QST

January 1986 $2.75

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Amateur Radio shines at Jambo '85

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...after 58 years, still a leader in the world of amateur radio

THERE ARE A LOT OF GOOD REASONS. WE KNOW THAT WE HAVE PROVIDED THE KIND OF EQUIPMENT AND SERVICE THAT THOUSANDS OF AMATEURS HAVE COME TO EXPECT. THEY KEEP COMING BACK, AND WE'LL DO OUR BEST TO SEE TO IT THAT THEY, AND YOU, WILL HAVE EVERY REASON FOR COMING BACK.

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58 YEARS OF SERVICE

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ALL NEW!

Power-Full...70 Watts!

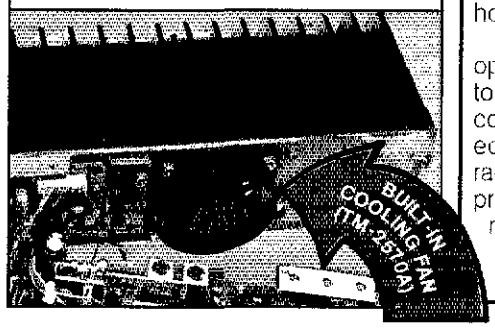
TM-2570A/2550A/2530A

Sophisticated FM transceivers

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

- **First** 70-watt FM mobile (TM-2570A)
- **First** mobile transceiver with telephone number memory and auto-dialer (up to 15 telephone numbers)
- Direct keyboard entry of frequency
- Automatic repeater offset selection according to the ARRL 2-meter band plan —**a Kenwood exclusive!**
- Extended frequency coverage for MARS and CAP (142-149 MHz; 141-151 MHz modifiable)
- 23 channel memory for offset, frequency and sub-tone
- Big multi-color LCD and back-lit controls for excellent visibility
- Front panel programmable 38-tone CTCSS encoder **includes 97.4 Hz** (optional)
- 16-key DTMF pad, with audible monitor
- Center-stop tuning—**another Kenwood exclusive!**
- Frequency lock switch
- **New** 5-way adjustable mounting system
- **Unique** offset microphone connector —relieves stress on microphone cord
- HI/LOW Power switch (adjustable LOW power)
- Compact DIN size

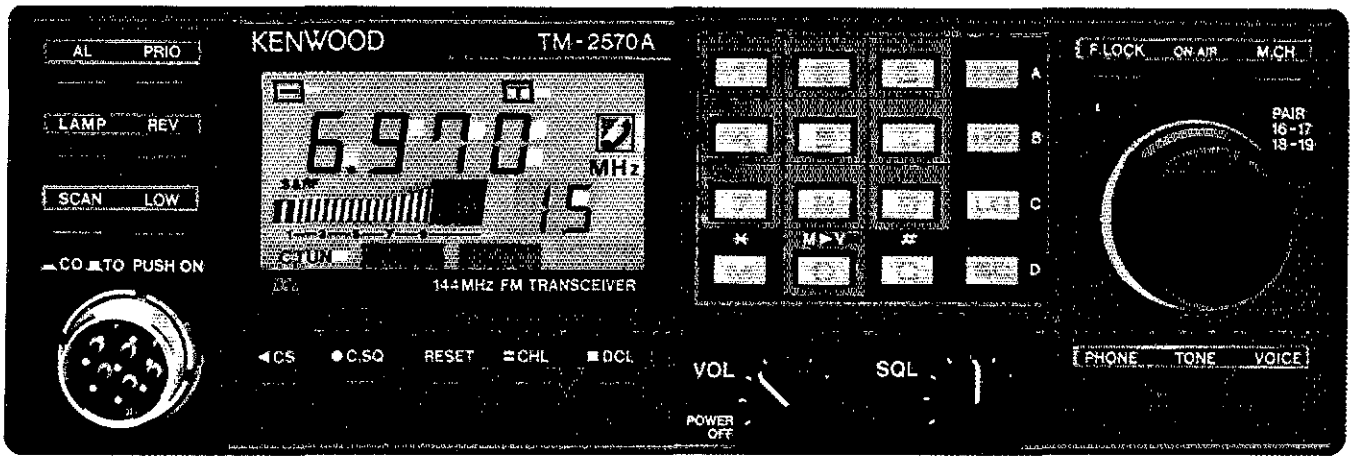
Large heatsink with built-in cooling fan (TM-2570A)



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
- **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 tuner

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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
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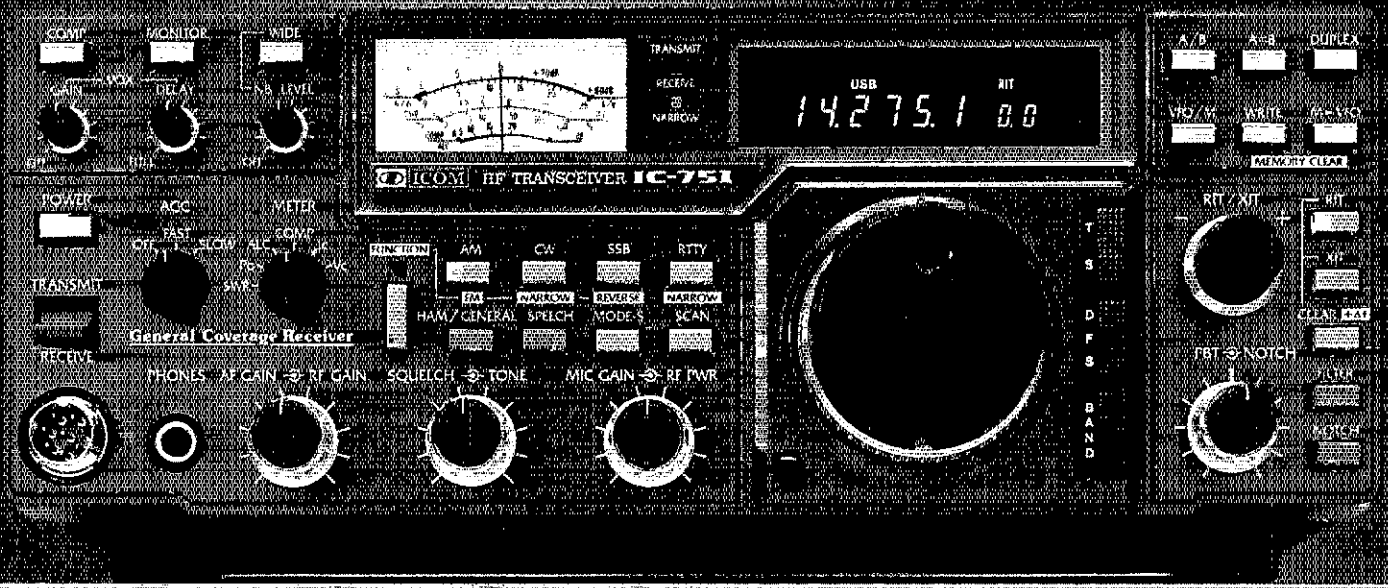
ICOM HF Transceiver IC-751



The Standard of Excellence in HF Base Stations

The IC-751 is the most advanced transceiver available today. It's a competition grade ham receiver, a 100KHz to 30MHz continuous tuning general coverage receiver AND a full-featured all mode solid-state ham band transmitter. The IC-751 also covers the new WARC bands, MARS frequencies, and is AMTOR compatible.

Important Standard Features. Compare these important standard features in this "top of the line" base station:

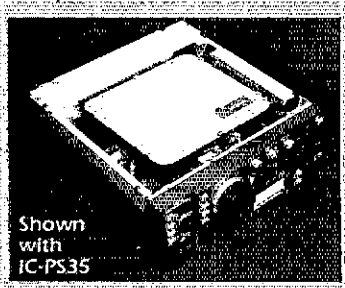
- 100KHz – 30MHz Receive*
- 105dB dynamic range
- QSK — full break-in CW (nominal speed 20WPM)
- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise Blanker
- RIT/XIT with separate readout
- IC-HM12 Microphone with Up/Down Scan
- Continuously adjustable transmit power.

Options: IC-EX310 speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, IC-SM6 desk mic, RC-10 external controller, and a variety of filters.

FILTER SPECIFICATIONS*

Filter	Model	Center Freq. (KHz)	-6dB (KHz) Width
STANDARD FILTERS			
AM Ceramic	CFW 455 F	455	6.0
SSB (PBT) XTAL	FL-30	9011.5	2.3
FM Filter	XM15A	9011.5	15 (-30dB)
SSB Narrow (Hygrade Crystal)	FL-44A	455	2.4
OPTIONAL FILTERS			
CW Narrow	FL-52A	455	0.500
CW Narrow	FL-53A	455	0.250
SSB Wide	FL-70	9011.5	2.8
CW Narrow	FL-32	9010.6	0.500
CW Narrow	FL-63	9010.6	0.250
AM	FL-33	9010.0	6.0

Operating From 12V. The IC-751 is also available with an optional internal AC power supply, the IC-PS35, for the winning edge in field day competition.



The IC-751 provides superior performance for all amateur radio operators...from novice to extra class. See the IC-751 at your local ICOM dealer.

Now with a ONE YEAR Warranty!

ICOM

First in Communications

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

January 1986 *Volume LXX Number 1*

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OUR COVER

What do you get when you bring 30,000 Scouts and leaders together to celebrate 75 years of Scouting? A wonderful opportunity for learning about an activity whose benefits last a lifetime! That's Bill, W3FTG, showing a couple of Scouts how it's done. *(photo by Mike Brown, WB2JWD)*

CONTENTS

TECHNICAL

NEWS AND FEATURES

OPERATING

DEPARTMENTS

PACKET EVOLUTION

From $219.95 Suggested amateur net price.

ANOTHER BREAKTHROUGH FROM AEA

Packet + RTTY= Pakratt™ PK-64.

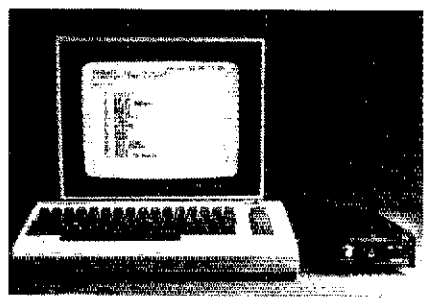
If you've read about packet, or are already into it, you know how exciting it is. With the hot new Pakratt PK-64 we've just brought a new dimension to packet. The Pakratt PK-64 is a complete, fully assembled and tested packet radio controller which, together with a Commodore 64 or 128 computer, can convert your shack into a packet operations center.
And we've included a new version of our advanced MBA-TOR™ software to make it the first packet controller with AMTOR, Baudot, ASCII and Morse. But an even more exciting part of the Pakratt controller is its great price.

Incredibly Simple To Set Up

Just plug the Pakratt controller into the C-64's game cartridge slot, add a mic connector for connecting to your particular transceiver, and you're set.
If you're anxious to try it out, our new "quickstart" manual section can get you on the air in under ½ hour.

Simply Powerful

The versatile Pakratt controller shows messages and connect status simultaneously on your Commodore with a unique split-screen display. And it lets you



PK-64 shown with HF modem option. Computer not included.

send letter-perfect text from the text editor software while monitoring incoming messages. The 20K byte QSO buffer stores more than 20 video screens of text! Disk commands let you save specific operating parameters for quick set-up for emergency services, clubs, and multiple frequency use. And the Pakratt controller's standard, TAPR style modem gives you 300 and 1200 baud operation with great HF/VHF performance.

We can't possibly list all of the important features of Pakratt here. But the absolutely best part of the Pakratt PK-64 is that it's at your dealer now. So stop reading, run down to your local dealer, and check Pakratt out. Because the real challenge will be to find one after the other hams see it.

Pakratt PK-64. Packet Power from AEA. At amateur radio dealers everywhere.

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

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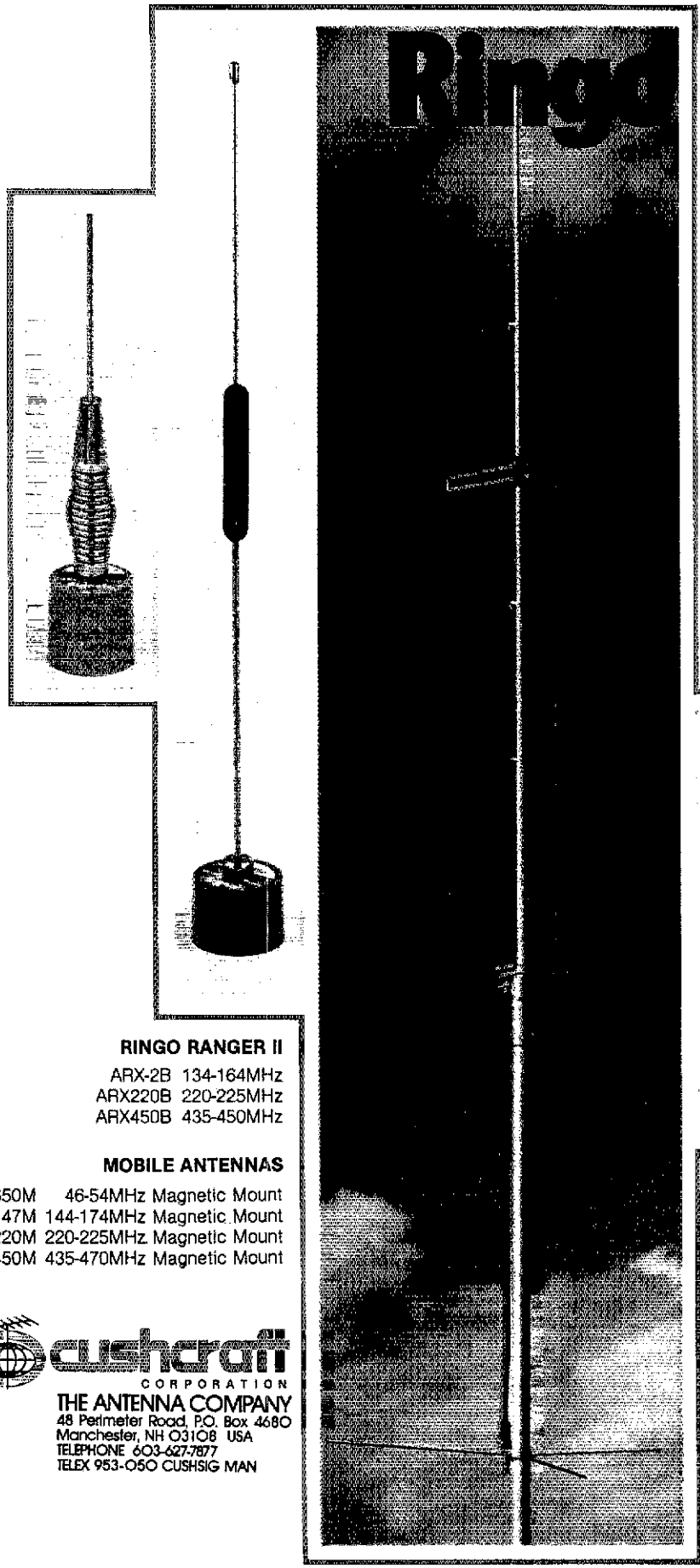

Ranger II

Simply the best

The best combination of gain, bandwidth and low angle radiation for simplex or repeater operation.

Quick easy assembly and installation

Mount anywhere with compact dimensions and neat appearance

Proven performance and durability in all environments

Complete FM band coverage

One year warranty

Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft antennas. The reason is very simply that they are the best. Now is the time for you to enjoy the value of a Cushcraft antenna. See your nearby dealer today.

RINGO RANGER II

ARX-2B 134-164MHz
ARX220B 220-225MHz
ARX450B 435-450MHz

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CS50M 46-54MHz Magnetic Mount
CS147M 144-174MHz Magnetic Mount
CS220M 220-225MHz Magnetic Mount
CS450M 435-470MHz Magnetic Mount

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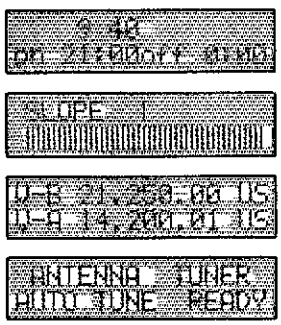
NEW!

"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.
- **Programmable scanning.**
- **Semi or full break-in (QSK) CW.**
- **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.
- **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.
- **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.**



Optional accessories:

• AT-940 full range (160-10 m) 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.

- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First.

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

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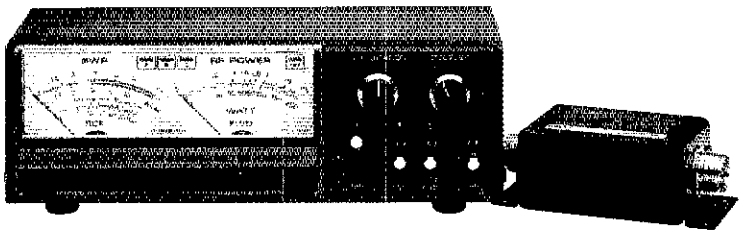
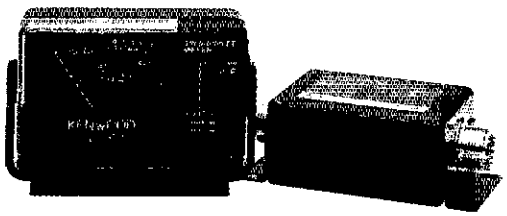
SWR/Power Meters





SW-200A/SW-200B/SW-2000

Base station SWR/power meters

SW-200A supplied with SWC-1, SW-200B supplied with SWC-2, SW-2000 supplied with SWC-3

Selectable Peak-reading/RMS, SWR/POWER meters cover 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) in range of 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) full scale for base station use

SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-200A), 140–450 MHz (SW-200B), 1.8–54 MHz (SW-2000) • Power measuring range: 0–20/200 W (SW-200A/B), 0–200/2000 W (SW-2000) • Accuracy: Less than ± 10% of full scale • Sensitivity: Less than 2 W (SW-200A/B), 20 W (SW-2000) • Power supply: 12 VDC 100 mA • Dimensions: 193 (7.6) W x 62 (2.4) H x 79 (3.1) D mm (inch).

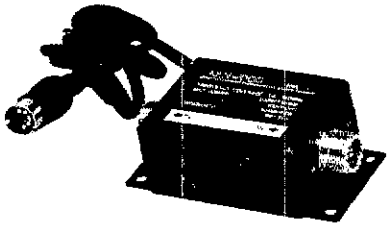
SW-100A/SW-100B

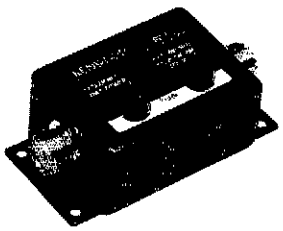
Compact SWR/power/volt meters

1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) in range of 150 W full scale for mobile use.

SPECIFICATIONS

• Impedance: 50–52 Ω • Frequency range: 1.8–150 MHz (SW-100A), 140–450 MHz (SW-100B) • Power measuring range: 0–150 W • DC VOLT meter: 0–20 V • Accuracy: Less than ± 10% of full scale • Meter illumination: 12 V 50 mA • Dimensions: display 92 (3.6) W x 64 (2.5) H x 36 (1.4) D mm (inch), coupler 62 (2.4) W x 50 (2.0) H x 30 (1.2) D mm (inch).





SWC-1/SWC-2/SWC-3/SWC-4

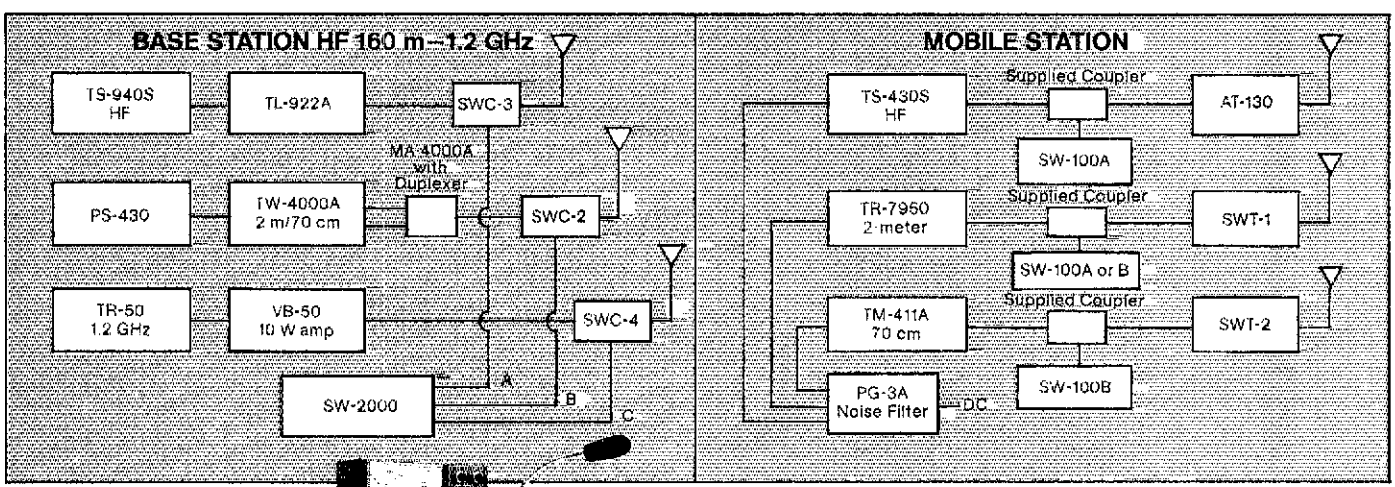
Optional couplers

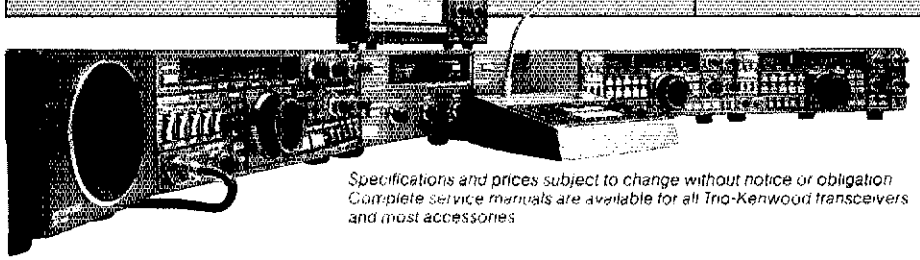
SWC-1 (1.8–150 MHz): Coupler for SW-200A/B, SW-2000
SWC-2 (140–450 MHz): Coupler for SW-200A/B, SW-2000
SWC-3 (1.8–54 MHz): Coupler for SW-2000
} SO-239 connectors
SWC-4 (1200–1300 MHz): Coupler for SW-200A/B, SW-2000–Type N connectors

SWT-1/SWT-2

Compact antenna tuners

• Frequency Range: SWT-1 (144–148 MHz), SWT-2 (430–450 MHz) • Input Impedance: 50 Ω (unbalanced) • Output Impedance (Matching range): 25–100 Ω (unbalanced) • Insertion Loss: Less than 0.3 dB • Max. Input Power: FM/AM 100 W, SSB 200 W (PEP) • Connector: SO-239 • Dimensions: 68 (2.68) W x 32 (1.26) H x 50 (1.97) D mm (inch) (Projections not included)





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Vice Director: Mrs. Evelyn Gauzens, W4WYR, 2780 NW 3rd St, Miami, FL 33125 (305-642-4139)

Southwestern Division

FRIED HEYN, WA6WZO, 962 Cheyenne St, Costa Mesa, CA 92626 (714-549-8516)

Vice Director: Wayne Overbeck, N6NB, 900 Avenida Salvador, San Clemente, CA 92672 (714-492-8025)

West Gulf Division

RAYMOND B. WANGLER, W5EDZ, 642 Beryl Dr, San Antonio, TX 78213 (512-733-9632 home, 512-522-2221 business)

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

*Executive Committee Member

Section Managers of the ARRL

Reports Invited: The ARRL Board of Directors (see list at left) determines the policies of ARRL. The 16 divisions of the League are further arranged into 73 administrative "sections," each headed by an elected Section Manager. Your SM welcomes reports of club and individual activity. ARRL Field Organization appointments are available covering a wide range of Amateur Radio volunteer interests. Whatever your license class, your SM has an appointment available. Check with your SM (below) for further information.

Canada

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)

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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)

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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)

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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)

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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 (201-337-7858)

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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)

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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 (503-773-8824)
Washington — Gene E. Sprague, KD7G, 10716 23rd Dr SE, Everett, WA 98204 (206-337-3459)

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Nevada — Joseph D. Lambert, W8IXD, PO Box 1201, Boulder City 89005 (702-294-0505)
Pacific — James F. Wakefield, AH6CO, 647 Kunawai La, #201, Honolulu, HI 96817 (808-524-0050)
Sacramento Valley — Robert H. Watson, W6IEW, 10994 Clinton Bar Rd, Pine Grove, CA 95665 (209-223-0101)
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 (408-263-9450)

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New Mexico — Joe Knight, W5PDY, 10408 Snow Heights Blvd, NE, Albuquerque 87112 (505-299-4581)
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)

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West Indies — Carlos Flores, WP4J, 2 Monserrate Towers, Apt. 1804, Carolina, PR 00630 (809-757-1564)

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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)

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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 . . ."

New Year, New Opportunities

WHAT ARE THEY UP TO NOW IN NEWINGTON? This plaint is heard from time to time as I make the rounds of affiliated club meetings and ARRL conventions and hamfests, speaking, visiting and getting to know radio amateurs all across the countryside. A flip answer to the question posed would be easy; I could just say, "BEATS ME, I LIVE IN GEORGIA!" (This is often a surprise to the questioner. The ARRL Presidency is a volunteer position; professionally, I'm on the faculty of Georgia Southern College in Statesboro.) But that wouldn't be a satisfactory answer, because I know the feeling well. Statesboro is far enough from Newington for me to know that, too often, radio amateurs in the field—League members or not—are left with a sense of isolation from the national organization, and a feeling of frustration at what sometimes seems to be a slow pace of progress.

But make no mistake—your League IS making progress. In fact, 1985 was an exceptional year on a number of fronts. Here are some examples.

US amateurs gained access to new bands at 24 and 902 MHz, and for uplinking to amateur satellites at 1260 MHz.

Tony England, WØORE, made history with the first two-way video exchange between earth and the Space Shuttle, followed up by the first operation from space by European radio amateurs on a subsequent Shuttle mission—contacting the Shuttle by Amateur Radio is becoming almost routine!

A new videotape documenting Tony England's Shuttle Amateur Radio Experiment was produced by Roy Neal, K6DUE, and his team of volunteers, and is already in circulation to audiences of potential hams.

The International Amateur Radio Union celebrated the 50th anniversary of its founding, and began preparations for whatever may lie ahead in the way of ITU conferences affecting our service.

The FCC gave amateur antennas a boost by declaring limited preemption of state and local regulations, thus giving us an important new weapon in the battle for amateurs' rights to have effective antenna systems.

FCC also launched a major rulemaking on the subject of repeater coordination, stimulating considerable useful discussion of this important topic within the amateur ranks.

We started down the road toward enhanced Novice privileges, to make Amateur Radio more attractive to potential newcomers and to provide greater opportunity for acquiring the skills necessary for upgrading.

ARRL Headquarters was reorganized to serve you better, and especially to concentrate more of our resources on assisting the active field volunteers. This shift in emphasis is already beginning to pay dividends, as we see the number of effective ARRL section-level organizations increase dramatically.

The ARRL Foundation met and exceeded its goal of raising $50,000 for the Scholarship Endowment Fund Honoring Senator Barry M. Goldwater, K7UGA.

Amateur Radio was effective to an unprecedented degree in handling health and welfare inquiries in the aftermath of the Mexico City earthquake, and provided vital disaster relief communications in this and other global tragedies.

The Volunteer Examiner Program achieved stability and success far beyond what even the most optimistic observers had expected, thanks in large part to the League's cautious, "better safe than sorry" approach to implementing its program. The real heroes are the thousands of Volunteer Examiners who have shouldered the burden at the local level, bringing convenient and fair exam opportunities to their communities while maintaining the highest standards of integrity.

For yet another year, there was no dues increase for ARRL members! The last increase was in 1981; since then we've actually managed to reduce the rates for multiple-year memberships, and this year there was a dramatic reduction for young people.

Speaking of membership, while the final figures aren't yet in, it looks as if the League will show a gain in membership on the order of 15,000 for the year 1985. To these new members, welcome! You've made the League stronger, and better able to promote and defend Amateur Radio. Our growth in membership was less than the ambitious goal of 25,000 that we set at the beginning of the year, but still represents the largest increase since 1977 and probably represents the first time in the League's history that there has been such a large increase in membership without a similar increase in the number of licensed amateurs. (The licensing figures for the year trended upward, but at a much slower rate than League membership—the figures for upgrading were extremely gratifying, though.)

Are there other signs of progress by the League? You bet! Have you seen *The ARRL Handbook* for 1986? At $18 it has got to be (next to League membership!) one of the best bargains going. It's the fattest, most modern and most useful in a long series of excellent Handbooks brought to you by the League's technical staff. This one belongs on the shack bookshelf (and workbench) of every radio amateur.

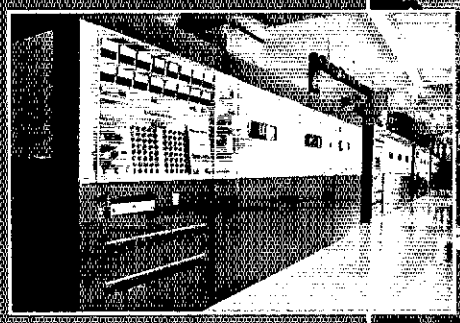
There's a new, upbeat look to *QST*, as well: new use of color editorially, new timeliness to news items, new emphasis on people and continued technical leadership. You'll see other innovations in keeping with this mood as the New Year progresses.

What else? Well, there's talk that maybe someday the ARRL will be giving FCC a hand with the call sign issuance process, so hams can obtain call signs more to their personal liking. At the moment there's just a continuing dialog at staff levels, but if you think about it this is just a logical extension of the things radio amateurs are already doing for themselves: administering exams through the Volunteer Examiner Program, and gathering information for enforcement actions through the Amateur Auxiliary. There are pros and cons to be considered, and your ARRL Board will be weighing them carefully before committing League resources to the call sign issuance process.

So, there's a lot of good work being done. How can you help? The first step is easy: BE POSITIVE. These days there is much that is RIGHT about Amateur Radio and the League. We have an excellent image internationally, with decision makers in Washington, and with opinion leaders among the general public in our own communities. We can and should work for continued improvement, but let's not be our own worst enemy by dwelling too much on the negative aspects that still need attention.

Entering 1985, we set a series of mileposts leading to five-year goals in membership and new licensees. We should continue to pursue those goals vigorously. Let's work together to bring the number of radio amateurs in the US to 600,000 by the end of the decade of the '80s, with at least half of them League members. If we can accomplish this, we'll be in a strong position to determine our own destiny. They're ambitious goals, but we're off and running. With your help, and the help of your local club, Amateur Radio will enter the decade of the '90s stronger than ever. —*Larry E. Price, W4RA, ARRL President*

Hugh Fallis, VP Engineering, Radio Free Europe, Munich, stands beside CE 100 kW HF transmitter using EIMAC 4CV100,000C tube.



EIMAC tubes provide long life for Radio Free Europe Service.

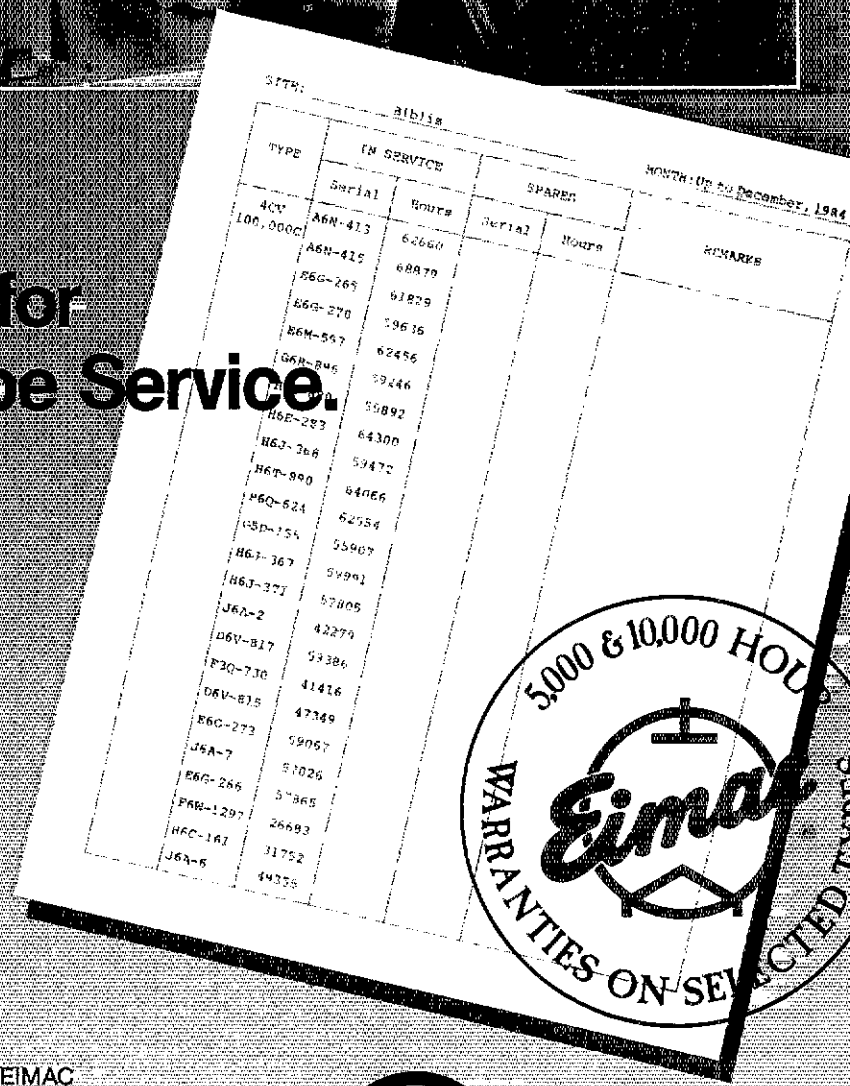
Radio Free Europe transmitters in Biblis and Lamperthelm, West Germany, use EIMAC 4CV100,000C power tubes in 12 Continental Electronics 100 kW HF transmitters.

The station logbook shows most tubes have over 50,000 hours of service, and many tubes logged over 60,000 hours! And EIMAC tubes are still running strong—that's long life!

These figures are representative of the long life EIMAC tubes log in a variety of high power broadcast applications.

Take advantage of proven reliability, longest warranty in the industry and 50-year expertise. Choose EIMAC, the world's foremost manufacturer of high power broadcast tubes.

Call Varian EIMAC or contact any Electron Device Group sales organization worldwide.



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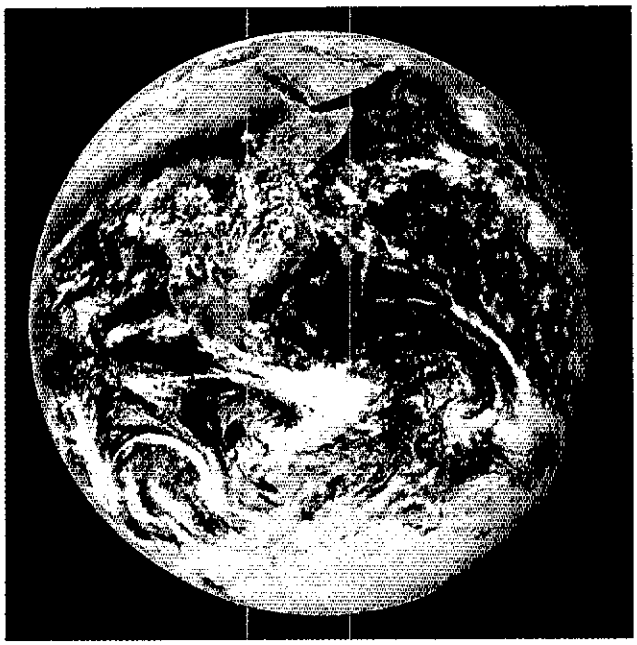
UP FRONT in QST



If you heard WØORE's signals transmitted from the Space Shuttle *Challenger* last August, you'll want to see the videotape on SAREX, the Shuttle Amateur Radio Experiment. The 18½-minute SAREX videotape documents all the excitement of this history-making Ham-in-Space mission, including the slow-scan pictures Tony England transmitted to earth. It's available from the ARRL Circulation Department—postpaid prices are $25 for VHS format and $35 for U-matic. Also, anyone who can have it shown to an audience of prospective hams can get it on loan from the ARRL Film Library; ask for VT-36. Among the many people involved with the SAREX videotape are Roy Neal, K6DUE, Executive Producer/Writer; Frosty Oden, N6ENV, Producer/Editor; Bill Pasternak, WA6ITF, Field Producer/Technical Supervisor; and Paul Courson, WA3VJB, Production Assistant.

Nicola Sanna, IØSNY, is at it again, having made another operating first—a 24-GHz Europe-to-Africa QSO. On July 8, IØSNY/ZB2 worked EA5RK/EA9 (Cetua) from high atop his perch on Gibraltar's famous rock. This was just one of the highlights of the VHF-and-above DXpedition to ZB2 (which included a 6000-QSO HF operation as well!). Other bands of operation included 144, 432, 1296 and 2320 MHz, and 10 GHz. Although propagation was not spectacular, 11 DXCC countries were worked on 144 MHz and above. Noteworthy are the relatively high number of QSOs made on the higher microwave bands: 14 on 10 GHz and 12 on 24 GHz. Nicola currently holds the world's distance records on 10 and 24 GHz—1663 and 331 km, respectively. The operators shown are (l-r) IKØFUX, I041PG (SWL), IØSNY, IK2DVG and EA5RK.

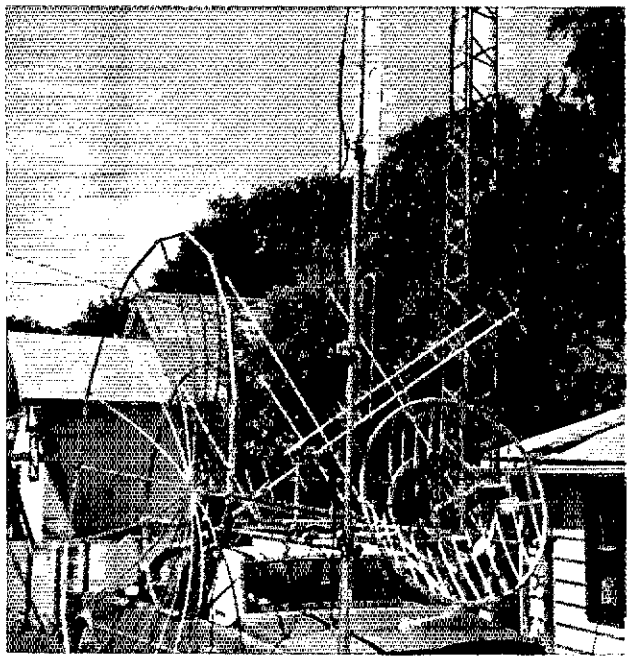
The Boy Scout Jamboree on the Air has special meaning for Ron St Laurent, ND5S, of Yukon, Oklahoma: "It's the one time of the year that I can combine two of my interests." A Scoutmaster of Troop 399 in Mustang, Ron likes to bring his Scouts into the ham shack for a first-hand look at Amateur Radio in action. Although propagation didn't favor overseas contacts during this past JOTA, August 19-20, the boys were able to share experiences with numerous other Scouts who were also guest operators at amateur stations across the country. Unfortunately, many Scouting groups don't get the opportunity to participate in JOTA because no local hams are associated with their troop. If you have room in your shack or can set up a Field Day operation, why not invite some Scouts into your shack the next time JOTA rolls around? Contact your local Scouting office for more information.

ARRL Board Election Results

League members in the Atlantic, Delta, Great Lakes, Midwest, Pacific and Southeastern Divisions have cast their votes for Director and Vice Director, and the ARRL Committee of Tellers has officially tallied the results. How did your favorite candidates fare? Check this month's Happenings for all the details.

Company on 160 Meters?

There's a good chance that radio amateurs will be sharing the 160-meter band earlier than the expected July 1, 1987 date. But will we know if another service is there? As a result of an FCC order (in PR Docket 84-874), wide-band radiolocation may already be operating at 1900-2000 kHz, but is inaudible to amateurs. See this month's Happenings for details.



When Bert Anderson, VE4AP, of Winnipeg, Manitoba, drives down the street, people take notice—particularly of his HF-VHF-UHF-microwave-satellite-EME mobile station! The equipment, most of which is homemade or cleverly configured from commmercial bits and pieces, allows Bert to operate from 3.5 to 1296 MHz from his car. In order for the car to be safe for the road, however, the 12-foot dish (for 1296 MHz) has to be turned around back to front and the 12-foot 2-meter unit on the rear left has to be laid on top of the car. He doesn't consider his base tower as part of the mobile unit, but all else is part of the unit, including the 4-foot dish at the rear.

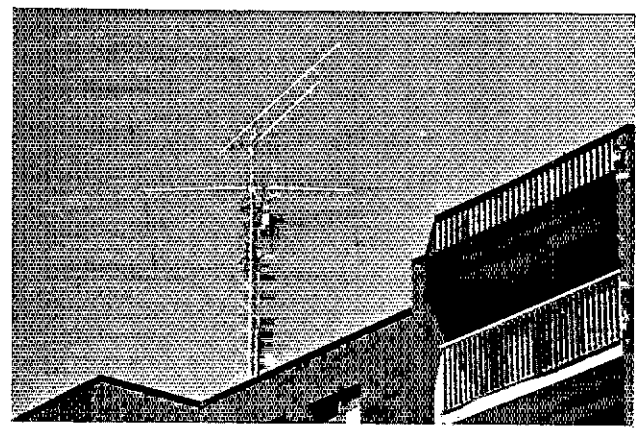
The holiday season is made a little brighter for youngsters in four Illinois hospitals, thanks to Operation Santa. For the past five years, in cooperation with the pediatrics staff at hospitals in Hazelcrest, Chicago Heights, Harvey and Olympia Fields, members of the Tri-Town Radio Amateur Club visit hospitalized youngsters and, through the magic of Amateur Radio, put them in touch with Santa Claus. The progran is well received by the kids and their parents as well, thanks in large part by the active participation of the staff at each hospital. Tri-Town members Mel Wahlert, W9NJC (left), and Marlon Wilcox, K9AOA (right), flank members of the Ingalls Hospital in Harvey. *(N9DKO photo)*

Satellite Users: Get the Latest Phase III Orbital Predictions and Operating Information

Project OSCAR has prepared a new set of orbital predictions for use in locating and working UoSAT-OSCARs 9 and 11, AMSAT-OSCAR 10 and the two active Soviet satellites (RS-5 and RS-7). When used with the appropriate plotter, this information allows the user to determine the access times to these Amateur Radio satellites. The predictions can be obtained for a minimum donation of $10 ($12 overseas). To obtain the orbital predictions, send a completed mailing label and a check or money order, payable to Project OSCAR, Inc, to POB 1136, Los Altos, CA 94023.

