huge easy-to-see 5/8 inch LCD numerals** and a sloped face that makes reading across-the-shack easy and pleasant.

You can read hour, minute, second, month and day and operate them in an alternating time-date display mode. You can also **synchronize them to WWV** for split-second timing. Both are **quartz controlled** for excellent accuracy.

MFJ-108 **$19.95**

MFJ-107 **$9.95**



They are **battery operated** so you don't have to reset them after a power failure, and battery operation makes them suitable for mobile and portable use. Long life battery included.

MFJ-108 is 4½x1x2 in. MFJ-107 is 2¼x1x2 in.

RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE MFJ-1229 $179.95

Everything you need is included for sending and receiving RTTY/ASCII/CW on a Commodore 64 or VIC-20 and your ham rig. You get MFJ's most advanced computer interface, software on tape and all cables. Just plug in and operate.

The MFJ-1229 is a general purpose computer interface that will never be obsolete. An internal DIP switch, TTL and RS-232 ports lets you adapt the MFJ-1229 to nearly any home computer and even operate AMTOR with appropriate software.

A crosshair "scope" LED tuning array makes accurate tuning fast, easy and precise.

You can transmit both narrow (170 Hz) and wide (850 Hz) shift while the variable shift tuning lets you copy any shift (100-1000 Hz) and any speed (5-100 wpm, 0-300 baud ASCII).

Automatic threshold correction and sharp multi-pole active filters give good copy under severe QRM, weak signal and selective fading.

There's an FM (limiting) mode for easy trouble-free tuning that's best for general use and an AM (non-limiting) mode that gives superior performance under weak signals and heavy QRM.

A handy Normal/Reverse switch eliminates re-tuning while checking for inverted RTTY.

An extra sharp 800 Hz CW filter really separates the signals for excellent copy.

12½ x 12½ x 6 inches. Uses floating 18 VDC or 110 VAC with MFJ-1312, $9.95.

MFJ PORTABLE ANTENNA

MFJ's Portable Antenna lets you operate 40, 30, 20, 18, 15, 12, 10 meters from apartments, motels, camp sites, vacation spots, any electrically clear location where space for full size antenna is a problem.

A telescoping whip (extends 54 in.) is mounted on self-standing 5½ x 6¾ x 2¼ inch Phenolic case. Built-in antenna tuner, field strenght meter. 50 feet coax. Complete multi-band portable antenna system that you can use nearly anywhere. 300 watts PEP.

MFJ-1621 $79.95

MFJ ANTENNA BRIDGE MFJ-204B $79.95

Now you can quickly optimize your antenna for peak performance with this portable, totally self-contained antenna bridge that you can take to your antenna site—no other equipment is needed.

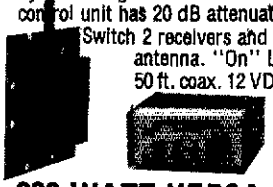
You can determine if your antenna is too long or too short, measure its resonant frequency and antenna resistance to 500 ohms. It's the easiest and most convenient way to determine antenna performance available today to anyone. There's nothing else like it and only MFJ has it. Built-in resistance bridge, null meter and tunable oscillator-driver (1.8-30 MHz). Uses 9 V battery. 4 x 2 x 2 inches.

REMOTE ACTIVE ANTENNA

The authoritative "World Radio TV Handbook" rates the MFJ-1024 as "a first-rate easy-to-operate active antenna ... Quiet, with excellent dynamic range and good gain ... Very low noise factor ... Broad frequency coverage ... the MFJ-1024 is an excellent choice in an active antenna"

54 inch remote active antenna mounts outdoor away from electrical noise for maximum signal and minimum noise pickup. Often outperforms long-wire hundreds of feet long. Mount anywhere-atop houses, buildings, balconies, apartments, ships.

Use with any radio to receive strong clear signals from all over the world. 50 KHz to 30 MHz. High dynamic range eliminates intermodulation. Inside control unit has 20 dB attenuator, gain control. Switch 2 receivers and auxiliary or active antenna. "On" LED. 6 x 2 x 5 in. 50 ft. coax. 12 VDC or 110 VAC with MFJ-1312, $9.95.



MFJ-1024 $129.95

200 WATT VERSA TUNER

MFJ-901B $59.95

MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier. Efficient air-wound inductor gives more watts out. 4:1 balun, 5x2x6 in.

ROLLER INDUCTOR TUNER

MFJ-989 $329.95

Meet the "Versa Tuner V", the compact roller inductor tuner that lets you run up to 3 KW PEP and match everthing from 1.8 to 30 MHz.

Designed to match the new smaller rigs, the MFJ-989 is the best roller inductor tuner produced by MFJ. Our roller inductor tuner features a 3-digit turn counter plus a spinner knob for precise inductance control for maximum SWR reduction. Just take a look at all these other great features! **Built-in 300 watt, 50 ohm dummy load, built-in 4:1 balun and a built-in lighted meter** that reads SWR and forward and reflected power in 2 ranges (200 and 2000 watts). Accuracy ±10% full scale. Meter light requires 12 VDC. 6 position antenna switch. 10¾ x 4½ x 15 inches.

MFJ "DRY" DUMMY LOADS

MFJ-262 **$64.95**

MFJ-260 **$26.95**

MFJ's "Dry" dummy loads are air cooled—no messy oil. Just right for tests and fast tune up. Non-inductive 50 ohm resistor in aluminum housing with SO-239. Full load to 30 seconds, de-rating curve to 5 minutes. **MFJ-260 (300 watt),** SWR 1.1:1 to 30 MHz, 1.5:1, 30-160 MHz, 2½x2½x7 in. **MFJ-262 (1 KW),** SWR 1.5:1 to 30 MHz, 3x3x13 inches.

MFJ ELECTRONIC KEYER

MFJ-407 **$69.95**

MFJ-407 Deluxe Electronic Keyer sends iambic, automatic, semi-auto or manual. Use squeeze, single lever or straight key. Plus/minus keying. 8 to 50 WPM. Speed, weight, tone, volume controls. On/Off, Tune, Semi-auto switches. Speaker. RF proof. 7 x 2 x 6 inches. Uses 9 V battery, 6-9 VDC or 110 VAC with AC adapter, MFJ-1305, $9.95.

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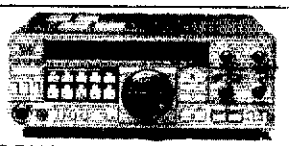

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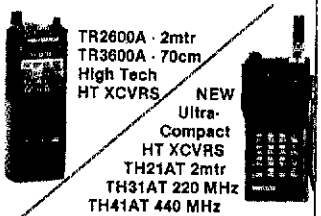

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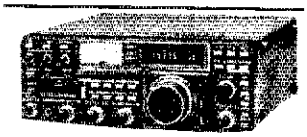

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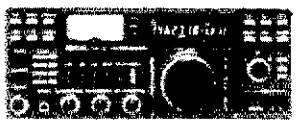

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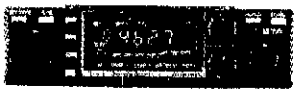

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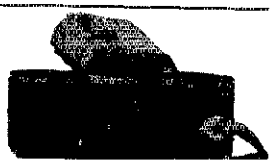

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Dual Band Xcvr List $549
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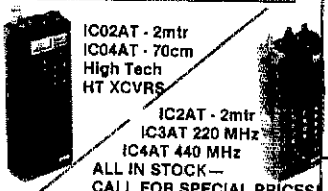

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Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

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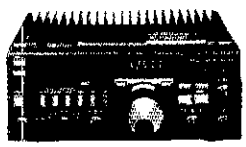
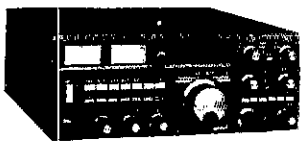


FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!



FT-726R LIST PRICE $899
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Operation! List $579
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2mtr HT
5 Watt Output
NOW IN STOCK

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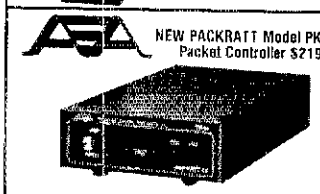

NEW PACKRATT Model PK-64
Packet Controller $219.95

PK-80 Packet Controller	$219.95
CP1-1 Computer Patch	$169.95
CP-1/64 Computer Patch W/C64 MBATEST	$219.95
CP-100 Deluxe Computer Patch	$299.95
PK64 C64 Packet System	$219.95
MBATOR Software C64 or VIC20 (Specify)	$89.95
Doctor DX CW Band Simulator Software	$99.95
Doctor QSO Morse Code Trainer Software	$79.95

Isopole 144MHz, 220MHz & 440MHz Antennas
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ONLY $199!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$249
B23S	2M	No	2W	30W	$ 79
B23A	2M	Yes	2W	30W	$ 89
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

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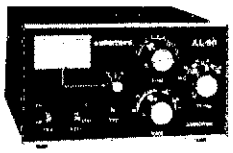

AL80A NEW 1000W 3-500Z Amplifier $689
Al-84 600W PEP Output
(4-6MJ6 Tubes) $379
RCS-4 4 Pos Remote Antenna Switch $119.95
RCS-8V 5 Pos Remote Antenna Switch . . $119.95
ATR-15 1500W Antenna Tuner $289

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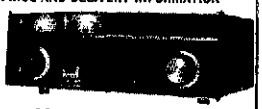

425 Titan New 3KW amplifier
in stock - Call For Special Price

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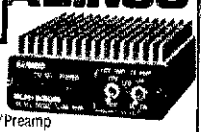

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Other Alinco Amps in Stock Call For Special Price

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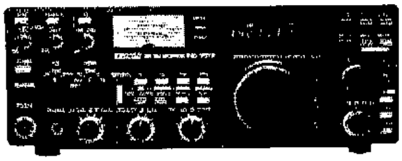

IC-751 9 Band Xcvr, I-30 MHz

HF Equipment	List	Juns
IC-751 Xcvr	1399.00	Call $
IC-751A Xcvr	1499.00	Call $
IC735 Xvcr	889.00	Call $
PS-55 Power Supply	169.00	Call $
PS-35 Power Supply	169.00	Call $
Receivers		
IC-R-7000	969.00	Call $
IC-R71A	849.00	Call $
VHF/UHF		
IC-02AT 2m, HT	369.00	Call $
IC-2AT	269.00	Call $
IC-271A 2m, Base	735.00	Call $
IC-27A Compact	389.00	Call $
IC-3AT, HT	299.00	Call $
IC-37A Compact Mobile	449.00	Call $
IC-04AT 440 MHz, HT	399.00	Call $
IC-4AT	299.00	Call $
IC-471H 75w, 440 MHz	1149.00	Call $
IC-47A	489.00	Call $
IC-3200 25W, Dual Bander	569.00	Call $
IC-290H 25W, 2M, SSB/FM	$549	Call $
IC-490A, 10W, 440, SSB/FM	$649	Call $
RP-3010 UHF, Repeater	1049.00	Call $
IC-1271A 1.2 GHz Base	1049.00	Call $
IC-120 Mobile	499.00	Call $

KENWOOD

HF Equipment	List	Juns
TS-940S w/AT	2099.95	Call $
wo/AT	1899.95	Call $
TS-430S	899.95	Call $
TS-830S	999.95	Call $
TS-530S	799.95	Call $
TS-670 Quad Bander	749.95	Call $
Receivers		
R-2000	629.95	Call $
R-1000	519.95	Call $

TS-440S All New Compact HF Xcvr

VHF/UHF		
TR 2600A 2m, FM, HT	349.95	Call $
TR 3600 440, HT	359.95	Call $
TH 21AT Compact 2m	239.95	Call $
TH 31AT Compact 220	249.95	Call $
TH 41AT Compact 440	249.95	Call $
TM 4000A 2m/70cm	599.95	
TM 2570A 70w, 2m	549.95	Call $
TM 2550A 45w, 2m	459.95	Call $
TM 2530A 25w, 2m	399.95	Call $
TM 211A 2m, Mobile	369.95	Call $
TM 411A 70 cm	449.95	Call $
	List	
TM-201B 2m, FM Mobile	339.95	Call $
TM-401B 70 cm Mobile	369.95	Call $
TS-711A 2m, All Mode	799.95	Call $
TS-811A 440, Base	899.95	Call $
TS-711A 2m, All Mode	839.95	Call $
TS-811A 440, Base	949.95	Call $
TL-922A HF Amp	1399.95	Call $
SM-220 Moniter	379.95	Call $
TS-440s w/AT	1099.95	Call $
TS-440s wo/AT	949.95	Call $

ENCOMM

Santec	List	Juns
ST-20T 2m HT	349.95	Call $
Welz Power Meters, Acces.		Call $
Tokyo Hy-Power		
VHF/UHF Amps/Tuners		Call $

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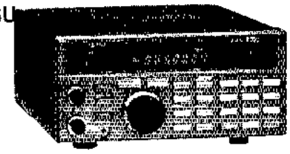

FRG-9600 60-905 MHz Receiver

HF Equipment	List	Juns
HT ONE Xcvr	2859.00	Call $
FT 757GX Xcvr	879.95	Call $
FT 980 CAT System	1659.00	Call $
Receivers		
FRG 8800 150kHz-30 MHz	569.00	Call $
FRG 9600 60 - 905 MHz	649.00	Call $
VHF/UHF		
FT-203R/TT 2m, HT	259.95	Call $
FT-209RH w/FTS-6	359.95	Call $
FT-103R/TT 220 MHz	279.95	Call $
FT-703R/TT 440 MHz	299.95	Call $
FT-709 RH 440 MHz, HT	349.00	299.95
NC-15 Quick Charger	79.00	Call $
FT-270 RH w/FTS-8 2m	439.00	Call $
FT-2700RH w/FTS-8	599.95	Call $
FT-726R All Mode		
OSCAR	925.00	Call $
6m Module	215.95	Call $
SU-726	109.95	Call $
430/726	299.95	Call $
440/726	299.95	Call $
HF/726	225.95	Call $
FTR-2410 2m Repeaters	1075.00	Call $
FTR-5410 70cm Repeaters	1249.00	Call $

TE Systems	List	Juns
Mirage		Call $
Ameritron		Call $
Amp Supply Co.		Call $
Bird Products In Stock		Call $
KLM Antennas		Call $
Hustler Antennas In Stock		Call $
Larsen Antennas In Stock		Call $
AEA	Products in Stock	
Kantronics	Products in Stock	
Astron	Products in Stock	
Bencher	Products in Stock	

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ATLANTA HAMFESTIVAL–P.O. BOX 77171–ATLANTA, GA. 30357

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(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 August 14 through September 13 will appear in November *QST*. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New firms or individuals offering products or services for sale must submit a production sample (which will be returned) for our examination. Dealers are exempted, unless the product is unknown to us. Check with us if you are in doubt. You must furnish a statement in writing that you will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or 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).

MORSE TELEGRAPH CLUB, established 1942, seeks landline and radio operators interested in telegraphy and Morse history. 46 chapters USA & Canada. For information and sample paper contact W. K. Dunbar, AD9E, 1101 Maplewood Dr., Normal, IL 61761 309-454-2029.

THE FLORIDA Amateur Digital Communications Association (FADCA) publishes a monthly newsletter, the FADCA Beacon, about Packet Radio. Write for a sample copy, FADCA, 812 Childers Loop, Brandon, FL 33511.

FCC EXAMS, Novice-Extra. Sunnyvale VEC ARC. 408-255-9000, 24 hour. 73, Gordon, W6NLG, VEC.

THANK YOU for attending Warren Ohio Hamfest. See you August 17, 1986.

INDIANA (MUNCIE) June 8: The Muncie Area ARC (MAARC) will hold its Annual Hamfest at the Delaware County Fairgrounds from 8 AM till 3 PM Sunday. Admission: in advance $2. At the door $3; tables $5. With electricity. Overnight camping hook-up $5 per space. Amateur Upgrade Test will be given in a separate building from 9 AM to 11 AM only. Free parking and food available, security will be on site at all times. For more info contact Robert A. Casada, KC9TY, 2608 Sycamore Ave., Muncie, IN 47302. Tel. 317-288-9449.

PENNSYLVANIA (MEADVILLE)—July 5: Firecracker Hamfest by Crawford Amateur Radio Society. Electronics, radios, computers. New location at Meadville Recreation Center just off Rt 27E in Meadville. All indoors; no rain-out. One olympic and two child-size deluxe swim pools with lockers and showers and other sports available in Center. Free indoor fleamarket space; bring table. Dealers: free indoor space and table(s) available by preregistration; reserve early. Admission adult-$2.00, children free, swimming for small extra. Talk-in 144.53/145.13, W3MIE/R. For information: write CARS HAMFEST-86, PO Box 653, Meadville, PA 16335 or call Ben Ferer, KF3F, 814/724-2432.

NORTHERN NEW JERSEY—Sussex County ARC Hamfest, July 19th. Sussex County Fairgrounds, Augusta, N.J. 8:00 AM. Indoor/Outdoor space. Acres of parking. Refreshments. Talk-in 147.90/30 and 146.52. For information call Donald Stickle, K2OX, 201-663-0677.

1986 "BLOSSOMLAND BLAST" Sunday, October 5, 1986. Write "Blast" PO Box 175, St. Joseph, MI 49085.

THE 8TH ANNUAL TSRAC Wheeling Hamfest/Computer Fair, Sunday, July 20, Wheeling Park, 9 AM to 4 PM. WV's largest. Dealers welcome 30,000 square feet under roof: 5 acres flea market. Family activities at Park. Admission $3 in advance-$4 at door. To reserve space contact: Jay Paulovicks, KD8GL, RD 3 Box 238, Wheeling, WV 26003 304-232-6796, for tickets, TSRAC, Box 240, RD 1, Adena, OH 43901, 614-546-3930.