YAC Needs *YOU*

Are you involved in amateur space communication and willing to share information about it with young people? The Young Astronaut Council and ARRL are looking for radio amateur volunteers to provide space communications experiences to young people in YAC chapters across the country. Requirements are a willingness to devote a substantial amount of time to working with local chapters on a long-term basis and the ability to provide communications for OSCAR, EME and ham-in-space operations, including monitoring Shuttle audio transmissions. Volunteers will be listed in the Young Astronauts Program Chapter Leaders' handbook, and will be contacted directly by local chapter leaders seeking space communications activities. If you'd like to participate, leave your telephone number with the Development Office, ARRL HQ.



How did Claude Vallee, VE2ARU, of Quebec City, succeed in getting a 24-foot tower installed on the roof of his high-rise building? First, he chose a condominium unit on the top floor—for shorter connecting lines, less signal loss to the antenna and easier access to the tower. Second, before the building was even built, he submitted a request to build the tower to the building engineer and sought advice on making the tower structure as strong as possible—it includes three sections of heavy-duty self-supporting tower, several guy-wire supports and a cement base. With the help of VE2FVO, the tower was put in place and a beams for 10-15-20 meters and for 2 meters and 70 cm were installed. Of course, condo rules pertaining to private antennas had to be considered and a building permit had to be taken out before construction on the tower could begin. So far, Claude has logged QSOs with amateurs in Europe, South America, Australia and Japan—with only 60 W into the antenna. Amateurs interested in particulars on this tower installation can QSO Claude on 20-meter RTTY on Saturday and Sunday mornings and sometimes on phone and CW on the other bands.

League Lines

In communications to ARRL and to their representatives in Congress, amateurs are running up verbal "hurricane warning" flags regarding the ***Electronic Communications Privacy Act of 1985,*** S. 1667 and H.R. 3378. "Small craft warnings" would be far more appropriate: The bill indeed requires some attention from the amateur community, but it poses far less threat to amateurs than some people think. More next month, but for now be assured that: (1) the bill ***does not*** propose to outlaw phone patches; (2) it ***would not*** make possession (by anyone) of any kind of equipment illegal; (3) the bill can't possibly reach the House (or the Senate) for a vote before February or later; and (4) ARRL is working closely and personally with Committee staff to smooth out rough spots.

"The Skywarn program may continue to function as it has in the past pending the Commission's action on reconsideration of the Report and Order"—that's the message in a November 8 letter to Joseph J. Conte II of the National Weather Service by FCC Private Radio Branch Chief Robert S. Foosaner. Radio amateurs had worried that recent Commission action in BC Docket 79-47 (see last month's Happenings) had nixed Skywarn. No; wrote Foosaner: " ... there was no intent to disturb the Skywarn program of the National Weather Service, which has a long tradition of minimizing loss of life and property when severe weather threatens." Yet Amateur Radio/NWS cooperation may be heading for MARS—or close to it. "We feel that at some point ... it will be necessary to know whether the Weather Service can make use of government frequencies for its Skywarn program, in much the same way as the Military Affiliate Radio Service makes use of Amateur Radio operators and government frequencies ... we suggest that you explore this possibility with the Interdepartment Radio Advisory Committee."

We have a reciprocal operating agreement with the Republic of South Africa—in fact, it's been on the books since May 1 of last year. FCC didn't receive official word of the agreement until November 19, despite having sought information on several occasions. Only after the League provided our Department of State with an official announcement in ***Radio ZS*** was the agreement made public.

FCC has amended the amateur rules to prohibit amateurs who have had their operator licenses ***suspended*** and station licenses ***revoked*** from participating in Amateur Radio communications ***as third parties.*** The Commission wrote that without such an amendment, a former licensee could continue to engage in the types of communications that had necessitated enforcement in the first place if the former licensee were permitted to operate as a third party by a current licensee. FCC points out that the amendment does not change present rules provisions pertaining to third-party participation; it simply precludes disqualified persons from attempting to circumvent enforcement sanctions by participating in third-party communications. (This action, in PR Docket 85-51, is effective January 24, 1986; details in February Happenings.)

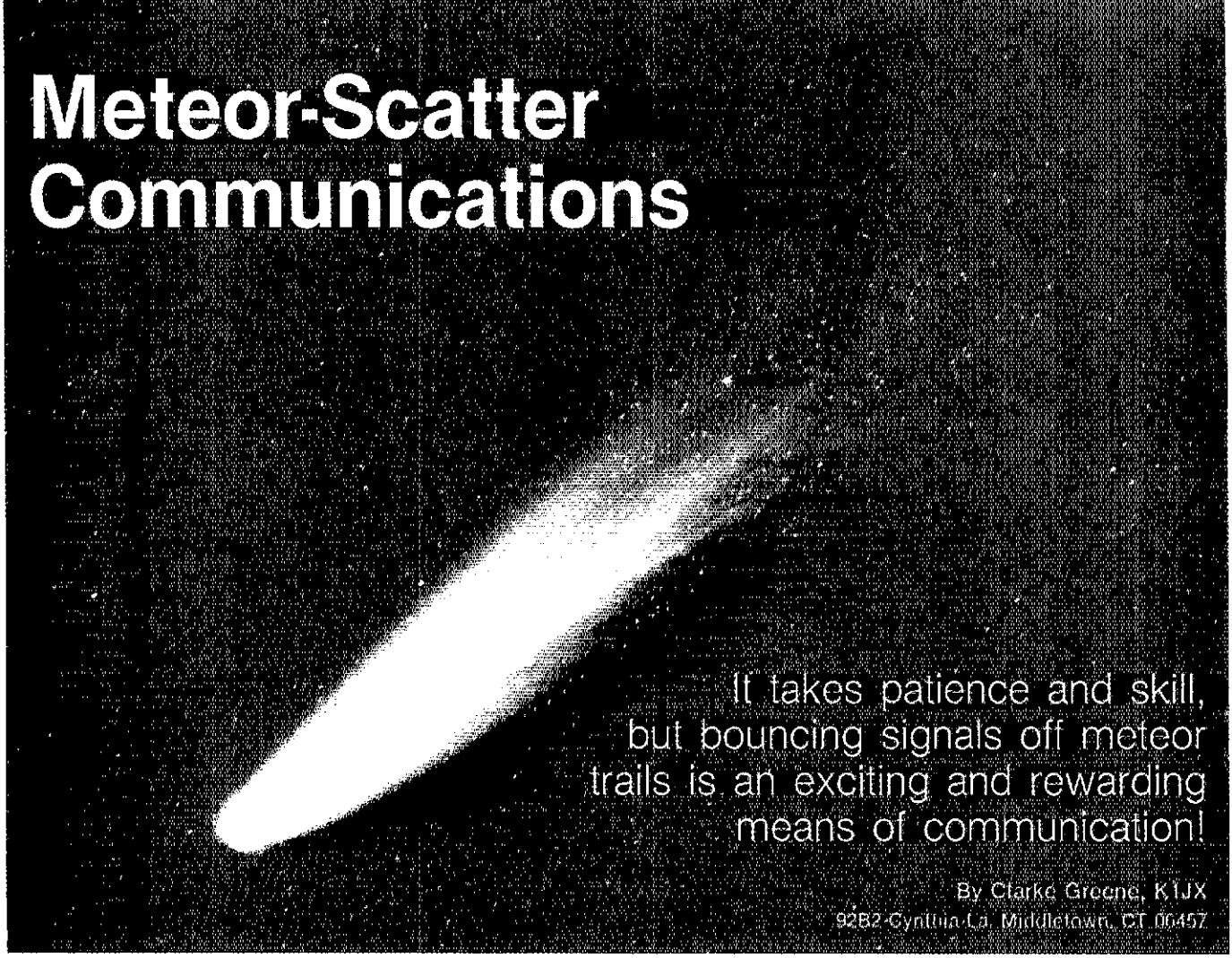
FCC has given the go-ahead for spread-spectrum Amateur Radio. Our new privileges, as set forth in FCC's ***Report and Order*** in GEN Docket 81-414, go into effect June 1. (Happenings will carry details.) But there's work to be done in deciding upon exactly what standards should be set to assure station-to-station compatibility as amateur spread-spectrum techniques blossom. At Minute 50 of its July 1985 meeting in Hartford, the ARRL Board of Directors authorized an Ad Hoc committee to write the necessary interoperability standards for spread-spectrum operation in the Amateur Radio Service. In granting amateurs spread-spectrum privileges, FCC specified only what it thought necessary to guarantee its ability to monitor such transmissions, and to avoid encryption. Standards to be considered by the committee include: frequencies of operation, chip rate, code, code rate, spreading function, transmission protocol(s) including the method of achieving synchronization, modulation type, type of information transmitted, and method/frequency(ies) for identification.

The seven members of the committee, chosen by ARRL President Larry Price, W4RA, are: David W. Borden, K8MMO, Chairman; Hal Feinstein, WB3KDU; William J. Howard, K1LNJ; John R. (Dick) Bingham, W7WKR; William E. Sabin, WØIYH; Frank Butler, W4RH, Board Liaison Member; and Charles Hutchinson, K8CH, Staff Liaison Member. The committee has a two-year life span. Its work is divided into two phases: phase one comprises the writing of interim standards by the June 1 deadline, and phase two, to be completed two years from now, will result in the writing of final standards. Both interim and final standards will be published in *QST*.

The Field Services Department is looking for a Convention Program Manager; starting salary $15,496. This full-time staff position handles ARRL sanction applications, consignment/prize shipments and a host of other ARRL-Convention-related duties. If interested, contact Richard Palm, K1CE, Field Services Manager, ARRL HQ.

Your club should consider sponsoring a plaque for the 1986 ARRL International DX Contest—sponsorships in several categories are available. Here's an excellent chance to publicize your club's commitment to DX and contesting in the pages of *QST*. Contact the ARRL HQ Contest Branch for details.

Meteor-Scatter Communications



It takes patience and skill, but bouncing signals off meteor trails is an exciting and rewarding means of communication!

By Clarke Greene, K1JX
92B2 Cynthia Ln, Middletown, CT 06457

Amateurs who inhabit the VHF bands operate in a different world, propagationwise, from those on HF. The F-layer propagation that makes the HF bands so exciting for long-haul communications visits 6 meters only briefly during peak sunspot years. Above 6 meters, it is nonexistent. For contacts outside the local area—200 to 500 miles, depending on station capabilities—VHFers turn to some pretty exotic propagation modes. One of the more reliable ways to work VHF DX is to reflect signals from meteor trails. To the uninitiated, meteor-scatter communications may seem impossible! This article will take some of the mystery out of this exciting facet of Amateur Radio.

How Do Meteors Make Propagation Possible?

The ionized trail of a meteor (see sidebar) can refract a radio signal. The ability of an ionized area to refract a radio wave is dependent on the electron density. A low electron density will have only a moderate index of refraction, while a high electron density will have a large index of refraction.

The effect is also dependent on the frequency of the radio wave. The electron density in a meteor trail is such that radio waves between 25 and 60 MHz are significantly affected. Since the meteor's size and velocity determine the trail size and hence the ion density, it stands to reason that some meteors have more effect than others. A small percentage of meteors create enough ionization to refract 144-MHz signals, an even smaller percentage can refract 220-MHz signals, while a very few can propagate 432-MHz signals.

The signals refracted by a meteor trail propagate just as they would for any other form of ionospheric propagation. The ionization takes place in the E-layer, so the distance covered by meteor-propagated radio waves is similar to that found in E-layer propagation—normally 1400 miles (or less).

The duration of the meteor-produced ionization is also a function of the electron density. Large, fast meteors ionize a lot of air molecules and create relatively dense ionization. The time required for all the ionized air molecules to contact electrons and recombine is much longer than it would be if only a few ions had to combine with electrons. When the meteor first burns up, the ionization is at its greatest. As time passes, more and more free electrons and ions combine, reducing the ion density, until the density finally becomes virtually zero. At that point, no propagation is possible.

How Does Meteor-Trail Propagation Work?

Enough of that technical stuff! What's it all mean? As illustrations, let's examine two different meteors.

A relatively large meteor, perhaps the size of a peanut, has a chance to encounter Earth in its respective trips around the sun. While passing close to Earth, the meteor finds itself attracted by Earth's gravity, a force stronger than the sun's gravitational pull (since the meteor is much closer to Earth than to the sun). Upon being drawn in at a high rate, perhaps 40 miles per second, the meteor begins to vaporize (burn), stripping electrons from the vaporized gas.

As meteor ionization goes, the ionized trail is very dense. So dense in fact, that a 220-MHz signal from K1WHS in Maine is reflected and received by W5RCI in Mississippi (they just happen to be listening and transmitting on the same frequency; more on that later). The ion density is so great that the index of refraction is high enough for total reflection of K1WHS's signal. A meteor trail capable of total reflection of a signal at a given frequency is

known as an "over dense" trail. The ion density is great enough that signals can't penetrate and be refracted; they're reflected. Of course, frequencies below 220 MHz are similarly affected by this meteor; the index of refraction improves for a given ion density as the signal wavelength gets longer.

W5RCI hears K1WHS for maybe 12 seconds at S8 on his receiver. The signal then starts to fade gradually over the next four or five seconds, until it disappears. No more 220-MHz propagation between Maine and Mississippi until the next meteor.

At the same time all this happened, W1YTW in Maine just happened to be scheduling K5BMG in Louisiana on 144 MHz. The signal from Louisiana rose from nothing to S9 for 20 seconds before fading down over the next 20 seconds into noise. Lower ion density is required on 144 MHz than on 220 MHz for propagation, and the ion density from this particular meteor stayed above the threshold on 220 for only a few seconds. The minimum ion density required for 2-meter propagation could be maintained for a much longer period of time than the higher 220-MHz minimum density level.

A lot happens in Maine. While these two Maine VHFers are working unusual meteor-scatter DX, K1UO is operating the ARRL 10-Meter Contest. In response to a CQ, a collection of W4s, 5s and 9s call K1UO. They're all audible at S7 for a couple of minutes before they gradually fade into the noise. Again, the ionization density in the meteor was sufficient for propagating 10-meter signals for several minutes because the required density level is even lower than at VHF.

Meteors like that in the first example are few and far between. Our second example is more the norm.

Time passes for K1WHS. He hears nothing from W5RCI for 20 minutes. 'Tis a lonely life, that of the 220-meteor jockey.

W1YTW has heard little for the past few minutes. Then he hears just above the noise, "TW from K5B." At least the meteors didn't go the way of the passenger pigeon. The particular meteor that propagated that small bit of information was about the size of a grain of sand. The ion density in its trail wasn't great enough for any type of propagation at 220 MHz; it wasn't even sufficient for reflection at 144 MHz. It was dense enough, however, to refract for a brief moment K5BMG's signal from Louisiana. Only a portion of K5BMG's signal was refracted toward Maine, hence the low signal level. The ion density was low enough that in a short time it dissipated below the level necessary to refract two meteor signals. A meteor trail of this type is known as "under dense."

What of K1UO on 10 meters? He heard a loud, 20-second-long burst from W9RE, with a few more seconds of weak signal.

Earth encounters billions of meteors each day. These billions of meteors are spread over the entire Earth, but meteors appropriately placed for communications between a given set of stations are relatively rare. Of these, only a fraction will be large enough to create an ionized trail adequate for propagation at 2 meters; most of the time this propagation will allow a single letter to be received. Even at 10 meters the duration may be but a few seconds. There will be longer propagation "bursts" of course, but these comprise but a few of the meteors.

Table 1
Major Meteor Showers

Shower	Date(s)	Hourly Rate
Quadrantids	Jan 3-5	45
Lyrids	Apr 19-23	12
Eta Aquarids	May 1-6	12
Arietids	Jun 2-14	70
Delta Aquarids	Jul 26-31	22
Perseids	Jul 27-Aug 14	50
Orionids	Oct 18-23	30
Taurids	Oct 26-Nov 16	16
Leonids	Nov 14-18	60
Geminids	Dec 10-14	70
Ursids	Dec 22	13

Just What Are Meteors?

Meteors are chunks of material usually associated with the debris from a comet. They travel in highly elliptical orbits about the sun. Every day, Earth encounters billions of these meteors. When the meteor's orbit crosses paths with Earth's orbit, the meteor is drawn by Earth's gravitational field into the atmosphere at speeds of about 22,000 to 220,000 miles per hour!

Any object moving at that high speed is bound to have an effect when it collides with an innocent bystander, such as an atmospheric air molecule. The large amount of kinetic energy possessed by the meteor is converted to heat from the friction of entry into the atmosphere. Atoms on the surface of the meteor are vaporized because of the high temperature. These vaporized atoms are contained by the air molecules. The interaction between air molecules and high-temperature atoms ionizes the air molecules and strips electrons from the vaporized meteor atoms.

A trail of free electrons and positively charged ions is left behind the meteor as it races through the sky. This ionized trail is parabolic in shape, with the burning meteor at the head. The size of the meteor and its velocity determine the size of the trail. A typical meteor is about 1 millimeter in diameter, about the size of a grain of sand. A particle of this size creates a trail head of about three feet in diameter and a trail length of between 12 and 40 miles, depending on speed.

When Are My Chances Best for a Meteor-Scatter QSO?

The earth encounters meteors that will support communications every day of the year. There are particular times, however, when the number of meteors increases dramatically. Swarms of meteors, probably the remnants of old comet trails, orbit the sun, and Earth passes through these swarms yearly. These swarms cause "meteor showers."

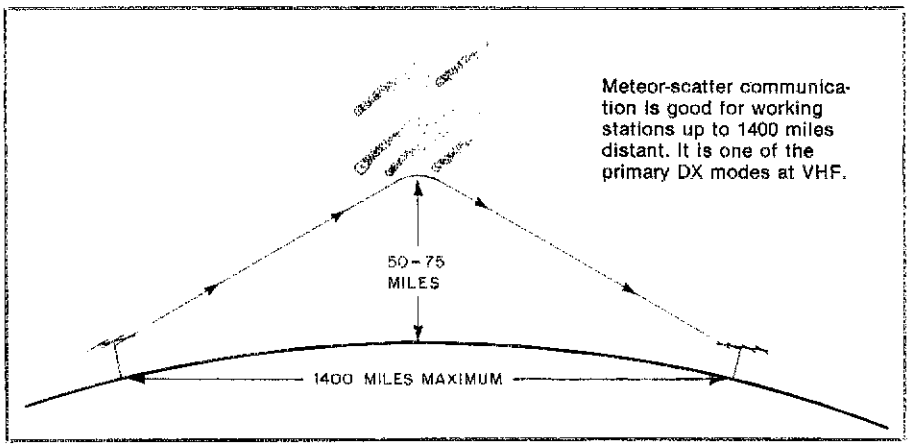
Only a very small percentage of meteors will provide communications between any two points on Earth. Observers use the term "meteor count" to describe the number of meteors that will provide chances for communications between any two points during the course of an hour. The rate depends on the time of day, shower intensity and, of course, radio frequency. During meteor showers, meteor counts of over 60 per hour are quite common on 2 meters, while the count on 10 meters will be greater.

Table 1 shows the yearly meteor showers that are of interest to amateurs. The two largest meteor showers of the year occur in August and December. The Perseids (so named because they appear to emanate from the constellation Perseus) are usually the most productive, followed by the Geminids (emanating from Gemini). Hourly meteor counts on 2 meters of up to 70 and more are quite likely at the peak hours; rates of well over 100 per hour will be seen on 10 meters. Meteor-scatter QSOs are likely, however, during any of the meteor showers listed in the table.

The optimum time of day for meteors is usually in the morning, often around dawn. As Earth revolves around the sun, the "leading edge" encounters meteors first where they are attracted by gravity. As Earth travels further in its orbit, the segments of the planet not in the leading edge are exposed to areas of space that have been "swept clean" of meteors. Only meteors newly arrived to the orbital track can be attracted by gravity for descent to Earth. Consequently, only meteors that have caught up with Earth in its orbit enter the atmosphere.

Burst duration is also greatest around dawn. As Earth revolves around the sun, it has an orbital velocity of its own. At the leading edge of Earth, our planet's orbital velocity is added to the velocity of any meteor attracted toward Earth (much like two cars in a head-on collision; the impact is that much more violent). Burst duration is related to meteor velocity, so the relative velocity improvement found at Earth's leading edge offers an improvement in burst duration.

Some meteor-scatter communication takes place outside of the major meteor showers. Hard-core 6-meter enthusiasts are active most weekend mornings, trying to



Meteor-scatter communication is good for working stations up to 1400 miles distant. It is one of the primary DX modes at VHF.

work new grid squares or just working random stations for the challenge of it. Savvy VHF-contest operators often use random meteor activity to increase multiplier counts dramatically. Most activity takes place on 6 meters between midnight and dawn. The bigger stations routinely work as many as 100 stations and 40 to 50 grid squares via meteors that they would otherwise miss. Meteor-scatter QSOs are possible on 2 meters most mornings, especially during the summer months. More and more stations are scheduling 2-meter meteor QSOs during VHF contests to work additional multipliers.

Where Can I Use Meteor Scatter Propagation?

Meteor-burst propagation can be quite useful for both the VHFer and the amateur operating the ARRL 10-Meter Contest (which usually occurs during the Geminids). For the 10-meter enthusiast, those predawn (preionospheric opening) hours (between midnight and seven local time) can be very productive. Contacts can be made out to about 1400 miles. Rather than waiting to work those relatively close-in stations on backscatter (when the long haul is loud) or on a fluke short-skip opening, they can be worked via meteor propagation.

On 6 meters, which is blessed with quality sporadic-E openings each summer and F-layer propagation at the sunspot peak, meteor scatter is widely used. Bursts can be heard on 6 meters every morning of the year. Although most of these bursts are caused by random meteors, they are usually just called "scatter." Even during nonshower periods, bursts last more than a minute—easily long enough to make contact.

On the higher VHF bands, meteor-burst communication is one of the most reliable long-distance propagation modes available. Sporadic-E propagation on 2 meters allows communications over the same paths as meteors do, but sporadic-E on 2 meters occurs infrequently (perhaps a half dozen times a year) and is only vaguely predictable. Auroral propagation is limited primarily to northern latitudes, and tropospheric ducting is a rare event. Moonbounce provides the most consistent communications link, but it requires above-average station sophistication. Meteor-burst communication is the prime propagation mode for 144- and 220-MHz DX hunters. On 432 MHz, at least three contacts have been made; meteor-burst propagation certainly presents a challenge to the 70-cm operator when bursts are weak and are infrequent.

How Do I Make Contact?

Generally, meteor-scatter QSOs are made on SSB. Some operators prefer high-speed CW, and there is some experimentation with packet radio. Although techniques vary from band to band, there is one basic guideline for making meteor-burst contacts: Keep all transmissions as short as possible. Burst duration may be as long as a few minutes or as short as a few seconds. The "opening" time is limited, so time efficiency is very important. The critical aspect is to get call signs and report through—it is easy to make the mistake of talking right through the opening.

Much of the activity on 10 and 6 meters is done randomly. That is, people who enjoy meteor-scatter contacts call CQ or listen for others calling. A good approach for calling CQ on these bands is to call a single CQ, followed by your call sign, repeated two or three times. In that way, even short bursts will convey the information: CQ FROM K1JX. When answering such a CQ, it is usually best to give the other station's call and your own in phonetics once: K1JX FROM W9 ROMEO ECHO. The best response K1JX could give would be W9RE 59 CONNECTICUT and stop. Then immediately W9RE should say ROGER, 59 INDIANA. Upon receipt of W9RE's information, K1JX could say ROGER, QRZ FROM K1JX.

An entire QSO from CQ to QRZ, with complete reports, call signs and acknowledgment (the necessary components for a legitimate QSO) can be completed in about 12 seconds. Usually, a single meteor can sustain ionization for an adequate period of time to complete a contact on 10 meters. Occasionally, multiple bursts are required for both parties to complete the contact. Again, the key is to keep transmissions short and concise. Repeating information unnecessarily is a waste of time, and time is propagation!

Six-meter meteor-scatter operation is similar to that on 10 meters. Since bursts are shorter, it may take several tries to convey all of the information needed to complete

DON'T GIVE UP TOO EASILY!

a QSO.

The story is different on 144 and 220 MHz, however. Because bursts are short and infrequent, most 144-MHz and virtually all 220-MHz meteor-burst contacts are made by schedule or at least through some standardized operating sequence. Schedule frequencies are coordinated in advance down to the kilohertz, as are transmission and reception times. The need for listening and transmitting on the right frequency is obvious. Standardized and agreed-upon-in-advance transmitting and receiving periods keep both stations from simultaneously transmitting or receiving and thereby wasting a possible meteor burst.

Throughout the United States there is a simple accepted standard for transmission timing. Each minute is broken up into four 15-second periods. The station at the eastern end of a potential contact transmits during the second and fourth 15-second period of each minute, and the western station transmits during the first and third period of each minute.

A VHF meteor-scatter QSO may not be completed on a single burst. In fact, since it may take an hour or more for a burst to occur that is good enough to complete a QSO, standards have evolved to judge the validity of a contact. There are three necessary contact components for a contact to be valid. The first is identification of call signs—complete identification. Each station must hear his call sign and that of the other station. The second part is exchange of some sort of information, both ways. The last is acknowledgment, in both directions, of receipt of exchanged information. The integrity of a contact can be considered honored only by strict adherence to this standard. There are those who will try to convince you that something less than this is acceptable. Consider this: Does this person want to really make a contact or does he only want a QSL card? Is the satisfaction in the cardboard or in the accomplishment of a difficult contact?

At the beginning of a schedule, each operator sends calls for the entire 15-second transmit period. The station being called is sent first, followed by the calling station, like this: W9RE K1JX, W9RE K1JX, W9RE K1JX. Some of the most experienced operators "break" about halfway through the 15-second transmission in case a meteor burst is taking place. By doing this, even short bursts can be used successfully.

Once an operator hears a complete set of call signs, he can send the unknown information along with calls. A common system used for years is the S report. A report from S0 to S5 is given based on the burst duration. Unfortunately, the standard for what the different S numbers mean in terms of burst duration have become muddled over the years. As a result of this, the Central States VHF Society, a group of serious VHFers throughout the United States, has advocated the exchange of state or province name in place of an S report. Each system has its merits, but the important thing is for scheduling stations to agree on a particular system. (Random contact seekers don't have that luxury. It adds to the challenge.) In any event, the 15-second transmit period would sound something like this: K5YY K1JX S2, K5YY K1JX S2.

Call signs must be sent continually until you copy the signal report from the other station. You know that the other station has received your call signs when you begin to hear a signal report. A signal report can only be sent upon receipt of complete call signs. Except for an occasional call-sign announcement to satisfy FCC identification requirements, calls needn't be sent from this point on; they only waste burst time.

When you receive a signal report, you can start to send the acknowledgment. This is simply sent in the form of ROGER on voice or R on CW. You must continue to send signal reports until you receive acknowledgment. Then, only the acknowledgments are required. The process is continued until the acknowledgments are received in both directions. The contact is then complete.

Description of the contact sequence may make the process seem difficult and complicated. In practice, it isn't. Since an example is worth something less than a thousand words, here is how a typical schedule between K1JX and KØALL might go. In this case, K1JX receives during the first and third 15-second sequences (00 to 15 seconds and 30 to 45 seconds after the minute) and transmits during the second and fourth.

(As heard at K1JX)

(RX) 0900 (00)-0900 (15)—"Hiss ..."

(TX) 0900 (15)-0900 (30)—KØALL K1JX, KØALL K1JX, KØALL K1JX, BREAK ... (momentary hiss) ... KØALL K1JX, KØALL K1JX, KØALL K1JX

(RX) 0900 (30)-0900 (45)—"Hiss ... ØALL K1JX ... Hiss ..."

(TX) 0900 (45)-0901 (00)—KØALL K1JX, KØALL K1JX, KØALL K1JX, BREAK ... (momentary hiss) ... KØALL K1JX, KØALL K1JX, KØALL K1JX

Some time later

(RX) 0911 (00)-0911 (15)—"Hiss ... JX KØALL K1JX KØ ... Hiss"

(TX) 0911 (15)-0911 (30)—KØALL K1JX S2, KØALL K1JX S2, BREAK ... (momentary hiss) ... KØALL K1JX S2, KØALL K1JX S2

(RX) 0911 (30)-0911 (45)—"Hiss"

Continues like this until sometime later

(RX) 0913 (30)-0913 (45)—"Hiss ... K1JX KØALL S2 K1JX KØALL S2 K1JX KØ ... Hiss"

(TX) 0913 (45)-0914 (00)—ROGER S2, ROGER S2, ROGER S2, ROGER S2, BREAK ... (momentary hiss) ROGER S2, ROGER S2, ROGER S2, ROGER S2

(RX) 0914 (00)-0914 (15)—"Hiss ... S2 S ... Hiss"

(TX) 0914 (15)-0914 (30)—ROGER S2, ROGER S2, ROGER S2, ROGER S2, BREAK ... (momentary hiss) ROGER S2, ROGER S2, ROGER S2, ROGER S2

Continues until some time later

(TX) 0917 (15)-0917 (30)—ROGER S2, ROGER S2, ROGER S2, ROGER S2, BREAK ... (momentary hiss) ROGER S2, ROGER S2, ROGER S2, ROGER S2

(RX) 0917 (30)-0917 (45)—"Roger Roger Roger Roger Roger Roger Roger ... 73, 73"

(TX) 0917 (45)-0918 (00)—73, 73 RON BREAK; "73 Clarke"

Calling CQ for random contacts on 2 meters is a similar process. The time sequences are the same, except that you call CQ instead of another station during the appropriate 15-second period (CQ K1JX, CQ K1JX ...). The greater challenge here lies in identifying the caller, exchanging reports and acknowledging, all without any prior knowledge. Usually, random CQing is carried on at 144.200 and 5 kilohertz increments up and down from calling frequency (144.195, 144.190, 144.205, 144.210, and so on). There is so little 220 meteor-scatter activity that almost all work there is done by schedule.

You can get started by listening to 6 meters during any VHF contest or on most weekends. If you hear stations calling CQ, give them a call—just be ready for a quick reply. If you're only on HF, listen to 10 meters during the ARRL 10-Meter Contest. And you can try 2 meters during the meteor showers. No matter what your planned activity, remember one thing: Keep it short and sweet.

What Kind of Equipment Do I Need to Work Meteor Scatter?

As with any weak-signal work, a sensitive receiver, legal-limit power amplifier and high-gain antenna will make meteor-scatter communications easier. If you don't have these things, not all is lost!

For 10-meter work, all you'll need for many meteor-scatter QSOs is a standard 100-W transceiver and a three- or four-element beam. If you have a kilowatt amplifier, you'll be able to work even more stations.

At 6 meters, you can use as little as 10 W and a small Yagi to work some of the "big guns"—if you're patient. You'll enjoy a slew of contacts with 100 W and a four-element beam. If you run high power and have a good receiving preamplifier, you'll practically be able to ragchew with other big stations.

On 2 meters, the average station consists of a multimode transceiver, 100- to 160-W amplifier and a single long Yagi. You'll be able to make many a schedule with a setup like this, but if you're interested in random contacts you'll probably want more. A good station for that type of operation might include a pair of long antennas, a low-noise preamplifier and a 500- to 1500-W power amplifier.

Signals at 220 MHz are much weaker, so a better station is desirable. You'll want a low-noise receive preamplifier and a pair of antennas. Although contacts are possible with a 100-W "brick" amplifier, a tube-type amp capable of 300-500 W or more is a big help.

In Search of the Perfect Picture

Part 2: Here's the "how-to" installment you've been waiting for. You're now one step closer to the perfect picture!

By Clayton W. Abrams, K6AEP
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Probably the most exciting product to be introduced to SSTV in the past few years is the Robot Research Model 1200 Color Scan Converter.[1] This unit is in a class by itself because of its high-resolution capability and computer interface. The interface is unique and allows the converter to be expanded beyond its intended SSTV application. The converter has all of the attributes of expandability, resolution, manufacturer's reputation and microprocessor control I discussed in Part 1. The converter also has many built-in features not available in competitive units. These additional features are accessible only by a host computer attached to a parallel or serial interface within the 1200. Robot Research produces units with less capability and cost, but these units do not allow for expansion and upgrades as does the 1200. The 1200 can display 240-line color pictures with 256 pixels per line. Each pixel can have over 200,000 unique colors! To see how this is possible, let's pull out our screwdriver and open the 1200 to see how it works.

Inside the Robot 1200

At the heart of the 1200 is an Intel 8031 microprocessor. This is a relatively new IC. It has built-in parallel ports, timers, RAM, a serial port and a rich instruction set. The instruction set is designed to allow for the easy movement of bits and bytes in memory. For example, the processor allows single-bit memory locations to be addressed directly as you would 8-bit memory locations! The processor also has a high code-execution speed that adds to its usefulness. This processor is used as a "traffic cop" to interpret operator instructions from the front panel or computer interface. A 16-kbyte × 8-bit EPROM (27128) contains the microcode or intelligence for the converter.

To discuss each microcode instruction would be impractical. I can, however, discuss some of the major categories of the computer-controllable instructions that allow the code to be more easily understood.

Table 1
High-Resolution Picture Memory Requirements

Mode	*Color, 240 lines (bytes)*	*B & W, 240 lines (bytes)*
No compression	184,320	61,440
C1 image compression	138,240	46,080
C2 image compression	61,440	23,040

Robot 1200 Commands

Read/Write Commands: These commands allow the picture information to be transferred to and from a host computer by means of an internal parallel interface. The commands allow portions of pictures, entire pictures, full-resolution pictures or compressed-resolution pictures to be transferred. The memory requirements for the host computer range from 185 kbytes to 31 kbytes, depending on the picture resolution involved. A total of 13 commands is in this set.

Memory-Selection Commands: A total of seven commands tells the 1200 where in memory the picture is to be moved or loaded. The 1200 is segmented into two "pages" or low-resolution picture areas of one large, high-resolution picture area.

Special Functions: Some of the more exciting features of the 1200 are controlled by 14 special-function commands. These include sending tones from the 1200, inverting images, displaying a gray scale, test-pattern generation, adding graphic characters to pictures and zooming to any screen location. Black-and-white or color pictures can be sent to a printer attached to the parallel port.

Control and Status Commands: These commands allow the computer to access any of the front-panel controls of the 1200. This permits memory selection and speed changes to be made from the computer. Two additional functions can also be computer selected—the panel status and the vertical position of the in-memory SSTV frame last transmitted.

Selecting a Computer

With the rich instruction set the 1200 has, an obvious enhancement to the SSTV system is the addition of a controlling computer. With the proper interface, the computer can not only gather picture data from the 1200, but it can use the 1200 as an external display interface.

To accept picture information from the 1200, the computer must have a large amount of memory and the means of directly addressing this memory. The memory requirements for picture storage are shown in Table 1. As you can see, a high-resolution picture occupies a lot of memory. The two compression modes allow pictures to be saved in less memory. The C1 compression mode is equivalent to the high-resolution mode, but takes 46 kbytes less. The C2 compression mode does cause a slight degradation in picture quality, but the resulting picture is still amazingly good using this limited amount of memory.

Once an image is transferred to the computer, you can perform image analysis or

[1]Part 1 appears in December 1985 *QST*, page 14.
[1]Notes appear on page 24.

save the picture to disk. When choosing a computer system to use with the 1200, you should select a computer equipped with a microprocessor that can handle large amounts of data and one which supports high-volume disk storage. Two popular computers now available meet these criteria. One computer uses an 8088 microprocessor; the other has a 68000 microprocessor. I chose the 8088-based system, an IBM PC-XT, for this project because of the large amount of software support and ease of software development. I found that a hard disk is a desirable accessory if you plan to perform picture storage, especially high-resolution color pictures. If floppy disks are used for storage, only one high-resolution picture can be stored per disk.

Next, you must decide what programming language will be used to write the necessary software. I wrote the software in BASIC and C. (This software has not been optimized.) Assembly language is too difficult to write and understand, and BASIC is too limited and slow to use alone. I found C to be almost as fast as assembly language and relatively easy to code. I use C in all of my advanced PC projects.

Computer Interface

Two methods of interfacing the 1200 to the computer exist: serial and parallel. The serial interface is by far the simplest. All you need is the asynchronous communications hardware for the PC and some simple driving software. The 1200 has a built-in serial port that communicates through an interface at 4800 bauds. This interface is a one-way communications path only; no handshake is included in the 1200's microcode. Therefore, all control-program timing loops must be written carefully. This interface allows only graphics information to be placed on the display. The available commands for use in the serial mode are a subset of the commands mentioned previously. A use for this interface will be discussed later.

The parallel interface is the more flexible of the two. Before deciding how to tackle this interface, I had to make some decisions on what I was trying to accomplish. Although I found the 1200's features extensive, I wanted more. I required the ability to receive WEFAX. This is as important to me as SSTV. How could I accomplish this feat? One way was to rewrite the 1200 microcode. This could be done, but it would require a lot of work. The easier path was to have the computer accept the analog data, then transfer it to the 1200. All that's required to do this is an analog-to-digital converter (ADC) on the interface card along with the 1200's parallel-interface hardware.

I could have purchased an interface card from John Bell Engineering, but I did not have a spare full slot in my PC to hold the card.[2] Therefore, I decided to design my own card to fit the small I/O slot on the PC-XT mother board. Another option exists for those of you who are not interested in WEFAX operation: Use a Metra-Byte card.[3] Pin-out information for the Metra-Byte card is shown in Table 2.

Table 2
Metra-Byte PIO-12 To Robot 1200C Connections

DB-25M Pin No	*1200C Signal*	*DB-37F Pin No*	*Metra-Byte Signal*
1	Data out 0	37	PA 0
2	Data out 1	36	PA 1
3	Data out 2	35	PA 2
4	Data out 3	34	PA 3
5	Data out 4	33	PA 4
6	Data out 5	32	PA 5
7	Data out 6	31	PA 6
8	Data out 7	30	PA 7
9	NOT out strobe	25	PC 4
10	Output busy	24	PC 5
11	Ground	19	Digital common
12	Ground	17	Digital common
13	Ground	15	Digital common
14	Input data 0 (LSB)	10	PB 0
15	Input data 1	9	PB 1
16	Input data 2	8	PB 2
17	Input data 3	7	PB 3
18	Input data 4	6	PB 4
19	Input data 5	5	PB 5
20	Input data 6	4	PB 6
21	Input data 7	3	PB 7
22	NOT input strobe	22	PC 7
23	Input busy	29	PC 0
24	Ground	13	Digital common
25	Ground	11	Digital common

Care should be taken to ensure correct connections before attempting to connect the Robot and the computer. The Metra-Byte connector has +5, −5 and +12 V dc on unused pins.

To use the PIO card with the software, the board address must be 280 H or 640 decimal. The top left of the card has an 8-position DIP switch that must be set as follows:

8	7	6	5	4	3	2	1	0
ON	OFF	OFF	ON	ON	ON	ON	ON	ON

The parallel interface requires eight bits of bidirectional data and two bits each way for the handshake signals. Much to my surprise, I did not have to place interface drivers on the card. This is because data is transferred in one direction only at a time, and there's a long delay between transfers. So, if any ringing or noise is present on the interconnecting line, it is not seen. (I currently use an interface cable 20 feet long without problems.)

Next, I had to determine at which address I could place the card. In the PC-XT, only a small band of I/O addresses is available that do not conflict with any existing hardware. One range of usable addresses is Ø2ØØH to Ø3ØØH; I chose to use an address of Ø28ØH (H designates a hexadecimal address).

The schematic diagram for the homemade interface card is shown in Fig 1. This card uses two 8255 ICs for the I/O ports. The first 8255 is used to communicate between the PC and the 1200. The second 8255 handles the analog signals. For the ADC, I chose the National ADC0809. This is a low-cost IC ($4.95), and is a reasonably fast and accurate 8-bit ADC with an 8-way multiplexer. The IC is strapped to allow for input signal amplitudes of 0 to 5 V. Strapping is accomplished by connecting the reference on pin 12 to +5 V and connecting the reference ground (pin 16) to ground.

I use the second analog input at pin 27 for all my FAX signal inputs. To digitize FAX requires relatively slow ADC operation. The ADC0809 has a conversion time of 100 μs—more than adequate for this type of operation. A sample-and-hold circuit is not required. Only one additional input signal is required for FAX: a sync signal derived from the FAX decoder interface. This pulse is fed to port C of the 8255 and is conditioned by a single gate. Conditioning is required for noise reduction and to bring the input signal to TTL levels. The FAX interface has an output level of +8 V. This signal tells the software that data will immediately follow detection of the sync signal.

The remaining seven analog input signals to this interface can be used for any type of instrumentation application you wish. One possible application is the reception of other SSTV formats not provided by the Robot 1200. With a little imagination, other applications can be designed.

One port on the second 8255 is not used. This allows eight free bits for use in other applications. This port is intended to be used as a digital-to-analog (D/A) port and is left free for possible use as an SSTV generator. A DAC and VFO could be installed. With a little clever software, FAX or SSTV signals can be generated by the PC.