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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: wil 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 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

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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¢ self addressed business size envelope required. Mary Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

QSLs Samples 40¢ (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577

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QSL's — since 1956, free samples, Rusprint, Box 7575, Kansas City, MO 64116.

FREE, 100 QSLs with first order. Samples 50¢. Gazebo Press, Rt. 4, Box 4148, LaPlata, MD 20646.

ENGRAVING. CALLSIGN/name badges by WØLQV. SASE for price sheet. Box 4133, Overland Park, KS 66204.

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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.

QUALITY QSLs, Samples 50¢. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

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, 310 Commercial, Emporia, KS 66801.

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QSL CARDS, free samples. Shell Printing, KD9KW, PO Box 50, Rockton, IL 61072.

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CANADIANS—WANT Mint Collins KWM-2 and 75S-3C. VE5VX 306-652-6328.

COLLECTORS: RARE Davco DR-30 Receiver, w/DR-30/ps, Manual. Spotless, mechanically perfect. Information 1/67 QST. VE2FW, 514-482-1984.

WANTED; old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

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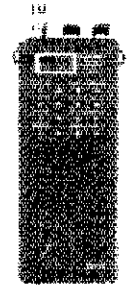

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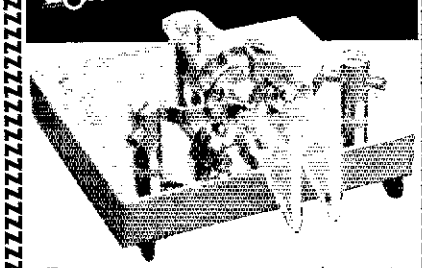

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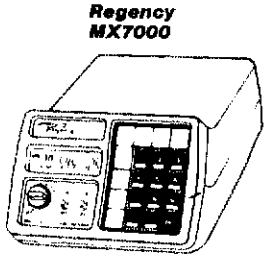

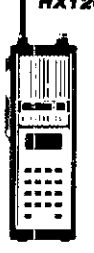

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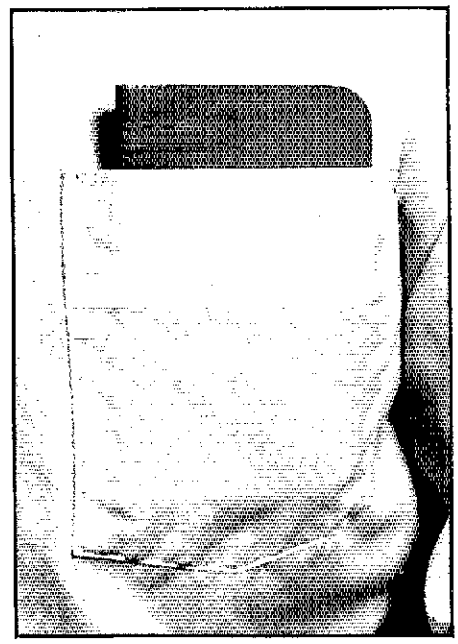

THE ARRL 1986-1987 REPEATER DIRECTORY!

10,320 LISTINGS 29.5 MHz-10GHz

We've made the **ARRL Repeater Directory** even more practical to use. Now you can carry it around in your pocket and it will fit in most glove compartments. Even though we shrunk the size of the book to 3¼ x 5¼ inches, the listings appear in the same size as the previous editions. In this handy book, you'll find much useful information including: CTCSS (PL) Tone Frequency Chart, Addresses of members of both the ARRL VHF-UHF and Repeater Advisory Committees, separate listings of digipeaters and other special mode repeaters, band plans, repeater operating practices and a compilation of frequency coordinators and ARRL Special Service Clubs. 15th Edition, copyright 1986. Still only $3.00. Please add $2.50 for shipping by parcel post or $3.50 for UPS for each order or available from ARRL dealers.

THE AMERICAN RADIO RELAY LEAGUE, INC.
225 Main Street
Newington, CT 06111

29.5 — 29.7 MHz

TYPICAL LISTINGS

Location	Input	Output	Call	Notes	Sponsor	Source
ALABAMA						
Bessemer	29.60	145.15	N4AHN	oal	K4GTQ	ARC
Birmingham	29.56	29.66	K4GTQ	o		ARC
Mobile	29.54	29.64	KE4QC	o	KE4QC	ARC
Tuscaloosa	29.58	29.68	KX4I	o		ARC
CALIFORNIA						
MONTEREY BAY AREA						
#MONTEREY	29.52	145.64	N6AHW	ol	MRRBG	N6AHW
#MONTEREY	146.91	29.60	WB6CAN	o	MontBay	NARC
SANTA CLARA	29.54	29.64	K6GZK			
#SANTA CRUZ	29.52	29.62	N6AHW	ol	MRRBC	
SOLANO	29.56	29.66	N6BPK	o		
Hollywood Hls	29.56	29.66	W6ORD	o		
Johnstone Pk	29.58	29.68	WB6IGH			
Monrovia	29.54	29.64	W6OE[illegible]			
Newbury Park	29.52	29.62	[illegible]			NARC
Palomar Mt.	29.56	29.[illegible]	[illegible]		[illegible]	N6AHW
						NARC
COLORADO						SCRRBA
Boulder				oPL 1B		SCRRBA
CONNEC[illegible]			[illegible]	oPL 1B	SGVARC	SCRRBA
Bl[illegible]			WB6WGE	PL XB		SCRRBA
			N9PL	o		SCRRBA
	29.56	29.66	W9IA	o	RMVHFS	CCARC
[illegible]TICUT						
[illegible]omfield	29.58	29.68	KB1GA		KB1GA	TSARC
Columbia	29.55	29.65	WA1CBY			TSARC
Glastonbury	29.68	147.69	K1NQJ	PL		TSARC
Montville	29.57	29.67	KA1DFI	o		TSARC
N Coventry	29.54	29.64	K1JCL	o(ca)e	K1JCL	TSARC
DELAWARE						
Claymont	29.56	29.66	KC3AM	o	KC3AM	TMARC
DISTRICT OF COLUMBIA						
Fairfax, VA	29.58	448.725	KD4DN	ol	KD4DN	TMARC
Gaithrsbrg MD	29.56	29.66	N3AUY	o	KD3R	TMARC
Sterling, VA	29.58	29.68	KD4DN	ol	KD4DN	TMARC
FLORIDA						
Clearwater	29.58	29.68	KF4ZC	oPL 1Z	KF4ZC	FRC

WANTED: AEA KT-2, CK-2 or MM-2 and Bencher Lambic Paddle. J. Waskowitz, 580 83rd. St., Brooklyn, NY 11209.

FOR SALE: DRAKE MN-75 Ant Tuner 10-80 meters. New $185 (excellent buy) (+ UPS). AK-75 Dipole Antenna 10-75 Meters, new $29.95 (+ UPS). 215-271-8898, Tony Musero, K3UKW.

WANTED: 2M all-mode Xcvr 25W Base Station 2 yrs old or newer. Cushcraft 4218XL, 215WB, 32-19, Heath Weather Station ID 1290. W2UGM, 66 Columbus Ave., Closter, NJ 07624 201-767-0123.

R-390A RECEIVER, .5-30 MHz all modes, 4 mechanical filters, meters sealed (Government removed, operation unaffected): complete/checked $195, complete/reparable $115, spare parts unit (80% complete) $65. R-390A parts, tubes, sections. Info SASE. Shipping charges collect. Baytronics, Dept. QST, Box 591, Sandusky, OH 44870, 419-627-0460 evenings.

ARCOS VHF/UHF amplifier parts and kits. Harold "Connie" Bramstedt, 6104 Egg Lake Rd., Hugo, MN 55038, 612-429-9397.

BELDEN 9913 Coax Special 39c/ft. to 100 feet. 38c/ft. 100 feet & up. Belden 9258 RG-8X 17c/ft. Amphenol N-type fitted for 9913 $4.50. Other connectors and adaptors in stock. 8 gauge hook-up wire $.28/foot. U.S. Geological Survey Maps, complete N.J. index in stock, $2.50 ea. Inquire for other areas. Same day shipping. VISA & Master Charge accepted. Call Bill, KA2QEP or Jim, KA2RVQ at 201-887-8424 or write QEP's 110-4 Route 10, East Hanover, NJ 07936.

DISCOUNT TOWER ACCESSORIES: ¼" EHS Guy Wire 15¢/ft—Preformed end grips $1.90—8" Ground Rods $10.50—Strain insulators $2.25—Galvanized Anchors $12—Professional Climbing Belts, More! KME Enterprises (AB8Y) Box 25, Richland, MI 49083.

COMMODORE 64/128 "COMKEY" Program turns computer into sophisticated memory keyer. Send characters as you type them or load 16 message areas (256 characters each) with Call, Name, QTH, Rig, Contest Exchange, etc. to be sent later with a single keystroke. More. Write for free details. $15 for program and instructions for building simple interface of $28 postpaid for program and homemade interface (nothing else needed to make your computer key your transmitter). Specify tape or diskette. Fritz Reuning, K4OAQ, 120 Elk Rd., Bristol, TN 37620.

SHORT DIPOLES for 160/75, 160/40, 160/30 . . . coax-fed, no tuning. $59.50 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

THE DX BULLETIN — America's Oldest Weekly Amateur Radio publication contains complete DX information. SASE or call for sample. Box 4233, Santa Rosa, CA 95402. 707-523-1001.

EXPERT REPAIR on all types of ham gear by WA6SRX, P.O. Box 2064, Idyllwild, CA 92349, 714-659-4018.

HEATH HW-16, HG-10B VFO and Speaker. Clean, works good. I UPS for $115 cashier's check. David Combs. W5VJW, 2000 Victory, Wichita Falls, TX 76301.

WANTED QTH Northern New Jersey. Small, Simple, Hilltop. WA2VHQ, 212-532-5845 eve

HAM ACCESSORY CATALOG-Send legal size SASE to H.A.M. Sales, P.O. Box 497, Finksburg, MD 21048.

WANTED: MOTOROLA or GE VHF Repeater; leave model and price on machine. 718-783-3188. N2HA.

ICOM '745 with Internal P.S. and SSB Filter for sale. Never used. W5ZZ, 214-235-6927.

DON'T CLIMB? Heights/Universal 50 ft., screw-operated, foldover Hinge Tower, excellent, pickup only $600. Almost new Cushcraft A3 with A3SK $145 and HD73 Rotor $75. WB4ZCD, 606-441-9684.

WANTED: DRAKE RV-75, SPR4. Call Reiner, WA2VHQ, 212-532-5845.

INFOTECH M200F & 9" monitor $350. Sonar 2M FM w/PS $45. Computer Power Supply + 12, - 12, + 5 at 5 Amps $30. 6 ft. rack $25. 2AP1A scope tube, shield & bezel $20. Drake FL1600 $30. UT-2 $20. ICOM TTP Mike $15. Dave, K3KD. 1-215-754-6286.

HAM RADIO SOFTWARE for C64 or V20. 12 programs on disc. Includes Morse Code, WAS, WAZ, DXCC and more. Send $14.95 check or M.O. to H.A.M. Sales, P.O. Box 497, Finksburg, MD 21048.

CODECOPY program for IBM-PC and compatibles. Copies CW using simple interface through RS232 DSR line. $15.00 postpaid includes interface plans and software. SASE for information. OPS SOFTWARE, POB 866414, Plano, TX 75086.

KENWOOD AMATEUR REPAIR, Experienced Professional Service, Visa/MC accepted. Mon-Fri 10:00 to 4:00 PM. Pacific Rim Communications, 23332 58th Ave West, Mountlake Terrace, WA 98043, 206-776-8993.

GET YOUR "F.C.C. Commercial General Radiotelephone License." Electronics Home Study, Fast, Inexpensive! "Free" details. Command, D-215, Box 2223, San Francisco 94126.

8877 VHF AMP KITS. HV power supplies, CX600N relays, MuTek LTD front end boards for IC251/IC271, EME newsletter and QRO parts. SASE for new catalog. KB7Q, "Q" Products, 417 Staudaher Street, Bozeman, MT 59715.

1986 CALLBOOK SUPPLEMENT, $9. Both Callbooks & Supplement, $44. Callbooks only; either, $20; any two or more, $18 each. Postpaid U.S. Elsewhere, add $3/item. Century Print, 6059 Essex, Riverside, CA 92504-1566, 714-687-5910.

DX ANTENNAS FOR 160 - 10 METERS! Small size, broadband, high performance. Also many antenna parts, Beverage insulators, wire and cable for do-it-yourself amateurs. Low prices, fast service. S.A.S.E. for catalog. W1FB, Oak Hills Research, P.O.B. 250, Luther, MI 49656.

NEEDED: DRAKE 4-NB Noise Blanker. Gordon Moss, 1221 Formosa Ave., Los Angeles, CA 90046. 213-851-2262.

YAESU OWNERS—Hundreds of modifications and improvements for your rig. Select the best from fourteen years of genuine top-rated Fox-Tango Newsletters by using our new Comprehensive Index. Only $4 postpaid with Rebate Certificate creditable toward Newsletters purchases. Includes famous Fox-Tango Greensheet and Filter information for your rig (if specified). N4ML, FTC, Box 15944, W. Palm Beach, FL 33416. Telephone 305-683-9587.

MADISON-BELDEN 8214 lowloss foam coax $31/100 ft; only 100' multiples at this price; 9913 lowloss, solidcenter, foil/braid shield 50¢/ft; 8267 RG213 55¢/ft; 9258 RG8X 20¢/ft. Belden specs available. Amphenol PL259 silverplate $1.25; adapters stock; Prices FOB Houston. Madison Electronics, 3621 Fannin, Houston, TX 77004. 1-713-520-7300 Mastercard/VISA/COD.

WANTED: BC1000A/SCR300A, BC610, also schematic copy, for Air Champ one-tube & 2 tube receivers. Buddy Herring, 1310 Andover Rd., Charlotte, NC 28211. 704-366-6600 evenings.

WANTED: KWM-2A, 30S and 30L Linears. Any Condition. Send information to: M. Gonzales, 3737 Red Cedar, Harvey, LA 70058.

WANTED: REMOTE VFO, Drake RV7 or RV75. K8SL, Rolf, POB 51174, Raleigh, NC 27609.

IBM COMPUTER program, "Hamlog." 15 modules; logs, auto-sorts 7-band WAS/DXCC. Full feature editing. Much more. $24.95. KA1AWH, PB 2015, Peabody, MA 01960.

WANTED: ASTATIC Microphone Model 10DA-500. Call collect, 904-249-0483. K4PYT.

TRADE OR SELL: Have two Alpha 77 Amplifiers in fine condition with fresh 8877 in each. Trade both on Alpha 77SX (two tube) or sell for $2500, each. Chris NQ6Q 408-372-4348 collect.

CQ CONTEST: VHF'ers and contesters everywhere are invited to join in the fun of the 2nd annual CQ World-Wide VHF WPX Contest, scheduled for July 19-20. 8 categories of competition, including QRP, portable/hilltop and FM only! If you're equipped for the bands above 50 MHz, get out in the sun and have fun in this international operating event. Logs/entry sheets available for free (S.A.S.E. appreciated) from SCORE, P.O. Box 1161, Denville, NJ 07834 or from CQ Magazine. Rules in QST "Contest Corral" and other leading journals.

COLLINS 180S-1 1 kW Antenna Tuner with Shockmount. New/never-used (Round) $300. DL-1 Dummy Load (Round) $60. Directional Coupler and SWR meter for 312-B4/B5 (new) $40. N.Y.C. area. Dengel 212-884-7064.

TEMPO ONE, AC/One, mic, fan, new finals, manuals. $225. You ship. N0EFG, Independence, IA 319-334-2182 evenings.

WANTED: The following equipment on VHF-High, UHF or 800 MHz. Repeaters: MSF-5000, MSR-2000. MICOR, MASTR-II, "MSY." Portables: STX, MX, MX300T, MX300S, Expo. Mobiles: Syntor-X, Syntor, Mitrek, Privicy-Plus 1000. Pagers: PC-50-TVD, Spirit. Misc: Dyna-Tac 8000, Dyna-Tac 6000, 1/4 kW Micor or MASTR-II Repeater. Call Chuck, N0CAM, 303-632-8413.

APPLE COMPUTER program, "Hamlog." 15 modules; logs, auto-sorts 7-band WAS/DXCC. Full feature editing. Also CP/M. $14.95. KA1AWH, PB 2015, Peabody, MA 01960.

TECHNICAL PUBLICATIONS, 1935 to date, for sale. W3AFM is retiring. The offer includes BSTJ, Record, IRE/IEEE, PGCT/CS/AP/VC. QST. CQ. 73, Ham Radio; British IEE, POEEJ. A ton. Microwave Journal. Virtually unbroken runs. Telephone 301-654-7669, for discussion of costs. Excellent condition. Ideal for emerging-national universities, libraries, colleges, PTT's, laboratories. Paul Rockwell, W3AFM, 5800 Hillburne Way, Chevy Chase, MD 20815.

THE RADIO CLUB OF JUNIOR HIGH SCHOOL 22 N.Y.C. INC. is a non-profit organization incorporated under the laws of the State of New York with the goal of using the theme of Ham Radio to further and enhance the education of young people. Your equipment donation would be greatly appreciated. WB2JKJ via callbook or telephone (516) 674-4072, 24 hours, seven days a week. THANK YOU.