Software

Language Types

Now that we've constructed a bit of hardware, how do we fit it all together? The "glue" we use is software. (I call it "glue" because it's sticky to write and ties things together.) Some of the software is written in IBM/Microsoft® BASIC. Since the software listings (BASIC and machine language) are so long, they are not published here.[4]

As mentioned earlier, BASIC is not ideal for this application. The language has only one advantage: It is used and understood by many people. When the programs are run in the interpretive BASICA mode on the PC, operation is quite slow. To speed up the programs, you can compile them using the IBM/Microsoft BASIC Compiler. Both programs are written so that they are compatible with the BASIC V1 Compiler. When compiled, the software

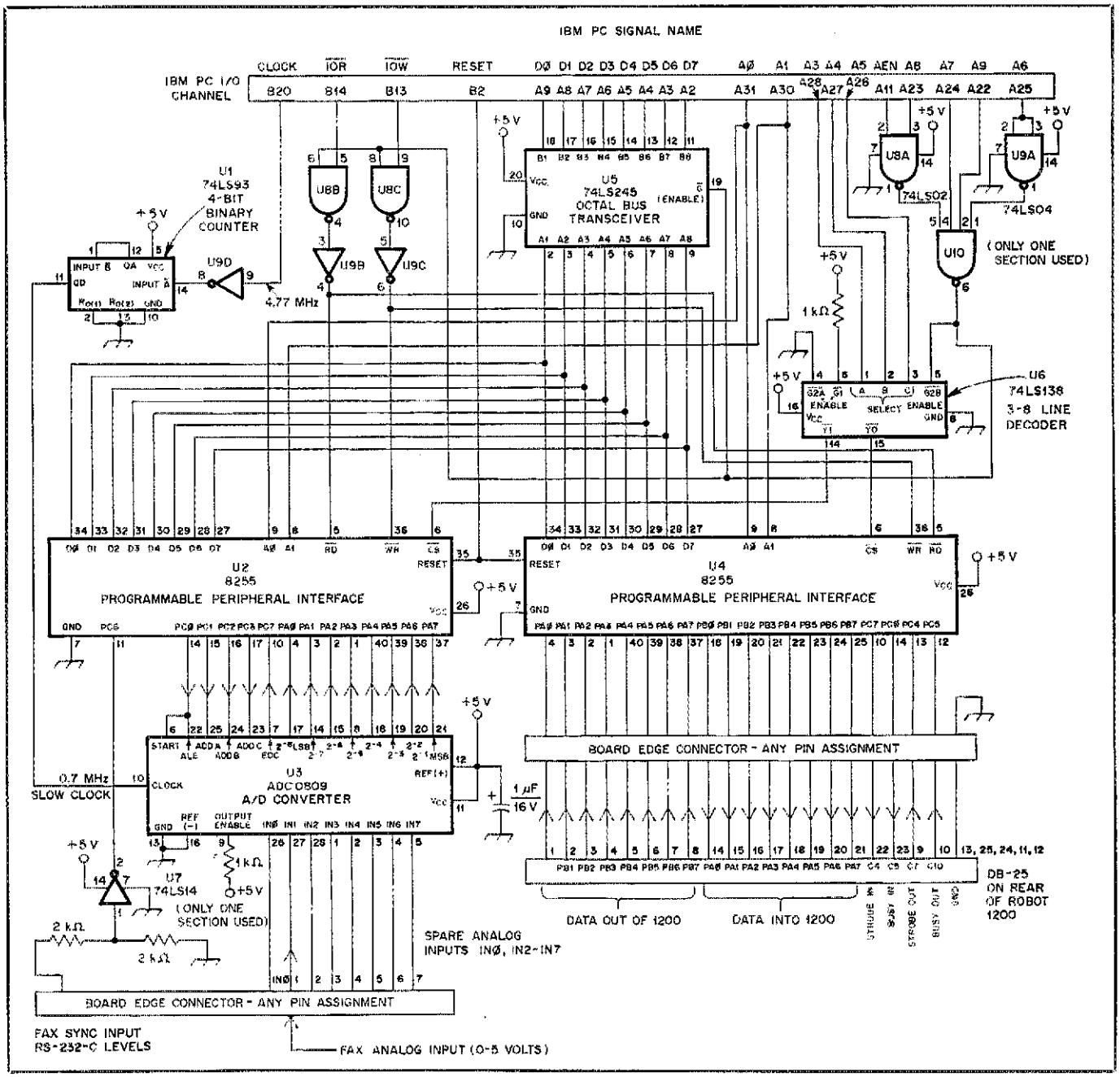


Fig 1—Schematic diagram of the PC/Robot 1200 interface. The base address for U2 is 286H; for U4, 280H.

will run at least 10 times faster. To go even faster, another language must be used. Two possibilities are Forth and C. Pascal is not a good choice since it severely lacks I/O-handling capability.

One of the problems the software has to conquer is how to transfer 183 kbytes of information to the RAM (random-access memory) in the PC. Few languages for the PC support the ability to address directly all of the available RAM. Only three ways currently exist to do this: BASIC, C and assembly language. In BASIC and assembler, you must figure out how to use the 8088 segmentation register. This can be very difficult for many novice programmers to do. If C is used, you don't have to worry about this! An array can be declared and addressed directly in the large memory models of most professional C compilers such as the CI-C86, Mark Williams and Microsoft compilers. The Lattice C compiler is one of the more popular compilers and is the one I use for FAX.

BASIC Programs

Let's examine the two BASIC programs that control the 1200. These programs are called SERIAL.BAS and PARALLEL.BAS. The program names describe the type of interface with which they are used.

SERIAL.BAS: This program is menu driven. The menus allow you to select all of the built-in Robot 1200 functions such as test-pattern generation, camera-frame grabbing, zooming in on images and the generation of various size characters of a multitude of colors at different screen positions. The program assumes that the PC has an asynchronous communications interface card in the COM2 position. If your system has just one communications port, change line 190 to COM1. On the asynchronous DB-25 connector, place jumpers between pins 4 and 5, and 6 and 20. These jumpers tell the port not to expect any handshaking with the 1200. Program lines 240 through 270 are software delays for transmission of the SSTV RGB sequence.

These WEFAX pictures were captured by K6AEP on August 15, 1985. At the left, Hurricane Danny is shown slamming into the east coast of Louisiana. The photo on the right shows the tropical quadrant of Danny.

This sequence is used when images are transmitted to older color SSTV systems. The software delays are approximate and are the delays between picture transmission. Watch out when using software delays in BASICA. This version of BASIC has a built-in function called "garbage cleanup" or a "garbage collector." This means that the BASIC intepreter will periodically interrupt program execution to discard temporary variables no longer in use. Because of this, exact software timing loops cannot be counted on. Software delays in IBM BASIC are approximate and will vary each time the program is run.

Program lines 31Ø to 35Ø contain the strings holding call signs and other specifics that are displayed. Change the contents of these strings to hold the correct information.

PARALLEL.BAS: Also written in IBM/Microsoft BASIC, this program allows commands to be routed to and from the 1200 via the parallel interface of Fig 1. You can run this program under BASICA, but this is not recommended because of the slow execution speed; this program should be compiled for the reasons mentioned earlier. PARALLEL.BAS provides picture transfer, disk storage, character generation and other features. Like SERIAL.BAS, PARALLEL.BAS uses the same areas for text messages and the COM2 serial port. Two delay constants in lines 42Ø and 43Ø can be changed to accommodate the compiler or serial port.

The program allows for two picture sizes to be transferred—184 kbyte (full RGB) or compressed resolution (C2) 61 kbyte. A segmentation-register location of 45ØØ was chosen to store the pictures. This location was chosen by trial and error and is largely dependent on what type of software you're using. If you have Sidekick™ and a printer spooler installed when you try to transfer pictures, the segmentation registers may have to be changed. The register is defined in line 2Ø4. A simple BSAVE command is used to save pictures to disk; BLOAD is used for loading. These commands are limited to handling 64 kbytes at a time. If you wish to save or load high-resolution pictures using these commands, you'll have to develop a method to append the files once they are saved to disk. The disk routines are located in lines 4ØØØ through 427Ø, inclusive.

Lines 331Ø to 396Ø contain the picture-transfer routines. These routines expect that an 8255 parallel interface is attached to the computer at the addresses defined in lines 23Ø to 31Ø. These lines may be altered to contain any address in the PC I/O memory map. The handshake lines for the parallel interface are in lines 26ØØ to 267Ø. Subroutine access to the parallel interface is through these lines. The remaining portions of PARALLEL.BAS are similar to SERIAL.BAS.

WEFAX

Currently, a number of satellites orbit the earth and stream pictures back to earth on a daily basis. Some of these satellites use signals in the VHF range and others use the microwave (S band) frequencies. These satellites are under the jurisdiction of the National Environmental Satellite Service

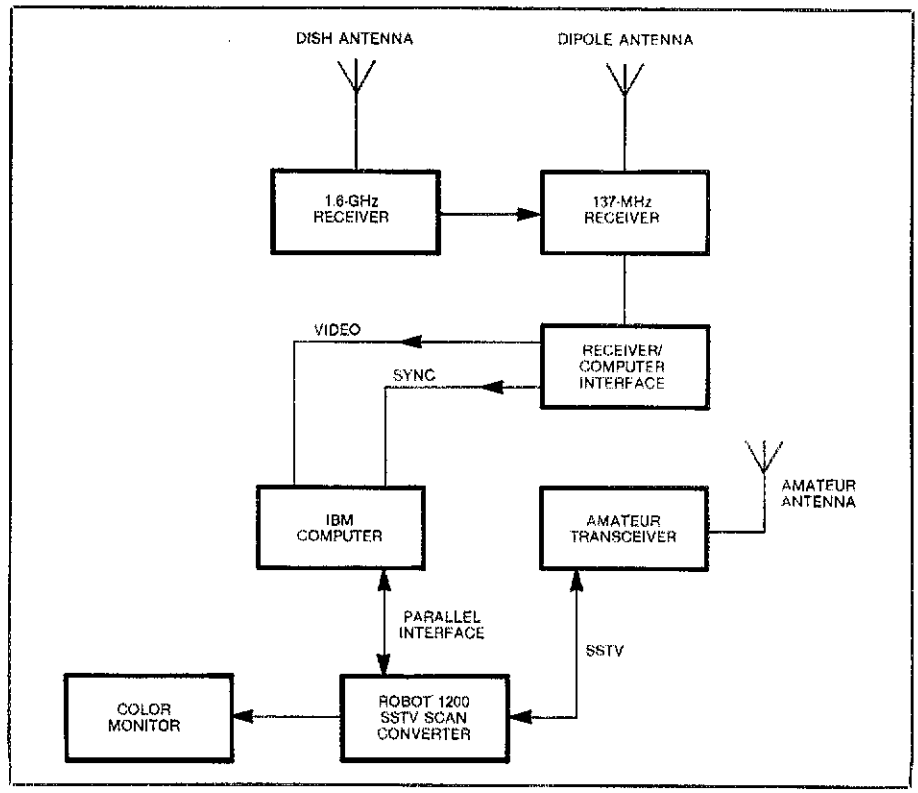


Fig. 2—Block diagram of an S-band satellite receiving station.

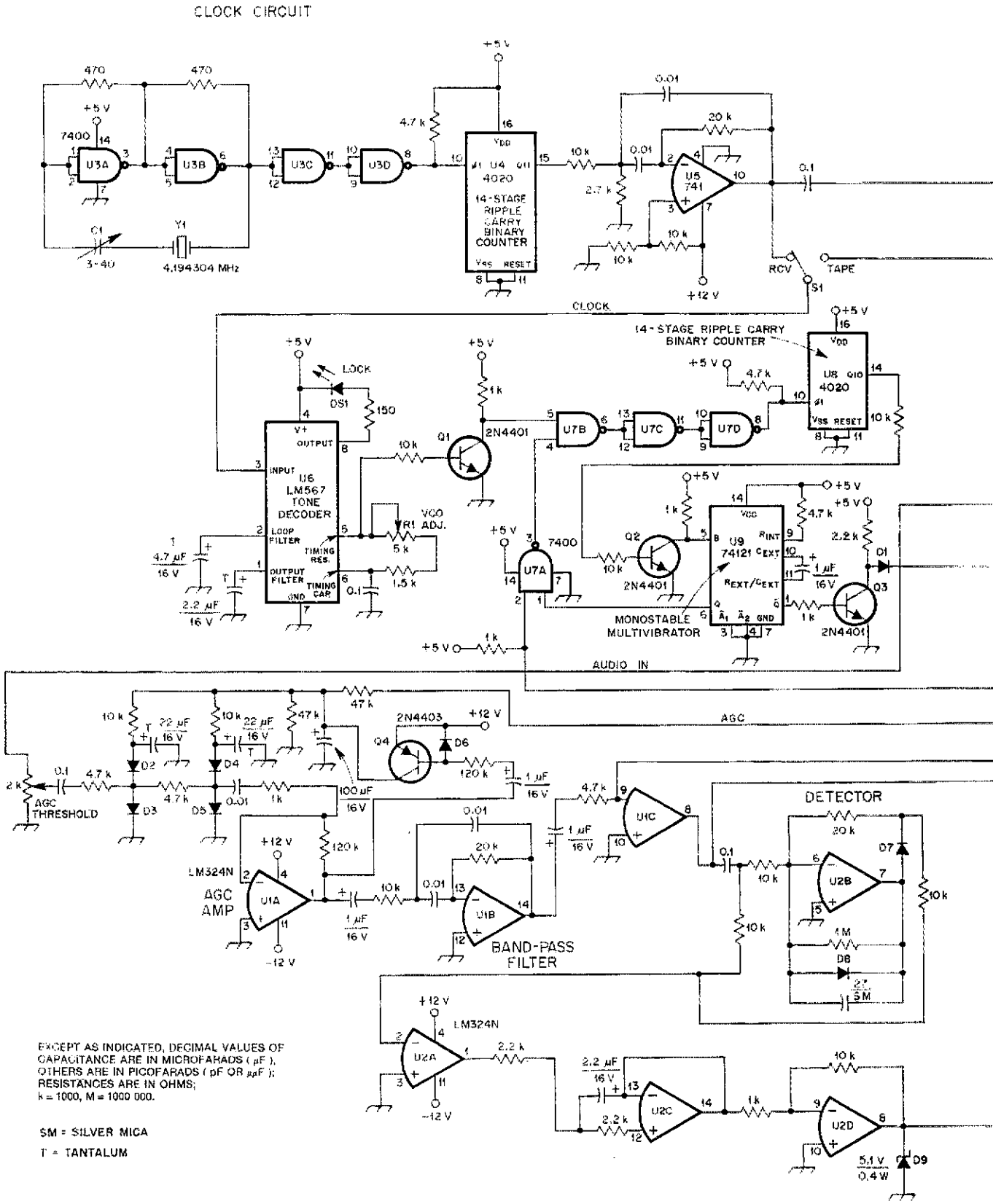
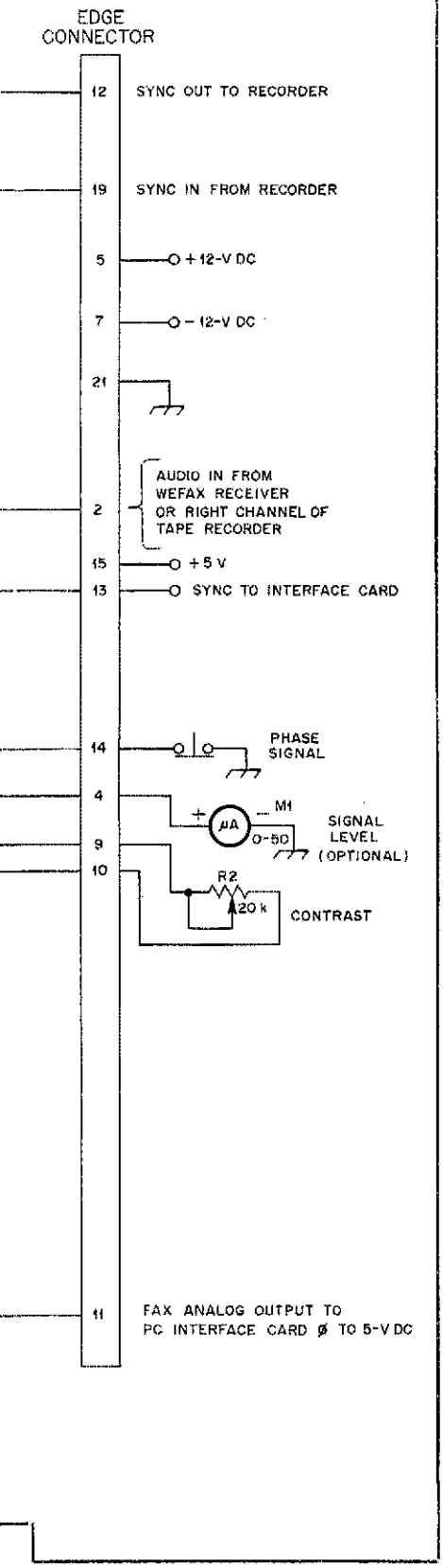


Fig 3—The FAX interface schematic diagram. All diodes are 1N4148 or equivalent.



(NESS) of the National Oceanographic and Atmospheric Administration (NOAA) of the US Department of Commerce. Some of the satellites orbit the earth at altitudes of 600 miles or so; these are called *polar orbiters.* Other satellites orbit the earth at the same speed at which the earth rotates and at altitudes of about 23,000 miles. These satellites are called *geostationary.* With geostationary satellites, you can point your receiving antenna at one location in the sky and receive continuous pictures of the earth's surface and atmosphere.

Your WEFAX Station

Over the years, many amateurs have used their skills to receive WEFAX signals and use the resultant data to predict local weather. This type of reception is closely related to SSTV; the only major difference is the type of front-end electronics equipment used. Providing a blow-by-blow account of setting up a complete WEFAX receiving station is beyond the scope of this article,[5] but a brief description is in order.

To receive the VHF satellite signals, the receiver should have a wide bandwidth (30 kHz) and be capable of receiving signals at 137 MHz. The antenna may be a simple crossed dipole with a vertical pattern. The S-band satellite receiving station requires a 1691-MHz converter ahead of the VHF receiver. A block diagram of such a station is shown in Fig 2. This type of gear is difficult for the average amateur to construct, but it is available from commercial sources.[6,7] The VHF receiver used with the converter should have a variable IF. This is necessary because the microwave downconverter can drift 10 to 20 kHz, depending on the outside temperature. For S-band signals, the antenna can range from a high-gain Yagi to a homemade dish. I found that a 4-ft-diameter dish, a GOES receiver and a preamplifier with a noise figure of 2 dB can produce closed-circuit picture quality at my QTH.

The FAX/Computer Interface

Once you can hear the satellite, the next step is to convert the image into a form that can be placed directly into the computer. "Color Computer SSTV" (*73*, Nov/Dec 1984) provides some background on the signal formats that are emitted by the satellites. The circuit for the decoder shown in Fig 3 was developed by Dr. Ralph Taggart, WB8DQT, for use with the Radio Shack TRS-80C® Color Computer. An earlier version of this circuit was published in the "Color Computer SSTV" article. If you do not wish to build the interface, you may purchase it.[8] The interface may be placed in a box with its own power supply and connectors.

Video Circuits

Video information (at audio frequencies) from the VHF/FM receiver or the right channel of the stereo tape recorder enters at edge connector pin 2 and is amplified by U1A. U1B is a 2400-Hz active band-pass filter, and U1C is a gain block with the gain controlled by the 1200's front-panel CONTRAST control. Video detection, filtering and buffering are done by U2. U2A and B provide precision full-wave detection; U2C is the active low-pass post-detection filter, and U2D inverts and buffers the signal before sending it to the ADC via pin 11. The peak white level is set by the CONTRAST control (R2), but it is limited to +5 V by means of a Zener diode (D9) at the output of U2D.

Clock and Sync Circuits

FAX signals may be handled directly or a stereo tape recorder may be used to record and play back the signals. During recording, the signal information is fed to the right channel and a synchronization signal to the left channel. The interface clock is the means by which the computer syncs the video information with the display. Oscillator U3 operates at 4.19304 MHz. The output frequency is divided by a factor of 2040 by U4. The resultant frequency is 2048 Hz. This signal is buffered and filtered by U5 and fed to pin 12 of the edge connector for use during recording.

When the RCV/TAPE switch (S1) is in the RCV position, U6, a phase-lock loop tone detector, receives the sync signal directly from the clock circuit. With S1 in the TAPE position, the incoming 2048-Hz sync signal from the left channel of the tape recorder at pin 19 is fed to U6. The VCO output of U6 is buffered to TTL levels by Q1 and routed through a series of phase-control gates and a buffer (U8). This results in a 2-Hz or 120-LPM (line-per-minute) clock signal. The signal is then buffered by Q2, which drives a 5-ms single-shot trigger, U9. Output from U9 drives an RS-232-C level buffer that is internally connected to the PC interface. The other output of U9 is connected to a phase circuit. This phase circuit extends the duration of the single shot so that the video portion of the detected FAX signal is placed at the center of the display.

FAX Software

On the disk with the BASIC programs is a simple program written in C that can be used to receive FAX signals with the PC/Robot 1200 combination. This program assumes that the hardware described in this article is constructed as shown. Written in Lattice C, the software makes calls to the ROM BIOS and may not function on some of the IBM PC compatibles. The program feeds picture bytes to the computer and transfers them immediately to the 1200. Provisions are made to reset the picture to the top of the screen to permit phasing the sync pulses. Software delays are used for timing the reception of the FAX signals. For those of you who

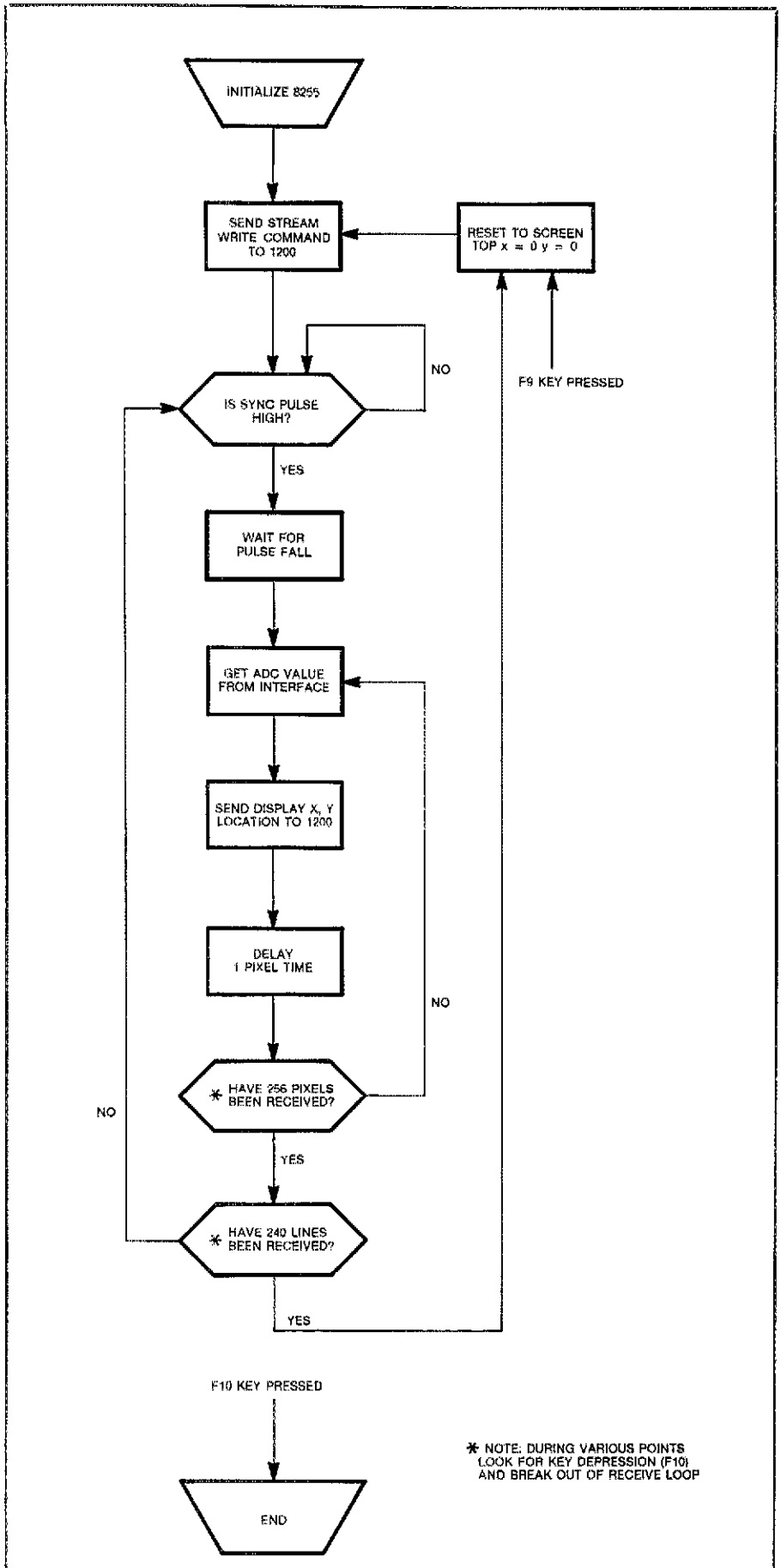


Fig 4—FAX software flowchart for K6AEP's program.

wish to know more about writing your own FAX software, Fig 4 provides a flow chart of how this program functions.

Conclusions

This PC/Robot 1200 project has been very rewarding. It has touched many new areas of Amateur Radio that were not reachable with the technology that existed only a few years ago. I expect numbers of units like the 1200 will become available with computer interfaces. These units will attach to off-the-shelf personal computers to create systems of a complex nature and perform functions never dreamed of by their designers.

I would like to thank my friend and associate, Dr. Ralph Taggart, for his help in designing the FAX interface and allowing me to publish the circuit. Thanks also to Robot Research for their assistance in providing photographs of the 1200. I hope many of you will benefit from this article. Perhaps you can improve on my work—I'm anxious to hear from you!

Notes

[1]Robot Research Inc, 7591 Convoy Ct, San Diego, CA 92111, tel 619-279-9430.
[2]Universal I/O card 83-064—available from John Bell Engineering, 1014 Center St, San Carlos, CA 94070, tel 415-592-8411.
[3]This card bears the part number PIO-12 and is available from the Metra-Byte Corp., 254 Tosca Dr, Stoughton, MA 02072, tel 617-344-1990. The price is $97 plus shipping. The Metra-Byte card has a 37-pin male D connector that protrudes through the rear of the PC. The mating cable should use a 37-pin female D connector (DC37S for solder connections, or AMP 745242-1 for insulation-displacement cable).
[4]Contact the author for information on obtaining the software. Please include a business-size SASE; foreign correspondents should include two IRCs.
[5]More information can be found in the *New Weather Satellite Handbook*, by Ralph Taggart (Peterborough: Wayne Green Publications, 1983). Unfortunately, this book is now out of print.
[6]Vanguard Labs, 196-23 Jamaica Blvd, Hollis, NY 11423, tel 718-468-2720.
[7]Spectrum International Inc, PO Box 1084A, Concord, MA 01742, tel 617-263-2145.
[8]RTM Circuit Boards, 205 Elm St, Van Horne, IA 52346.

Strays

And on the Last Page ...

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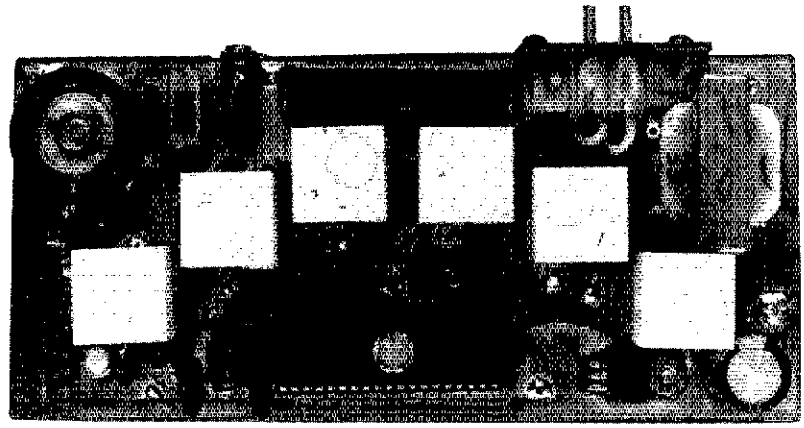
Send Error-Free Code with One Hand



This small, one-hand keyboard keyer includes its own microcomputer.

By W E Quay, W4MKC* and R H Turrin, W2IMU**
*4128 SE 10th Ave, Cape Coral, FL 33904
**PO Box 65, Colts Neck, NJ 07722

Standard keyboard keyers offer the advantage of error-free character formation, but require two-hand operation and a large keyboard. We will describe a small and unusual one-hand electronic keyboard keyer that generates Morse code characters from multiple key closures. The circuit uses six keys that provide a sufficient number of key closures to accommodate the English alphabet, the decimal numbers, selected punctuation marks and a few special radiotelegraph characters. Five keys would not provide sufficient combinations to develop this format of characters: Six keys allow 63 combinations—more than enough to accommodate all the characters.

The keyer design is based on the use of a single programmable Intel 8748 microcomputer with internal EPROM (*E*rasable *P*rogrammable *R*ead *O*nly *M*emory). With this approach, the microcomputer replaces much circuit hardware. While this may not be the most economical approach, it minimizes construction time, part count and size. A dual timer (556) acts as the code-speed clock and audio sidetone oscillator.

Operating Features

Special operating features of the keyer are:

Initialization

When the keyer is turned on, a sequence of five dots is produced by the sidetone monitor. Transmitter keying is not implemented at this time, but the first keyboard entry will drive both the monitor and the output to the transmitter in parallel. These five dots provide an audible indication that the keyer has been turned on and an indication of the keyer speed setting. This feature is provided instead of a pilot light.

Automatic Space Bar

The keyer does not use a space bar, but provides that code characters do not appear at the keyer output until all keys have been released. To send a character, it is necessary to press only those keys that form the input pattern for the desired character, then release all keys and the code output will start. All character generation is self completing, which means that a space equal to one dash length follows the end of each character without interruption. This ensures proper character spacing, a feature commonly found in most modern electronic keyers.

Overlapping Key Accumulator

In forming the multiple-key closures, it is not necessary that all keys be pressed simultaneously. The keys may be pressed in any sequence provided they overlap in time. The last key of a sequence, when released, initiates the code output. The operating program also provides for software key debounce of about 10 ms.

Two-Character Buffer

It is highly desirable to have some buffering of the output in any keyer. The short Morse code letters, such as "E", require less time to complete and would ordinarily require rapid finger keying to begin the next letter. With a buffer, one can generate characters ahead of the output and send smooth, continuous code output without having to hurry the input. The two-character buffer provided in this design is arbitrary, but sufficient to permit the code output to be smooth and still maintain immediate presence of sending.

Abort Key Code

A simple method of correcting errors before transmission is provided. This feature permits the current input code to be aborted simply by pressing all six keys before the last one is released.

Circuit Description

The schematic diagram is shown in Fig 1. A PC board is recommended, but not necessary. A socket is required for U2, but sockets are optional for the other ICs. Wiring is not critical, except for the code-speed timing circuit. Half of the 556 dual timer, U1, is a free-running clock pulse generator. The clock pulse is applied to the interrupt (pin 6) of the microcomputer. The actual dividing process to generate dots and dashes is the function of the microcomputer program. The length of a single dot is equal to 16 timing-pulse periods. The RC values shown in Fig 1 produce a Morse code speed range of approximately 10 to 40 WPM. The 0.1-μF timing capacitor should be connected directly from U1 pins 8-12-13 to U1 pin 7 to ensure that the output timing interrupt pulses have a pulse width of less than 10 μs. The other half of U1 provides a keyed sidetone oscillator that drives a small speaker.

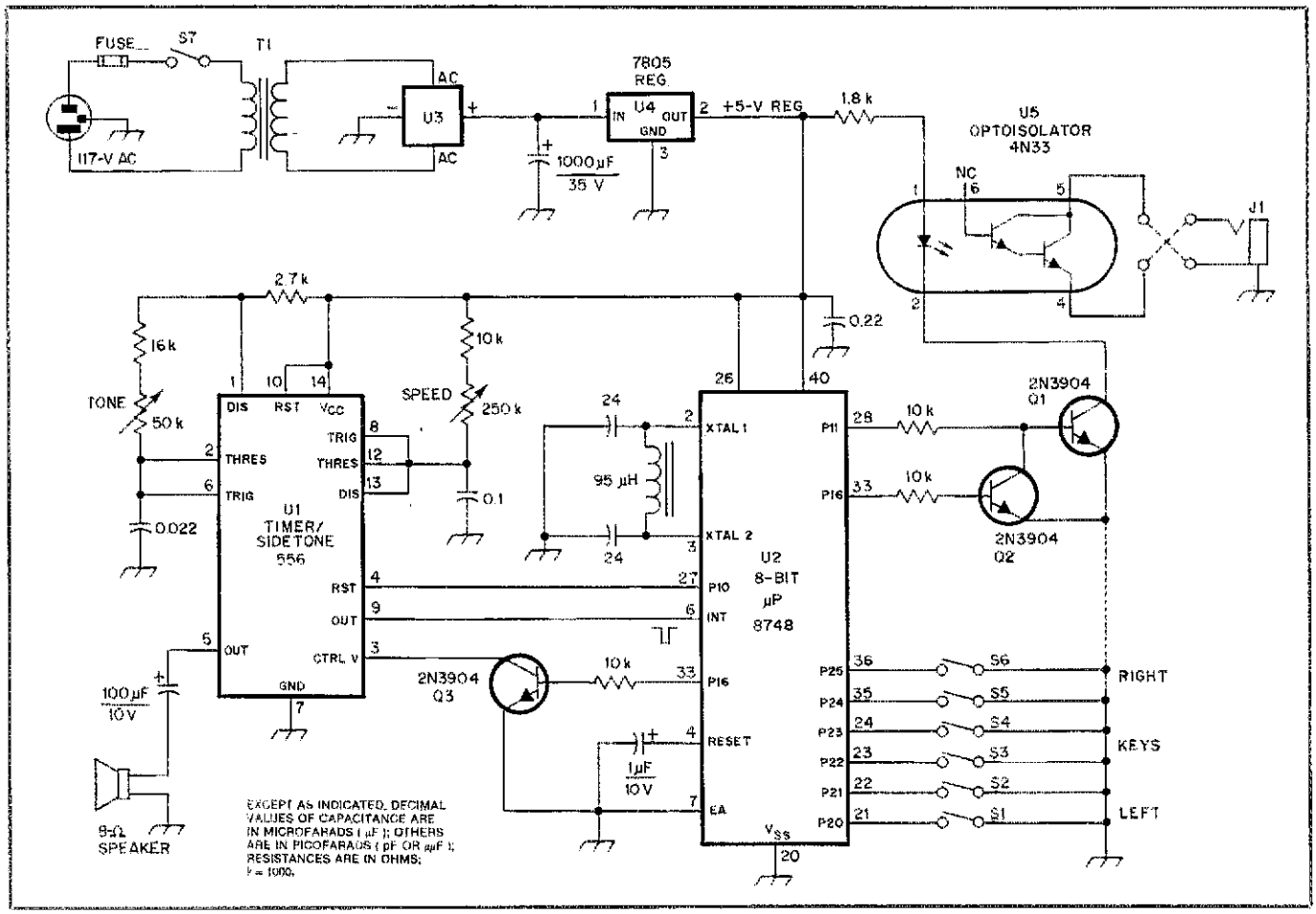


Fig 1—One-hand keyer schematic diagram.
Q1-Q3—NPN transistor, 2N3904.
U1—Dual timer, 556.
U2—Microcomputer, Intel 8748.
U3—1.0-A, 50-PIV diode bridge (RS 276-1161).
U4—Voltage regulator, 5-V (RS 276-1770).
U5—Optoisolator, Darlington, Motorola 4N33 or equiv.
T1—Power transformer, 12-V, 300-mA (RS 273-1385).

The microcomputer clock tank, connected between pins 2 and 3 and ground, should have short leads. The oscillation frequency will be around 3.6 MHz and is not critical. The 8748 IC bypass capacitor should have low lead inductance, and should be connected directly between pins 20 and 40, which are at opposite ends of the large IC. A 0.25-inch-wide copper strip running between the IC pins is recommended as a common ground strap.

Transmitter keying is accomplished by an optoisolator that permits wiring the polarity to accommodate the transmitter. Most modern transmitters can be keyed directly with this method. The output transistor in the optoisolator has a reverse breakdown voltage of about 30 V and a forward current rating of about 50 mA. The other three transistors are used as logic switches to inhibit keying during microprocessor initialization.

The Keyboard

The input keyboard is a critical part of this keyer—it must provide a comfortable and functional interface between the operator and the electronics. Generally, Amateur Radio telegraph operators prefer to use only one hand for generating code, keeping the other hand free for housekeeping chores such as turning knobs, throwing switches, thumbing through logs or papers and possibly writing cryptic notes. Accordingly, a prime requisite of this keyboard is to be operable with one hand. The six keys are placed in an arc, and the symmetry of this arrangement allows right- or left-hand operation. This keyboard represents our best single-handed operator design, but this does not preclude using whatever arrangement you find most comfortable.

The keys must not require too much pressure to operate since multiple keys must be pressed during operation. They should have fairly large tops for easy access, and the closure travel distance should not be too great or speed will be sacrificed. We used standard computer-grade, reed-switch keys modified to meet the requirements. It may be more appropriate and convenient to use keys that present a low profile for operating ease, such as the types used in hand calculators.

Microcomputer Software

The heart of this keyer's operating system is the program that is entered into the 8748 microcomputer EPROM. The 8748 has 1020 bytes of erasable programmable space available, arranged in four 255-byte pages. Only about 150 bytes are used for the operating program, and about 50 for a look-up conversion table that generates the output code characters. Table 1 shows the program listing for the complete operating system, including the character look-up conversion table for the authors' choice of input key combinations, and the corresponding international Morse code and special characters. The look-up conversion table is purposely placed in page 3 of the EPROM because a simplified instruction for accessing this type of table is available in the 8748 microcomputer. The input key codes are shown in Table 2. The choice of input key codes is based partly

Table 1
Program Listing for the 8748 Microcomputer EPROM

Line No. Decimal	Line No. Hexadecimal	Machine Code Hexadecimal	Instruction Mnemonic
Page #0			
000	00	04	JMP
001	01	0C	#12
002	02	00	NOP
003	03	04	JMP
004	04	55	#85
005	05	00	NOP
006	06	00	NOP
007	07	00	NOP
008	08	00	NOP
009	09	00	NOP
010	0A	00	NOP
011	0B	00	NOP
012	0C	27	CLR A
013	0D	39	OUTL P1, A
014	0E	A8	MOV R0, A
015	0F	A9	MOV R1, A
016	10	AB	MOV R3, A
017	11	AE	MOV R6, A
018	12	BA	MOV R2, data
019	13	01	#1
020	14	A5	CLR F1
021	15	97	CLR C
022	16	00	NOP
023	17	00	NOP
024	18	BF	MOV R7, data
025	19	FC	#252
026	1A	05	EN I
027	1B	BE	MOV R6, data
028	1C	00	#0
029	1D	0A	IN A, P2
030	1E	37	CPL A
031	1F	C6	JZ
032	20	1D	#29
033	21	AE	MOV R6, A
034	22	BD	MOV R5, data
035	23	0A	#10
036	24	BC	MOV R4, data
037	25	14	#20
038	26	0A	IN A, P2
039	27	37	CPL A
040	28	96	JNZ
041	29	3A	#58
042	2A	FC	MOV A, R4
043	2B	96	JNZ
044	2C	36	#54
045	2D	FD	MOV A, R5
046	2E	C6	JZ
047	2F	3E	#62
048	30	07	DEC A
049	31	AD	MOV R5, A
050	32	BC	MOV R4, data
051	33	14	#20
052	34	04	JMP
053	35	26	#38
054	36	07	DEC A
055	37	AC	MOV R4, A
056	38	04	JMP
057	39	26	#38
058	3A	4E	ORL A, R6
059	3B	AE	MOV R6, A
060	3C	04	JMP
061	3D	22	#34
062	3E	FE	MOV A, R6
063	3F	43	ORL A, mask
064	40	CO	#192
065	41	37	CPL A
066	42	C6	JZ
067	43	1B	#27
068	44	FF	MOV A, R7
069	45	C6	JZ
070	46	49	#73
071	47	04	JMP
072	48	44	#68
073	49	FE	MOV A, R6
074	4A	00	NOP
075	4B	00	NOP
076	4C	00	NOP
077	4D	E3	MOVP3 A, @A
078	4E	AF	MOV R7, A
079	4F	04	JMP
080	50	1B	#27
081	51	00	NOP
082	52	00	NOP
083	53	00	NOP
084	54	00	NOP
085	55	AB	MOV R3, A
086	56	FB	MOV A, R0
087	57	C6	JZ
088	58	5C	#92
089	59	C8	DEC R0
090	5A	04	JMP
091	5B	92	#146
092	5C	F9	MOV A, R1
093	5D	96	JNZ
094	5E	63	#99
095	5F	FF	MOV A, R7
096	60	A9	MOV R1, A
097	61	BF	MOV R7, data
098	62	00	#0
099	63	76	JF1
100	64	83	#131
101	65	F9	MOV A, R1
102	66	97	CLR C
103	67	F7	RLC A
104	68	A9	MOV R1, A
105	69	C6	JZ
106	6A	8B	#139
107	6B	FA	MOV A, R2
108	6C	96	JNZ
109	6D	77	#119
110	6E	23	MOV A, data
111	6F	03	#3
112	70	39	OUTL P1, A
113	71	A5	CLR F1
114	72	B5	CPL F1
115	73	E6	JNC
116	74	7F	#127
117	75	04	JMP
118	76	7B	#123
119	77	23	MOV A, data
120	78	01	#1
121	79	04	JMP
122	7A	70	#112
123	7B	B8	MOV R0, data
124	7C	10	#16
125	7D	04	JMP
126	7E	92	#146
127	7F	B8	MOV R0, data
128	80	30	#48
129	81	04	JMP
130	82	92	#146
131	83	23	MOV A, data
132	84	00	#0
133	85	29	OUTL P1, A
134	86	A5	CLR F1
135	87	B8	MOV R0, data
136	88	10	#16
137	89	04	JMP
138	8A	92	#146
139	8B	E6	JNC
140	8C	92	#146
141	8D	B8	MOV R0, data
142	8E	20	#32
143	8F	97	CLR C
144	90	27	CLR A
145	91	AA	MOV R2, A
146	92	FB	MOV A, R3
147	93	93	RETR

Page 1

Empty

Page 2

Empty

Page 3 (Look-up Table for Code Characters)

	Address	Data	Character
—	04	A0	A
—	06	78	B
—	0C	58	C
—	1C	70	D
—	14	C0	E
—	0E	D8	F
—	1E	30	G
—	16	F8	H
—	0A	E0	I
—	1A	88	J
—	05	50	K
—	07	B8	L
—	0D	20	M
—	1D	60	N
—	15	10	O
—	0F	98	P
—	1F	28	Q
—	17	B0	R
—	0B	F0	S
—	1B	40	T
—	25	D0	U
—	27	E8	V
—	3A	90	W
—	2D	68	X
—	3D	48	Y
—	35	38	Z
—	31	04	0
—	02	84	1
—	03	C4	2
—	12	E4	3
—	32	F4	4
—	22	FC	5
—	13	7C	6
—	33	3C	7
—	23	1C	8
—	11	0C	9
—	21	74	$\overline{BT}$
—	20	AA	.
—	30	CE	?
—	24	32	,
—	09	6C	/
—	26	AC	$\overline{AR}$
—	2A	BC	$\overline{AS}$
—	29	EA	$\overline{SK}$
—	28	A8	$\overline{AA}$
—	18	86	'

on the six-key Braille code. This may not be the most efficient or appropriate code, but it is the code familiar to one of the authors.

Software control makes this keyer a universal code machine. Input key combinations and output codes may be chosen almost at the preference of the builder, with no more required than changes in the look-up conversion part of the program. Programming of the EPROM requires additional equipment and information that is not covered in this article. Contact someone who is able to perform this service, since it has to be done only once. A source of information regarding programming of the 8748 is available.[1] As a last

[1] *MCS-48 User's Manual*, Intel Corp, 3065 Bowers Ave, Santa Clara, CA 95051.

resort, one of the authors will program your 8748 for $5 if the request includes an 8748 with cleared memory and a suitable return envelope with return postage.

Testing And Operating The Keyer

Check the +5 V regulated power supply before installing U1 and U2. If the voltage is correct, 4.8 to 5.1 V, turn off the keyer and install the ICs. Turn on the keyer and, if all is working properly, you should be greeted by a string of five dots at whatever speed was set. As explained earlier, these initial five dots only appear at the monitor output. Next, press some key code combination shown in Table 2 and release the keys. An audible output of the character you chose should be heard on the monitor and also be available at the optoisolator output to key your transmitter.