COMMODORE 64 OWNERS, extend the life of your computer! Use my soft reset switch to get out of a program or lock-up. Stop shocking your components by turning your computer off and on. Plugs into serial port and has a connector for your peripheral. $14.95. Harvey Baron, Box 196, Bethpage, NY 11714-0196.

ICOM 730 $400. Excellent. KB8RK. 313-352-3962.

WANTED: COLLINS 30S-1. Prefer round emblem, original owner. I would pick it up. Gordon Skul, 312-672-5767.

64 FOOT HEIGHTS aluminum free standing tower. Hy-Gain Mark 3 tri-band Yagi. 10-15-20 meters. One and one third acres, three bedroom, two bathrooms, two fireplaces and walk out basement. Basement finished with wet bar. $69,900. WB8ZMV Westland, Michigan 313-522-2067.

ROHN TOWERS-Wholesale direct to you. 34% discount from the Rohn dealer price. All products available. Also, very low prices on Antenna Specialists antennas and Andrews Heliax. Write or call for catalog and price list. Hill Radio, 2503 GE Road, Bloomington, IL 61701-1405, 309-663-2141.

WANTED: Advanced Electronic Applications—(MBA-RC) in working condition. Don Morar, W3QVZ, PO Box 129, Great Cacapon, WV 25422, 304-258-5351.

WANTED: MINT AL-80 Amplifier. K7XR, 26102 13th Pl. So., Kent, WA 98032.

YAESU FT-980, SP-980, md mike, MARS kit, filters, keyers module, keying relay, manual, control cable for Yaesu 757 tuner. $1,100 for all. Call Mike KA5RCS, 817-677-3358 after April 27.

YAESU FT-202R HT Speaker mike and desk charger $75. GLB 300 2 meter synthesizer $45. Heath HW-202 2m Xcvr and ac supply B/O. Model 33 (ASCII) TTY's, you pick up B/O. WB2FTX 201-838-9093.

COLLINS KWM-380 N.B., Key Pad, 1.7 kHz filter, all mods, like new $2,750. K4BOK, Dwight, 205-979-6005.

FOR SALE: Drake TR4C Transceiver, AC-4 Power Supply, MS-4 Matching Speaker and WH-7 Wattmeter. All in excellent condition $400. Sid Barnett, 277 W 21st, Deer Park, NY 11729 516-667-2213.

WANTED: SMALL 20 MHz Dual Trace Scope, and also Station Monitor Scope similar to SB-614. John Davis, 415 Mountainview Ave., Staten Island, NY 10314 718-698-3690.

PERFECT HAM HOME—Three bedrooms, dining room, 2 bath, finished walk-out basement and ham shack, garage, out buildings, 1 acre rural lot, blacktop road, 10' complete satellite system, tower, beams and other antennas, sits high on hill with 3 state view, good hunting, fishing and boating. $79,900 QSL Ken Norpel, WØBCN, RR 2, Box 425, Dubuque, IA 52001.

SELL—SWAN 500C Transceiver 117C Power Supply $225; Collins 75S-3 receiver $250; Drake T4-X Transmitter and Power Supply $250. W3FBI, Peters, Pittsburgh, PA 15241, 412-221-2975.

DRAKE MN-2700 Tuner w/B1000 Balun $250 and W-4 wattmeter $45. Kenwood Speakers SP-930 w/Filters $40 and SP-520 $25. YK-88A-1 AM filter for TS-930S $30. Ameco Xcvr Preamp PT-2 $35. MFJ Electronic Keyer MFJ-407 $40. Astatic D-104 mic w/stand $25. Numerchron 24 hour clock $10. You ship. W1SD, Shore Road, Sebago Lake, ME 04075. 207-787-2021 7-11 P.M. EST.

TEN-TEC Delta 580 9 band 200 Watts PEP Transceiver $399 mint condition. Glen Davison, KØSOI, Buffalo, MO 65622, 417-345-7682.

ICOM 25A, mobile 2 mtr radio, memory back-up, touch tone mike, original box, manual. Excellent. Call Bob, N6FQP, after 7 P.M. PST. 213-426-1259 $175.

HW-16, HG10B VFO $125. Bearcat 210XL $120. QST, 73, 1975-1984 Teletype free. Pickup only. N2ZY, 718-745-3218.

FOR SALE: DRAKE TR-4 (w/noise blanker), RV-4, Shure mike, Viking phone patch, manuals. $300 takes all. FOB K2EWA, 17 Crommelin Ct., East Brunswick, NJ 08816. 201-297-5057 eves.

FOR SALE, Ten-Tec 509 Argonaut $175, ICOM PS-15 Power Supply new $100. KT9F, 812-473-0424.

QUALITY REPAIRS at very affordable prices. $25/hr. Skylab thanks everyone for their patronage. We have moved to a larger location where we can better serve you. Non-warranty repair of all H.F. Kenwood, Yaesu, and ICOM equipment. Amp Supply, Ameritron, Dentron, ICOM, Kenwood and Yaesu, Amplifiers. Any Heathkit equipment, T.V. boards and High Voltage supplies at 20% less than Heath. Most TV monitors, tuners, VHF/UHF, satellite, computers, drives, telephones, CB's. We do modifications and filter installations. 30-day warranty on parts and labor. We fix almost anything! Be sure to file our new address for later reference. Skylab, Inc. 5514 W. Lisbon Ave., Milwaukee, WI 53210 414-87-12345, 24 hours.

COMPUTER PAPER and DISKS: Competitive prices, SASE, FCS, 9307 Worley Mill Rd., Hillsboro, OH 45133.

DC Power Supply-Vista X-R 8 amps, $49. W2QUT, 1-718-726-6759.

SWAN 600T Transmitter and 600R Receiver, $295. KA9OBP, 608-742-6965.

SURPLUS J.A.N. Tubes: 4CX250B $40; 811A $8; 304TL $55; 813 $22.50; 2E26 $6.50; 807 $3; 592 $45; 4X150D $30; 7-8-9 pin receiving tubes $1.25 each. Send SASE for list. All tubes new. Solidstate 866, 872 and H.V. Plate Transformers. WA7OPY 406-728-2359. 1740 S. 13th W. Missoula, MT 59801.

WANTED: KENWOOD 9130 and 9000 Multi-Mode Two Meter Rigs. George, KA5FXB, 618 Omega, Longview, TX 75601.

FIELD DAY for Apple II + /e/c. Other contests too! Walk away from Field Day with the paper work done. Accidental power failure-no problem $18. Demonstration disk $3. KBØVT, P.O. Box 1185, Des Moines, IA 50311. 515-274-2094.

FOR SALE: Drake FS-4 mint $125. Call Lou, NQ6S, AC 415-992-5330.

WANT: HY-GAIN 40-10 M Mono-Band Beams; CE MM-2; 3-1000Z, 8877. WØAIH, Paul Bittner, 1616 South St, Eau Claire, WI 54701, 715-832-8510.

TRADE, YAESU 757GX, Astron 35 Amp Supply, Manuals, Mike, Cables. Keyer not working, otherwise perfect. Want nice older rig with 160 and CW such as: TS-820/530/520, Drake B/C line, FT 101/102/901 Twins etc. Will pick up and deliver within 200 miles. George McCouch, WA3DNC/4 502-885-1553 Callbook ok.

WANTED: AM/CW Xmtr, such as Viking or similar rig. WA2HLM, 562 Whitney Avenue, New Haven, CT 06511. 203-789-2276, Jeffrey Barkin.

HOMEBREW 2 METER kilowatt; PR 4CX250B's, complete with power supply in rack. $300 pick up only. Heath SB200 amplifier $250. PR 572B finals for SB200 and others $59.95. PR 3-500Z finals $100. Michael Bloom, WA2RAT, 3 Kaywood Court, Bayport, NY 11705, 516-472-0226.

CALIF. HIGH SIERRA Mountain Retreat For Rent in Arnold, with antennas, 2-80 meters. Day or weekly rates. Send SASE for details. Don, N6KGE, 4690 N. Clubhouse Dr., Camarillo, CA 93010 or call 805-485-2718.

FOR SALE: Heath SB-230, like new $350. I ship. W4PKM, 703-977-7292.

ICOM 720A/filters, PS-15. Excellent condition, $699. N7AHI, 503-649-1617.

CUSHCRAFT R3 4 mos old, cannot use in new apt residence $100. Pickup preferred-Doug Frick, 215-323-1520 evenings.

DRAKE TR-4CW with RIT & 500 cycle CW Filter, Remote VFO RV-4C, MS-4 Speaker, AC4 P/S. Extra set of final. $500. George Wachter, WA4JSM. 205-852-4962. After 5 PM CST. 5003 Nail Road, Huntsville, AL 35810.

ALPHA 374-3 kW no tune (band pass) linear amplifier. 10-80-three 8874 tubes-Hypersil transformer-manufactured 1975. Looks new, works perfect - $1145 includes shipping. Jack, NQ2G, 201-486-0039.