Should the keyer fail to function, turn it off and check the wiring and part values and placement very carefully. If you used a PC board, check it carefully for errors and hairline cracks. Trail solder along the PC traces wherever it looks suspicious. If the output dots and dashes are irregular in length, the most likely cause is that the interrupt pulse to the microprocessor is too long. Check the wiring associated with U1, especially the 0.1-μF timing capacitor and the ground return path between U1 and U2.

Since the input key combinations will undoubtedly be new to you, it will take a little time to memorize them and become reasonably proficient in their use. Remember to release the keys to get an output and make use of the two-character buffer to maintain the continuity of code output. Our thanks to Gary Blaine, K2SC, for suggesting the microcomputer approach and for programming assistance.

Table 2
Input Key Codes

Character	Braille Key Codes (left to right) 1	2	3	4	5	6
A	—	—	X	—	—	—
B	—	X	X	—	—	—
C	—	—	X	X	—	—
D	—	—	X	X	X	—
E	—	—	X	—	X	—
F	—	X	X	X	—	—
G	—	X	X	X	X	—
H	—	X	X	—	X	—
I	—	X	—	X	—	—
J	—	X	—	X	X	—
K	X	—	X	—	—	—
L	X	X	X	—	—	—
M	X	—	X	X	—	—
N	X	—	X	X	X	—
O	X	—	X	—	X	—
P	X	X	X	X	—	—
Q	X	X	X	X	X	—
R	X	X	X	—	X	—
S	X	X	—	X	—	—
T	X	X	—	X	X	—
U	X	—	X	—	—	X
V	X	X	X	—	—	X
W	—	X	—	X	X	X
X	X	—	X	X	—	X
Y	X	—	X	X	X	X
Z	X	—	X	—	X	X
0	X	—	—	—	X	X
1	—	X	—	—	—	—
2	X	X	—	—	—	—
3	—	X	—	—	X	—
4	—	X	—	—	X	X
5	—	X	—	—	—	X
6	X	X	—	—	X	—
7	X	X	—	—	X	X
8	X	X	—	—	—	X
9	X	—	—	—	X	—
BT	X	—	—	—	—	X
AR	—	X	X	—	—	X
AS	—	X	—	X	—	X
SK	X	—	—	X	—	X
AA	—	—	—	X	—	X
.	—	—	—	—	—	X
,	—	—	X	—	—	X
?	—	—	—	—	X	X
'	—	—	—	X	X	—
/	X	—	—	X	—	—

Note: Some operators may wish to bridge two or more keys with a single finger or thumb.

Strays

I would like to get in touch with...

☐ anyone with information on the following equipment: Lafayette Radio signal generator (Model TE-20), National receiver (Model NC-90), Cornell Dublier capacitor bridge (Model BN, serial 10501), Readrite Meter Works tube tester (Model 432A) and General Electric ac-battery portable recorder (Model M 8450A). Alvord Paull, N6JJB, 1883 Jasmine St, El Cajon, CA 92021.

☐ anyone with a manual and circuit diagram for Jackson Model CRO-2 oscilloscope. James Connell, KH6JKG, 66-303 Haleiwa Rd, No 202, Haleiwa, HI 96712.

☐ anyone who has worked CAT programs for the Yaesu FT757GX on Texas Instruments 99/4A. LV Beachboard, K5BDH, 130 East Crosby, Slaton, Texas 79364.

☐ anyone with circuit/schematic diagram of a Sylvania CRT SC2799 or a scope manual. H Schroeter, Dorfstrasse 14, 3131 Gollau, Fed Rep of Germany.

☐ anyone with information of modifying the DX100 to improve signal quality. R. Wright, 3260 Lajoie, Trois Rivieres, PQ G8Z 3G8, Canada.

☐ anyone with schematic for IBM Mag Card II power supply. Howard S Robbins, KA8JIX, 15 Stonington Dr, Pittsford, NY 14534.

☐ anyone with operating manual for Knight TR106 6-m transceiver. W R Freas, K3YKM, 435 E Lancaster Ave., St Davids, PA 19087.

☐ anyone using a Timex 2000 or 2068 for Amateur Radio. Manos Darkadakis, SV1IW, Box 23051, 112 10 Athens, Greece.

Next Month in *QST*

Among the technical articles in the February issue you'll find the first of a three-part tutorial on the decibel, as well as a discussion on several uses for computer spreadsheets in the modern ham shack. Also, the Product Review column takes a close-up look at the TS-940S, Kenwood's newest HF transceiver.

On the features side, you'll find a wrap-up of the Amateur Radio events that shaped 1985—from a major preemption ruling and Amateur Radio's response following a tremendous earthquake, to WØORE's historic operation from space. And there'll be a look at the League's *License Manual* series—how to use them to get that first or upgraded ticket. Other items include the results of the Radiosport contest and a look at the DX Contest Awards Program.

• *Beginner's Bench*

The Principles and Building of SSB Gear

Part 5: Man does not live by milliwatts alone! So let's learn how to increase our SSB exciter output power through linear amplification. Our project this month is a 10-W broadband amplifier.

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

Faithful reproduction of the RF input signal, with minimum distortion, is the name of the game when using a linear amplifier. Of course, the amplifier must increase the signal power while preserving the waveform characteristic. If we are to ensure acceptable linear amplification, we must make certain that the low-power driving signal fed to the amplifier is relatively free of unwanted distortion products (and spurious responses that can originate in the SSB exciter unit). A clean driving signal should be available from the circuits described earlier in the series, so let's concentrate this month on the 10-W amplifier we will add to obtain a necessary boost in signal level.

RF Power Amplifiers in General

Whether we are considering vacuum-tube or solid-state power amplifiers, various linear and nonlinear operating classes are available to us. For example, we may use a class-C amplifier (nonlinear) to boost the power of an FM or CW signal without the need to worry about generating distortion products. Similarly, we may employ a class-C amplifier for AM power amplification, provided the modulation is applied to the last stage (class-C) of the transmitter. On the other hand, if we wish to amplify SSB signals, we must use a linear amplifier (class A, class AB or class B) to minimize unwanted distortion products developed within the amplifier. If we have a low-power AM transmitter and wish to increase the effective output power of the station, we need to use a linear amplifier after the transmitter stage to which modulation is being applied. The class of operation is controlled by the bias voltage we apply to the amplifier tubes or transistors. Linearity is dependent also upon the amount of driving power we supply to the amplifier input. Proper coupling to the load (antenna) is also important to linear operation, along with attention to impedance matching between the amplifier and the load.

The different classes of amplifier operation yield unlike percentages of *efficiency*. Class-C service is the most efficient (80%, approximately), and class-A operation provides roughly 33% efficiency. What is efficiency? It is the ratio of the RF power output to the dc power input to an amplifier, expressed as a percentage. For example, if an amplifier tube operated with a plate voltage of 500, and the plate current at resonance was 150 mA, the dc input power would be 75 W (0.150 A × 500 V = 75 W). Now, if the amplifier were operating efficiently in class-C, we would expect an RF-output power of 60 W (80% efficiency). If the same amplifier were changed to class-A operation (33% efficiency), the output power would drop to approximately 25 W.

The rules of efficiency apply rather well to vacuum-tube amplifiers; but solid state amplifiers, by and large, are designed for broadband rather than narrow-band service, and the efficiencies run pretty much the same for class AB or C service—50 to 60 percent, typically. This is caused in part by the need to include negative feedback (some of the output power is routed back to the input of the amplifier). The feedback voltage helps to ensure uniform power amplification across a wide range of frequencies, such as 3 to 30 MHz. Solid-state amplifiers, unlike their tube-type brothers, develop more gain as the operating frequency is lowered. A given transistor that is rated for 30 MHz may develop incredible gain at, say, 3.5 MHz, and this leads to destructive self-oscillation if careful design and feedback networks are not used. Self-oscillation occurs not only in the low-frequency or high-frequency spectrum, but it often takes place at audio frequencies! I have actually heard the transistors "screeching" when strong audio oscillations were taking place in a homemade transistor power amplifier. On one occasion I could see a bluish glow coming from within the transistors (visible through the ceramic heads of the devices) during a period of instability! Needless to say, the transistors self-destructed.

Class-AB and Class-C Circuit Comparison

A lengthy discussion would be necessary in order to define the various classes of amplifier operation. Biasing and the operating angles for AB and C types of amplifiers are subjects treated quite thoroughly in the ARRL *Handbook*, 1986 edition, pp 5-4 through 5-6. Also see p 3-17.

The mechanism of biasing is shown in schematic-diagram form in Fig 1. Theoretically, no collector current flows in Q1 (drawing A) when driving power is absent. No external bias is applied to the base of the class-C amplifier. If Q1 were a tube, a negative voltage would be required at the grid in order to cause plate-current cutoff for class-C service. But, the transistor of Fig 1A draws only leakage current (microamperes) when the base is returned to dc ground as shown. Collector current flows only when a driving signal is applied to the base. The efficiency can be increased somewhat by biasing the transistor to complete cutoff. The addition of a small-value resistor and bypass capacitor between the emitter and ground is the usual technique used for biasing a class-C transistor amplifier. Placing a resistance or negative bias between the base and ground is dangerous, because it applies a prohibitive potential between the transistor base and emitter, which will lead to internal destruction of the device during peaks in driving voltage.

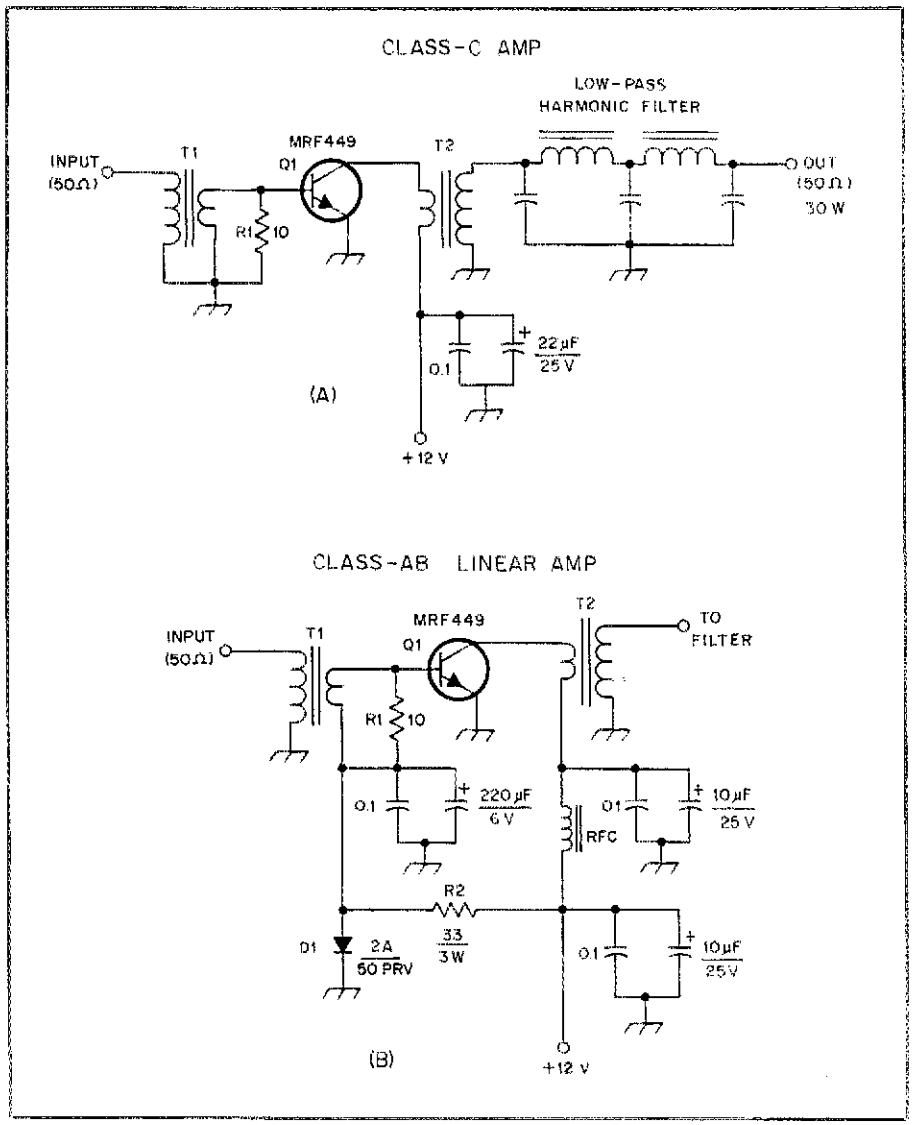


Fig 1—The circuit at A shows how a transistor RF amplifier is biased for class-C operation. T1 and T2 are broadband matching transformers. Circuit B demonstrates the linear-amplification concept. A positive bias voltage of approximately 0.7 is supplied to the base of Q1 to establish class-AB operation. D1 provides the required bias voltage (see text).

The 10-ohm resistor (R1) across the T1 secondary winding does not create a bias voltage when the stage is driven. The dc resistance of the transformer winding is a fraction of an ohm, which negates the effect of the resistor. R1 serves as a load resistor that lowers the Q of the T1 secondary winding. This helps prevent self-oscillation while creating a more constant load for the exciter that connects to T1.

A class-AB amplifier is shown in Fig 1B. The circuit is nearly identical to that of Fig 1A except for the addition of positive bias on the base of Q1. R1 is retained as a load resistor, but the bottom lead of the T1 secondary winding is lifted from ground to permit a positive voltage to reach the transistor base. This voltage causes a steady flow of standing or quiescent collector current when no excitation signal is present. The current increases when drive is applied.

D1 is a silicon diode. Therefore, the barrier voltage is roughly 0.7, which is the effective bias that is applied to Q1. The bias results from the voltage drop across the diode junction. R2 acts as a current-limiting resistor to protect the diode. An RF choke and two additional capacitors have been added to the collector circuit of Fig 1B. These serve as a decoupling network between the collector and base of Q1. This prevents RF output energy from flowing along the +12-V line to the base of Q1. Self-oscillation might result if this precaution were not taken.

Both amplifiers in Fig 1 are single-ended types. In practice, most solid-state RF power amplifiers are push-pull units. Push-pull operation offers the advantage of improved harmonic reduction (cancellation) at the even harmonics (2nd, 4th, and so on). This is particularly important when using solid-state amplifiers, which have substantially more harmonic currents present in the output than is normal for vacuum tubes. In a typical solid-state RF amplifier the 2nd and 3rd harmonics might be only 10 or 12 dB below the peak level of the desired signal power. Therefore, without proper harmonic filtering, a 100-W amplifier might produce 10-W harmonics that could be heard worldwide, depending on the antenna being used!

Pros and Cons of Tubes and Transistors

Tubes withstand output-load mismatches much better than transistors do in a severe case. When a high SWR exists between the transistor amplifier and the load, collector-to-emitter RF voltage can soar to prohibitive levels. This excessive peak voltage may exceed the safe ratings of the transistor, thereby causing immediate destruction of the device. Tubes are more tolerant of high peak voltages.

Heat is the enemy of tubes or transistors. We must be sure to provide ample heat sinking for our transistors. This is done by thermally coupling the transistor body to a large metal surface or heat sink. The heat sink absorbs much of the transistor heat and helps to keep the transistor junction temperature within safe boundaries. My rule of thumb for cooling transistors is to apply normal rated power for one minute, then turn off the amplifier and drive. If the heat sink is just warm to the touch, all is well. If holding my finger on the heat sink causes discomfort, I switch to a larger sink. This method has always worked for me, however unscientific it may be.

A notable advantage of a broadband transistor amplifier is that fixed-tuned filters and broadband matching transformers can be used in the output circuit. This eliminates the need to dip and load (tune) the output tank when changing operating bands or frequencies. Contesters, DXers and handicapped operators find this feature especially attractive.

Amplifier Distortion

Earlier, I referred to linear amplifier intermodulation distortion (IMD). This form of distortion takes place when an amplifier is fed more than one input frequency (tone). The tones combine to produce additional amplifier output signals that are not present at the input of the amplifier. These are unwanted signals. The human voice contains many varying-frequency bursts that can generate amplifier IMD products. They cannot be eliminated, but good design and proper operating procedures can limit the power of these responses. Fig 2 shows a spectral display of the output of a linear amplifier that is driven by a two-tone signal. The two high peaks at the center are the desired output responses. Left and right of these peaks we can see IMD-product responses (3rd-, 5th- and 7th-order IMD products). The first responses (3rd order) are over 30 dB below peak power, which is considered accept-

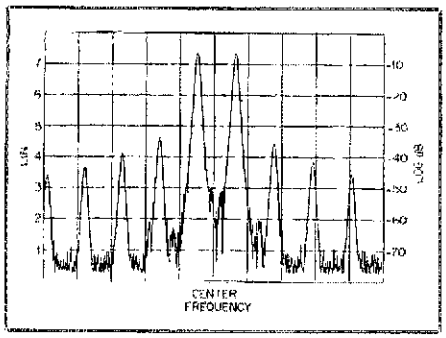


Fig 2—Spectrum-analyzer display of a two-tone SSB signal. It shows the IMD products caused by the two tones. Each horizontal division is equal to 1 kHz, and each vertical division represents 10 dB. See text for a discussion of the IMD phenomenon.

able. The 5th- and 7th-order products are somewhat lower in amplitude. If the IMD products are too great in magnitude, our signals will be excessively broad and will cause interference to others who share the amateur bands with us. The usual cause of excessive IMD in commercial amateur gear is the operator. That is, he or she may turn up the audio gain too high, shout into the mic, and grossly overdrive the linear amplifier.

A Practical Linear Amplifier

Fig 3 contains a schematic diagram of this month's workshop project. Circuit boards and parts kits for this amplifier are available from A & A Engineering.[1]

The circuit shows a pair of Motorola MRF475s in a push-pull arrangement. Broadband transformers (T1 and T2) provide a match to 50 ohms at each end of the amplifier. C1, across the primary of T1, tunes out unwanted reactance of the primary winding. This helps ensure a low SWR if the amplifier is used at frequencies in the 14- to 29-MHz range: This circuit is suitable for operation from 1.8 through 30 MHz when the appropriate filter is used at FL1. Suitable filter constants and parts values are available in the transmitting chapter of the ARRL *Handbook*.

C2, C3, R1 and R4 of Fig 3 are used as gain-leveling components. As the operating frequency is lowered, these components pass smaller amounts of the driving signal, thereby compensating for the increased transistor gain versus frequency mentioned earlier. Without this network we would have to reduce the driver output as the operating frequency was lowered. With the network in place, the exciter can operate at the same power-output level from 160 through 10 meters, should you choose to incorporate this circuit in an all-band rig.

Bias for class-AB service is developed by means of D1, as discussed with relation to Fig 1B. The efficiency of this amplifier is between 50 and 60 percent.

Negative feedback is provided by the inclusion of R6, Z1 and Z2. As the operating frequency is lowered, the feedback network allows more and more output energy to be fed back to the input circuit. This provides a gain-controlling action. R6 is located on the FL1 side of T2, and the hookup-wire leads from R6 are passed through the core of T2 (to the Q1, Q2 side of T2), where ferrite beads Z1 and Z2 are located. The wires continue along the PC board to the base pads for Q1 and Q2. The wires that pass through the T2 core pick up some of the output energy of the amplifier. Z1 and Z2 offer less and less resistance to the flow of RF current as the operating frequency is lowered. Therefore, we actually have two mechanisms for gain control versus fre-

[1]Notes appear on page 32.

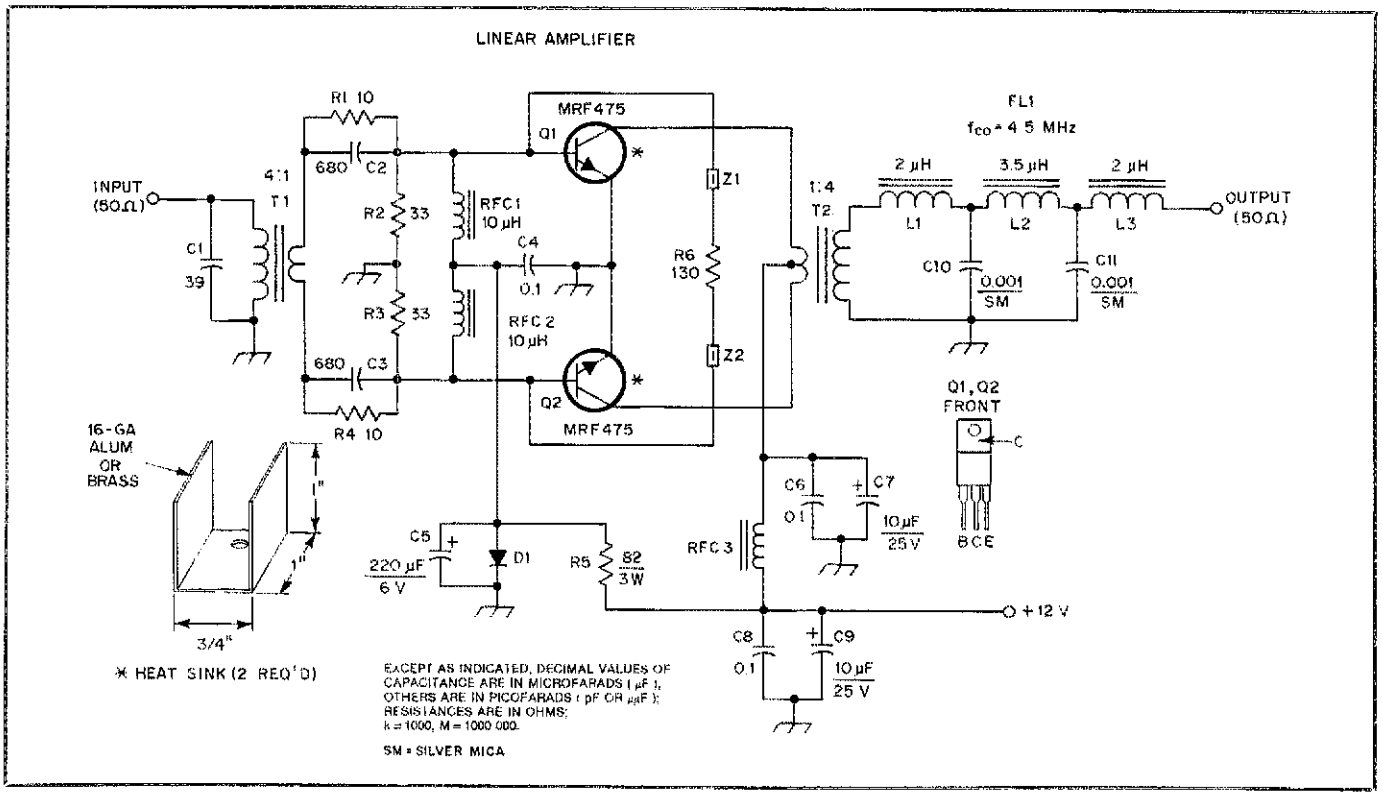


Fig 3—Schematic diagram of a 10-W linear amplifier. Capacitors are disc ceramic unless otherwise noted. Polarized capacitors are electrolytic or tantalum. Resistors are ½-W carbon composition except for R5, which is a 3-W unit.

D1—2-A, 50-PIV silicon rectifier diode.

L1, L3—20 turns of no 22 enam wire on an Amidon T50-2 toroid core.

L2—26 turns of no 24 enam wire on an Amidon T50-2 toroid core.

Q1, Q2—Motorola power transistor. Avail. from MHz Electronics, 2111 W Camelback Rd, Phoenix, AZ 85015. Also see note 2 for imported equivalent.

RFC1, RFC2—Miniature 10-µH RF choke (Mouser Electronics or equiv).

RFC3—5 turns of no 22 enam wire on an Amidon FT50-43 toroid.

T1—Two rows of three each Amidon FT37-43 toroids. Glue toroids together to form two sleeves, then glue sleeves together side by side to form balun core. Epoxy cement recommended. Primary has 4 turns of no 24 enam wire. Secondary consists of 2 turns of small insulated hookup wire.

T2—Amidon large balun core, no 43 material (ferrite, 900 μ_i). Primary has one turn of no 22 hookup wire. Secondary has two turns of hookup wire. Feedback-loop hookup wire is passed through core (see text).

Z1, Z2—Jumbo Amidon ferrite bead, no 43 ferrite material (see text).

quency (feedback and input-leveling networks). This general scheme was borrowed from Motorola application notes.

T2 serves as a matching transformer to interface the 29-ohm collector-to-collector impedance to the 50-ohm harmonic filter. We may calculate the collector impedance of a single transistor by means of $Z = V_{ce}/2P_o$. Thus, if a transistor provided 5 watts of power output and the collector-to-emitter voltage was 12, the equation would become 144/10 = 14.4 ohms.

FL1 is a low-pass filter designed for a cutoff frequency slightly above the highest desired operating frequency (4.5 MHz in this case). Our filter ensures that all harmonic responses are at least 40 dB below peak desired output power. RFC3 and the related bypass capacitors act as a decoupling network for the + 12 V supply line, as discussed earlier. C5 charges to help regulate the 0.7-V forward bias for Q1 and Q2. C7 and C9 function as bypass capacitors for VLF and audio frequencies. This minimizes the occasion for low-frequency self-oscillation. C6 and C8 act as bypass capacitors for the RF frequencies between 1.8 and 30 MHz. C4 serves in the same manner.

The driving power required to provide 10 W of amplifier output power is between 1 and 2 W. Less power would be needed if T1 did not have some losses, and if the RC leveling network were not present.

Construction Notes

When designing your own PC boards, be sure to keep the layout in a straight line to reduce unwanted coupling between the input and output parts of the circuit. Also, keep all PC-board foils large and direct. It is vital to minimize unwanted stray inductances in the low-impedance sections of the amplifier circuit. Wide, short foils reduce the inductance of the circuit-board elements.

The PC board used should be copper clad on both sides. The foil on the unused side of the board is included as a ground plane to help stability. It should be made common to the ground foils on the etched side of the board at several points. This can be done by passing short pieces of bus wire through the board, then soldering them in place on both sides of the PC board.

The metal tab of the MRF475 transistors is common to the collector. The homemade heat sinks are mounted on isolated PC pads to prevent short circuiting the + 12-V line. The copper around the heat-sink mounting-screw holes (on the ground-plane side of the board) is etched away to prevent the screw heads from contacting the ground plane. Heat-sink compound (silicone grease) is used between the transistor bodies and the heat sinks. The Q1 and Q2 collector leads are snipped off, since the tabs serve as the circuit connection in this design.

You may substitute similar TO-220 transistors for the MRF475s. The devices specified were earmarked for CB use and carry specifications for 27 MHz. Any bipolar transistor with similar ratings should be suitable.[2] V_{ce} should be 24 V or greater, P_d at 10 W and the gain should be 10 to 13 dB at 30 MHz.

In Closing

Space was available here for the bare essentials of amplifier design and operation. I hope you will garner an up-to-date copy of the *ARRL Handbook* and dig deeper into the matter of linear amplifiers. Although the circuit in Fig 3 produces only 10 W of output power, you should be pleased with the contacts you will make on 75 meters—especially during the daylight hours when the band is not heavy with QRM.

Notes

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

[2]Two power transistors for $6, available from State Street Sales, PO Box 249, Luther, MI 49656.

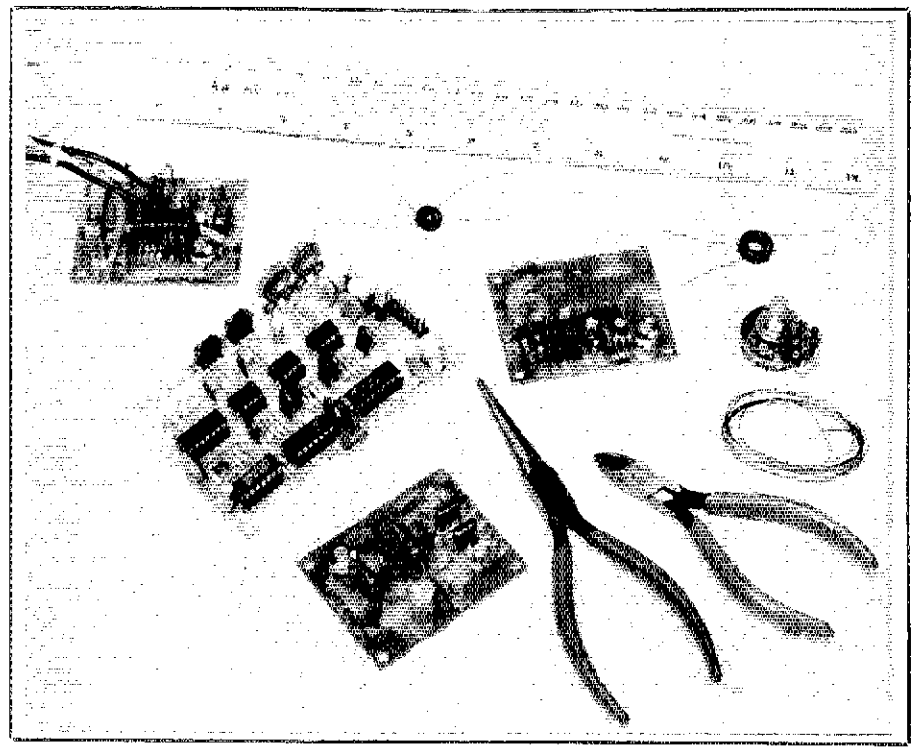
Strays

THE WHOLE KIT AND CABOODLE

☐ Do you like to build your own radio gear? Do you like the feel of excitement that comes from seeing something you've constructed with your own hands both looking and working well? Perhaps you've put off assembling some of the projects you've seen in *QST* simply because you don't want the hassle of parts procurement or the added work of etching a single PC board. Others of you may not, for one reason or another, be able to handle the small parts used in modern electronic equipment, but would still like the use of a project you've seen in *QST*. Well, don't let any of these reasons stand in your way!

To make things easier and more pleasant for *QST* readers, we've arranged to have many of the construction projects that appear in the journal be available from A & A Engineering in three forms: full kits of parts, semi-parts kits and assembled units. Some of the recent projects are shown in the accompanying photo.

So heat up that soldering iron and start building! For more information, contact A & A Engineering, 7970 Orchid Dr, Buena Park, CA 90620, tel 714-521-4160. —*Paul K. Pagel, N1FB*



Cable Television Interference: 1986

Here's how to make CATV + Amateur Radio = a happy coexistence.

By Greg Bonaguide, WA1VUG
Contributing Editor
PO Box 12248, St Petersburg, FL 33733

If you are experiencing interference caused by a leaking TV cable (CATVI), you may find it hard to believe that some hams can place their 2-meter FM radios atop a cable-fed TV set and experience no interference. Yes, even with the FM receiver tuned to 145.25 MHz! Sound strange? It's true in some locations—unfortunately, it is not true in all cable areas. In this article, I will discuss why interference from (and to) "the cable" happens. In a future *QST* article, I will give you some pointers on dealing with that interference.

Let's start this update with some vocabulary. A cable system that causes (or experiences) interference is called a "leaking cable." This means the signals that should be confined to the cable are getting out—that is called egress. Leaking also can mean that signals from outside can be getting in—we call that ingress.

Have you "heard" a leaking cable? Some hams (particularly VHF mobile operators) know the characteristics of CATV leakage all too well. While driving through a certain area, a carrier suddenly appears on frequency and rises to a significant (perhaps S9+) signal strength before receding and finally disappearing. This "trouble" area may wipe out ongoing amateur communications on some frequencies for several hundred feet or more. These "trouble spots" aren't as rare as they once were, prompting concerned hams to ask *why* the interference occurs, *where* it comes from, and *what actions*, if any, can be taken to cure it.

Why this problem with CATVI? As it turns out, growth for both Amateur Radio and CATV helped to bring about today's interference problems. The growing popularity of 2-meter FM forced amateurs below 146 MHz in pursuit of uncrowded spectrum space for repeaters. Similarly, CATV experienced a boom, not only in terms of new subscribers and wider geographical coverage, but also in new and extended cable services. These new services required more spectrum than the early 12-channel VHF cable systems could provide. New channelization plans were formed and implemented. Today, Amateur Radio and CATV operators legally use the same frequencies in the same geographical areas. This does not mean that we share frequencies in the proper meaning of the word. Cable systems are allowed to use frequencies inside their cables that are assigned exclusively to such services as broadcasting, public and safety services—and Amateur Radio. The most prominent CATV interference problem is found around the cable-channel-E visual-carrier frequency—145.25 MHz (see Table 1). Leakage levels adjacent to and near some cable systems are so high that repeater operations are impossible in parts of their normal service area. Repeater operations follow a band plan nationwide; in the heavily populated areas of the country, alternative repeater frequency pairs are not available.

Table 1
Common Channelization Plans

Channel Name	Visual Carrier Frequency Standard	HRC	IRC
2	55.25	54.0	55.25
3 Low	61.25	60.0	61.25
4 VHF	67.25	66.0	67.25
4A			73.25
5	77.25	78.0	79.25
6	83.25	84.0	85.25
A-2	109.25	108.0	109.25
A-1	115.25	114.0	115.25
A	121.25	120.0	121.25
B Mid	127.25	126.0	127.25
C Band	133.25	132.0	133.25
D	139.25	138.0	139.25
E	145.25	144.0	145.25
F	151.25	150.0	151.25
G	157.25	156.0	157.25
H	163.25	162.0	163.25
I	169.25	168.0	169.25
7	175.25	174.0	175.25
8	181.25	180.0	181.25
9 High	187.25	186.0	187.25
10 VHF	193.25	192.0	193.25
11	199.25	198.0	199.25
12	205.25	204.0	205.25
13	211.25	210.0	211.25
J	217.25	216.0	217.25
K	223.25	222.0	223.25
L	229.25	228.0	229.25
M	235.25	234.0	235.25
N Super	241.25	240.0	241.25
O Band	247.25	246.0	247.25
P	253.25	252.0	253.25
Q	259.25	258.0	259.25
R	265.25	264.0	265.25
S	271.25	270.0	271.25
T	277.25	276.0	277.25
U	283.25	282.0	283.25
V	289.25	288.0	289.25
W	295.25	294.0	295.25
AA	301.25	300.0	301.25
BB	307.25	306.0	307.25
CC Hyper	313.25	312.0	313.75
DD Band	319.25	318.0	319.25
EE	325.25	324.0	325.25
•	•	•	•
•	•	•	•
•	•	•	•
UU	421.25	420.0	421.25
VV	427.25	426.0	427.25
WW	433.25	432.0	433.25
XX	439.25	438.0	439.25
YY	445.25	444.0	445.25
ZZ	451.25	450.0	451.25

In a perfect world, a CATV system would be totally closed. That means no television signals getting out and no amateur signals getting in. Theoretically, the well-shielded coaxial cable used by the CATV industry will confine its signals. In "real world" cable systems, however, complete isolation is difficult to achieve. Any "cracks" in the closed cable may cause varying degrees of interference. Further, because amateurs use receiving equipment designed to detect extremely low-level signal energy, amateur installations are particularly sensitive to cable leakage.

The CATV System

Fig 1 is a simplified illustration of a typical CATV system. The headend is the control center of the cable system. Here, off-the-air TV signals, satellite signals (such as ESPN, HBO and others) and local originations (weather, community events, and so forth) are processed and, by

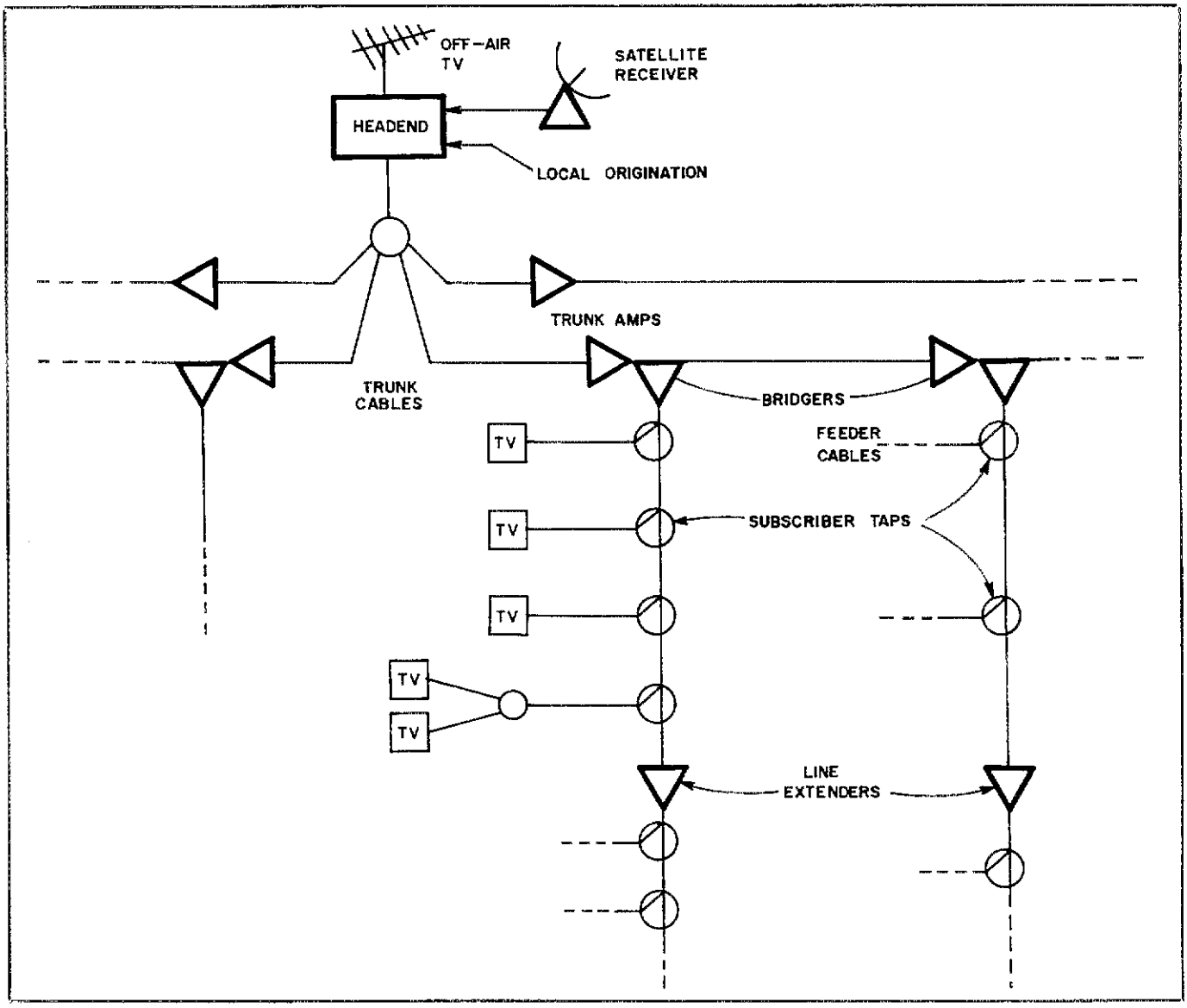


Fig 1—A typical CATV installation consists of the headend, trunk and distribution systems. Cable signals originate at the headend. The trunk system carries the signals to the various parts of the service area. Individual subscribers receive their signals from the distribution system.

modulation or conversion, put on the various cable channels. This composite block of TV signals, extending from 54 MHz to as high as 450 MHz, forms the CATV signal that is fed into the coaxial cable for "downstream" distribution.

There are two distribution systems used for transferring cable signals from the headend to the subscriber's TV set. The first, called the trunk system, forms the main distribution artery, bringing CATV into the far reaches of the community. Trunk amplifiers are placed along this trunk system to make up for cable attenuation and distribution losses.

Bridging amplifiers transfer the CATV signal from the trunk system into the second distribution artery, the subscriber system. Passive directional couplers placed along the subscriber system form taps that divert signal energy from the cable into individual subscriber converter boxes. Line-extending amplifiers compensate for cable attenuation and system losses.

Subscriber taps are usually located along the metal-sheathed cable, with a cable similar to RG-59 or RG-6 forming the "drop" to a grounding block. This grounding block is often mounted to the side of a subscriber's house. At the block the shield of the subscriber drop cable is connected to ground. A second piece of coaxial cable connects to the other side of the grounding block and weaves its way to the CATV converter box or subscriber's TV set.

Cable Power Levels

There is some misconception about the power levels used by the CATV industry. Amateurs experiencing CATVI tend to believe that CATV operators use high power levels. CATV system engineers are concerned with preserving signal-to-noise ratio (S/N) and low distortion—that means enough, but not too much power. Higher power gives better S/N, but it also increases distortion. CATV signals need only be as strong as local TV broadcast signals to give excellent results on most home TV receivers. For this reason, the trunk signal level is maintained at around 13 μW. In CATV talk, that translates to +30 dBmV (decibels referenced to 1 mV across 75 ohms). At first glance, this may not seem like a significant amount of power, but keep in mind that a typical amateur 2-meter FM receiver may have a sensitivity of 0.2 μV (across 50 ohms) for 20-dB quieting, which is equal to 0.08 pW ($\mu\mu$W). The cable-signal level is 82 dB greater than the minimum discernible 2-meter signal. That means that shield attenuation and propagation losses of greater than 82 dB will result in no discernible signal. Levels on the subscriber distribution system typically run higher (from 84.13 μW [+38 dBmV] to as high as 1.33 mW [+50 dBmV]). True, the power level found on a CATV line is ex-

tremely small; nevertheless, it can cause interference if system integrity is not maintained.

Leakage Points

Not surprisingly, there are many places where leaks are possible between the headend and the subscriber's TV set. Trunk lines have two main leakage sources. One is related to an older type of Hardline connector used on the aluminum-jacketed cable. As the outer clamp is tightened down over the bare aluminum sheath, the soft aluminum deforms under the pressure. This prevents good mechanical bite and may lead to loss of electrical conductivity. Even if a good connection is made initially, long-term exposure to wind, rain and airborne contaminants may allow corrosion to build up, effectively insulating the connector from the sheath. An entire length of cable can radiate like an antenna when this occurs. Even with improved connectors, corrosion or sloppy installation may still lead to connector radiation. This can occur at amplifier housings and passive components (power dividers, filters, directional couplers) or at cable-splice points.

The other kind of trunk leak is caused by splits or cracks in the aluminum jacket of the cable. These cracks occur because trunk lines are usually supported by utility poles and are subjected to many of the same mechanical stresses as telephone and electrical cables (rubbing or falling branches, automobile/pole collisions, wind, icing, and so forth). Trunk amplifiers, correctly installed and operated, rarely cause interference.

The subscriber distribution system uses coaxial Hardline just as the trunk system does and is prone to the same types of leakage. The bridging amplifiers and line extenders placed along the subscriber distribution system cause little interference, as long as they are installed and operated properly. Unterminated passive directional couplers (subscriber taps) may, however, be a source of leaks.

Generally, there are four taps available at each directional coupler. Unused taps are supposed to be terminated in a 75-ohm load for proper operation. The termination provides a load resistance and shielding for the connector. If a tap terminator (consisting of a 75-ohm resistance in an F connector) is missing, or an improper termination has been used, the tap can leak like a spigot. While these types of directional-coupler leaks are rather common, they are also among the easiest to fix.