"CQ" ANYONE with operational Flesher/HAL T.V.'s for standard RTTY machines, gathering dust. USAF Auxiliary-Civil Air Patrol can use them! Donate for tax write-off or state selling price: Major Gene R. Pfeiffer, Suffolk County Group Communications, 2032 Saint Paul Avenue, New York, NY 10461-3906 212-839-9000.

ICOM R-71A Receiver, $475; New CD-45 rotor with 100' cable, $100; Mosley TA-33 Jr. pickup only, $100; RS 64K Color Computer, $95; Disk Drive, $125; many other accessories; KI4SU, 321 Buttonwood, Lake Mary, FL 32746.

WANTED: ICOM IC-211 for cash. K2AK, 718-358-6837, after 4 PM.

ICOM '740, Internal Power Supply, FM Board, CW Filter, Desk and Hand Mikes, excellent condition. $500. W6TLK, 415-586-4196.

DOVETRON MPC1000C deluxe RTTY TU. Manual, cables. $250. Harvey, N6HL, 818-784-9501.

KANTRONICS HAMTEXT for VIC-20. Mint. $45. W8MCH, 304-354-7134.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Swan and all others. Six ½" digits. 5½" wide by 1¼" metal cabinet. Send $1 for information. Receive a $25 discount. Be specific. Grand Systems, POB 3377, Blaine, WA 98230.

YAESU FT227R $240, TI-99 Computer stand alone RS232 (new) $90, TI Thermal Printer $60, Royal Business Computer: separate DSDD drive, Peachtree's Peachtext, Peachcalc software, parallel and serial parts, RGB and composite outputs (new) $250. K2UOR, 124 Winding Lane, Avon, CT 06001 203-673-2399.

IC-735, CW filter, $625. Autek MK1 $60. W9ZR, 1-414-434-2938.

SELL: HEATH SB-102 Transceiver, SB-600 Speaker, SB-650 Digital Frequency Display, HP-23B Power Supply, Johnson Match Box, Realistic Mike, complete $390. K1ZBD, 19 Moss Road, Monroe, CT 06468. Tel. 203-268-0067.

AMPLIFIER, HV Power Supply components, Drake, Collins equipment and many station accessories SASE to WA8YVR, 4139 Doyle, Bloomington, IN 47401.

CRYSTALS: BUILD something! QRP, quick and easy with inexpensive FT-243 crystals. All bands FT-243's 160M to 2M made to order. See page 168 April classified. Crystals Since 1933. Stamp or long SASE for 1700 - 60,000 kilocycles, listings-circuits. W9LPS. C-W Crystals, Marshfield, MO 65706.

SALE: ICOM IC-25A with backup supply $199. W2WHK, 716-692-5451.

HAM-ID'er - Lets you quickly identify call vs. name and other info. For use on Repeaters, Nets, Schedules, Hamfests, etc. For shack or mobile. 32-page spiral bound. Room for 2,240 entries. Send $6.50 (includes postage) for each copy to K4LDI, 2920 Shillingford Ct., Marietta, GA 30067.

IC-735 WITH 8-pole, 400 Hz CW Filter, SM-8 amplifier desk mike, special tuning knob, Astron 20A p/s. Low hours, absolute mint. $700 firm. N2BFL. 212-873-9659.

*NOVICE RADIO OUTLET*New and used equipment dealer! *Used Heathkit HW-100 transceiver, w/manual, power supply, $195. Large SASE for equipment list! Free shipping U.S.A. 919-286-7927 1604 Delaware Ave., Durham, NC 27705.

SALE - NEW Kenwood TS-940S with ant. tuner, YK-88C1, YG-455C1 filters and VS-1, factory warranty $1695. Also have MC-60, HS-5 and SP-940 speaker. Unable to obtain zoning variance for ant. system at QTH. K7BP, 5335 E. Marilyn Road, Scottsdale, AZ 85254 602-996-8656.

HEATH CLEARANCE - ET-3400 Microcomputer $50; IO-4550 Dual Trace Scope. Factory aligned $199; IC-5218 Sine/SQ Audio Generator, factory aligned $50; IM-28 VTVM, needs work, $10; ask about most Heath Continuing Ed Courses. Shure PE56 Microphone, $35; E.V. 664 Microphone, $25; Military rack mt. 26 pos patch bay with cords, $25; Dentron W-2 Wattmeter, $35; 6 LED VU Meters, $5 ea.; RAC-59 S.W. Antenna Switch, $20; Strip Chart Recorder w/paper, $45; Fredrick 1202R VF Radio Teletype Receiver (Type-B), $225. Walter Anderson, 3168 Star Lake Dr., Birmingham, AL 35226, 205-933-2858.

ROUGH WINTER? Ham heaven. 2br2ba home of approx 2000 sq. feet. Located in active Sun City, with tower, quad, and much more. $110,000. W7LOL, P.O. Box 1358, Sun City, AZ 85372.

WANTED: HyGain, 18 HT Hightower antenna. NC8N, 316-421-8468, 3164 Belmont, Parsons, KS 67357.

WANTED: ANY USA Ham Stamp First Day Covers postmarked Anchorage, Alaska, December 15, 1964, for Amateur Radio stamp collection. KL7HBV, 4118 Mendenhall Blvd., Juneau, AK 99801.

COMPLETE DRAKE Ham Station, amplifier, matching network, mike, phone patch, Telrex ant. beam and tower. All or separate. Must retire! K2BUR, phone 609-423-0484.

HW-100 XCVR, SB-201 Linear, HP-23 Power Supply, MM-35 Tristao Mini-Mast, TR-44 Rotor, TA-33JR Antenna $400. WB2AYF, 238 Sheraden Ave., Staten Island, NY 10314.

NEWSOME RTTY-CW Interface and ROM cartridge for C-64, cables, manual $90. Hardly used. See November CQ. W8SQS.

COLLINS 30L-1 RF-AMP (Round) with 16 new/extra 811A tubes. $600. Pickup N.Y.C. area. Dengel, 212-884-7064.

MOVING SALE: Kenwood TS-520S, SP520, MC-50, CW Filter, Dentron GLT-1000, 35' tower, Ham IV, TH3-MK3 Tribander, other accessories. 516-541-8172, Jerry, KW2Y.

AEA MICROPATCH MAP-64/2 Amtor, RTTY, ASCII, Morse. Complete with MBA-TOR program. $95. Norman Smith, 5455 E. McMullen Rd., Floral City, FL 32636, 904-344-3423.

WANTED: PLATE meter for Model SBE-34 SSB Transceiver or broken/working rig of same model. Richard McMahon, NSGA Box 316, FPO NY 09518.

WANTED: TEN-TEC Delta 580, PS, Filters. State condition and price. W8JKB, 2359 Woodford, Toledo, OH 43606.

2 KLM 16-LB Antennas good condition with Baluns $45 each. Micro Wave Module 432-100 100 watts amp mint $200. Bird 43 thruline wattmeter mint $100, T2-X Tailtwister extra heavy rotor $200 mint. Lunar PAG 432 GaAs. FET Preamp 0.4 dB noise fig. $50. Two Mtr. 8877 amplifier 2 kW plus, plus! with brand new spare 8877. No power supply $1000. Yaesu FT-101E needs work $175. Yaesu Landliner Phone Patch $50. N2MB 347 Beach 43rd. Street, Far Rockaway, NY 11691, 1-718-327-4952.

4X4 CHAVERIM October 1986 tour. W3OXT, 215-676-6769.

SLEP SPECIALS: Marconi TF-1066B/6 signal generator 10 MHz thru 470 MHz, both AM/FM, plus deviation, 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, Lampkin 107C communication service monitor $850, HP803A VHF Impedance Bridge, 50 MHz thru 500 MHz, measures directly 2 to 2000 ohms plus phase angle $125. Collins 180S-1 antenna tuner for S-line/KWM-2 $275, HP608F signal generator, 10 MHz thru 455 MHz, 19" panel with blue/brey cabinet $375. Lab-Tested, satisfaction guaranteed, add shipping. VISA, M/C, or check. Phone 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

ADVERTISING DEPARTMENT STAFF

Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Deputy Adv. Mgr.
Lindy Messmer, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel

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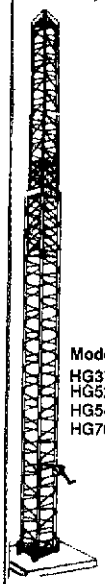
ANTENNA/TOWER SALE!



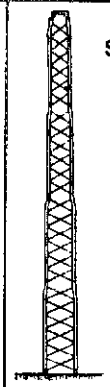
hy-gain
CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



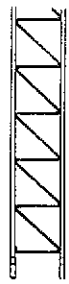
ROHN
Self Supporting Towers On SALE!
FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	164	$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	353	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.

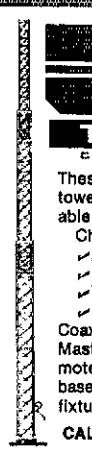
ROHN
Guyed Tower Packages



- 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
TX436	22'	38'	18 sq ft	829
TX456	22'	55'	18 sq ft	1249
TX472	23'	72'	18 sq ft	2069
HDX556	22'	55'	30 sq ft	1879
HDX572	23'	72'	30 sq ft	3229

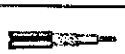
*Note—towers rated at 50 mph to EIA specifications

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

Coaxial Cable Loss Characteristics (DB/100 ft)

Cable Type	Imped.	10 MHz	30 MHz	150 MHz	450 MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	5.8
RG-58/U	52	1.4	1.9	6.0	12.5
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™

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.

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

AMPHENOL CONNECTORS

Silver PL259 .. $1.25
UG21B N Male .. $2.95 UG23D N Female .. $2.95

Antenna Wire & Accessories

Solid Copperweld	12 ga. $.12/ft	14 ga. $.10/ft
Stranded Copper	14 ga. $.10/ft	16 ga. $.09/ft

¼ mile 18 ga copper-clad steel wire $30
6 inch heavy-duty end insulator ..... $3.00/ea.
Dog-bone insulator $.79 Coax seal $2.50

Van Gorden

1:1 Balun .... $11 Center Insulator $6
Dipole Kits D80 $31/D40 $28
Short Dipole Kits SD80 $35/SD40 $33
All-band Dipole w/ladder line $29
G5RV all band antenna $49

ALPHA DELTA

DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander Beam $209
A743 30/40 mtr Kit for the A3 ..... $75
A4 4-el Tribander Beam $269
A744 30/40mtr Kit for the A4 ..... $75
R3 20, 15, 10mtr Vertical $259
AV5 80-10mtr Vertical $99
D40 40mtr Dipole $149
40-2CD 2-el 40 mtr Beam $279
A50-5 5-el 6 mtr Beam $79
215 WB NEW 15-el 2 mtr Beam $75
4218 XL 18-el 2 mtr Beam $95
3219 19-el 2mtr Beam $89
220B 17-el 220MHz Beam $89
424B 24-el 432MHz Beam $75
ARX2B 2mtr Vertical $39

hy-gain

- Discoverer 2-el 40-mtr Beam ..... $
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- EXPLORER-14 SUPER-SPECIAL ..... $
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- 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 ..... $

Limited Quantities purchased at old prices. Call for current prices.

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 $129 Delivered (Cont. USA)

- Full Legal Power 80/10 Meters
- Optional Stub Tuned Radial Kit Model STR II $29
- Optional Roof Mounting Kit Model RMK II $49 (Includes STR II)
- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF2V 80/40 Meter Vertical Antenna $129 Delivered (Continental USA)

- Optional 160 Meter Resonator Kit Model TBR 160 $49

HF4B "Butterfly" $189. (del. cont. USA)

- Covers 10, 12, 15, 20M
- Compact Beam Design
- Max. Element Length of 12.5'
- Light Weight. Only 17 lbs.
- Use with TV Rotor

Free Shipping On Butternut Accessories Also When Purchased With Antenna

KLM

KT34A 4-el Broad Band Triband Beam $339
KT34XA 6-el Broad Band Triband Beam $489
2m-14C 14-el 2-mtr Satellite Antenna $89
2m-16LBX NEW-16-el 2-mtr Beam $99
2m-22C NEW-22-el 2-mtr Satellite Antenna $119
432-30LBX NEW-30-el-432 MHz Antenna $99
435-18C 435 MHz Satellite Antenna W/CS-2 $119
435-40CX 435 MHz Satellite Antenna W/CS-2 $159

ROTORS

Alliance HD73 (10.7 sq ft rating) $119
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 HDR3000 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 TOWERS

10 ft Stack Sections
20G $39.50 45G $112.50
25G $49.50 55G $149.50

All 20G, 25G, 45G and 55G Accessories In Stock at Discount Prices - CALL!

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 Foldover Double Guy Kit $249
45G Foldover Double Guy Kit $269
*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex
All Foldover Towers Shipped Freight Prepaid Continental USA! Foldover Prices 10% Higher West of Rockies

TOWER/GUY HARDWARE

3/16 EHS Guywire (3990 lb rating)	$ 15/ft
1/4 EHS Guywire (6650 lb rating)	$ 18/ft
5/16 EHS Guywire (11,200 lb rating)	$.29/ft
5/32 7 x 7 Aircraft Cable (2700 lb rating)	$ 15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$ 45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$ 45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 x 9EE (1/2" x 9" Eye to Eye Turnbuckle)	$9.95
1/2 x 9EJ (1/2 x 9" Eye & Jaw Turnbuckle)	$10.95
1/2 x 12EE (1/2" 12" Eye & Jaw Turnbuckle)	$12.95
1/2 x 12EJ (1/2" x 12" Eye & Jaw Turnbuckle)	$13.95
5/8 x 12EJ (5/8" x 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
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

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for Information 1 (214) 422-7306

VISA MasterCard

TEXAS TOWERS

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice)

(Antenna/tower product prices do not include shipping unless noted otherwise)


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KENWOOD
TS940S "DX-cellence"
• Programmable Scanning
• High Stability, Dual Digital VFO's
• 40 Channel Memory
• General Coverage Receiver
KENWOOD
TS430S "Digital DX-terity"
• Tuneable Notch Filter
• 250 Watts PEP on SSB
• General Coverage
• Mobile or Base
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
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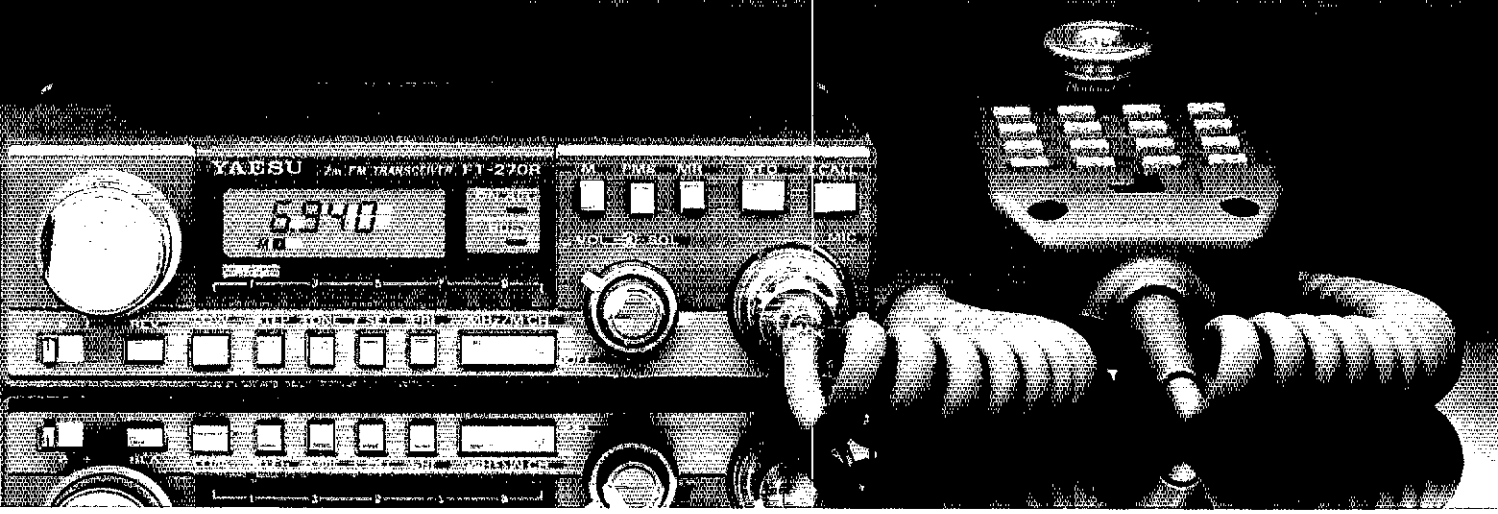
FT-757GX "CAT SYSTEM"
• All Mode Transceiver
• Dual VFO's
• Full Break-in CW
• 100% Duty Cycle
YAESU
FT-2700R "Yaesu gets you there"
• Duo-Band Full Duplex
• 25 Watt
• 144/430 MHz
YAESU
FRG-9600
• 60 MHz-905 MHz Continuous
• 100 Memories
• Clock
YAESU
FT209RH "Powerful HT"
• 5 Watts
• 10 Memories
• LCD Readout
• Battery Saver
ICOM
IC-735 "NEW"
• HF Transceiver
• Ultra Compact Mobile
• Simplified Front Panel
• Continuously Adjustable output Power up to 100 Watts
ICOM
IC-751 "One Year Warranty"
• 100 KHz - 30 MHz
• FM Standard
• 32 Memories
• QSK (Nominal Speed 20 WPM)
ICOM
IC-27A "Call for Price"
• 25 Watts
• 32 PL Frequencies
• 9 Memories
• Scanning
ICOM
IC-2AT
• DTMF Pad
• 1.5 Watts
• Thumbwheel freq. selector
IC-02AT
• DTMF Direct Keyboard Entry
• 3 Watts Standard
• 5 Watts Optional
Kantronics
PACKET COMMUNICATOR
• Fully Assembled
• One Year Warranty
• RS-232 Compatible Port
AEA
PK - 64
• MBA - TOR™
• AMTOR • Baudot
• ASCII • Morse
• 300 and 1200 Baud
ALINCO
ALR-206T "More For Your Money"
• Completely Programmable From Microphone
• 25 Watt
ALM-203
• 5 Watt
• Subaudible Tone
• 10 Memories
• Built-in "S" meter
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
"OUR ASSOCIATE STORE IN THE ST. LOUIS AREA"
Floyd Electronics
2213 VanDalia
Collinsville, IL 62234
618-345-6448
QUATRON
AM-6000G - $109.00
• 4 Band Graphic Equalizer
• Power Output Adjust
• VU Meter
• Compressor Amplifier
• Condensor Microphone
"Adaptable to Any Radio"
AEA
ALINCO
AMERITRON
ASTRON
AVANTI
B&W
BENCHER
BUTTERNUT
COMM SPEC
CUSHCRAFT
DAIWA
HUSTLER
HYGAIN
ICOM
• MOST ORDERS SHIPPED SAME DAY •
KANTRONICS
KDK