In many instances, the causes of CATV interference are found between the utility pole and the subscriber's TV set. The drop line, consisting of coaxial cable similar to RG-59 or RG-6 except that it has multiple layers of shielding, is usually free to wave in the breeze, and may suffer from mechanical damage. The fittings used on the ends of these drop lines are another potential source of interference. Inexpensive F connectors may prove virtually impossible to install in such a way as to avoid interference. The biggest problem with F connectors in general is getting good mechanical and electrical contact between the aluminum fitting and the aluminum shielding of the cable. If a good connection is not made, the entire drop line may radiate.

The grounding block, found on the side of the subscriber's house, is an electrically important connection. It mates the coaxial-cable shield with an acceptable ground. (Acceptable grounds vary from state to state.) If corrosion is present, connections are defective or the heavy wire running from the block to the system ground is broken or missing, interference caused by ingress is likely.

Subscriber ignorance can also pose interference problems. Sometimes, an F connector may get pulled away from its aluminum shield or yanked right off the end of the coaxial cable at a TV converter box. Instead of calling the cable company to install a new F connector, the subscriber may just stick the end of the cable back into the converter. Seeing that his picture is restored to its original quality, he may opt to "leave well-enough alone," unaware of the radiation coming off the line. There are also those who try to feed additional TV sets using homemade signal splitters. Connections are sometimes made directly from 75-ohm coaxial cable to 300-ohm twin lead, causing unwanted radiation.

These are the most common leakage sources in a CATV system. If interference is heard in a particular area, these are the items likely to be investigated first. Of course, it would be to everyone's benefit if cable operators implemented a maintenance program to repair leaks as soon as they occurred. Unfortunately, rigorous monitoring programs can be expensive, and most systems operate on a tight budget. System employees are generally kept busy with the day-to-day responsibility of hooking up and terminating subscribers, and have little time to patrol cables. There is an answer to the patrol problem. Many cable establishments require employees to tune the FM radios in company vehicles to a frequency in or near the FM broadcast band. In the cable, a distinctive signal is carried so that cable leakage can be easily identified. Even with this type of monitoring, it is possible to miss leaks in the miles of cable found in a typical system. (These would be the leaks that occur where the cable runs through alleys or easements far from the road.) Feedback from amateurs is actually appreciated; cable operators are concerned about the state of their systems. There are mutual benefits: Hams stand to be rid of interference, and the cable operator may discover either illegal subscriber hookups or leaks that are detrimental to the overall picture quality being received by subscribers.

Recent Developments

Today, more than ever, the cable companies are taking a sincere interest in complaints lodged by amateurs. And no wonder! Today's cable technology features bidirectional signal flow. This could lead to more interference problems, unless leakage (ingress and egress) can be controlled.

Bidirectional cable is very attractive because it ushers in a whole new world of possible cable services. Chief among these are various interactive services that may soon permit subscribers to bank, shop and even go to school without leaving home. Some of the other services already in use employ only one-way "up stream" signal flow from the subscriber to the headend. Burglar and fire alarms and utility metering are examples of these upstream-only applications. Upstream transmissions use frequencies in the range from 5 to 30 MHz, overlapping several HF amateur bands. The cumulative effect of several Amateur-Radio signals "leaking" into the CATV system could be a severe overload problem. As the upstream signal moves toward the headend, amplifiers will intensify these signals, delivering large, disruptive bursts

CATV Glossary

CATVI—Interference to or from cable television
dBmV—decibels referenced to 1 millivolt across 75 ohms
downstream—moving (as a signal) from the headend toward the subscriber
egress—signals escaping from within the CATV cable
Hardline—a coaxial cable with a solid aluminum sheath
headend—the point of origin for downstream signals
ingress—signals from outside entering into the CATV cable
leak—signal egress and ingress caused by a cable fault
subscriber distribution system—the part of the cable system that delivers signals from the trunk system to the subscriber tap
subscriber drop—the part of the cable system that delivers signals from the subscriber tap to the converter or TV set
subscriber tap—a directional coupler that couples energy from the distribution system into the subscriber drop
trunk system—the "backbone" of the cable plant that delivers signals from the headend to the subscriber distribution systems
upstream—moving (as a signal) from the subscriber toward the headend

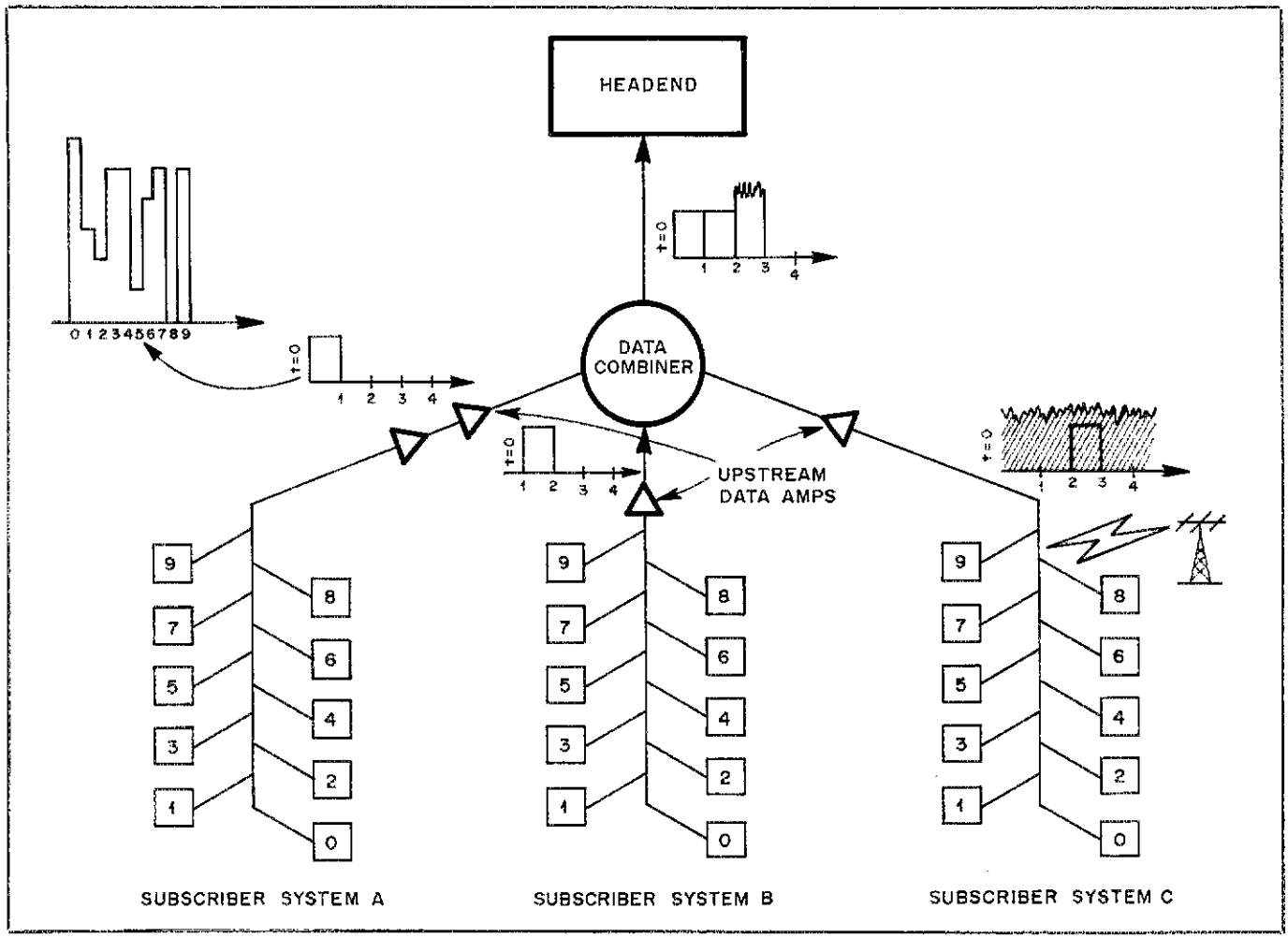


Fig 2—Interference to upstream cable signals is difficult to locate. Here, analysis of the headend composite data signal can only track the interference to subsystem C, which may be several miles long.

of energy. Not only can this ham interference significantly alter the streams of data flowing to the headend, but because it moves upstream it is difficult to pinpoint where (or how) the undesired signal entered the system (Fig 2).

Even a small, sporadic level of energy may be enough to prevent legitimate alarms from being reported. Clearly, in cases such as these, cable ingress and egress must be minimized. CATV systems must be extremely well-isolated from the noncable world.

Today, cable-TV leakage poses problems to amateurs and cable-TV operators. In some areas, interference on 145.25 MHz disrupts amateur communications. Interference from amateur HF stations may cause serious problems to modern two-way cable systems, unless cable operators take steps to clean up cable leaks. Cooperation between amateurs and CATV operators in identifying and correcting leaks can go a long way toward improving communications for everyone.

Strays

I would like to get in touch with...

☐ anyone interested in starting a net on 6-meter FM. Henry Kirschner, WBØYCQ, 266 Carissa Dr, San Luis Rey, CA 92056-1745.

☐ anyone with an instruction book or schematic for a National HRO600 receiver. Wally Cox, RR 4, Box 188, Georgetown, IN 47122.

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

☐ Wonder what you've been missing by not subscribing to *QEX*, the ARRL newsletter for experimenters? Among the features in the December issue were:

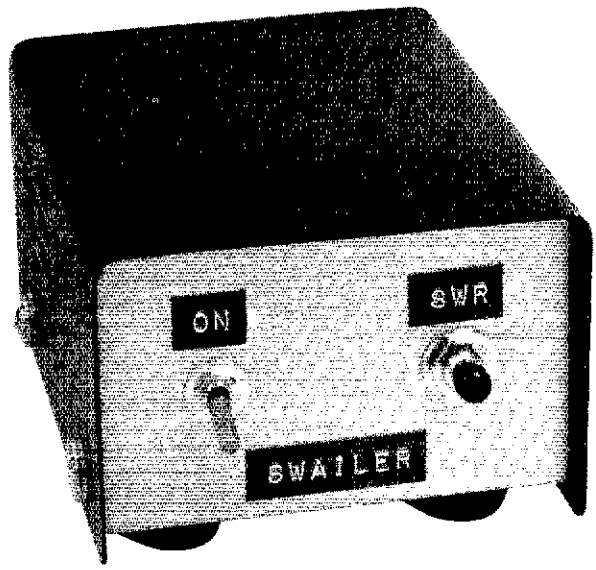
• W Conley Smith, K6DYX, shares his notes on TELEFAX for the Apple® //e and Apple®][+ computers.

• Clint Bowman, W9GLW, tells how to construct a square-wave generator for 47 kHz-52 MHz using the MC1648P IC.

QEX is edited by Paul Rinaldo, W4RI, and Maureen Thompson, KA1DYZ, and is published monthly. The special subscription rate for ARRL members is $6 for 12 issues; for nonmembers, $12. There are additional postage surcharges for mailing outside the US; write to Headquarters for details.

Meet the SWAILER!

Make tuning up easier. You can "hear" your SWR with this Standing Wave Audible Indicator and Level of Effective Radiation monitor.



By George Murphy, VE3ERP
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Alliston, ON L0M 1A0, Canada

The SWAILER is a tune-up aid that not only provides an audible indication of RF output, but also indicates SWR, thus offering a simple method of tuning both the rig and the antenna.

Operation

As an RF-output indicator, the SWAILER functions much the same as many existing audible relative-power indicators in that the transmitter is tuned to obtain the highest possible tonal pitch from the built-in speaker without losing the tone altogether. After maximum output is achieved, the SWR push button is pressed—a change in tone indicates the presence of a reflected wave. While the push button is pressed, the antenna matching network is adjusted for a tonal pitch closer to the original tone. By alternately touching up the transmitter output (with the push button released) and the matching network (with the push button pressed), the two tones can be closely matched. Identical tones indicate an SWR of 1:1.

Circuit Description

The schematic diagram for the SWAILER is shown in Fig 1. A differential amplifier, U1, drives a voltage-to-audio-frequency (V-F) converter, U2. U1 amplifies the difference voltage between input 3 (forward voltage) and input 2 (reflected voltage when S2 is open and zero volts when S2 is normally closed). If all reflected power can be tuned out, the output of U1 will be the same with S2 open as with S2 closed, resulting in identical tones from U2.

Q1, Q2 and Q3 function as a current mirror, necessary for the unit to produce a usable range of audible tones. R4 is a "set-and-forget" control that establishes a usable tonal range.

Input Signals

The SWAILER requires samples of the forward and reflected dc voltages from the transmission line between your rig and the matching network. If your matching network has a meter, or meters, to indicate forward and reflected power, the wiring is probably similar to one shown in Fig 2. To obtain sample voltages for the SWAILER, install a 1/8-inch stereo jack on the rear panel of your matching network and wire it as shown in Fig 2. This must be an open-circuit jack. A closed-circuit jack will ground your meter when the SWAILER is not connected. Solder a 0.01-μF capacitor between each jack lug and the ground lug if your matching network does not already have them at the point where you wire into the meter circuit. If your matching network does not have metering, an SWR indicator, such as the Radio Shack no 21-525 Field Strength/SWR Meter, with a stereo jack installed as described above will be required. If your SWR indicator has a nonmetallic case, make sure that the sleeve of the jack is directly connected to the internal ground of the meter circuitry. You will also require a cable, made up of two-conductor shielded wire, with a 1/8-in stereo plug at each end, and each end of the shield grounded.

Construction

The SWAILER can be installed in any small metal enclosure. I used a Radio Shack no 270-251 cabinet with S1 and S2 mounted on the front panel, and J1 on the rear panel. Drill a hole pattern on the rear panel, and secure the speaker over the holes with epoxy glue. When choosing your enclosure, don't forget to allow room for the 9-V battery. Also remember to drill a small access hole in the cabinet top to allow adjustment of R4.

There is nothing critical about parts placement except that C1 and C2, which are soldered across J1, should have leads as short as possible. There are two possibilities for PC boards for this project. Fig 3 shows the layout for a hand-cut PC board that I used in my first unit. A conventional version of this layout, suitable for etching, is shown in Fig 4. Parts placement is the same using either circuit board and is shown in Fig 5. Fig 6 shows placement of the PC board and speaker, and battery space in the cabinet.

Initial Setup

When the SWAILER is turned on, it will emit a low-pitched growl. Turn on the transmitter, with carrier inserted (CW mode), and the tone should rise. Adjust R4 to establish the tone at a mid-range pitch, then tune the transmitter for the highest possible pitch. If the tone disappears altogether, adjust R4 to bring it back into the audible range. The setting of R4 depends on the forward voltage picked up by the SWR indicator and will vary with different power levels. Once set for a particular transmitter and SWR indicator combination, however, it will probably not require resetting.

The SWAILER seems to work best at levels of 100 W or less, so if you have an amplifier, turn it off while you tune up. I

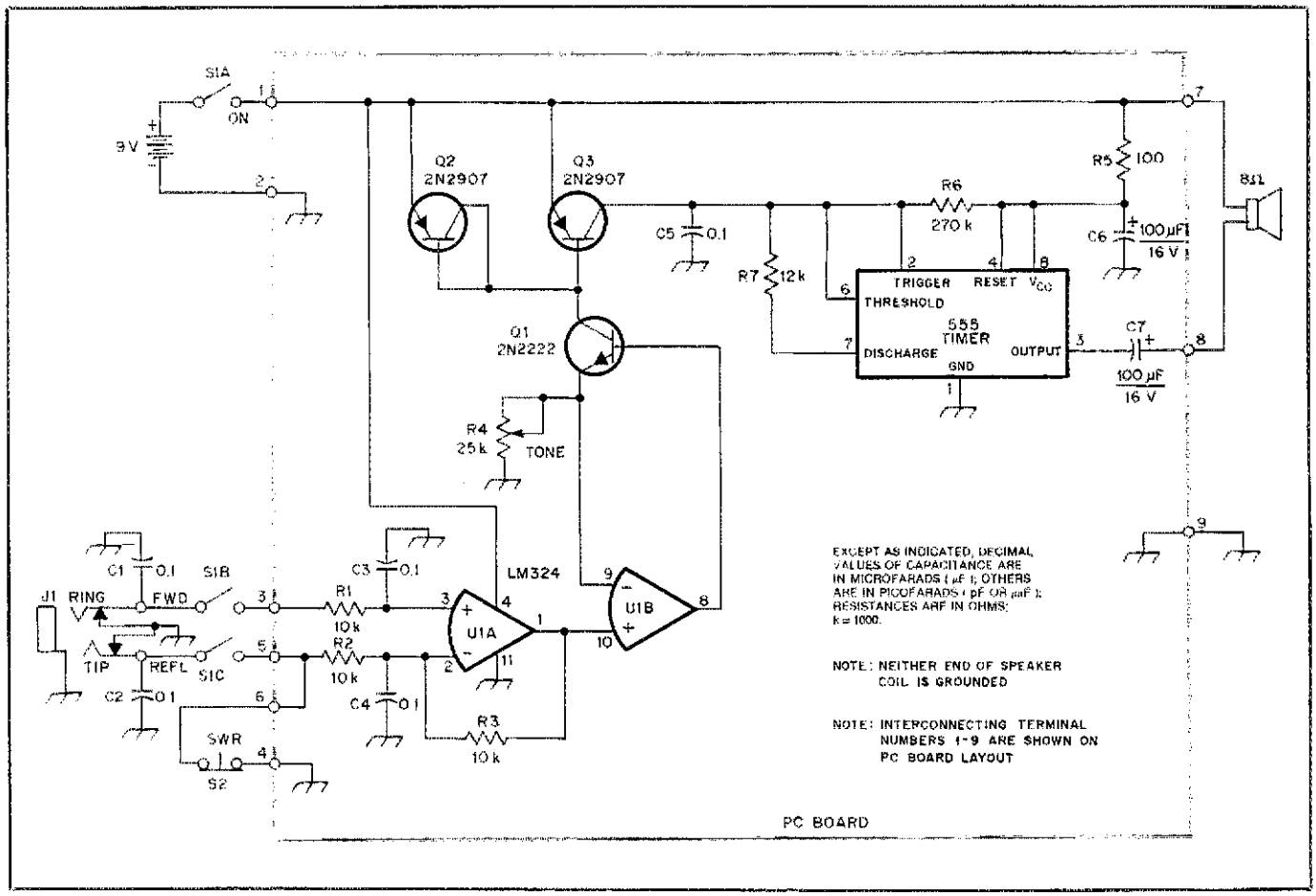


Fig 1—SWAILER schematic diagram. Radio Shack part numbers are shown in parentheses.

C1, C2—0.1-µF disc ceramic (272-135).
C3-C5—0.1-µF PC-mount capacitor (272-1069).
C6, C7—100-µF, 16-V electrolytic (272-1028).
J1—Closed-circuit stereo jack (274-250).
J2—Open-circuit stereo jack (274-249).
Q1—General-purpose NPN transistor (276-2009).
Q2, Q3—General-purpose PNP transistor (276-2023).
R1-R3—10-kΩ resistor (271-1335).
R4—25-kΩ potentiometer (271-336).
R5—100-Ω resistor (271-1311).
R6—270-kΩ resistor.
R7—12-kΩ resistor.
S1—3PST or 3PDT switch (275-661).
S2—Normally closed push-button switch (275-1548).
U1—LM324 quad op amp (276-1711).
U2—555 timer (276-1723).

Miscellaneous

Qty	*PN*	*Description*
1	(276-1999)	14-pin DIP socket.
1	(276-1995)	8-pin DIP socket.
1	(40-245)	2-in. 8-Ω speaker.
1	(270-251)	Cabinet.
1	(270-325)	Battery snap.
1	(278-1276)	Shielded cable, 2-wire.
2	(274-284)	Stereo plug.
1	(21-525)	SWR meter (if required).
9		Push-in terminals.

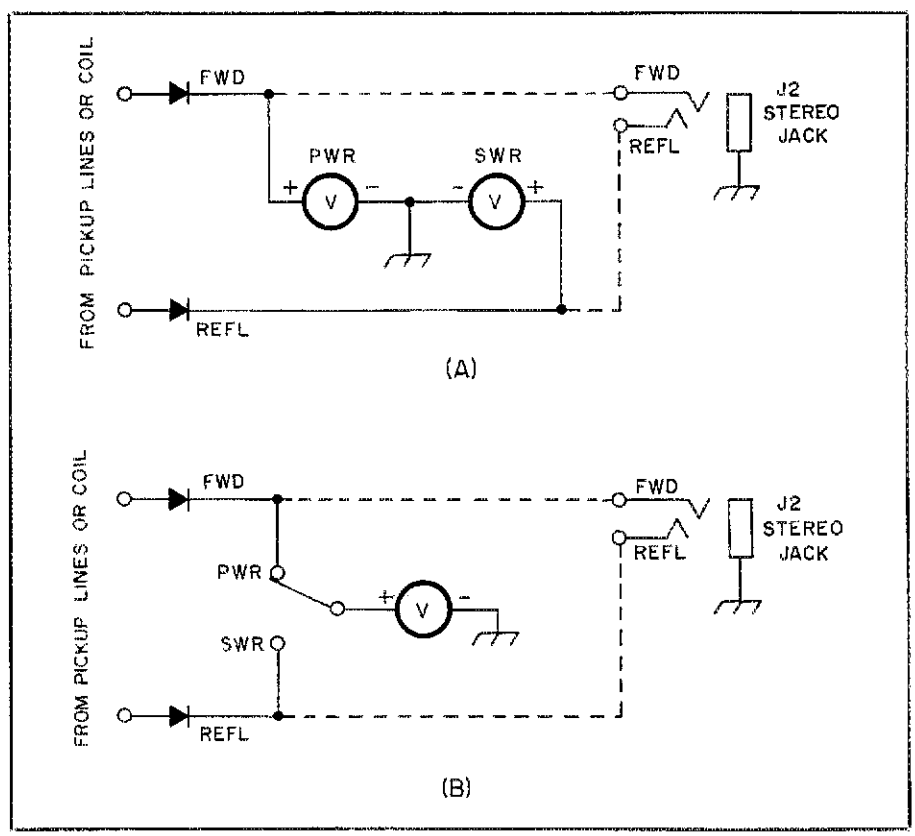


Fig 2—SWR indicator configurations. At A, 2 meters are used. At B, a single, switched meter is used.

do not have an amplifier, so I have no idea what might happen if you fed one into the SWAILER.

When the front-panel SWR button is pressed, the tone will change if reflected

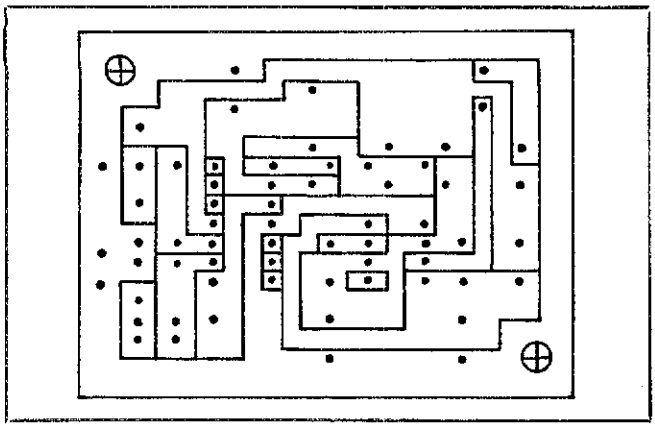


Fig 3—Hand-cut circuit board design.

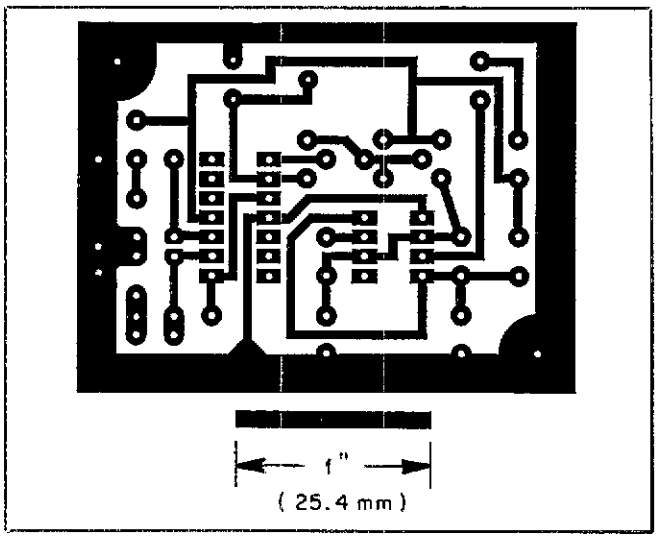


Fig 4—A conventional PC-board design.

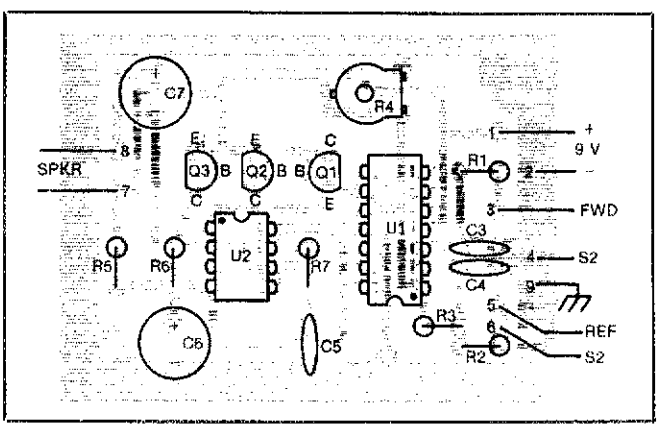


Fig 5—Parts-placement diagram for either PC-board configuration.

power is present. Adjust your matching network until the tone is as close as possible to the original tone. Release the push button from time to time to hear the forward tone, which will probably have changed somewhat. (As you reach a match, the forward power increases.) When the two tones are as close together as you can get them, you have achieved minimum SWR.

Don't expect to be able to match the two tones exactly. Unless you have the "ultimate antenna," there will probably always be a small amount of reflected power present. It may be so small that your meters won't show it, but the SWAILER will sniff it out if it is there.

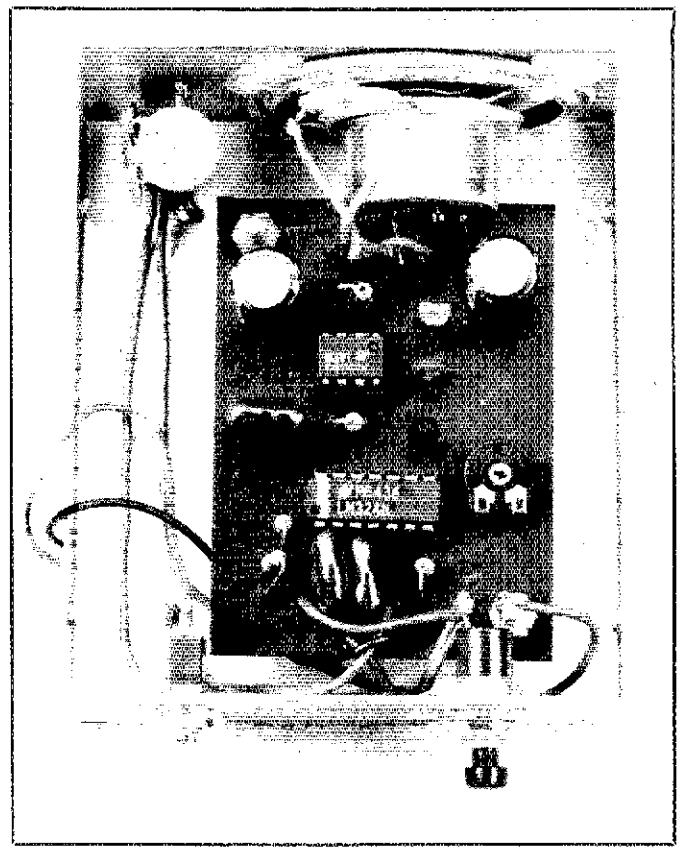


Fig 6—Internal view of the completed SWAILER. Note the position of the speaker on the rear panel.

If you lose the tone altogether during the initial adjustment procedure, adjust R4 until the tone is reestablished. Remember that where the tones are on the musical scale is unimportant—it is the *difference* between them that matters.

For your initial setup, you may want to install an additional SWR meter ahead of your matching network to check things out. The SWR push button on the SWAILER, being normally to ground, may ground the meter in your pickup unit when it is switched to read reflected power. When everything has been checked out, remove the temporary meter, and leave the meter in your pickup unit switched to the forward position to avoid grounding the meter when you are using the SWAILER. If your indicator has a separate meter for reflected power, it will be grounded by S2 when the SWAILER is in operation.

Afterthoughts

The SWAILER has lots of RF bypassing, but is still somewhat sensitive to strong RF fields. My station is upstairs, with no ground, and my antenna is a random wire running right from the matching network, so there is lots of RF in my shack. The SWAILER works fine there, however. Make sure that the SWAILER is completely enclosed in a metal cabinet. Running a ground strap from the cabinet to the station ground system wouldn't hurt. It is important that the cable between your SWR indicator and the SWAILER be shielded.

Conclusion

Try using the SWAILER. Listening to its gentle voice is a lot easier than trying to watch the antics of several meters at the same time.

Most of the credit for developing the SWAILER belongs to Jim Swail, VE3KF, and Lloyd McSheffney at the National Research Council in Ottawa, who took my original design (which didn't work very well), refined it, redesigned it and made it come to life.

Build a Homemade Signal Generator

Part 3: Last month we discussed the basic test gear needed in the ham workshop. Now, let's learn how easy it can be to build our own test instruments.†

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

Is your test-equipment budget "flat-broke and busted?" Perhaps you can push aside your reluctance to equip the home workshop with the fundamental apparatus necessary for general testing. If you, like me, dislike spending large sums of money for factory-built test gear, the appeal of low-cost homemade apparatus should cause your soldering iron to be turned on and made ready for this easy project.

Most of us would prefer to have a precision signal generator with calibrated output, wide frequency coverage and digital readout. But, we can ill afford to spend $1000 to $4000 for such an item! A simple homemade instrument is capable of performing a host of repair or design tasks, and we need not be ashamed of owning a modest unit that we built at home. Whatever our philosophy, a signal generator of some type is almost as useful as is our VTVM or VOM.

†Part 1 appears in November 1985 *QST*, page 38.

Signal-Generator Uses

Perhaps the most frequent need for a generator is when we have a receiver to troubleshoot or align. The sensitivity of a receiver can also be checked if we own a generator that has a variable attenuator at the output. This makes it possible to create a weak signal for testing the noise figure (NF) or general receiver sensitivity. At higher output levels from the generator, we may evaluate the automatic-gain control (AGC) action of a receiver. Similarly, large signals from the generator may be used when checking the performance and relative calibration of a receiver S meter.

Small-signal RF amplifiers can be tested for gain by means of a signal generator. I have used this method a number of times when evaluating a multistage, low-power linear amplifier that was designed for broadband amplification.

Types of Generators

Modern technology dictates the use of synthesizers in signal generators that are manufactured for commercial use. Certainly, this kind of circuit provides accurate and stable RF energy, but such a circuit is too complex and costly for an inexperienced amateur to tackle. The extreme option is to assemble the simplest of

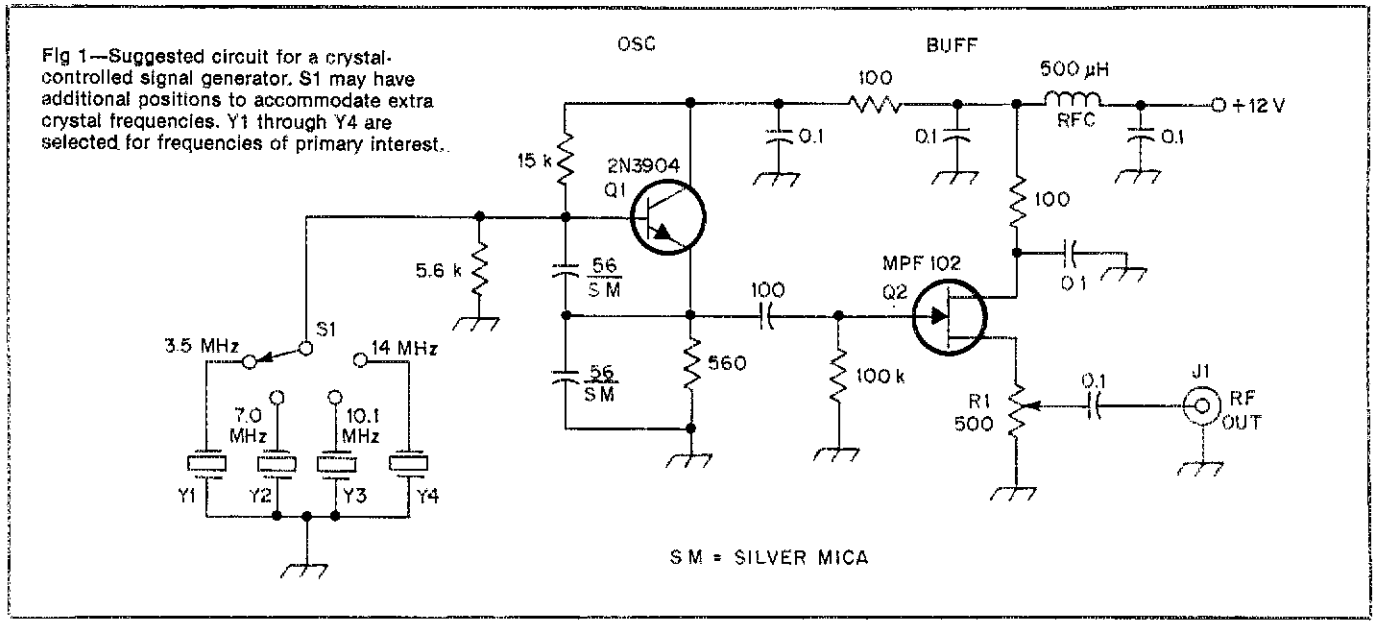


Fig 1—Suggested circuit for a crystal-controlled signal generator. S1 may have additional positions to accommodate extra crystal frequencies. Y1 through Y4 are selected for frequencies of primary interest.

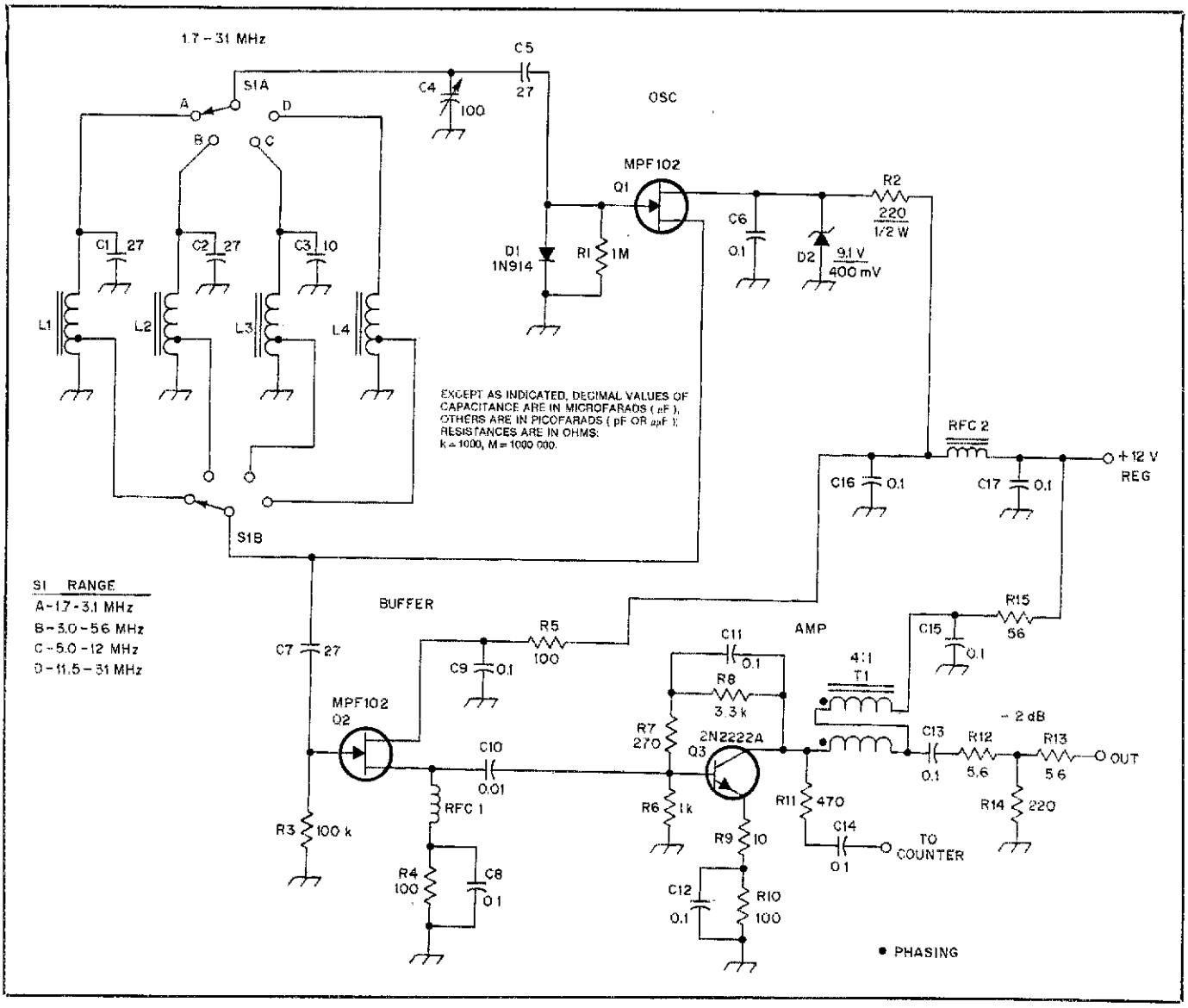


Fig 2—Circuit for a practical tunable HF-band signal generator. Fixed-value capacitors are disc ceramic, except for C1, C2, C3, C5 and C7 (see parts list). Resistors are ¼- or ½-W carbon composition.

C1, C2, C3, C5, C7—NP0 ceramic.

C4—Miniature 100-pF air variable (double-bearing type preferred).

L1—Toroidal inductor, 70μH. Use 32 turns of no 26 enam wire on an Amidon Assoc FT-50-61 ferrite toroid. Tap 8 turns from ground.

L2—Toroidal inductor, 21 μH. Use 18 turns of no 24 enam wire on an FT-50-61 ferrite toroid. Tap 5 turns from ground.

L3—Toroidal inductor, 8.5 μH. Use 41 turns of no 26 enam wire on an Amidon T50-2 powdered-iron toroid. Tap 10 turns from ground.

L4—Toroidal inductor, 1.75 μH. Use 21 turns of no 26 enam wire on a T50-6 toroid. Tap 5 turns from ground. Dip all toroids in Q-Dope® or polyurethane varnish after winding (see text).

RFC1—Miniature 1-mH RF choke.

RFC2—Use 15 turns of no 26 enam wire on an FT-37-43 ferrite toroid.

S1—Two-pole, four-position rotary wafer switch, phenolic or ceramic.

T1—Broadband bifilar-wound transformer, 4:1 Z ratio. Use 12 turns of no 26 enam wire. Twist 8 turns per inch before winding. Core is an FT-50-43 ferrite toroid.

generators by using a quartz crystal to provide a single frequency in one of the ham bands. Several crystals can be switched to allow output on several frequencies or bands. A typical circuit is shown in Fig 1. S1 selects the spot frequencies, Q1 is the oscillator and Q2 is a broadband source-follower buffer. R1 functions as an attenuator, *but does not ensure a 50-ohm output condition.* If you have a collection of crystals for popular test frequencies, you may opt for this circuit. But, the cost of new crystals would make the project more costly than the circuit we will describe later for general-coverage work.

Design Objectives

Accurate frequency readout is important for most test applications. We can do a reasonable job in this area if we employ a vernier-drive mechanism that has a finely graduated dial face. An old HRO (National Radio receiver) dial drive and gear train can be used to advantage if we decide to use analog readout. The dial mechanism from a surplus BC-221 frequency meter would also be suitable for a well-defined readout device. A dial-calibration chart can be created by logging the dial-face settings while measuring the generator output frequency with a frequency counter. Alternatively, we can plot a chart by listening to the generator signal on a calibrated general-coverage receiver.

If you are skilled in the design of digital circuits, you may wish to include a frequency counter with the circuit of Fig 2. It may be possible to buy a used frequency counter at a flea market, then make it an integral part of your signal generator. An outboard counter can be used with the circuit in Fig 2, should you not want to tie up your

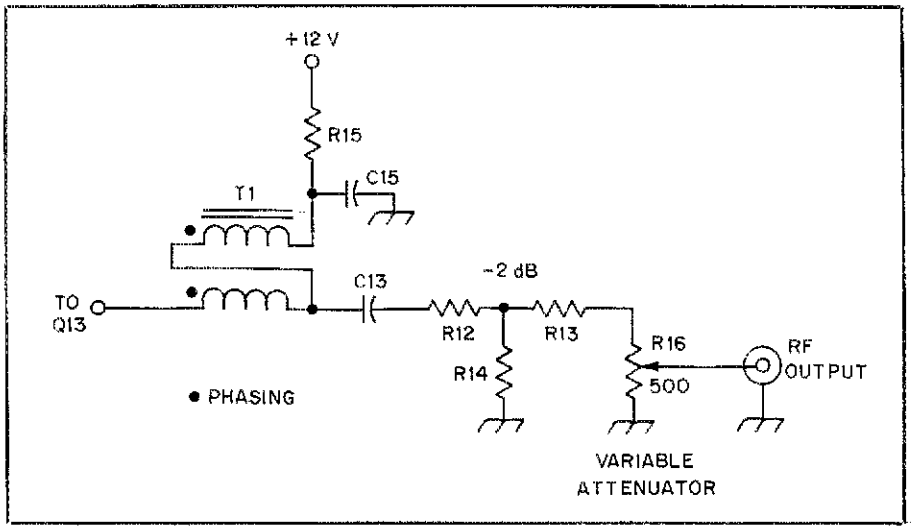


Fig 3—Method for using a variable-output attenuator with the circuit of Fig 2. This technique leaves a great deal to be desired (see text). R16 is adjusted for the generator output level desired.

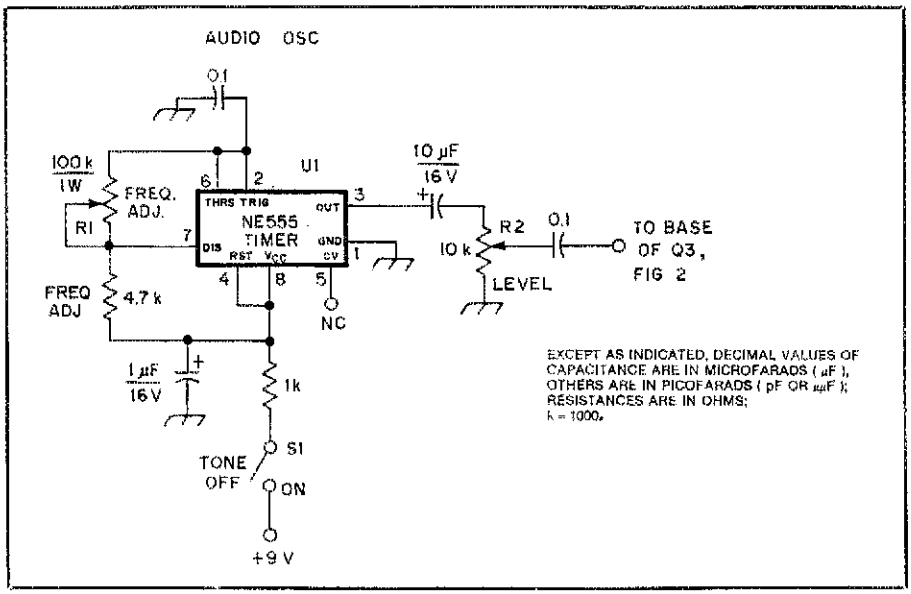


Fig 4—An audio-frequency generator that can be used to modulate the RF signal from the circuit of Fig 2. R1 sets the tone frequency and R2 determines the modulation level. This circuit is suitable also for use as a sidetone monitor or a code-practice oscillator.

counter for singular use.