Presenting two small cases for a lot of mobile power.

You won't find a 45-watt, 2-meter FM mobile rig that's built smaller than the Yaesu FT-270RH.

Nor will you find a dual-band FM mobile that offers the crossband full-duplex capability found in the 25-watt Yaesu FT-2700RH.

It shouldn't be surprising. We've been coming up with a lot of innovative concepts lately.

The FT-270RH measures just 2 x 6 x 7 inches. Conveniently fitting its high-power punch into many small spaces of your car. Places where other 45-watt mobiles just won't fit.

The FT-2700RH is small too. Smaller than other dual-banders. But with one big difference: a "DUP" button. Push it, and you're operating full duplex, 2 meters on one VFO, 440 MHz on the other. Each at 25 watts. So you can simultaneously transmit and receive in true telephone style.

Once installed, you'll find the FT-270RH and the FT-2700RH equally simple to operate. Just turn the rig on, dial up a frequency, select offset or duplex split, and you're on the air.

Each rig gives you 10 memories for storing your favorite frequencies. Dual VFO capability. A clean, uncluttered LCD display for easy readout. Push-button jumps through the band in 1 MHz steps. Band scanning with programmable upper and lower limits. And priority channel operation.

You don't even have to take your eyes off the road to determine your operating frequency and memory channel. An optional voice synthesizer announces them both at the push of a button on the microphone. The FT-2700RH announces both your 2-meter and 440 MHz operating frequencies.

Also, tone encode and encode/decode capability is programmable from the front panel, using an optional plug-in board.

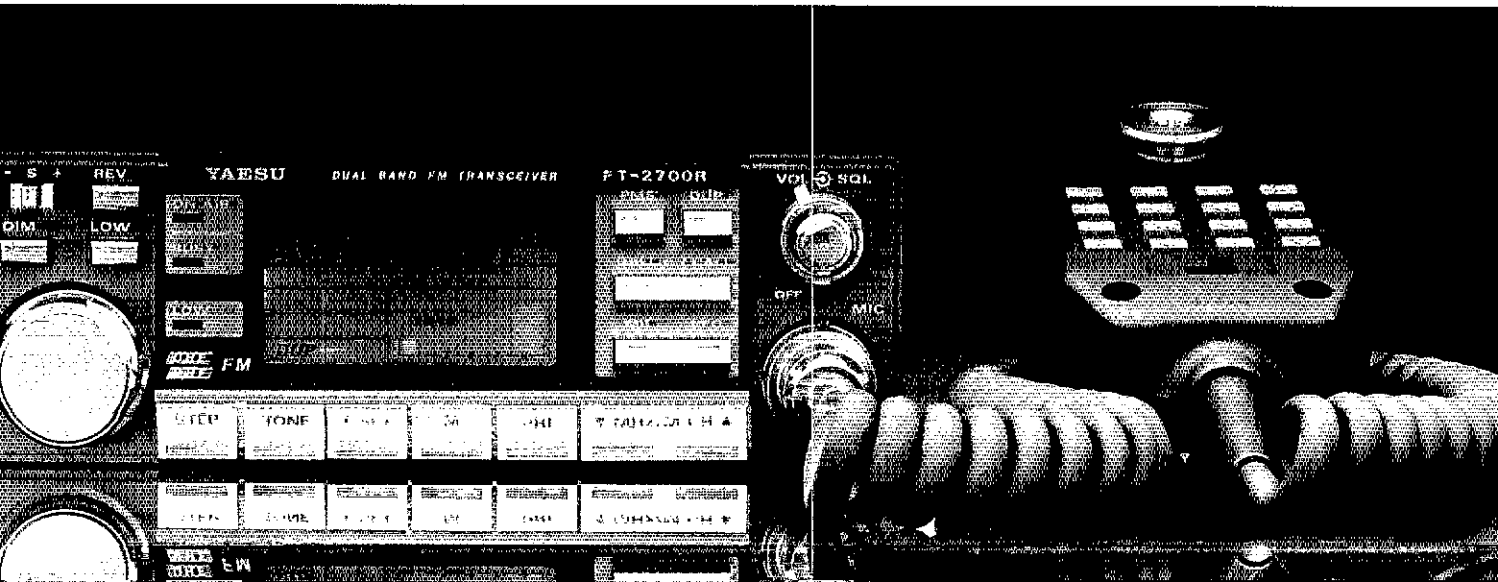
So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

YAESU

Yaesu USA
17210 Edwards Road, Cerritos, CA 90701
(213) 404-2700

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.



KENWOOD

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NEW Computer Interface

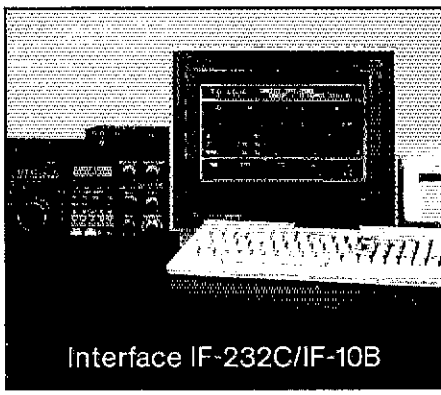
"DX-cellence!"

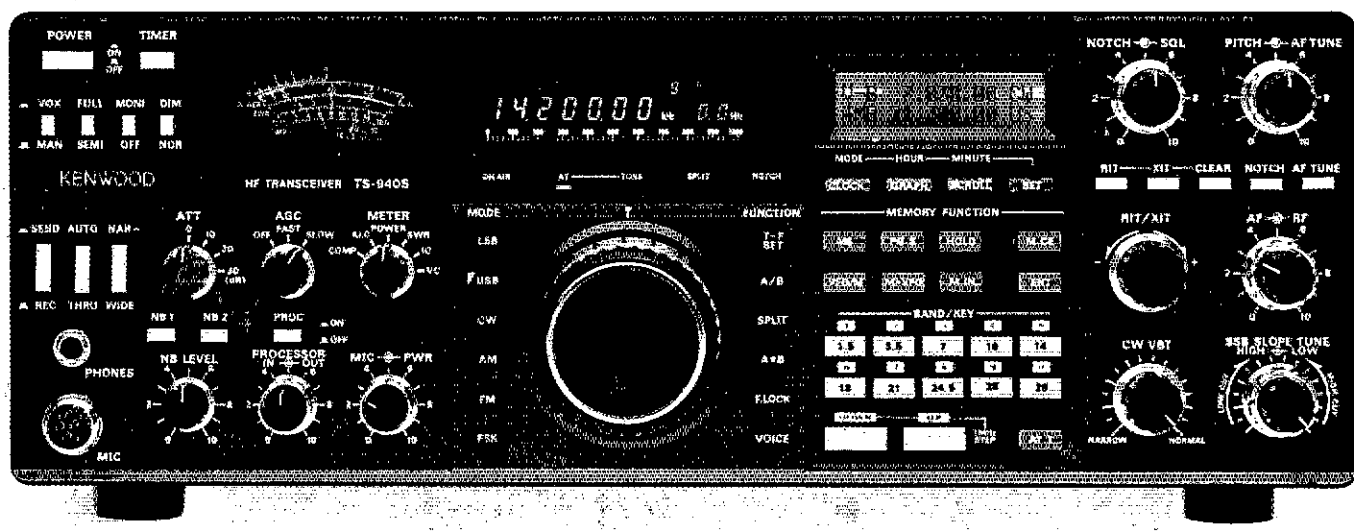
TS-940S

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-42S 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.

KENWOOD

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