Frequency stability is a primary need when using a generator. We don't want a signal that creeps and wanders when we are adjusting trimmers in a receiver! This is particularly important today when we consider the narrow bandwidth (selectivity) of modern receivers. A long-term drift of 100 to 300 Hz should be the maximum tolerable amount if we are to use our generator successfully. Solid-state devices and good design can make this order of stability possible.

Variable output power from the generator is also an important need. Ideally, the output impedance of the generator should be 50 ohms in order to have it match the impedances of most receivers and small amplifiers. A continuously variable attenuator (50 ohms) is a complex thing to design and calibrate in microvolts (μV). We will not attempt that feat in this series because the mechanical aspects of the problem are a bit challenging for the beginner. A simple alternative is offered in Fig 3. A better approach to that of Fig 3 is discussed later in this article.

Signal leakage from the generator is also a matter to keep in mind. In other words, we want the RF to come only from the "spigot," or test cable. Stray radiation from the unit will render the output attenuator useless at low power-output levels. The usual preventive technique for reducing stray radiation is to filter the power leads that enter or leave the generator. Also, the cabinet should be well designed as an RF shield (no holes or slots through which RF can escape). A double cabinet (one conductive box within another) is the prescribed approach to reduce leakage greatly. You may wish to design your generator enclosure in this manner. Double-sided PC-board stock works nicely as a double-shield cabinet material if the box walls are joined separately (inside walls and outside walls) with solder at the edges where the walls join. An air-tight cabinet also aids stability by keeping air currents from reaching critical oscillator components.

Tone Modulation

It is not necessary to generate a modulated signal for most of our amateur testing, but if you desire to have an audible tone when conducting receiver tests, you might consider the circuit of Fig 4. Output from this modulator can be coupled to the base of Q3 of Fig 2. This amplitude modulation (AM) will be useful when aligning AM receivers. FM could be generated with this test instrument by adding a varactor-diode modulator to the Q1 circuit. However, except for tests at 29 MHz, there is little need for an FM generator in the HF spectrum. The *ARRL Handbook* contains design data for FM modulators.

A Practical 1.7- to 31-MHz Generator

Fig 2 contains the circuit for our project this month. A tapped-coil Colpitts oscillator is used at Q1 to provide four tuning ranges from 1.7 to 3.1 MHz, 3.0 to 5.6 MHz, 5.0 to 12 MHz and 11.5 to 31 MHz. We could spread the tuning range considerably more by using a smaller-value main-tuning capacitor (C4) and using more coils and switch positions. But, the purpose of this exercise is to provide a simple, low-cost unit. It represents a suitable starting point for equipping the home lab.

A Zener diode (D2) is used at Q1 to lower the operating voltage of the oscillator. Voltages as low as 6 are useful if oscillation can be sustained, since the lower drain-source voltage will reduce drift. Changes in transistor junction capacitance and resistance are lower when the oscillator operates at reduced power levels. You may want to experiment with Zener diodes that provide lower regulated voltages, if you want to reduce drift. However, a small-value capacitor is used at C5 to ensure light coupling to the tuned circuit, and this aids stability also.

Q2 is a source-follower buffer stage. It helps to isolate the oscillator from the generator-output load. The source of Q2 is broadly tuned by means of RFC1. Energy from Q2 is routed to a fed-back, broadband class-A amplifier, Q3. The amplifier response is relatively flat (constant output power) from 1.5 to 35 MHz. T1 is a broadband ferrite transformer that steps the Q3 collector

impedance from roughly 200 ohms to 50 ohms. A 2-dB attenuator is used at the output of T1 to provide a 50-ohm termination for Q3 and to set the generator-output impedance at 50 ohms.

A test point is provided for connection of an outboard frequency counter. It is connected to the Q3 collector through a resistor and blocking capacitor. The value of R11 may be larger or smaller, in accordance with the sensitivity of your frequency counter. Use only that value of resistance needed to permit triggering your counter. In other words, use the lightest coupling possible to prevent loading Q3 and robbing power from that stage: The higher the resistance of R11, the lighter the coupling.

C16, C17 and RFC2 form a brute-force RF-decoupling network to keep the generator energy from radiating outside the box on the 12-V supply line. If you have a 0.001-μF feedthrough capacitor available, use it on the outer wall of the equipment cabinet as a +12 V terminal. This will improve the filtering of the power lead.

We can vary the output power of the signal generator by using the circuit of Fig 3. The 500-ohm control can be mounted inside the case of the equipment and made adjustable from the front panel. The shortfall of this technique is that the generator output impedance will vary as the control is adjusted. At the lowest settings, the potentiometer will create a dead short.

A better way to control the generator output is to attach a step attenuator at the output of the instrument. This will provide calibrated steps of attenuation and will maintain the 50-ohm output characteristic of the unit. An attenuator kit is available from Circuit Board Specialists.[1] Details of the attenuator can be found in *QST*.[2] PC boards and kits for this project are available from A&A Engineering.[3]

Wrap-up

I'd like to leave the choice and style of cabinet up to you. The packaging format will be dependent upon the type of analog or digital readout system you choose. I urge you to use a cabinet you may have on hand, thereby reducing the cost of this project.

Frequency stability for this generator will be improved if you dip each of the completed toroid coils in Q-Dope® or polyurethane varnish. This will prevent the coil turns from moving, which would result in frequency changes. Also, the leads between S1 and the coils should be stiff and direct, and as short as possible. Similarly, keep the lead from S1 to C4 short and rigid.

If you like to build direct-conversion receivers, try this generator as a local oscillator. It can be used also as a VFO for transmitters. If this is done, add a bandspread capacitor (10 or 15 pF) in parallel with C4. Without a bandspread capacitor the tuning rate will be much too fast for VFO operation!

Later in this series we will describe a signal generator for VHF use. Meanwhile, good luck in setting up your test bench!

Notes

[1]Circuit Board Specialists, PO Box 969, Pueblo, CO 81001, tel 303-542-5083.
[2]B. Shriner and P. Pagel, "A Step Attenuator You Can Build," *QST*, Sept 1982.
[3]A & A Engineering, 7970 Orchid Dr, Buena Park, CA 90620, tel 714-521-4160.

New Products

AEA PAKRATT™ MODEL PK-64 DATA CONTROLLER

☐ Advanced Electronic Applications' PAKRATT-64 is the world's first five-mode-in-one Amateur Radio smart data controller. Designed to operate with the C64™ or C128™ computers, the PK-64 works packet radio, RTTY (Baudot or ASCII), AMTOR and Morse code. All software, including the advanced terminal program, is supplied, together with all necessary hardware and cabling to connect with your transceiver and computer. Even the 12-V-dc wall adapter is furnished.

Features common to all modes: on-screen tuning indicator; split-screen operation with status indicators; full disk, cassette and printer capabilities; receive text in one mode, send out in any other mode without having to use disk or cassette; 10 message/command buffers; text editing with block moves; NOVRAM-style parameter/option storage via disk; 20-kbyte QSO buffer; keyboard selectable HF or VHF modem with pre- and post-detection filtering for improved signal-to-noise performance; and built-in frequency counter and software for self calibration.

Morse, Baudot, ASCII, AMTOR features: Baudot RTTY speeds of 60, 67, 75, 100, 132 WPM; ASCII speeds of 110, 150, 300 bauds; and Morse speed of 5 to 99 WPM (Morse receive requires HFM-64 modem option).

Special packet-radio features: AX.25 version 2.0 fully implemented, TAPR-style commands used where possible, connect alarm siren, connect with up to 10 stations simultaneously, date and/or time stamp for incoming messages, user-generated message for auto response to connect, one-key text scroll command, monitor reject command, special "connect check" terminates connection if path is lost, data carrier detect (DCD) and squelch input avoid packet collisions, hardware HDLC allows full duplex communications and invertible squelch input for busy-channel transmit inhibit.

Deluxe HF modem option (necessary for Morse receive): independent dual-channel filtering, improved adjustable-threshold DCD operation, AM detector and front-panel FM-discriminator-style tuning indicator.

The PK-64 is available from your AEA dealer, or for information contact Advanced Electronic Applications, Inc, PO Box C-2160, 2006 196th SW, Lynnwood, WA 98036, tel 206-775-7373. Price class: PK-64, $219.95; HFM-64 deluxe modem, $99.95.—*Bruce O. Williams, WA6IVC*

LADPAC SOFTWARE FOR ELECTRONIC LADDER CIRCUITS

☐ LADPAC consists of five menu-driven, interactive programs. All programs generate or read disk files, providing communications between the various routines. The central core of LADPAC is the General Purpose Ladder Analysis (GPLA) program that will calculate and display in graphs or tables the transducer gain (in decibels), phase, return loss and group delay for an arbitrary filter of up to 49 elements. Elements may include resistors, capacitors and inductors of finite Q, as well as numerous complex elements such as parallel and series resonators, transmission lines (with loss), quartz crystals and even a half-wavelength dipole. Parallel branches may be included in a circuit.

Other programs that are included are: LPF, used in design of Chebyshev or Butterworth filters up to 48th order; BPFDES for design of coupled-resonator LC filters; XFILDES, which can be used to design lower-sideband ladder crystal filters, and Schematic Draw, which reads a disk file generated by any of the other programs and draws the filter schematic on the CRT screen.

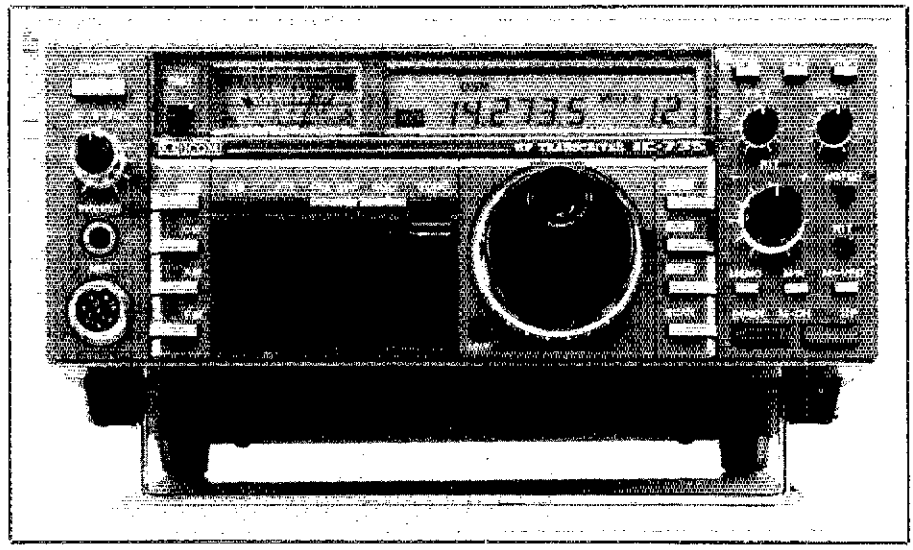
The program disk is supplied with a detailed manual in a looseleaf notebook. The manual contains an introductory chapter with installation data, followed by a detailed chapter for each program, an advanced applications chapter and an index. LADPAC operates on the IBM® PC with DOS 2.0, or later, operating system. LADPAC has also been used on the IBM-XT and IBM-AT and several IBM PC "compatibles." A minimum of 192 kbytes of RAM, and at least one disk drive are required, as is an IBM Color Graphics Adapter, or similar equipment. A dot-matrix printer is optional, but highly recommended. LADPAC-87 is identical to LADPAC, but with support for the Intel 8087 co-processor.

LADPAC is copyrighted by Hayward Electronic Systems, Inc. The program disk is not copy protected. Price of LADPAC or LADPAC-87 is $149, postpaid. Available from Hayward Electronic Systems, Inc, 7700 SW Danielle Ave, Beaverton, OR 97005.—*Bruce O. Williams, WA6IVC*

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

ICOM IC-735 HF Transceiver

ICOM has entered the small, full-featured transceiver market with the IC-735. This compact, low-profile radio has plenty of features for convenient, casual HF operation. It competes directly with the Kenwood TS-430S (reviewed in March 1984 *QST*), and the Yaesu FT757GX (December 1984).



Receiver Features

The '735 uses a triple-conversion (70 MHz, 9 MHz and 455 kHz) scheme to receive SSB, CW, AM and FM signals from 100 kHz to 30 MHz. There are three ways for a signal to enter the IC-735 receiver. Normally signals pass around the RF attenuator and preamplifier to enter what ICOM calls a "direct-feed mixer." When the preamplifier is activated, about 10-dB of gain is provided ahead of the mixer. When the RF attenuator is selected, incoming signals are reduced by 20 dB. Various combinations of the preamplifier and attenuator switches allow four possible mixer-input levels over a 30-dB range. In addition, receiver input and output jacks on the rear panel allow connection of an external receiver or an unswitched outboard preamplifier. See Fig 1.

Receiver selectivity varies with the emission mode. The −6 dB bandwidths are 15 kHz for FM, 6 kHz for AM and 2.3 kHz for SSB and CW. Optional 9-MHz IF filters are available for either a 500- or 250-Hz CW bandwidth. There are no optional SSB filters available. The '735 does, however, include passband tuning for SSB and CW modes and a notch filter. (A narrow setting of the passband tuning nearly equals the performance of the 500-Hz CW filter in the test radio.) Adjacent signals can be reduced up to 28 dB by the notch filter. The noise blanker includes a threshold adjustment from the front panel. This feature is seldom seen in contemporary transceivers, and I feel that any additional control given the operator is worthwhile. Operators can also adjust the receiver audio character with a tone control that is reachable with a screwdriver through an access hole in the case. An audio squelch is provided to reduce unnecessary receiver noise in the shack.

Transmitter Features

Transmit frequency coverage for the IC-735 is shown in the specification table. The HAM tuning-rate switch together with the main tuning knob select the desired band on the amateur frequencies. Sideband selection is automatic—USB on 10 MHz and all bands above 10 MHz, and LSB on 7 MHz and all lower bands. One chooses between sidebands by pressing the SSB-mode switch.

Output power can be adjusted from 10 to 100 W using the RF POWER control. An internal three-speed fan cools the transmitter. The fan always operates during transmissions, but never during reception. When the PA temperature is below 50°C, the fan operates at low speed. Fan speed increases to medium when the PA temperature exceeds 50°C and to high when the PA temperature exceeds 90°C. According to the manual, the '735 can

ICOM IC-735 HF Transceiver/General-Coverage Receiver, Serial No 1257

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency range: Receive—100 kHz to 30 MHz; transmit—1.80000-1.9999, 3.40000-4.0999, 6.9000-7.4999, 9.9000-10.4999, 13.90000-14.4999, 17.9000-18.4999, 20.9000-21.4999, 24.4000-25.0999, 27.9000-29.999 MHz.	Receive—as specified; transmit—as specified.
Modes of operation: SSB, CW, AM, FM.	As specified.
Frequency display: 5/16-inch liquid crystal digital display.	As specified.
Frequency resolution: 10 Hz, 1 kHz	As specified.
Transmitter:	*Transmitter Dynamic Testing*
Power output: 100-W SSB, CW, FM; 40-W AM.	160 m, 107 W; 80 m, 115 W; 40 m, 117 W; 30 m, 117 W; 20 m, 120 W; 17 m, 120 W; 15 m, 123 W; 12 m, 125 W; 10 m, 120 W. (AM output was not measured.)
Spurious signal and harmonic suppression: Better than 50 dB.	See Fig 3.
Third-order intermodulation distortion: Not specified.	See Fig 4.
Keying waveform: Not specified.	See Fig 5.
Receiver:	*Receiver Dynamic Testing*

		80 m	*20 m*
Receiver sensitivity: Less than 0.15 μV for 10 dB (signal + noise)/noise	Minimum discernible signal (noise floor), (dBm):	(Preamp −127/−134	out/in) −126/−133
Receiver dynamic range: Not specified.	Blocking dynamic range (dB):	Noise limited	Noise limited
	Two-tone, 3rd-order intermodulation distortion dynamic range (dB):	90/92	85/88
	Third-order input intercept (dBm):	8/4	1.5/−1

Receiver recovery time: See Fig 6.	
S-meter sensitivity (μV for S9 meter reading): Not specified.	RF amplifier out/in: 160 m, 64/22; 80 m, 52/16.5; 40 m, 52/16.5; 30 m, 52/16.5; 20 m, 52/17; 17 m, 50/19; 15 m, 52/21; 12 m, 54/21; 10 m, 58/21.
Squelch sensitivity: FM, 0.3 μV.	0.25 μV (preamp on).
Receiver audio output at 10% total harmonic distortion: 3 W.	As specified.
Color: Gray.	
Size (height, width, depth): 4¼ × 9¾ × 10¾ inches.	
Weight: 11 lb.	

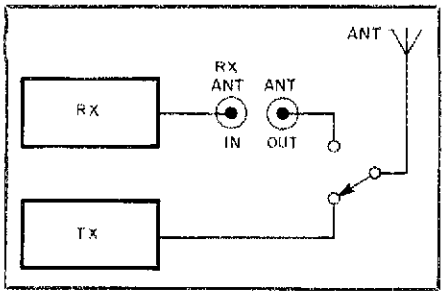


Fig 1—Antenna TR connections for the IC-735. RX ANT IN and ANT OUT are connected by a jumper for normal operation. An external preamplifier connected in place of the jumper needs no TR-switching provisions. An external receiver is controlled by the IC-735 TR circuitry when it is connected to the ANT OUT jack.

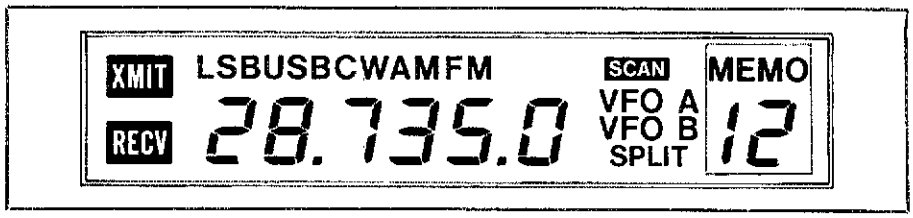


Fig 2—A layout of the IC-735 LCD showing all indicators.

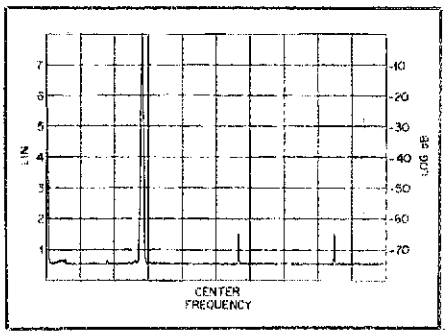


Fig 3—Spectral display of the IC-735. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 100 W at a frequency of 28 MHz. All spurious emissions are at least 65 dB below peak fundamental output. The IC-735 complies with current FCC specifications for spectral purity.

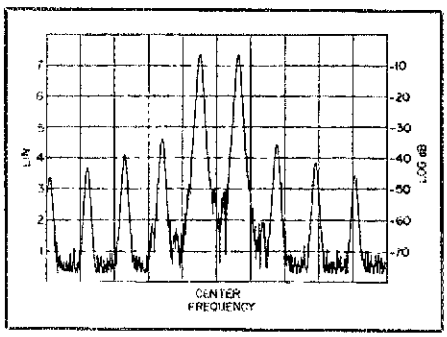


Fig 4—Spectral display of the IC-735 output during transmitter two-tone intermodulation distortion (IMD) test. Third-order products are 33 dB below PEP, and fifth-order products are 39 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The IC-735 was being operated at rated input power on the 20-meter band.

transmit continuously for long periods with no reduction in power, as long as ambient temperature is 25 °C or less. The unit is designed to operate with an SWR of 1.5:1 or less. According to the operating manual, output power is reduced as SWR increases above 1.5:1, but it is possible to damage the transmitter by operating with a high SWR.

During AM transmissions, the carrier must be adjusted to 40% of the normal output level. The speech processor may be used during AM transmissions. No reduction of output power is necessary during FM transmissions. An optional 88.5-Hz tone unit (UT30) is available for use with tone-access repeaters. The tone is active when transmitting in the FM mode.

Front-Panel Controls

The most used controls are grouped at the center and right of the front panel. At the top right-hand corner are the VFO controls, VFO, A=B and SPLIT. If the VFO button is pressed during memory operation, frequency control is transferred to the VFO that was in use when memory operation began. Another press of the same button transfers control to the other VFO. The A=B button equates the frequency and mode of the second VFO to that of the VFO currently displayed. A=B has no effect during memory operation. When the SPLIT switch is pressed, "SPLIT" appears on the frequency display, and subsequent transmissions take place on the frequency/mode of the second VFO. This allows convenient cross-mode contacts. A second press of the switch cancels split operation.

Below the VFO buttons are two knobs that set the passband tuning (PBT) and notch-filter frequency (NOTCH). The instruction manual describes two different PBT actions. In CW mode, PBT varies the receiver bandwidth from 2.3 kHz (maximum clockwise rotation) to 800 Hz (maximum counterclockwise rotation). In the SSB mode, a detent at the 12 o'clock position corresponds to maximum bandwidth (2.4 kHz), and knob rotation shifts the IF filter center frequency up to 1.8 kHz above or below its normal frequency. PBT does not function during AM or FM operation.

The large knob at the right side of the front panel is the RIT frequency control, with a range of ±800 Hz. To the right of the RIT knob are two on/off push-button switches for the NOTCH and RIT features.

Memory controls, all push-button switches, are grouped at the lower right of the front panel. MEMO transfers frequency/mode control of the transceiver to the memory indicated on the display. The current frequency and mode are written into the memory indicated on the display when the MW (memory write) switch is pressed. When in the VFO mode, a press of the M>VFO button transfers the contents of the displayed memory to the active VFO. When in the memory mode, the M>VFO button transfers the display frequency and mode to the VFO that was in use prior to memory operation. (Since the operator may tune away from a recalled memory frequency without affecting the memory contents, the information transferred need not be the same as the contents of the active memory.) A pair of memory-channel (M-CH) switches (DOWN and UP) change the memory number on the display. When under VFO control, only the memory number changes; in the memory mode, frequency, mode and memory number change to match the selected memory.

The main tuning knob on the IC-735 serves several purposes. A column of buttons to the right of the knob determines the tuning rate. With no button selected, the tuning steps are 10 Hz each. Pressing the KHZ button changes the rate to 1-kHz steps. The MHZ step rate serves as a band switch for general-coverage reception, while the HAM rate switches from one amateur band to the next as the main tuning knob is rotated. When the HAM rate is selected in the SSB mode, the appropriate sideband for each band is automatically selected. Tuning speed varies not only with the selectable step rates, but also with the speed of knob rotation. That is, as the rotation speed increases, so does the number of steps per rotation.

At the bottom of the button column is the SCAN switch, which starts or stops transceiver scanning. (Note that transceiver scanning is different than tuning with the scanning microphone, which is discussed later.) In all scanning modes, the receiver halts when it comes to a signal. Dependent on the scan-timer switch setting, inside the radio, the scan may resume after about 10 seconds or may halt completely. Once the scan continues, it will halt at signals only if the RECV indicator was off (squelch closed) when the scan resumed. An internal jumper selects either a slow- or fast-scan rate. Programmed scan limits are stored in memories 11 and 12. The programmed scan begins at the lower of the two limits and scans to the upper limit at either 10-Hz or 1-kHz steps as determined by the step-rate switches. Scanning can be stopped by again pressing the SCAN button, by transmitting or moving the tuning knob.

A memory scan selects all memories, in sequence, regardless of mode. It is initiated by pressing the SCAN button while in the memory mode. Memories with different modes than the displayed memory are excluded from the scan by pressing the dial-lock button before initiating the memory scan.

It is possible to tune the IC-735 with a scanning microphone. Scan operations and the microphone scan occur at the same jumper-selected rate. I used only the slow-scan rate. At the slow rate, it is possible to stop the scan before passing a signal. The step rate of the scanning microphone is either 10 Hz or 1 kHz, depending on the step-rate switches on the front panel. It is interesting that the dial lock inhibits tuning from the knob, but not from the scanning microphone buttons.

The '735 is one of the first HF transceivers to use a liquid-crystal display. Fig 2 shows the display with all indicators active. The frequency digits are 5/16-inch high. The brightness of the pleasant green display backlight is adjustable through a cabinet-access hole, and the display is easily visible under any conditions

of ambient lighting. The display does not show the offset effect of RIT nor the on/off status of the notch filter.

The meter, to the left of the display, shows signal strength during receive and power output (PO) or ALC level during transmit (selectable by a front panel METER switch). When PO is selected, the meter can function as a reflectometer. A three-position, rear-panel switch selects the PO, SET or SWR function. Sensitivity of the reflectometer is not variable—the transmitter power-output level is adjusted to obtain full-scale meter deflection with the switch in the SET position. Reflected power may then be directly read by switching to SWR.

Controls that are less often used are grouped under the meter on the left side of the front panel. They include: noise blanker (NB on/off), ATTenuator (on/off), PREAMPlifier (on/off), AGC (slow/fast) and speech COMPressor (on/off). Below these buttons is a small recessed compartment with a smoke-colored plastic door. I have large fingers and found the door a nuisance. ICOM had foreseen this problem, however, and made the door removable. This compartment houses a switch panel with 12 separate controls—six sliding potentiometers and six push buttons. The sliding controls are: noise-blanker threshold (NB LEVEL), RF GAIN, RF POWER, VOX GAIN and DELAY, and MICrophone GAIN. The MIC GAIN control also functions as a SPEED control when using the optional electronic keyer. Push-button controls are: AM and CW filter (WIDE/NARROW), METER (ALC/PO), VOX (ON/OFF), break-in keying (BK-IN, FULL/SEMI) and keyer mode (ELEC KEY/ MANUAL), which selects the optional electronic keyer.

A group of four push buttons to the left of the switch panel select the mode of emission (SSB, CW, AM and FM). Pressing the SSB button initiates the single-sideband mode with the appropriate sideband selection (LSB under 10 MHz, USB on 10 MHZ and above). Subsequent presses of the SSB button will cycle the sideband selection between LSB and USB.

At the left edge of the front panel are: a push-button POWER switch, concentric AF GAIN and squelch (SQL) controls, a ¼-inch PHONES jack and an eight-pin MICrophone connector.

Rear-Panel Controls and Connectors

On the rear panel are several controls and connectors: SO-239 antenna connector; transverter output (30 mV, phono jack); antenna output (phono jack); receiver antenna input (phono jack); compressor-level adjustment; external speaker (1/8-in phone jack); microphone-tone adjustment; AM carrier-level adjustment; key jack (¼-in, three-conductor phone jack); anti-VOX adjustment; accessory jack 1 (for phone patch or AFSK connections, 8-pin DIN jack); meter switch (power out, set or SWR reading); accessory jack 2 (for connection to ICOM transmatches with automatic bandswitching, 7-pin DIN jack); ALC (phono jack); 6-pin power connector; remote (1/8-in phone jack for computer control of IC 735); send (PTT line, active low); and ground terminal (spring clip).

In addition to the previously mentioned backlight dimmer and AF-tone adjustments, there are cabinet-access holes for sidetone volume and tuning-knob drag adjustments. With the cabinet removed, one can select output power (100 W/ 50 W), 25 kHz marker-generator on/off, scan-timer on/off or move a jumper to select fast- or slow-scan rate.

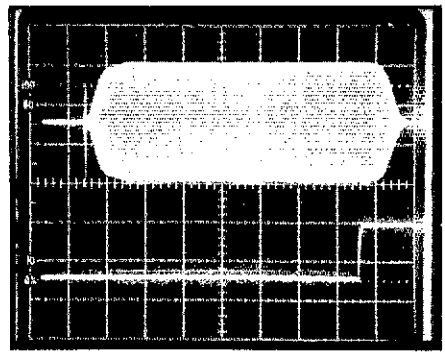


Fig 5—CW keying waveform of the IC-735. The lower trace is the actual key closure; the upper trace is the RF envelope. Each horizontal division is 5 ms. The very faint spike at the beginning of the envelope is discussed in the text.

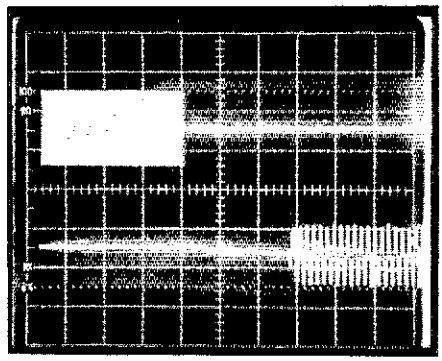


Fig 6—Receiver recovery (turnaround) time. The upper trace shows the key opening; the lower trace shows receiver audio output. Horizontal divisions are each 5 ms. There is an approximate 14-ms delay before receiver recovery.

Operation

This radio reminds me of the early days of scientific calculators. The '735's capabilities can be somewhat intimidating, but a few days spent reading the manual and practicing various operations opens new realms of convenience and control. The 46-page instruction manual gives complete explanations for all normal operations. It does not, however, give any information about use of the remote-control capabilities of the IC-735.

I found the VFO and memory controls exceptionally easy to use, and powerful. Each memory has the flexibility of a VFO; essentially, the radio has 14 VFOs. Mode scanning was very helpful during the WØORE/ Challenger space-shuttle flight, when I used this feature to monitor various WA3NAN frequencies for shuttle communications. Normal noise conditions limit the effectiveness of the audio squelch, and therefore the scan operations in the SSB, CW and AM modes (except for the scanning microphone). Under quiet conditions, however, the functions are useful.

The optional IC-EX243 keyer was installed in the test radio. I am very happy with the keyer, but there are two aspects of its operation that are potentially inconvenient. Keyer speed is adjusted by means of the MICrophone GAIN/SPEED control on the front panel. The control is a sliding potentiometer in a recessed compartment. At my normal keying speed (15 to 25 WPM), I found the control somewhat difficult to adjust. Also, those who work both CW and phone must readjust the control each time they switch modes. CW weighting is adjusted during the installation of the keyer. When the keyer is switched off, one paddle may be used to hold the transmitter on while a matching network is adjusted.

My other radios do not offer full-break-in operation. Because the relay closures in those radios do not follow the key action exactly, I normally operate with a long VOX delay that maintains the transmit mode throughout a word. I found break-in operation with the IC-735 a pleasure. The TR relay is very quiet and not at all distracting. Break-in operation is effective up to about 35 WPM, where the space between dots becomes less than the AGC time constant.

A photo of the keying waveform (Fig 5) shows a very faint spike at the beginning of the RF envelope. This could cause a key click of extremely short duration if the spike were present on the air. I asked about clicks during every CW contact and received nothing but excellent reports.

The IC-735 performed flawlessly for me. It is a pleasure to operate. It is a lightweight, but feature-packed rig. The ICOM IC-735 is available from ICOM America, Inc, 2380 116th Ave, NE, Bellevue, WA 98004, tel 206-454-8155. Price class: IC-735, $849; IC-EX243 keyer, $50; FL-32 500-Hz filter, $60.—*Bob Schetgen, KU7G*

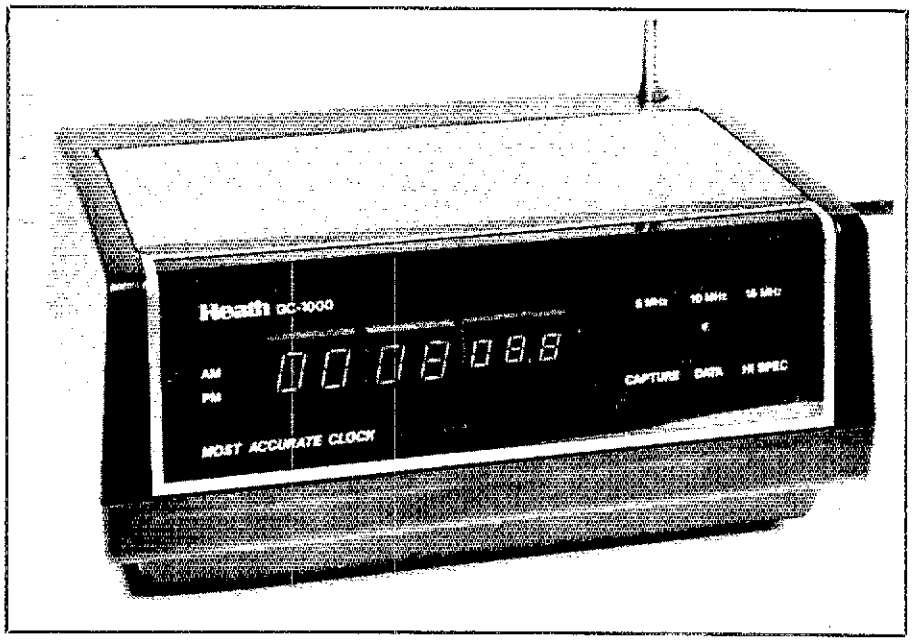
HEATH GC-1000: "MOST ACCURATE CLOCK"

Our lives all revolve around one common element—time. Every day we hear or ask the question, "What time is it?" When asked this question, most of us will glance at a $3.94 mail-order-special timepiece and blurt out some sort of a reply. After such an encounter, do you ever wonder what time it really is?

If you own the Heath GC-1000, you probably will never again have to wonder. Why? Because the GC-1000 automatically sets itself to the National Bureau of Standards time signals whenever a strong signal can be received from WWV on 5, 10 or 15 MHz. The unit is modifiable to use WWVH by changing one resistor and two capacitors during construction. The clock will run on either 117- or 234-V ac. If the power source fails, an external 12-V dc source can keep the clock running accurately. Even if such a source is not available, the GC-1000 will reset itself automatically when power is restored if an adequate WWV signal is received. An optional RS-232-C output is available to supply chronograph information to your computer at speeds between 110 and 9600 bauds.

NBS Time Information

The National Bureau of Standards' stations (WWV in Colorado, WWVH in Hawaii) transmit time signals continuously on frequencies of 5, 10 and 15 MHz. The RF receiver in the clock scans these three frequencies and locks on to the strongest signal. A binary-time code is included in the transmissions. This code consists of one-minute-long strings of binary data made up of several sets of pulses. Each set of pulses represents one digit of informa-



tion. The position of the digit in the code determines whether the digit represents an hour, a minute or a second. Time-code pulses are sent once each second, so that in the one-minute time frame enough information is sent to convey current hour, minute, second and day of the year.[1] Using this mechanism, the GC-1000 automatically calibrates itself to NBS.

Time Display

The most easily observed difference between the GC-1000 and most other digital clocks is in the time display. In addition to hours and minutes, seconds and tenths of seconds are displayed. If the clock has not set itself within the past 24 hours, the tenths-of-seconds display is dimmed. When the clock is running in the standard (12-hour) format, two LEDs indicate whether the time is AM or PM. These LEDs are extinguished in the 24-hour format.

In addition to the actual time display, six status LEDs are situated in two rows of three on the right side of the front panel. The top three LEDs (5, 10, or 15 MHz) indicate which WWV frequency is being monitored. The three lower LEDS indicate: CAPTURE (green), if the receiver is locked on WWV; DATA (amber), signifying that digital time information is being received; or HI SPEC (green) indicating that the clock has just calibrated itself and is accurate to within 10 milliseconds.

The Bottom Panel

Two DIP switches located on the bottom panel are used to: Select the time zone (including Daylight Savings Time); set the 12- or 24-hour format; activate or lock out each of the three WWV frequencies; and set the receiver propagation delay for distances of up to 3600 miles from WWV. In addition, UTC 1 (corrected UTC) can be selected to adjust the clock automatically in 0.1-second increments to make up for the slight variations in the earth's movement. When the variation exceeds 0.7 second, NBS initiates a "leap second," usually on June 30 or December 31, to get things back in line. With the GC-1000, there's no need to reset for a leap second—this is done automatically!

Documentation

The 91-page manual supplied with the kit is used during assembly, testing and alignment. These instructions lived up to what I have learned to expect from Heath—all steps, from assembly through final testing, are clearly spelled out.

Construction

Most of the components used in the GC-1000 are contained on four PC boards. One of these, the three-channel scanning receiver, is factory assembled, tested and aligned. This board simply plugs into the main circuit board with an edge-type connector. The three remaining subassemblies, (display, tone decoder and main circuit board) must be "stuffed" and soldered. The tone decoder and display boards, like the receiver, plug into the main circuit board. Construction took about 8 hours, with an additional 20 minutes required for initial test and calibration.

Initial Test and Calibration

The internal microprocessor provides three modes to aid in unit calibration. The first mode checks all the LED segments in the time display. The second mode calibrates the 1000-Hz tone decoder used in WWV reception, and the third mode is used to align the 1200-Hz tone decoder used for WWVH reception. Only an insulated screwdriver, supplied with the kit, is required to perform these three adjustments. These constitute the entire calibration for the GC-1000. Four no 6-32 machine screws attach the cabinet to the electronic assembly. Finally, the 54-inch telescoping antenna is attached, and you're ready to tell time.

Operation

The Heath GC-1000 has been in service at W1OD for almost a year now, with no problems. The clock sits atop my transceiver. Although the presence of full-legal-limit RF approximately 6 inches from the unit does prevent the clock from calibrating itself to WWV while I'm operating, the internal 3.6-MHz oscillator keeps the time display accurate. This oscillator is electronically trimmed: Every time the clock aligns itself to WWV, the oscillator "remembers" the correction direction and adjusts its frequency accordingly. The 54-inch telescoping antenna will not provide a reliable WWV signal at my QTH, so an external antenna is used.

If you take pride in knowing what time it really is, the GC-1000 is definitely for you. Available from Heath/Zenith Computers & Electronics. Price class: GC-1000 Most Accurate Clock kit, $230; assembled and tested, $425. GCA-1000-1 RS-232-C Output Accessory, $50.—*Mike Kaczynski, W1OD*

[1]Information on the exact format of the timing code can be obtained from the *NBS Time and Frequency Users Manual*, NBS Special Publication 559. A copy may be purchased from: US Department of Commerce, National Bureau of Standards, Washington, DC 20234.

New Books

THE COMMODORE HAM'S COMPANION

by Jim Grubbs, K9EI. Published by QSKY Publishing, PO Box 3042, Springfield, IL 62708. First edition, 1985. Soft-bound volume, 8½ × 5½ inches, 160 pages. $15.95 plus $2.50 for shipping and handling.

Whether you already own a Commodore 64™ or VIC 20™ computer or are thinking of buying one, you're sure to have a need for information on how to use it effectively in your hamshack. The 14 chapters in this book are designed to do just that, as well as provide you with some guidelines concerning the purchase of one of the many Commodore computers. The chapters are brief and cover a lot of territory.

Off the top, the pros and cons of the many Commodore machines are discussed. According to Jim, over 100,000 hams already own either a VIC 20 or a C64. That alone should give you some indication of why Amateur Radio equipment manufacturers and software developers favor those machines. If you don't already have a computer, you might consider this oft-quoted rule: Find the software that'll do the job you want to do, then buy the machine to run the software. (It's usually frustrating to try to do it the other way around.)

The software—communications, log keeping, MSO, FAX, grayline, and so forth—and hardware (RTTY/CW modems and TNCs) for use with the Commodore machines are discussed in several chapters. Other chapters cover computing by telephone and the information services and magazines that are available for Commodore users. A multiple-page listing of Commodore software and/or hardware suppliers is given in an appendix. Two other appendixes provide you with the addresses of about 20 different magazines and a glossary of terms. A bibliography of over 60 magazine articles pertaining to use of the Commodore computers and radio is also included.

Throughout the book are strewn tips and hints and tidbits of information that Commodore users are certain to feast on. Next to the "power on" switch, this is one item ham-oriented Commodore users will want to have.—*Paul K. Pagel, N1FB*

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

DIPOLES FOR HAND-HELD 2-M TRANSCEIVERS

☐ I have seen several descriptions of portable antennas for 2 meters. Most of them were of the "J" configuration, which seems unnecessarily complicated to me. What is wrong with the "lowly" dipole?

After five years of using the dipole I am about to describe, I have concluded that there is nothing wrong with it. It has traveled from coast to coast and border to border and has always permitted solid contact with at least one repeater (except in the most sparsely populated areas).

The center insulator of my dipole is shown in Fig 1. It is made from a piece of scrap Plexiglas® about ¼ × 1 × 2 in. Make a hole large enough to pass RG-58 cable in the center. Near each end, make a hole somewhat larger than the insulated element wires. (I used my soldering iron to melt the holes through the plastic.) Other center insulators can be used: NØAXK used a plastic milk-bottle cap.

For the elements, I used split "zip" cord. Hook-up wire would also work. Begin with the element wires too long, about 21 inches each, and strip about ½ inch from one end of each element.

Choose a length of coaxial cable for the feed line. Place a connector suitable for your transceiver on one end of the cable. Insert the other end of the coax through the center hole of the insulator. Strip off enough of the cable jacket so that the braid, when fanned out and twisted, can reach from the insulator center hole through one of the end holes, and be looped back to itself. Strip the center conductor to within ¼ inch of the shield. Feed it through the other end hole and loop it back on itself. Feed the stripped ends of the elements through the end holes (from the same side of the insulator as the feed line) and twist them to the coax conductors. Solder all twisted connections.

I support each end of the antenna with a few feet of mason's twine. A couple of half hitches around the element ends supply enough grip so the antenna does not fall down. I usually hang the antenna between a curtain rod and a chair leg.

Adjustment requires a tape measure, wire cutters and an SWR meter. Put the SWR meter between the transmitter and the feed line. Hang the antenna a couple of yards from any conductors. (I wonder if hanging it in an aluminum window frame would be a better approximation of a hotel room window.) Set your transceiver frequency to the center of the band segment you plan to use. Measure the SWR. Then, using the tape measure to assure equal element lengths, cut off about ¼ inch from the end of each element. Continue measuring and pruning until the SWR reaches a minimum.

Take the antenna down, coil it up, tie the bundle with the end support strings and throw it into your suitcase. You are ready to travel!—*Tony Appelget, KØDCF, Plymouth, Minnesota*

☐ When you bring up the subject of antennas for 2-meter hand-helds, you might attract 10 different hams with 20 different opinions! There are many antennas on the market, and each one has its devoted admirers. Each manufacturer presents all sorts of advertising claims.

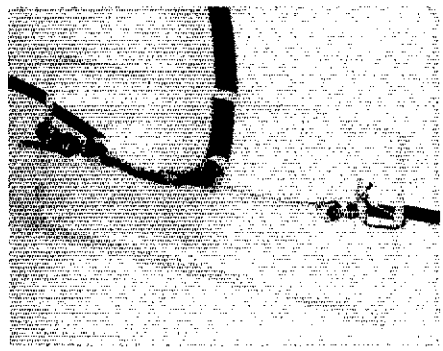


Fig 1—The center insulator of KØDCF's simple, portable, 2-m dipole antenna.

Fig 2—KD7MW's dipole for a 2-m hand-held radio.

One simple fact is often overlooked: Many common vertical antennas (λ/4, 5/8 λ) require an ideal ground reflector in order to work as we expect. The ground reflector simulates a mirror-image of the radiating element, providing the gain and radiation patterns that we associate with the antenna.

When a rubber duck or whip antenna is used with your hand-held radio, there is no ground reflector. Under such conditions, the theoretical gain we associate with a "textbook" λ/4 vertical antenna is not available. In fact, the vertical element acts as one half of a dipole, while the radio itself acts as the other half. [An excellent discussion of 5/8-λ and other vertical antennas appears in *The ARRL Antenna Compendium.*—Ed.] If we add a second resonant λ/4 element, a center-fed dipole and better performance should result.

I added a λ/4 wire to my hand-held radio to find out (Fig 2). Attachment of the second wire is simple. First, find an alligator clip large enough to grip the metal jacket of the hand-held-radio antenna connector. (The clip can be found at Radio Shack® or an auto-parts store.) Connect the clip to a piece of wire. (I used 16 AWG, stranded, insulated wire.) Cut the wire so that the entire assembly is 19¾ inches long. Bend the wire down 90° about 4 inches from the clip. Fasten the clip to the top of the antenna connector so that the wire hangs down clear of your hand.

[My TR-2500 has an insulated BNC connector, which prevents use of an alligator clip. I used no 20 wire for the element and formed a loop in the end of the wire. The loop slips over the BNC jack and is pressed into contact when the BNC plug is tightened.—Ed.]

Table 1
Relative Strength Readings for Several Antennas with and without an Added λ/4 Wire Element

Antenna	*S Units*	
	Without Element	*With Element*
Rubber duck	6.5	8.5
λ/4 no 1	7	9.5
λ/4 no 2	8	9 + 10 dB
Hot Rod	9 + 10 dB	9 + 10 dB

Does it work? You bet! I tested four antennas: two homebuilt λ/4 whips, the rubber duck that came with my ICOM 02-AT and an AEA Hot Rod.™ All but the Hot Rod show significant improvement when used with the second element. Received signals are stronger. Relative field-strength measurements are higher and show that the angle of radiation has been lowered. The results of on-the-air tests with another ham, located about five miles away, are shown in Table 1. He measured my signal strength on the S meter of a Yaesu transceiver. The wire boosts the signal strength of the λ/4 whips and rubber duck by about 2 S units. I have repeated this test with other hams and achieved similar results. With the added wire, the λ/4 whips performed as well as the Hot Rod, and even the rubber duck puts out a better signal than a λ/4 whip alone.

Note that the wire has no appreciable effect on the performance of the λ/2 AEA Hot Rod. This is not surprising since a λ/2 conductor is already a complete antenna.

I find the Hot Rod a superb hand-held-radio antenna, but it appears to be an end-fed "Zepp" oriented vertically and fed through a matching network. My λ/4 whip and λ/4 wire comprise a λ/2 vertical dipole. As my results show, a λ/2 antenna radiates equally well, whether it is end or center fed.

Every hand-held-radio antenna is a compromise between radiation efficiency and size considerations. Rubber ducks are very convenient, but not very efficient performers. Longer antennas offer more efficiency and gain, but their length often presents a hazard to objects and people.

For me, the best all-around hand-held-radio antenna is a λ/2 dipole, consisting of a λ/4 flexible-steel whip, made from measuring tape, and a single λ/4 wire. With

this configuration, I can walk down a street near my home and talk through a repeater 70 miles away, in Victoria, British Columbia. Except for the Hot Rod, no other antenna I have tried can do that. The measuring-tape antenna is not too long for most indoor use, and it does not damage itself or the surroundings in the event of a collision. The wire dangles down harmlessly beside my hand and rarely gets in the way.

On those occasions when I must use the rubber duck, I attach the λ/4 wire. This allows me to reach repeaters that are normally inaccessible with the duck alone. Under windy conditions that would blow the tape antenna over, I use the Hot Rod.

A heavy-duty dipole could be made using coat-hanger wire or aluminum clothesline. The second element can be made of any insulated wire that is stiff enough to hold its shape during use and flexible enough to roll up and put in your pocket.

Tune the dipole by attaching it to an SWR indicator and carefully pruning for minimum reflected power. (Many SWR indicators designed for HF use give a valid reflected-power null at 2 m, although higher SWR readings may be inaccurate.) Be sure to keep the radio and antenna in the same position relative to your body and nearby objects each time you take a reading; varying proximity effects distort the measurements.

One other tip: Do not touch either element while operating. You may not get an RF burn at low power levels, but you may detune the antenna and attenuate both transmitted and received signals.

The extra wire may look a little odd, but it works very well. To my mind, a 2-S-unit improvement is worth a few snide remarks! In this high-tech age, it is nice to be able to boost your signal so much with such a simple, easily made accessory. It is probably the cheapest 2 S units you will ever gain!—*Peter A. Klein, KD7MW, Seattle, Washington*

PUT YOUR HEATH DX-20 AND VF-1 ON 30 METERS

☐ The Heath DX-20 is a 50-W CW transmitter that covers the 80, 40, 20, 15 and 10-meter amateur bands. It can operate on 30 meters with two simple wiring changes, if 20-m operation is sacrificed. The conversion entails moving a tap on the plate-tank coil of the oscillator/multiplier stage and disconnecting a tap on the pi-output inductor of the final amplifier.

First, move the 20-m tap on the plate inductor of the 6CL6 (oscillator/multiplier) to 12.5 turns from the plate end (three turns toward the ground end from its original position). The new doubler tank tunes from about 9.4 to 15 MHz, so be sure to tune it for peak PA grid currrent near maximum capacitance. Then, disconnect the 20-m tap (from the band switch) on the pi-output inductor of the 6DQ6A final amplifier.

The transmitter can be used with 5-MHz crystals or with a 5-MHz VFO. The Heath VF-1 VFO can provide a 5-MHz signal if we pad the 11-m oscillator (which originally operated from 6.74 to 6.81 MHz). (I connected about 115 pF, NP0, in parallel with the 11-m trimmer.) Adjust the trimmer so that a 5.05- to 5.075-MHz output signal is produced while tuning from 7 to 7.135 MHz on the VF-1 high-frequency dial. Then peak the VF-1 output by adjusting the slug in the HF output coil. Peak VFO output is indicated by a maximum grid-current reading for the 6DQ6A in the DX-20.—*Carl Long, K8OWL, Parkersburg, West Virginia*

THE ETCHED MONIMATCH IS ACTUALLY AN OMNIMATCH

☐ A circuit for an SWR meter appears in "An Etched-Circuit Monimatch ...", October 1969 *QST*, pp 29-33. The same circuit appears on page 124 of *The ARRL Antenna Anthology* (out of print). I built the circuit without deeply considering its operation. After a while, I became suspicious at the ease with which my antenna tuned (as indicated by the twin meters).

I discovered that, under some conditions, voltage developed by D2 back biases D1, so that unity SWR is indicated regardless of the transmission-line conditions. Since I wish to retain both meters, I quickly installed a dual potentiometer (see Fig 3) and found a vastly different situation concerning the dynamics of the antenna, tuning settings, and so on. —*Kevin C. Parsons, VK2DYW, Turramurra, Australia*

MORE ON RFI TO TOUCH-CONTROLLED LAMPS

☐ I had the same problem as W7OTC (Hints and Kinks, May 1985 *QST*) with a touch-controlled lamp switched on and off by my transmissions (100 W to a roof-mounted vertical, with two radials per band). The problem occurred during operation on the 80- through 15-m bands, but 10-m operation had no effect. A 1-kΩ resistor was not a complete cure in my case.

A 3.3-kΩ resistor in series with the signal input on the lamp helped on all bands except 80 m (an additional 1.8 kΩ prevented the lamp from functioning). When the resistor was replaced with an RF choke (100 μH, 139 mA), the problem abated on all bands except 80 m. On 80 m, the interfering signal was considerably attenuated by the choke, but the lamp still switched. The choke alone may be enough to clear up the problem in some cases.

The final answer turned out to be both the RF choke and a 1.8-kΩ resistor in series with the signal-input lead to the touch-control circuit.—*Colin Hall, G4JPZ/W6, Marina del Rey, California*

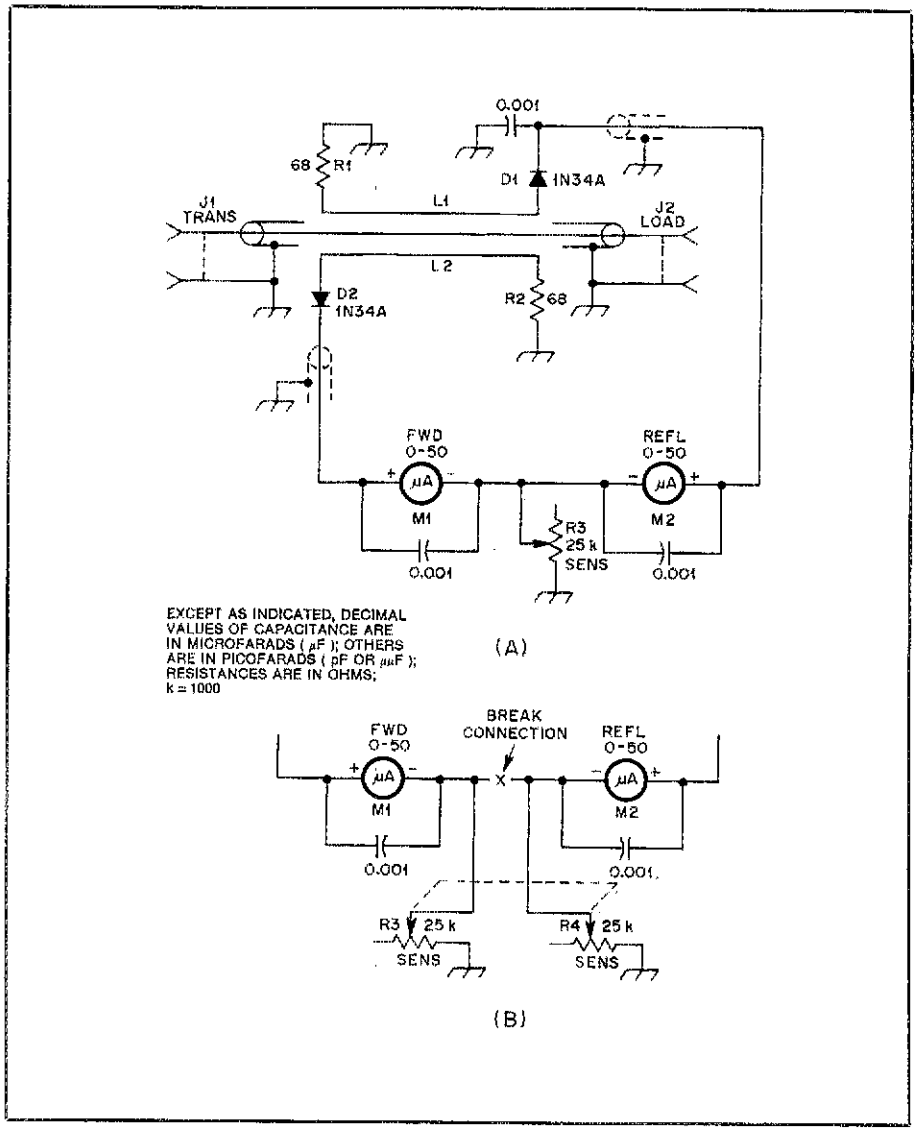


Fig 3—An original (A) and corrected partial schematic (B) of the etched-circuit monimatch. For details of L1 and L2, see *The ARRL Antenna Anthology* or the original *QST* article mentioned in the text.

Station Design for Traffic Handlers

An active traffic handler draws upon personal experience to outline his concept of a proper station layout.

By Bradley Wells, KR7L
5053-57th Ave, SW
Seattle, WA 98126

For many amateurs, station design follows no conscious direction. Most often, design and layout is dictated by equipment purchases, available space and financial constraints. However, several groups, notably contesters and DXers, spend a great deal of time and effort organizing their stations for the greatest operating efficiency to maximize their station's on-the-air potential. Traffic handlers would do well to follow their example because these amateurs have long realized that an efficient, easy-to-operate station will boost contests scores or country totals. This has little to do with owning the latest or most powerful state-of-the-art equipment. The fundamental axiom is to make the *best* use of your *existing* equipment within a space engineered to deliver the best operator performance. What follows are some of my personal preferences for your consideration.

Dedicated traffic men and women, particularly those in the ARRL-sponsored National Traffic System (NTS), operate extensively, often under varying propagation conditions, and on a number of different bands. Accordingly, station-design concepts developed by DX addicts and avid contesters are equally useful to the operator handling formal message traffic. These design concepts include equipment selection, accessories, station location and layout, and operating aids.

Equipment Selection

Transceiver

The particular brand of transceiver is less important than several basic design factors. An important criterion in any HF rig used to handle traffic is its frequency stability. You need both short- and long-term freedom from drift. Much of your operating time will be spent on a net frequency. The Net Control Station (NCS) doesn't have the time (and seldom the inclination) to chase operators that drift away from the net. In addition, because of QRM normally encountered, some control stations may use narrow CW and SSB filters to help them hear better (although a 500-Hz filter is usable for virtually all CW applications; likewise for the standard 2.5-kHz SSB filter). If your rig drifts a couple of hundred Hertz, you will be out of the CW passband and unintelligible in a narrow SSB passband.

These days, most rigs sport digital frequency readouts, but analog dials still work just fine. The main criterion is reasonable accuracy. Most nets operate on established frequencies, plus or minus QRM. It is the NCS that sets the exact net frequency, and all other stations are expected to zero beat his signal. Likewise, when stations are paired up to handle traffic off frequency, it is the receive station that sets the exact frequency. Frequency resolution to 100 Hz is really unnecessary. Readout accuracy of 1 kHz is adequate. The only thing to watch for with analog dials is that few will track linearly for more than 100 kHz.

If your rig has an analog dial, be sure it also has a crystal calibrator. The best are those that generate a pulsed signal every 25 kHz. A calibrator will ensure maintaining reasonable analog dial accuracy if you make a wide frequency excursion. This is not an uncommon occurrence. For example, two Extra Class amateurs on the Central Area Net (14,322 kHz) may shift to 14,155 kHz to handle traffic. Occasionally, stations on this net will also move to the CW subband to pass traffic. Without a dial accuracy of 1 kHz, time will be wasted looking for the other station. And the possibility of out-of-band transmission is to be avoided.

A rig with solid-state finals really comes into its own when making wide frequency excursions or band changes. Just change frequency and start transmitting. Equipment using tube finals will need retuning (tune up into a dummy load, never on the air). This process can be speeded up by taping white paper (perhaps the blank side of one of your spare QSL cards) behind your transmitter knobs. Use a felt-tip pen, and place a small mark at the most commonly used positions on each band for the DRIVE, TUNE and LOAD controls. You might use different colors for phone and CW settings to avoid any confusion.

Operators engaged in regular traffic schedules require the same receiver selectivity demanded by contesters or DXers. There is no casual operation here. Messages must be received in spite of or through the QRM. Today's crowded bands may require filter curves with steep skirts and 80-100 dB attenuation outside the passband. The selectivity of many older (and some newer) receivers might be improved by better IF filtering. A broad selection of replacement IF crystal filters for a number of rigs are available in the marketplace and can improve receiver performance. They can give you the ability to copy under almost any type of conditions. With certain rigs, it is possible to gang these units together providing up to 16 poles of IF filtering.

Should you have a receiver for which no replacement crystal filter is made, there is another approach—audio filtering. While not as effective as IF filtering, it has several advantages. Audio filters come in all shapes, sizes, features and prices. Since they are external to the rig, they are easily hooked up. An almost infinite number of audio passbands may be obtained with these units, although the pace of traffic operating may not permit elaborate adjustments. In addition, to some degree audio filtering removes much of the internally generated "white" noise and power-supply hum that can plague older receivers. Many audio filters also contain variable-frequency notch filters, a definite aid to reducing interference.

Headphones

A good pair of headphones is a necessity in handling traffic as in all operating. No

speaker can match the audio sensitivity or reproduction of a good set of headphones. Headphones will also reduce outside noise, a real consideration if your station is located in the family room or near such things as washing machines, dryers or furnaces. If children are in the house, headphones may be required in self-defense! Exercise some care in buying a pair of headphones since they will be worn for extended periods of time. Each person's head and ear size is different, and poorly fitting "cans" will become very uncomfortable.

Microphone

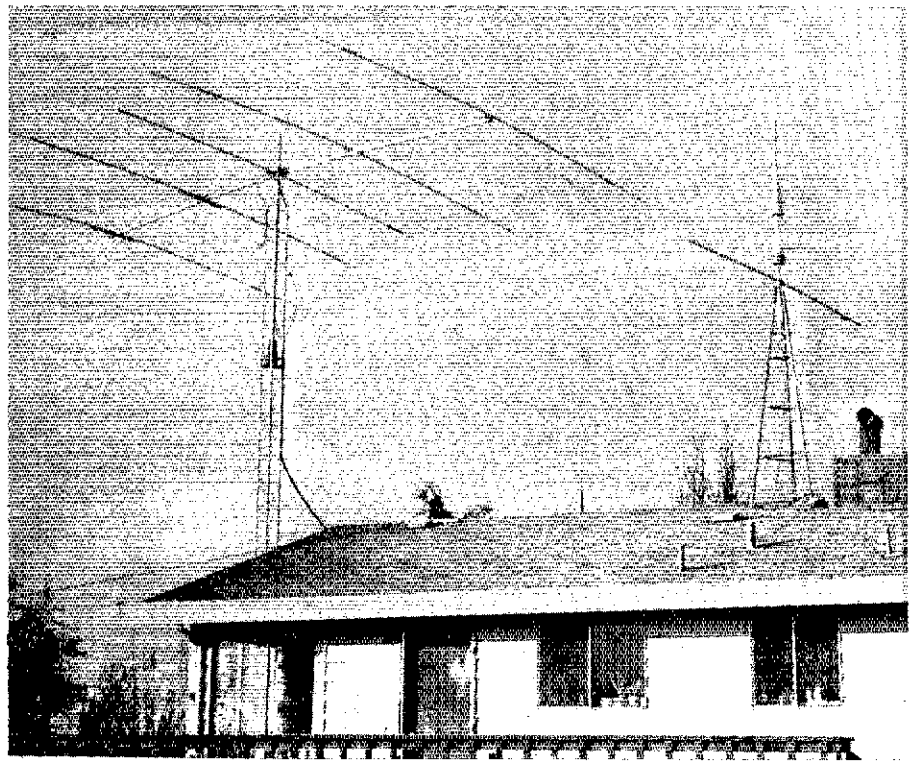
The quality of the transmitted signal is important. Give careful thought to the selection of a microphone. The matching microphone supplied by the transceiver manufacturer may not necessarily be the best one to use. For example, some have too much bass response for maximum intelligibility. A microphone should be selected on the basis of its audio response. I prefer a peak response around 2200 Hz with sharp rolloffs below 350 Hz and above 3000 Hz. There are, however, two options to consider in buying another microphone. The first is to add a microphone equalizer. These units are audio filters in which both bass and treble response are fully adjustable. They allow the operator to modify, at will, the response curve of the station microphone. The second option is to change the existing microphone element to one with a more tailored response. Under difficult operating conditions, the proper microphone can spell the difference between getting the message through or not at all.

Keyer

What the microphone is to SSB, the keyer is to CW. While operating with a straight key or bug is a nice touch of nostalgia, nothing beats an electronic keyer for good copy. Couple this with a rig capable of full-break-in operation (QSK) and you have what many consider the perfect combination for handling traffic on CW. A code reader is probably more of a hindrance than a help. Under poor conditions, it cannot equal the human ear and brain combination for solid copy. Also, code readers will not follow anything short of machine-generated characters. A good CW operator can usually sort out intelligence from almost any type of fist, but a machine can't.

VOX

Another nice touch is VOX (voice-operated switch) operation. With it properly adjusted, the phone equivalent of QSK can be obtained. In this mode, the receiving station can interrupt for a fill just as is done with the QSK feature on CW. The transmitting station should pause often to let the VOX drop and listen for the receive station. An additional advantage of VOX is that it leaves both hands free. If your rig is not equipped with VOX, or you dislike using it, consider a foot switch. This will leave both hands free, allowing optimum positioning of the microphone without cramping your hand when you try to reach the push-to-talk switch.



Better low-band antennas for effective traffic handling can be built even on small, urban lots. Here, 80- and 40-meter sloping Delta loops complement the tribander to provide a big signal and low-noise reception.

Backup Rig

You may wish to consider having a second, or backup, rig, if circumstances permit. Handling traffic is similar to contesting in that it demands maximum, continuous performance from equipment. I have found that equipment will fail at a rate directly proportional to its need! Often the backup rig is older equipment that is saved, not traded in, when a new rig was purchased. Another advantage of two rigs is using each one on a different band or mode. This provides the ultimate in band-changing speed and flexibility, particularly with transceivers having tube finals.

Linear Amp

One piece of equipment almost universally desired by contesters and DXers is a linear amplifier. Unfortunately, this is seldom the case with traffic handlers; many regular traffic operators do not own one. In the handling of traffic, operator expertise goes hand-in-hand with a good signal. An amplifier can be crucially important in successful traffic handling, particularly when the going gets rough. And it is nearly mandatory for the NCS, who should have a strong, commanding signal to maintain proper control. Obviously, a decent antenna system is equally important in this regard.

Antennas

A substantial amount of third-party radiogram traffic is handled on three HF bands: 80, 40 and 20 meters. It is for these three bands that the traffic operator should optimize antenna systems. Install the best antennas you have the space for and can afford. Propagation conditions for the next three years, in particular, will place a premium on efficient antennas. For example, a beam or some sort of directional array is a requirement on 20 meters. Stations regularly operating on 20-meter nets should shoot for something along the lines of a three-element Yagi at 40 feet. Anything less might lead to frustration and missed schedules.

The dipole or inverted-V is probably the standard antenna on 40 and 80 meters. Install it as high as possible to maximize performance. However, other antennas may be used on these bands that could provide superior results when compared to a dipole. For example, a sloping Delta loop will provide outstanding performance at low cost. Properly installed, it can exhibit a 1 or 2 S-unit gain over a dipole at the same height. A loop antenna is more broadly resonant than a dipole or inverted-V. Typically, it will have a bandwidth of

200-250 kHz with an SWR no greater than 2:1 on 80 meters and cover the entire 40-meter band at an SWR of less than 1.5:1. Most importantly, a closed loop antenna is quieter and shows much less noise pickup than a dipole or vertical. For hams in urban and suburban locations, man-made noise is often the limiting factor in reception. Side-by-side comparisons have been run at my QTH between inverted Vs and sloping Delta loops on both 80 and 40 meters. All antennas were installed with the same apex. In all cases, the background-noise level of the Delta loop was 3-4 S-units below the inverted-V.

Vertical antennas usually are not desirable for traffic handling on 80 and 40 meters because most vertical antennas have a low angle of radiation, placing the main lobe close to the horizon. This is great for chasing DX, but in NTS region and section nets, a high angle of radiation is more desirable. Seldom do you need to work out more than 500 miles on a region net and much less on section nets. Another drawback to a vertical is it is most susceptible to man-made interference. This is because such QRM is vertically polarized.

However, one distinct advantage of a vertical is that it requires less equivalent space than a dipole for 40 or 80 meters. Thus, for the ham on a small urban lot, the vertical may be the only feasible answer. When installing a vertical antenna, you should lay down the greatest possible number of radials. (For further information on antennas, see *The ARRL Handbook for the Radio Amateur.)*

Ground System

As an adjunct to improving your antenna system, install or upgrade the ground system. A good ground can improve the performance of antennas, eliminate RF in the shack and reduce or totally abate TVI. An effective ground consists of more than a pipe driven into the nearest piece of dirt. Three or four 8-foot ground rods, spaced 10-15 feet apart and bonded together, will provide an adequate ground for all but the most demanding situations. A braided copper conductor is more effective than single wire for bonding because of its much larger surface area. An inexpensive source of braided copper strap is the shield of old RG-8 coaxial cable. Use the coaxial shield to bond the ground rods together and for the ground lead to the operating position. A piece of 3-inch-wide flat aluminum stock or a ¾-inch copper water pipe can be run across the back of the operating desk. This will provide a large, low-resistance bonding surface for the ground leads from individual pieces of equipment. Short pieces of RG-58 coaxial shield with lugs soldered on each end are used to connect the equipment to the aluminum stock or copper water pipe.

It is important that all equipment in the shack be grounded. Failing to do this will negate the effectiveness of the ground system. All too often, only the transceiver is grounded, and operators may be mystified by continued RF feedback or TVI problems. Remember, too, that the importance of an effective ground is directly proportional to your power level.

Accessories

Clock

One essential station accessory is an accurate clock. The main requirement is that it keep 24-hour time so that it can be set in Coordinated Universal Time (UTC). UTC is the universally accepted method of time-keeping in Amateur Radio. No matter which type of clock you prefer, digital or analog, plain or fancy, place it where it can be easily seen from the operating position.

Typewriter

The typewriter is a common piece of equipment in a traffic station. However, most traffic handlers don't use it regularly. Only those operators routinely making BPL (Brass Pounders League) find it a full-time necessity. Most of us need this machine only during peak traffic periods like Christmas and Mother's Day. At these times, large traffic loads may require a method of writing faster than with a pen or pencil. Learning to use a typewriter or "mill," as it's often called, is similar to starting on CW with a keyer. Go slowly at first; speed will develop with experience. A "mill" could noticeably improve your ability to copy high-speed CW. Don't bother with upper- and lower-case characters. Just use lower case—it's faster and less confusing, and there's one less key to worry about. Headphones block out the sound of typing and allow complete concentration on reception.

2-Meter FM Rig

It should be mentioned that many active traffic handlers have a 2-meter FM rig. Larger and larger volumes of traffic are being handled via 2-meter FM Nets. Handling traffic on VHF will increasingly become more and more important, particularly using digital modes, because of the 100-percent copy afforded by repeaters. In addition, VHF traffic nets have high visibility, providing many stations that will accept messages for delivery. The next few years should also see an increase in the number of linked repeaters. When tied together in this manner, several "machines" can provide section-wide coverage for VHF nets. This has already occurred in northern California, where a system of linked repeaters has allowed the VHF traffic net to handle more messages per month than the CW section net.

PC

Along these lines, as the personal computer increasingly becomes a typical ham-shack accessory, traffic handlers should employ them to expand message-handling efficiency through digital modes. In short, packet radio developed as the radio communications mode of computers. Packet radio is faster than CW and RTTY, and more importantly is more accurate than CW, RTTY and voice. As packet-radio networks and techniques become fully established, packet radio will mature into a viable way of handling messages. For more information on packet radio, see *The ARRL Handbook.*

Station Location and Layout

Station location and layout is influenced by many factors, some of which are beyond the control of the operator. Available space is the primary consideration, and is influenced by such things as family size, house size and design, and available electrical outlets. Stations may be set up in separate buildings, a single room or even in a broom closet, depending upon circumstances. However, all good stations, no matter their location, have one thing in common. They all provide for ease of operating.

Desk

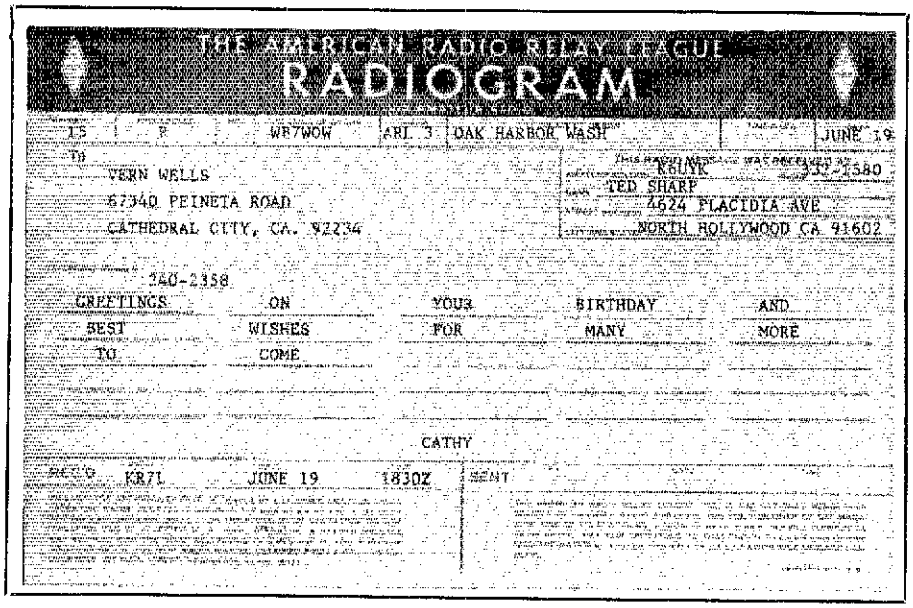
Assuming that you can commandeer a separate room or the corner of a room, the primary requirement is a good, solid desk. Even with a modest amount of equipment, in my opinion the ideal desk top should measure at least 36 × 72 inches. This allows plenty of space for writing, microphones, keyer paddles, coffee cups, and so on. The top of the desk can be covered with a sheet of glass or plastic to provide a smooth writing surface. Often-used reference material can be kept under the glass where it can be seen at a glance.

If a suitable desk is unavailable, one can be easily constructed. All that is needed are several two-drawer filing cabinets and a slab door. The use of a solid-core slab door will provide the needed weight. Using a 3-foot door will create a desk top measuring 36 × 80 inches. Filing cabinets are available from a variety of sources, and most lumber yards carry slab doors.

If your operating desk is in a shared room, such as a family room, constructing a short half-wall at right angles to the desk can provide some physical isolation. I prefer a wall approximately 54 inches high and 72 inches long. Covering both sides with carpeting will not only soften its appearance but provide some needed sound absorption.

Positioning Gear

Before positioning equipment, give some thought to the use each piece of gear receives. The most frequently used piece should be directly in front of you. Try setting up the equipment several different ways before deciding on a final arrangement. Equipment may be placed vertically as well as horizontally. No matter what ar-


THE AMERICAN RADIO RELAY LEAGUE

RADIOGRAM

15 | P | WB7WOW | ARL 3 | OAK HARBOR WASH | JUNE 19

TO
VERN WELLS
67340 PEINETA ROAD
CATHEDRAL CITY, CA. 92234
240-2358

FROM
KB7YK
TED SHARP
4624 PLACIDIA AVE
NORTH HOLLYWOOD CA 91602
352-2580

GREETINGS ON YOUR BIRTHDAY AND
BEST WISHES FOR MANY MORE
TO COME

CATHY

NR 6 KB7L JUNE 19 1830Z SENT

Fig 1—This message is typed on an official ARRL radiogram form for mail delivery.

rangement you decide upon, all essential equipment should be within reach without having to get out of your chair.

Lighting

Effective lighting is important for traffic handlers. Many hours will be spent writing at the operating position. Do not rely on normal room lighting. It is seldom adequate and can lead to eyestrain and headaches. An adjustable desk lamp is recommended. Use a frosted, rather than clear, bulb to reduce glare and provide a more even light distribution. Position the lamp in such a manner that there is no direct glare hitting your face.

Chair

The chair used by the operator is very important. What you need is one neither too hard nor too soft. Too hard a chair will lead to numbness in the posterior and be generally uncomfortable after an hour or so. Avoid the soft executive-type swivel chair. The executive chair is great if you want to prop your feet up on the desk, but no one actually operates in that position. This kind of chair makes it difficult to sit close to the desk and is tiring if you're trying to maintain correct posture. I favor a folding chair like those used with card tables. This chair has just enough padding to keep it comfortable and is narrow enough that you can sit right up to the desk.

Operating Aids

Just as dedicated DXers have their operating aids, so too the traffic handler acquires various aids to efficient operation.

Call Book

An up-to-date *Call Directory* is high on the list of needed items. Good traffic practice requires full name and address in addition to call sign when sending messages to other amateurs. Another useful aid is a postal ZIP Code directory. Often the traffic handler will have to engage in a bit of detective work to affect correct delivery. Occasionally, the name of city or town will be misspelled. If the ZIP Code is in the message, the correct city name can usually be found, or vice versa.

Telephone Prefixes

Another handy item is a telephone prefix list for your area code. These can normally be found in your telephone book. A copy of this list should be kept at your operating position for ready reference. In addition, you should keep a list of prefixes that may be called toll-free from your home. This can save you some grief when volunteering for message delivery.

Maps

A good road atlas or state map is also desirable. Often, when checking into section nets, the traffic operator will have to advise the NCS of the location of small towns. It is surprising how few people know the geography of their own state. Experienced traffic handlers develop an intimate knowledge of the location of every small town and hamlet within their section. A list of QN signals is also handy.

Scratch Pads

Most traffic operators start out by writing messages on official ARRL radiograms. This is a good way to begin, and adequate if you deal with only a few messages per month. However, if you handle any amount of traffic, this can become very expensive. There is a cheaper way—4- × 6-inch scratch pads, which may be purchased inexpensively at any office-supply store. These can be used in a manner similar to the official radiogram form. Another advantage of using this size scratch paper is that messages can be easily sorted by section, region or area; this greatly simplifies things for liaison operators between various NTS nets.

Radiograms

Every operator should have at least one pad of official ARRL radiograms (see Fig 1). These should be used for the occasional delivery that must be made by mail. Fill out the radiogram completely, translating any ARRL number into straight text, and mail it in a number 10 envelope to minimize folding. This radiogram is also available in postcard form, which further reduces mailing costs. The use of either form will foster a public awareness and appreciation of our Service.

The ARRL furnishes a number of operating aids for the traffic handler. These are available from ARRL HQ for a large SASE with the appropriate postage. Additionally, they are available at the ARRL booth at many hamfests or from your Section Manager or Section Traffic Manager. Form FSD-3 contains a list of ARRL numbered radiogram texts. Form FSD-218 has a list of commonly used Q signals in addition to those reserved for net use. It also contains a summary of the various handling instructions and precedences used in written message traffic. The best place for these forms is under the desk top glass, where they can be seen at a glance.

Publications

The *Net Directory,* FSD-50, is also available from the League, for $1. This pamphlet is filled with a wide variety of useful information, including a complete listing of NTS-affiliated traffic nets and numerous independent nets, message-routing guide, specific information on handling traffic and general operating information. The *Public Service Communications Manual* pamphlet is available free and should be in the library of every traffic handler. For a comprehensive treatment of traffic handling, along with a wealth of information on other operating procedures, you may wish to obtain a copy of *The ARRL Operating Manual,* available at your local radio bookstore or from ARRL HQ.

Conclusion

Like other organized, purposeful operating activities, traffic handling should be fun. Proper station design, correct equipment selection and the use of available operating aids can save the traffic handler from much physical discomfort and mental fatigue. A station designed for comfort and efficiency helps produce the competent operators needed by the National Traffic System.

Ham Radio—A Class Act in School

Fifth-grade students in Illinois enjoy first-class science studies using Amateur Radio.

By Larry Lisle, K9KZT
3030 Rutgers Pl
Rockford, IL 61109

This past year, we started a ham radio class as part of the 5th grade science curriculum at St. Rita School in Rockford, Illinois. So far, twelve 10- and 11-year-old girls and boys have their tickets, another has passed the code test and is working on the written portion of the exam, and several more have asked to be included in the next session. The kids who have their licenses are making contacts on the classroom station and are building transmitters to use at home until they get their own rigs.

The story really started 12 years ago, when I began teaching electronics as a science unit. We went through the history of electronics, schematic symbols and simple circuits, and built transistor radios, metal detectors and other simple projects. At the end of the course, I always talked about ham radio and told the kids that if anyone was interested I'd be glad to help them get their license.

The results were nil.

This past summer, I decided to try a different approach. I'd like to pass along what I did in case other ham-teachers would like to try a similar program in their classrooms.

Preparation and a step-by-step approach are the key elements, as they are in the teaching of any subject. During the summer, I toured the hamfests, purchasing parts for transmitters and a number of older receivers. There are fantastic bargains available in tube-type equipment! It may not be state of the art, but it works as well as it ever did—and it's cheap! Most of the receivers needed alignment and a few needed minor repairs; but I enjoy restoring old equipment, so that was no problem.

A Challenging Proposition

When class started in September, I was ready—but I didn't mention ham radio. Instead, I told the kids I was going to give them a real challenge later in the year, but wouldn't tell them what it was. From time to time, I mentioned the challenge; by the time Christmas vacation rolled around, they were really bursting with curiosity.

When they returned from Christmas vacation, they found a couple of shortwave receivers against the wall, with antennas draped out the windows (we're on the second floor).

We then started listening to shortwave broadcast stations, such as the BBC and Radio Canada. I put on the board a simplified HF spectrum showing the various SWBC bands, and explained how they were identified by both frequency and wavelength. I discussed briefly how the various controls on the receivers worked, especially the band switch, tuning dials and antenna trimmer, and why there were two gain controls. After that, the receivers became "learning stations" along with the three computers and other activities. The students had an assigned 10-minute period on the stations every day (a different one each day) and could spend more time if they completed their other work. This phase lasted about two weeks.

The next step was to bring in a good communications receiver for the ham bands. I added the HF ham bands to the spectrum on the board and let them sample what was going on. This became another learning station. I also brought in an inexpensive shortwave receiver ($10 at a hamfest) that they could take home and listen to at night.

This listening period is very important. Most kids don't know what shortwave means, and hardly any have heard a ham radio station.

The next step was the code. (I still wouldn't tell them what the challenge was.) Since the code was suggested as an extra activity in both our Reading and Science texts, I felt justified in exposing the whole class to it. I used the method in *Learning the Radiotelegraph Code*. In about a week, after we had gone through about half the letters at very slow speed, I told them that on Friday I'd tell them what the challenge was. One parent later told me that her boy was sick but begged to go to school to find out what it was! She assured him that I'd probably tell them Monday, too.

We started with the film, *The World of Amateur Radio*. After discussing the film, I showed them QSL cards from people I'd talked to using a simple transmitter they

Brad Pirrello, KA9TFF, puts a star on the map to mark a new contact. The kids have talked to other hams from Alaska to Florida. Look for us on 40!

Jennifer Medernach, KA9THV (left), and Genny Erb, KA9THQ, work on their transmitter. The students built five transmitters to use at home until they get their own rigs.

Kristine Schaefer, KA9TLB, Gary Hopewell, KA9TFG, and Lynn Holliday, KA9TLN (l-r), copy along while John Hernandez, KA9TFJ, operates the classroom station. There are fantastic bargains available in used tube-type equipment.

could build. I then told them I'd lend them some of the receivers, if they got their licenses, and that there would be a station at school from which they could operate. We discussed the Novice license requirements, and I told them I was sure some of them could pass the test. (I had no idea how many!) I then asked who wanted to take up the challenge and try to be hams.

Out of a class of 28, 12 boys and 3 girls decided to try it. In the first week three boys dropped out, but another girl decided to join. By the way, we have four Reading groups at different levels. Representatives of all four groups eventually got their tickets.

On Monday we started. The other members of the class worked on the general electronics program that we'd had for years while the ham group studied things specific to the Novice test. Naturally, there was considerable overlap in subject matter, and I sometimes taught the whole class at once. We obtained a number of old TV sets, and the kids had lots of fun tearing them apart and learning what electronics parts looked like. Some parts went for the transmitters, while others we saved for future projects.

Code practice was held after lunch during "prime time," a quiet reading period. At first, I tried giving the ham group earphones hooked to an oscillator, but we had so much trouble with volume levels and malfunctioning 'phones that I put them on the students who were reading to keep the sound of the code practice *out*.

When they got far enough along, I added a new twist to the learning stations—transistor oscillators on the 80-meter band and keys. The student at one learning station could ragchew with one at another—and learn more about operating the receiver and dealing with QRM.

Teaching Tips

I'd like to emphasize a couple of things about teaching code at this level. The person teaching it should *like* CW and be a CW operator. Don't teach the code as a necessary evil to be borne while waiting to use phone or RTTY, etc. It's enough to lay on the kids that they're going to have to work for weeks or months before they can operate. *Don't* make them think they'll have to work months *more* before they enjoy it! CW will be fun for the kids if they are taught that it will be. Note that I didn't demonstrate a QSO in the classroom. A CW QSO wouldn't have meant anything until they could copy the code, and phone would only remind them they'd have longer to work.

Don't set a deadline for the test. People learn at different rates. Everyone who stuck with the code beyond the first week eventually passed the test. Some got it quickly, some took over 10 weeks—but they *all* passed.

Watch for the person who tightens up during tests. Have plenty of practice tests and be sure they're solid at 6 or 7 WPM before trying the test at 5.

Some people learn better when the characters are sent fast with long spaces between them, while others can't handle it. Try different ways of sending to find out.

Don't teach opposites or similar letters at the same time. They won't remember which is which.

Finally, don't let them get discouraged when they've been stuck with three or four errors a minute for weeks. Tell them about the plateaus and humps on the learning curve. Let them borrow cassette tapes for extra practice at home, slow down the sending or give easy characters, speed it up and show that their error rate doesn't increase—vary the practice, and before they know it they're over the hump. It's a bore sending cipher groups at 5 WPM day after day, but it *will* pay off.

By the way, I prefer requiring solid copy for 1 minute as the code test. Kids make silly mistakes on multiple-choice tests anyway, and this just introduces an extra and unnecessary source of error.

Teaching the subject matter for the written test follows conventional classroom procedures. After they had a basic understanding, letting them tutor each other using *Tune in the World with Ham Radio* worked very well. I don't think it's a good idea to let them take the written test on the same day they pass the code test. Let them relax.

After a month or so, the kids began to pass their tests, and soon I started getting calls at home: "It came!" For most of the new hams their first QSOs were after school so I could help them along. It's *very* important for hams of this age to have someone close at hand for the first few go-arounds. Otherwise, we'll have license holders instead of operators.

I hope I have encouraged some teachers who are hams to give it a try—or maybe other hams who have free time during the day can volunteer to teach "mini-courses."

Finally, I'd like to thank Reggie Wells, W9GKI, who taught me about Amateur Radio when I was 14.

Jason Ackerman, KA9TFI, at his home QTH. Using one of the homebrew rigs until he bought his own equipment from one of the hams at the local club for $60, Jason has worked stations from coast to coast—proving that ham radio doesn't have to be expensive to be fun!

Amateur Radio at the 1985 National Scout Jamboree

Special-events station K2BSA gave Scouts a link with home—and a new perspective on achieving the Radio Merit Badge.

By Leo D. Kluger, WB2TRN
Club Program Manager, ARRL

"Did you see *Raiders of the Lost Ark*?" the scout asked me.

"Yep," I replied.

"Remember at the end where Indy's tied up and the bad guys die?"

"Sure."

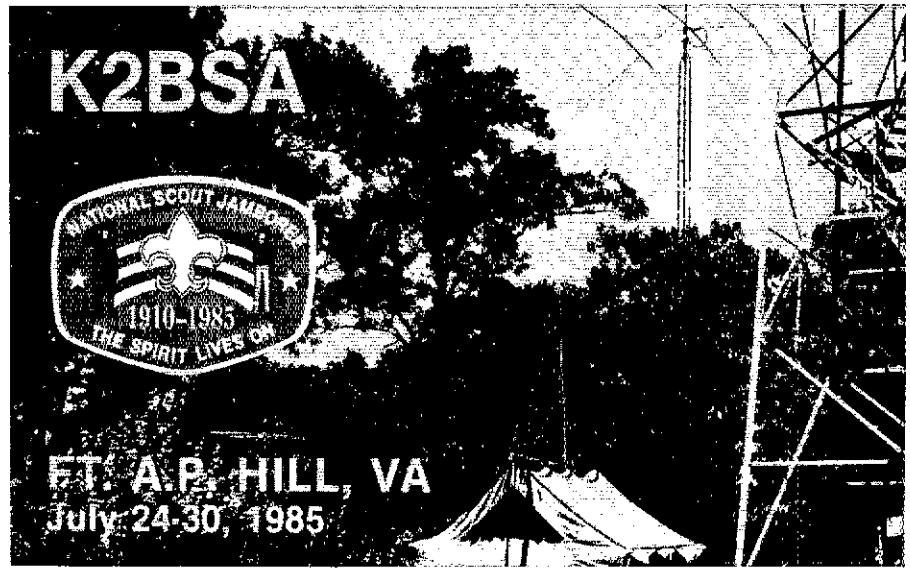
"Well, don't those clouds over there look just like the ones in that scene?"

They did, but my reply was lost as the storm front swept over the campsite. What had, moments before, been a busy but peaceful Amateur Radio tent was transformed into a melee of wild activity as we tried to keep ourselves, the tent and our equipment from being blown away.

The effects of Hurricane Bob were just about the only unplanned episodes at the 1985 National Scout Jamboree, where 30,000 Boy Scouts and leaders from around the nation and around the world gathered to celebrate 75 years of Scouting. Held at Fort AP Hill, an Army base near Fredericksburg, Virginia, the 1985 Jamboree was the 25th such event to be held in the US, where national jamborees are held every four years.

The Jamboree concept is simple: Gather in one place thousands of Scouts from BSA Councils all over the US and provide them with the best Scouting time imaginable. Mix in Merit Badge programs, high-technology exhibits, a week of camping and in-the-field cooking, meeting fellow Scouts from thousands of miles away, US military demonstrations, a free open-air concert by the Beach Boys, a visit from the First Lady and the largest fireworks show this year, and you have an idea of the fun the Scouts had.

Their ages ranged from 12 to 18, and each had to have achieved at least Second Class rank in Scouting. We weren't dealing with Tenderfeet here, but with young men who had demonstrated the ability to set goals and achieve them—the pick of the crop of the next generation of America's leaders. And, of course, Amateur Radio was there, and in force.



K2BSA, active 'round the clock during the Jamboree, worked over 100 countries and all 50 states while introducing thousands of Scouts to Amateur Radio. Staffed by an able 40-member crew, K2BSA spread the spirit of Scouting and Amateur Radio around the nation and around the world.

Logistics

Planning began more than a year ago, with the request by the National Scouting Staff to have a substantial Amateur Radio presence at the Diamond Jubilee Jamboree. Amateur Radio had been a part of the last several Jamborees, but this time the ARRL was asked to provide 24-hour-a-day operation, and were given 40 staff positions to fill, as opposed to the 10 or fewer amateurs who worked on past Jamboree Amateur Radio areas. A *QST* Stray netted 65 candidates, from which the staff members were picked. This was a more difficult task than it seemed, for all of the amateurs who asked to participate were excellently qualified. Those who ended up attending were uniformly of a high calibre, each one an experienced Scouter and Amateur Radio operator. We also had five "Youth Staff" members, Amateur Radio ops between the ages of 16 to 21 who were Scouts or had recently left Scouting. A list of the Amateur Radio staffers is shown in the accompanying sidebar.

Amateur Radio vendors and manufacturers were contacted and asked for donations or loans. Their response was terrific: They provided the Scouts with an array of the more exotic aspects of our Service. Special QSL cards were designed and printed, and a simple code oscillator—the same one used in the 1985 *ARRL Handbook*—was selected for Radio Merit Badge candidates to build. The National Traffic System (NTS) was notified of the expected overload of messages to and from the site.

We were fortunate in that the station site had already been proven for us; it was the same one that had been used for the last National Jamboree Amateur Radio station. The antenna supports, 30-foot telephone poles, were provided, as was power to

1985 Scout Jamboree Amateur Radio Staff

George R. Bair, KD8FJ
Peter Baker, KD2KD
Mike Brown, WB2JWD
Keith Bushong, KB8PN
Jim Clark, N5HOV
Dennis Cooper, K3NVI
Ed Crow, WD8DDE
Billie Dickson, WB8TRK
Dan Douglas, N7DC
Bob Downs, W7VTB
Lary Eichel, K2NA
Jack Feldman, WA4THF
Bill Free, W3FTG
Jerry Friedman, WA2FQA
Dwight Gann, K5MQA
John Geiger, NE0P
Bruce Hamilton, KK2A
Jim Hood, W0PUD
Harry Howell, KA5IMO
Ken Johnson, W7BES
Robert Johnson, K3RC
Otto Julick III, WB9WAZ
Leo D. Kluger, WB2TRN
Jason Mayrand, KW1W
Richard Mayrand, K1IEE
Ralph McMillan, ND2F
Ray Moyer, WD8JKV
Art Mueller, WA3BKD
Dan Nixon, N4DVW
S. Lee Price, KA2MLG
Doug Rowe, KA5GFJ
Jack Schechter, WD4KYC
Alan Schup, KA5WKA
Allan Schwartz, KA1CFA
John Sharps, KE5KX
Glen Singer, KA5GRP
Raymond Sloss, K5ZFN
George Weber, KC0ZQ
Fred Weigel, WD4BBZ
Shelly Weil, K2BS

spare. The National Boy Scout staff ensured that our station would not be near any of the computer exhibits.

The Layout

The Jamboree covered an area of about nine square miles, encompassing almost all of the sprawling Army base. With tremendous support from the Army Corps of Engineers (in fact, they did all the work), the base was prepared for its transformation into what would be the 15th largest city (by population) in Virginia, at least for the duration of the Jamboree.

Sleeping quarters—Army tents—for the 5000 staff members were erected; red, blue or yellow striped carnival-sized tents were put up for the exhibits and displays, and utilities for 30,000 people were put in. Electric power lines were strung, and a self-contained telephone system was installed, along with extensions of the existing Army phone system.

The ARRL Connection

The activities for the Scouts were of two main types: Merit Badge-related demonstrations and stand-alone exhibits. Both kinds encouraged hands-on participation. The activities were provided and supported through a number of sources: professional Scout staffers from the BSA National HQ in Irving, Texas; branches of the Army, Navy and Air Force; NASA; nonprofit professional organizations such as the ARRL, IEEE and NRA; and corporations with a product-related interest in the activities they supported, such as AT&T, Apple and IBM.

Some of these organizations, the ARRL among them, ran Merit Badge programs in addition to their hands-on exhibits. The ARRL program was unique in that ours was the only large-scale exhibit put on by a nonprofit independent group. The ARRL's program was divided into two sections: a working station and a Radio Merit Badge booth.

Radio Merit Badge

Our booth was one of about 125 exhibits at what was called the "Merit Badge Midway." From above, the Merit Badge Midway looked like a starfish, five arms of booths radiating from a central area. Each of the arms had about 12 exhibits on a side. The Scouts wandered from booth to booth, sampling the wares, testing the toys, participating in the projects and generally having fun. If he wanted, a Scout could stay a while longer at one particular exhibit and work on requirements for the Merit Badge represented by that booth. And if really motivated, he could complete all the requirements for that badge.

Because the main Amateur Radio exhibit was intended for actual Amateur Radio demonstrations, it was the latter type of Scout, the motivated kind, who Ken Johnson, W7BES, concentrated on. Ken ran the Radio Merit Badge booth and put together an elegant system that encouraged 39 Scouts to achieve the Radio Merit Badge.

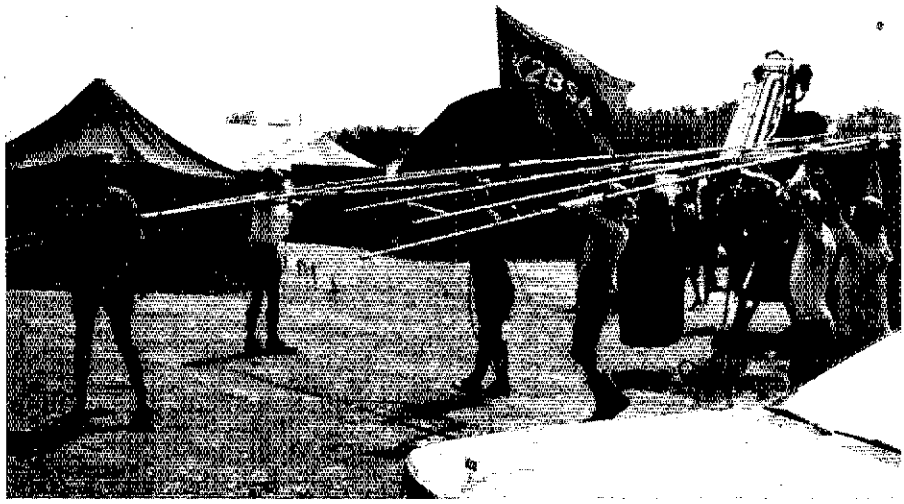
In a double-sized booth, about 10 by 20 feet, were an all-band receiver, a display of QSLs and Amateur Radio call sign maps, an array of test equipment and several workbenches with soldering stations. The typical Scout had his interest piqued at the main station, and was then taken under wing by Ken and his crew. At the Merit Badge tent, he went through the first few Radio Merit Badge requirements, learning about the shortwave bands from Doug Rowe, KA5GFJ, one of our youth staffers, and having sine waves from a frequency generator demonstrated on a 'scope by Jerry Friedman, WA2FQA. He then went on to build one of the oscillator kits, which came complete with battery, key and speaker. With 40 staff members, there were enough amateurs to give each Scout a private tutor into the assembly and theory of his oscillator. Donated by Circuit Board Specialists, these kits were the perfect means to teach basic circuit theory and construction without being overwhelming.

Good safety practices were encouraged, as was the proper way to solder discrete parts. But before actually soldering together his oscillator, each Scout contributed to our growing piece of "modern art": a haphazard construction of wire and parts contributed by staff members' junkboxes. At the end of the Jamboree, the statue was donated to the permanent K2BSA station shack in Texas.

As much of the Radio Merit Badge covers what's needed for the Novice license, several Scouts went beyond their Scouting requirements to ascend the first rung up the Amateur Radio ladder. During the Jamboree week, six Scouts went from from tyro to passing the Novice examination—a tremendous accomplishment!

Bringing anyone from scratch to their

The code-practice oscillator was a popular build-it-yourself project at the Radio Merit Badge booth. Here, Jack Schechter, WD4KYC, helps a Scout along. *(photo courtesy WB2TRN)*



Hoisting one of the two beams at K2BSA with a little help from the Rappahannock Valley Power Company and their friend, the bucket truck. *(photo courtesy K2NA)*

tickets in seven days isn't an easy job, but the fact that six Scouts did it is proof that motivation is the key. Besides the highly charged Jamboree atmosphere, we had a magician on our side, Dan Douglas, N7DC, a long-time ham, Scouter and accomplished short-wave-listening (SWL) enthusiast. Dan, a professional telecommunications officer, had an amazing rapport with the Scouts and was able to keep their attention for hours, regaling them with the wonders of electronic theory, Amateur Radio and Morse code while teaching them everything they needed to know to pass their Novice and probably their Technician, too.

In addition to the six new Novices, 60 scouts earned "partials" on their Radio Merit Badge. These Scouts were given sign-off sheets showing the areas completed so that once home they could contact a local Radio Merit Badge counselor to finish the rest of the requirements.

K2BSA—The Station

The main thrust was to entertain and educate the thousands of Scouts who would be passing by our exhibit. With this in mind, the K2BSA layout took shape as a multipart demonstration. We were located in a high-traffic area, next to the NASA tent and along a prominent path. All we had to do was lure the Scouts in and show them enough interesting sights from our hobby and they were hooked—enough for the more motivated ones to head over to the Radio Merit Badge tent.

A long counter continuously attended by staff members was at the front of the Amateur Radio tent. There, the Scouts were invited to originate traffic that would later be entered into the NTS. Three standard messages had been publicized through the NTS—JAMBO ONE, TWO and THREE —and the Scouts were encouraged to use them. A minicomputer was located on the end of the counter. Continuously loaded with Morse University® or CW Coach® (on loan from their respective manufacturers), the graphics programs did more than their share of attracting crowds of interested Scouts, while teaching a few letters of the code. It was fun to watch the Scouts learn five letters of the code in as many minutes—and hundreds did it! Also on the counter was an extra radio hooked to a long wire and used as a monitor rig for the Scouts to play with. Nothing is more interesting to a 13-year-old than the chance to turn some knobs, push some buttons and see or hear some results. An operating receiver gave them just that, and it was one more method we used to expose Amateur Radio to the Scouts.

After asking questions of those manning the counter and sending a message to their family (or, in some cases, their girl friends), the Scouts were invited to take guided tours of the rest of the station. The groups were first shown what were probably the flashiest and most interesting computer graphics programs they had ever seen: GrafTrack II and Silicon Ephemeris, two newly released software tracking programs by Silicon Solutions, Inc that we had set up on an IBM PC-XT.

These programs showed, in full color, real-time satellite-eye views of the earth. Footprints of the various "birds" were also displayed, and a zoom feature allowed the user to take a close look at the ground below the satellite. The geographic detail was impressive, and the Scouts enjoyed the fast mode, which allowed them to speed up the subjective orbit of the satellite, with the continents flashing by. These programs very naturally led to a explanation of the Amateur Radio OSCAR satellites, one of the more fascinating aspects of our hobby to these space-oriented Scouts of the '80s.

The tour group then went to one of the operating positions to make a contact. With a separate station and antenna for each of the five major HF bands, there was usually no problem in finding an open rig. The large staff size helped us again here, allowing us to have an operator at each position. The K2BSA call sign was a great help, causing more than the usual responses to casual CQs. The emphasis here was to encourage the Scouts to talk as much as possible. Getting some of them over "mic fright" proved to be difficult at times, but most of the thousands who came through our tent during the Jamboree took the chance to speak a few words to the voice at the other end. After their stint at the radio, the Scouts were given certificates of participation, signed by the control operator.

The undisputed highlight of the operating arena was when Shelly Weil, K2BS, got on 20 meters to work DX. Shelly, a famous DXer in his own right, has been to just about every one of the national and international Boy Scout Jamborees for the past 10 years. His rapport with the kids was matched only by the number of friends he has worldwide, amateurs who were always on the lookout for him on the air, and who were always glad to contact K2BSA. During the Jamboree we not only worked stations in every one of the 50 states, but also contacted DX stations in 119 countries. Most of this impressive operating feat was due to Shelly's skill and perseverance. We were privileged to have him on staff.

Station Details

Mounting an operation that succeeded in

Equipment Donations and Loans

No program as extensive as K2BSA could be accomplished without the generosity of equipment vendors and manufacturers who contributed their wares. Here's an alphabetical list of the ones who were so helpful for the 1985 Jamboree.

Advanced Computer Controls, Cupertino, CA
Advanced Electronic Applications, Inc, Lynnwood, WA
Bomar Crystal Company, Middlesex, NJ
Butternut Electronics Co, Lockhart, TX
Circuit Board Specialists, Pueblo, CO
HAL Electronics, Urbana, IL
Maggiore Electronics Laboratory, Inc, West Chester, PA
Microlog, Gaithersburg, MD
Mosley Electronics, Inc, St Louis, MO
Radio Inc, Tulsa, OK
Robot Research, Inc, San Diego, CA
Silicon Solutions, Inc, Houston, TX
Times Fiber Communications, Inc, Wallingford, CT
Trio-Kenwood, Compton, CA
Varian/Eimac Division, San Carlos, CA
Virginia Microsystems, Woodbridge, VA
Albert H. Wohlers Insurance Co, Park Ridge, IL

making over 2300 noncontest-style contacts over a seven-day period took some sophisticated equipment. Besides the equipment already mentioned, we had enough radio gear to make an amateur drool: state-of-the-art packet equipment lent by AEA and Microlog, HAL RTTY stations built into Zenith PCs for passing traffic, a Robot color slow-scan transceiver, and a few other computers used for logging and entering traffic into the correct format to be passed to the NTS. Backing all this up were two triband beams, numerous dipoles and several vertical antennas, roped off to keep heavy-footed Scouts from trampling the radials.

A Maggiore Hi-Pro on-site repeater helped us communicate around the Army base. It was controlled by an Advanced Computer Controls RC-850 controller, with the antenna and rig mounted on top of and inside AT&T's large display tent. Our thanks to the Middle Atlantic FM and Repeater Council for granting us temporary frequency coordination for the repeater during the Jamboree.

The stalwart staff at K2BSA, the Amateur Radio station at the National Scout Jamboree, held at Fort AP Hill, Virginia July 24-30, 1985. *(photo courtesy K2NA)*

Volunteer Examining

We figured that with 30,000 people around—over 150 amateurs signed our guest log book—at least one was going to want to go for his Novice or upgrade. Accordingly, Bill Free, W3FTG, put together a fine testing program under the ARRL/VEC. Bill's efforts (and those of his examiners) were worth it, resulting in four new Technician licensees and one new Amateur Extra.

Traffic Setup

Bob Johnson, K3RC, organized and ran the traffic operation at the Jamboree. Bob and his staff did a tremendous job, passing over 1700 messages and receiving 72. The National Traffic System was used throughout the operation, having been notified of the upcoming load by Jim Brodhead, KA4ERP. Received traffic was delivered to the appropriate Scouts by Order of the Arrow runners.

... And a New Group Is Formed

The results certainly justified the energy put into the program. Approximately 10,000 people passed through our 24-hour-a-day program, and hundreds of folks filled out on the spot requests for more information on Amateur Radio. Radio Merit Badge, for several years sadly near the bottom of the Merit Badge list in popularity, was given a big boost by the impressive number of Scouts who earned it in less than a week. The best news is that the Jamboree Amateur Radio program was the genesis of a group of amateurs with a renewed commitment to Amateur Radio in Scouting. It's a nationwide K2BSA club, with membership open to anyone with a mutual interest in the Boy Scouts and Amateur Radio. Interested? Contact Lary Eichel, K2NA, 11948 Deming Dr, Fairfax, VA 22030.

Operating K2BSA was one of the main attractions at the Amateur Radio tent. Nate Trumbull, KA1IPB, who upgraded to Technician during the Jamboree, takes the mic in fine style, while Otto Julick, WB9WAZ, and several Scouts experience 40-meter daytime 'phone. *(photo courtesy WB2TRN)*

Special Thanks

Every major operation has a few folks who do a tremendous amount of work over and above the rest. At K2BSA we had the special help of Mike Brown, WB2JWD, who co-coordinated the program with the author. Among other feats, Mike did the scheduling for the nine 24-hour days the K2BSA staff was at Fort AP Hill. Not as easy as it might sound, for he had to juggle all the jobs that *had* to be done versus the job that most people *wanted* to do—and he did it equitably, even when last-minute circumstances necessitated a complete reworking of the schedule. Mike also designed a database system for storing all the outgoing message traffic on floppy disks, to be transmitted later by the traffic crew. A great photographer, Mike also took what was to become the cover photo for this issue of *QST*.

One last person deserves a special mention, though he wasn't a member of the K2BSA Staff. Major Paul Cuda, WA7QEX, helicopter and fixed-wing pilot extraordinaire. Paul helped the K2BSA crew where others couldn't or wouldn't, pulling strings, moving antennas, and helping us out in varied, sundry and subtle ways.

Goldwater Scholarship Fund: Over the Top!

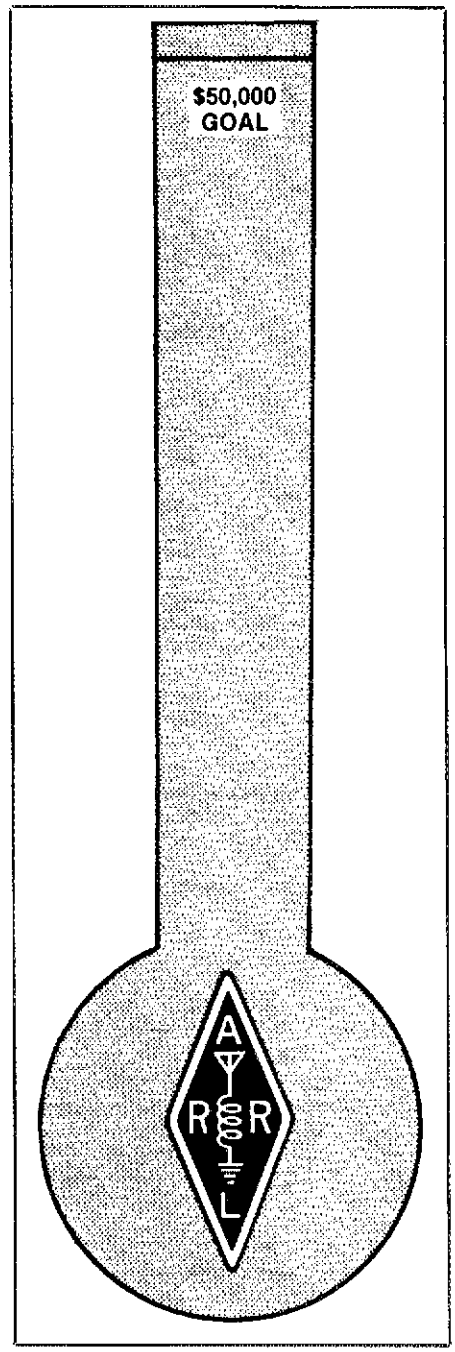
To all who helped make the $50,000 goal a reality: our sincere thanks.

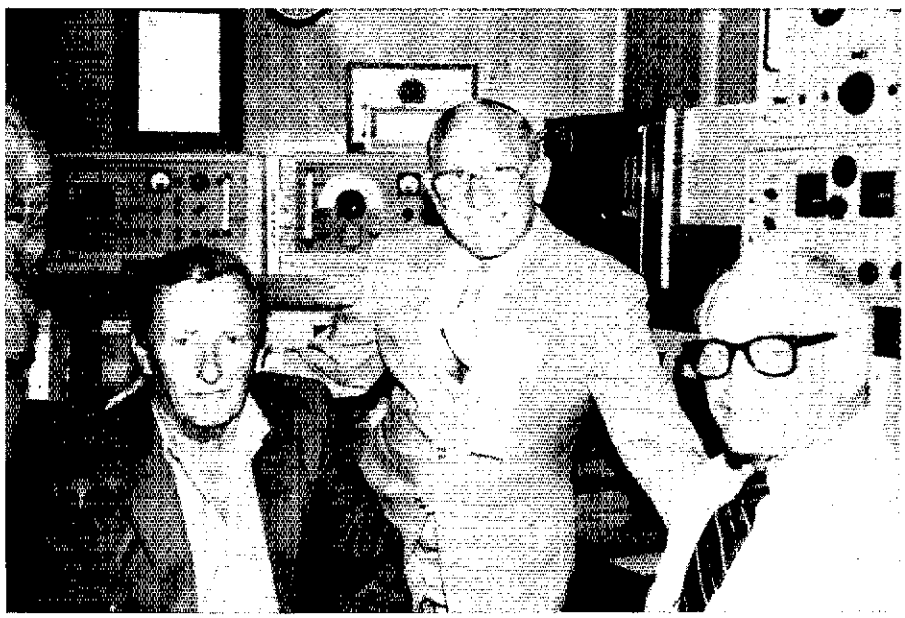
On November 9, 1983, Perry Williams, W1UED, ARRL's Washington Area Coordinator, announced the establishment of a scholarship to honor one of Amateur Radio's best-known figures, US Senator Barry Goldwater, K7UGA. The goal—$50,000—was set to create a perpetual endowment of $5000 a year to go to deserving young radio amateurs (see December *QST*—Up Front in QST and the article on page 64—for more information).

Thanks to a dedicated and selfless group of amateurs and friends around the world, that goal has not only been met, it has been exceeded. Contributions of all sizes rolled in, many of which were given in memory of hams who had made their own marks on Amateur Radio and their communities. Most agree that "Senator Goldwater is the best thing to happen to Amateur Radio in a long time. He's in a class by himself."

On October 4, 1985, a $3000 contribution from HAMCON, sponsors of the ARRL Southwestern Division Convention 1985, sent the scholarship fund well over the top (the group had already given $1000 to the scholarship fund). The clubs that sponsored HAMCON 1985 include The Associated Radio Amateurs of Long Beach, Inc; the Downey Amateur Radio Club; Hughes ESEA Amateur Radio Club; Southern California Amateur Radio Computer Club; TRW Amateur Radio Club; West Coast Amateur Radio Club; and the Young Ladies Radio Club of Los Angeles.

It's impossible to mention every contributor in a single article, but each has been acknowledged in *QST*. To the participants of HAMCON 1985 and all the others who have helped make this tribute to Amateur Radio's "elder statesman" a reality, we extend our sincere appreciation.—*Libby Karpiej, KA1DTU* QST





HAMCON 1985 Convention Chairman Nate Brightman, K6OSC (center) welcomes Roy Neal, K6DUE (left) and Senator Goldwater to the amateur station aboard the *RMS Queen Mary*, Long Beach, California, site of the 1985 Southwestern Division Convention.

MAJOR ARRL OPERATING EVENTS AND CONVENTIONS—1986*
(Check *QST* monthly for updates)

JANUARY

1	Straight Key Night
	West Coast Qualifying Run
5	Midnight Special
9	W1AW Qualifying Run (35-10 WPM)
10-12	*ARRL Hamfest (Sarasota, FL)*
11-12	January VHF Sweepstakes
12	*ARRL Hamfest (Oak Park, MI)*
12	*ARRL Hamfest (Richmond, VA)*
21	W1AW Qualifying Run
25-Feb 2	Novice Roundup
26	*ARRL Hamfest (Yonkers, NY)*
26	*ARRL Hamfest (Greenbelt, MD)*

FEBRUARY

2	*ARRL Hamfest (Villa Park, IL)*
4	West Coast Qualifying Run
7	W1AW Qualifying Run (10-40 WPM)
8	*ARRL Hamfest (Harlingen, TX)*
8-9	*ARRL Hamfest (Miami, FL)*
15-16	International DX Contest, CW
16	*ARRL Hamfest (Mansfield, OH)*
16	*ARRL Hamfest (Melville, NY)*
16	*ARRL Hamfest (Elkin, NC)*
16	*ARRL Hamfest (Kansas City, MO)*
19	W1AW Qualifying Run
21-23	*Great Lakes Div. Convention (Sharonville, OH)*
22	*ARRL Hamfest (Fridley, MN)*
23	*ARRL Hamfest (Davenport, IA)*
23	*ARRL Hamfest (Tallmadge, OH)*
23	*ARRL Hamfest (Vienna, VA)*

MARCH

1-2	International DX Contest, Phone
2	*ARRL Hamfest (Winchester, IN)*
5	West Coast Qualifying Run
7-9	*Florida State Convention (Orlando)*
8	W1AW Qualifying Run
8-9	*ARRL Hamfest (Lafayette, LA)*
15	*ARRL Hamfest (Auburn, NY)*
15-16	*ARRL Hamfest (Ft Walton Beach, FL)*
16	*ARRL Hamfest (Salem, IL)*
20	W1AW Qualifying Run
22-23	*ARRL Hamfest (Charlotte, NC)*
23	*ARRL Hamfest (Grayslake, IL)*
23	*ARRL Hamfest (Madison, OH)*

APRIL

1	West Coast Qualifying Run
5-6	*Nebraska State Convention (Kearney)*
11-12	*Michigan State Convention (Saginaw)*
12-13	*Missouri State Convention (Kansas City)*
13	W1AW Qualifying Run
13	*ARRL Hamfest (Bedford, PA)*
13	*North Carolina State Convention (Raleigh)*
14 (Mon)	144-MHz Sprint
18-19	*Midwest Division Convention (So Sioux City, NE)*
19	*ARRL Hamfest (Marietta, GA)*
22 (Tue)	220-MHz Sprint
25-27	Dayton HamVention (Dayton, OH)†
27	W1AW Qualifying Run
30 (Wed)	432-MHz Sprint

MAY

4	*ARRL Hamfest (Kankakee, IL)*
4	*ARRL Hamfest (Sandwich, IL)*
7	West Coast Qualifying Run
8 (Thurs)	1296-MHz Sprint
11	*ARRL Hamfest (Medina, OH)*
12	W1AW Qualifying Run
16-18	*Atlantic Div./New York State Convention (Rochester, NY)*
17 (Sat)	50-MHz Sprint
17-18	*Oklahoma State Convention (Wagoner)*
23-24	*ARRL Hamfest (Columbia, MO)*
24	W1AW Qualifying Run

JUNE

1	*ARRL Hamfest (Chelsea, MI)*
1	*ARRL Hamfest (Salina, KS)*
3	West Coast Qualifying Run
6-7	*ARRL Hamfest (Albany, GA)*
6-8	*ARRL Hamfest (Arlington, TX)*
6-8	*Northwestern Division Convention (Vancouver, WA)*
7-8	June VHF QSO Party
7-8	*ARRL Hamfest (St Paul, MN)*
8	*ARRL Hamfest (Wrightstown, PA)*
10	W1AW Qualifying Run (10-40 WPM)
14	*ARRL Hamfest (Midland, MI)*
23	W1AW Qualifying Run
28-29	Field Day

JULY

2	West Coast Qualifying Run
9	W1AW Qualifying Run (35-10 WPM)
11-13	*Texas State Convention (San Antonio)*
12-13	IARU Radiosport Championship
19-20	*Southeastern Div. Convention (Atlanta, GA)*
25	W1AW Qualifying Run
27	*ARRL Hamfest (Belvidere, IL)*

AUGUST

2-3	UHF Contest
2-3	*ARRL Hamfest (Cedar Rapids, IA)*
5	West Coast Qualifying Run
14	W1AW Qualifying Run
17	*ARRL Hamfest (Springfield, MO)*
23	W1AW Qualifying Run
23-24	*Roanoke Division Convention (Virginia Beach, VA)*

SEPTEMBER

3	West Coast Qualifying Run
5-7	*ARRL NATIONAL CONVENTION (San Diego, CA)*
6	*ARRL Hamfest (Windsor, ME)*
12	W1AW Qualifying Run
13-14	September VHF QSO Party

OCTOBER

11	W1AW Qualifying Run (10-40 WPM)
18-19	*Central Div. Convention (St. Charles, IL)*
18-19	*New England Div. Convention (Boxboro, MA)*
26	W1AW Qualifying Run

NOVEMBER

1-2	November Sweepstakes, CW
5	West Coast Qualifying Run
9	W1AW Qualifying Run
15-16	November Sweepstakes, Phone
24	W1AW Qualifying Run

DECEMBER

2	West Coast Qualifying Run
5-7	160-Meter Contest
8	W1AW Qualifying Run
13-14	10-Meter Contest
30	W1AW Qualifying Run

**Hamfests/Conventions of record as of November 15, 1985*

†*Not an ARRL event*

License Renewal Information

1) Attach a photocopy, or the original, of your license to the FCC Form 610 (available from ARRL HQ; SASE, please).

2) Mail to FCC, Gettysburg, PA 17325.

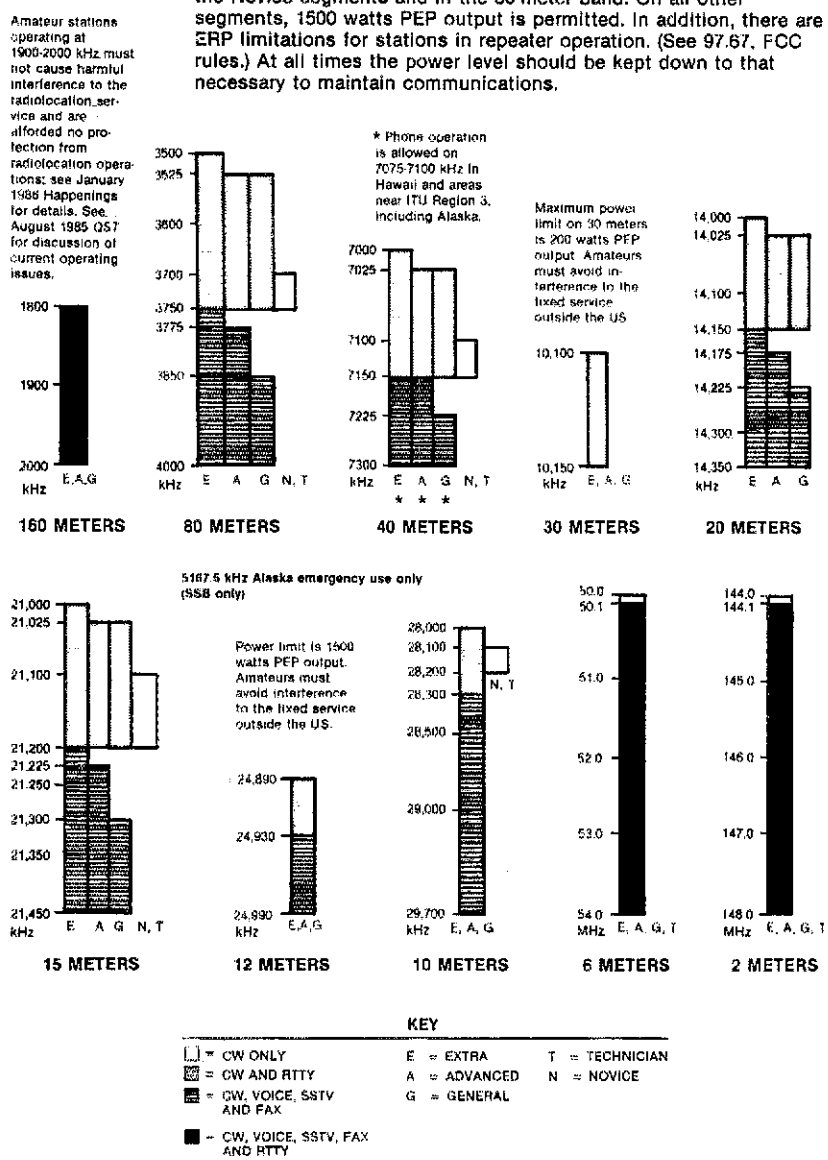
3) Retain copies of everything, if possible, as proof of filing before expiration. If you file before the license expiration date, you may continue to operate beyond the expiration date and until the new license arrives. After expiration, there is a two-year grace period under which you may still renew and keep your call sign without retesting, but you must wait until the new license arrives to operate. After this two-year grace period expires, you must be re-examined for a new license. Normally, application should be made approximately 90 days before expiration; however, renewal can be applied for at any time during the term of the license.

4) If you are simply modifying your license (change of address, for example), you must fill out the Form 610; a letter is no longer sufficient. Incidentally, your license will also be automatically renewed for 10 years at this time.

5) If you have any questions or problems, drop a note to Membership Communications Services, ARRL HQ.

US Amateur Subband Allocations, 1.8 to 148 MHz

Power Limits: All US amateurs are limited to 200 watts PEP output in the Novice segments and in the 30-meter band. On all other segments, 1500 watts PEP output is permitted. In addition, there are ERP limitations for stations in repeater operation. (See 97.67, FCC rules.) At all times the power level should be kept down to that necessary to maintain communications.



Operators with Technician class licenses and above may operate on all amateur bands above 50 MHz. For more detailed information see *The FCC Rule Book*.

The "Considerate Operator's Frequency Guide"

Some frequencies that are generally recognized for certain modes or certain activities (all frequencies are in MHz):

1.800- 1.825	CW only
1.825- 1.830	"DX window" (no W/VEs)
3.590	RTTY DX
3.610- 3.630	RTTY
3.790- 3.800	"DX window"
3.845	SSTV
7.040	RTTY DX
7.080- 7.100	RTTY
7.171	SSTV
10.140-10.150	RTTY
14.080-14.100	RTTY
14.100	NCDXF beacon
14.230	SSTV
14.313	Maritime mobile
21.080-21.100	RTTY
21.340	SSTV
28.080-28.100	RTTY
28.200-28.300	Beacons
28.680	SSTV
29.300-29.500	Satellite downlinks
29.520-29.580	Repeater inputs
29.600	FM simplex
29.620-29.680	Repeater outputs

ARRL band plans for bands above 29.300 MHz are shown in the ARRL *Repeater Directory* and the *FCC Rule Book*. This 24-MHz band plan was adopted by the ARRL Board of Directors in July 1985:
24.890-24.920—CW only
24.920-24.930—CW and digital
24.930-24.990—CW, phone and SSTV

U.S. Amateur Power Limits

At all times, power level should be kept down to that necessary to maintain communications. All US amateurs are limited to 200-W PEP output in the Novice segments. On all other segments, with certain exceptions in the 10, 902 and 420-MHz bands, 1500-W PEP output is permitted. (full-carrier double-sideband AM radiotelephone operations will use old power limits and standards until June 1, 1990.) Present restrictions limit 10-MHz PEP output to 200 W. See December 1984 *QST*, p. 61. (Revised as of November 1985.)

Conducted By David Newkirk, AK7M
Manager, Regulatory Information Branch

- *Radiolocation at 1900-2000 kHz*
- *ARRL Comments on Auxiliary Operation*
- *Watch that Form 610*

ARRL Election Results

Counting of votes for ARRL Division Directors and Vice Directors took place at Headquarters on November 20, 1985. Newly elected representatives, and those who were unopposed, will take office on January 1, 1986, for two-year terms.

Here are the results of the voting, and profiles of your newly elected representatives:

Atlantic Division

For Director: Hugh Turnbull, W3ABC (unopposed)

Hugh Turnbull has been Atlantic Division Director since 1982; this followed stints as Vice Director (1980-82) and Assistant Director (1974-80). Hugh has been a member of the Board's Executive Committee since 1984 and Chairman of the Board's RFI Task Group since 1980, and is the ARRL representative to ANSI C.63 ad-hoc Group for RF immunity. A registered Professional Engineer holding degrees from Lafayette College and West Virginia University, Hugh saw service during World War II in the US Navy, retiring from the Reserve program as a LCDR. He retired in 1979 after a 37-year engineering/management career with FCC, VOA and NASA.

For Vice Director: James M. Mozley, W2BCH—2857; Vince H. Bardsley, KB3OM—2254.

Licensed since 1938, Jim Mozley lives in Camillus, New York, and has held licenses in six call areas. He's in his fifth year as SEC of WNY, is an Assistant SM for WNY, and is an accredited VE for ARRL and Metroplex. He's Assistant RO, Onondaga County RACES; NCS, WNY Emergency Coordinators' Net; Second VP and Field Day Director of the Radio Amateurs of Greater Syracuse, Program Chairman of Rochester Hamfest; and holds membership in ARRL, OOTC, QCWA, AMSAT, SOWP, AWA, UNYREP-CO and the Salt City DX Association.

Jim is a graduate of Washington University, holding BS, MS and PhD degrees in Engineering, and is a licensed Professional Engineer in Delaware and Maryland. He served as combat infantry platoon leader in Europe during WW II, separating from the service in 1946 as 1st Lt. He recently took early retirement from a 27-year career as Professor of Radiology (Radiological Engineering), formerly at Johns Hopkins Hospital, and more recently at State University Hospital. Currently, he's an Adjunct Full Professor in Engineering at Syracuse University, teaching automatic control and instrumentation on a part-time basis.

Dakota Division

For Director, Tod Olson, KØTO (unopposed)

Tod returns as Director of the Dakota Division, a post he's held since 1981. He was Vice Director 1976-1981; Minnesota SCM 1974-75; Past President, Minnesota Wireless Association and station trustee for WØAA; Past President, Minneapolis Radio Club. He started the *National Contest Journal* (1972) and published it until 1976, when he resigned to serve as ARRL Vice Director. Tod has held ORS, OPS and OO appointments; he's a member of the HANDI-HAM System and an A-1 Operator; and holds 5BWAS 198. As a member of the ARRL, he has served on the Plans and Programs Committee and as Liaison to the Contest Advisory Committee, and is currently on the Administration and Finance Committee.

Tod is a strong opponent of "no-code," but favors encouraging new amateurs. He is a strong supporter of the VEC/VE program, and a proponent of special fees and programs to encourage young people to enter Amateur Radio.

For Vice Director, Howard Mark, WØOZC (unopposed)

Howard Mark returns to the Vice Directorship after having held that post for three years. He's been a radio amateur since 1957, when he was first licensed as WN6SQG. He upgraded to W6SQG and received WØOZC when he moved to the Twin Cities 16 years ago. His initial interest in radio was in the building, converting and testing of equipment. This interest led Howard to the conversion of commercial FM equipment for use on 144 MHz in the early '60s, and the conversion of 450-MHz equipment for fast-scan television later in that decade. Howard takes an active role in public service, having been involved in the Minneapolis Aquatennial, Burnsville Fire Muster, Twin Cities Triathalon, Walk for Mankind, Halloween Watch, Minnesota Sports Spectacular Run and the Ironman Bike Race. Howard is an active member of the local chapter of the World Future Society, with special interest and activities in communications technologies, computers and electronics. He taught evening courses in television production techniques at Metropolitan State University for two years. Presently, he's designing a course on the impact of existing and future technologies for consideration by the University.

Delta Division

For Director: Clyde Hurlbert, W5CH (unopposed)

Clyde Hurlbert returns for his third term of office as Director of the Delta Division. His responsibilities on the League Board include service on the Administration and Finance Committee, as well as with special committees to study various problems. He was the prime mover in obtaining the early release of the 12- and 30-meter bands. Clyde is proud of the VE program, Field reorganization, expanded subbands, the ARRL membership program ("we're on the upswing"), and the revised and enhanced OO program. Clyde cites improvements in the League's way of doing things: "Field Volunteers working harder! All Board meetings are now held in Connecticut, where they belong! ARRL is in sound financial condition; *QST* continues to improve, and is *on time!*" Responding to statistics indicating that the average age of radio amateurs has increased three years in the past four, Clyde is working hard to attract young people to Amateur Radio.

For Vice Director: Lionel A. Oubre, K5DPG—1246; Robert P. Schmidt, W5GHP, 656.

Lionel A. Oubre has served as Director, Vice Director and Assistant Director in the Delta Division, and for four years as the Delta Division VRAC member. He's 43, has been licensed as K5DPG for 25 years and holds an Extra Class license. Al is a Life Member of the ARRL, AMSAT and QCWA, and holds DXCC, WAS, WAC, CP-20 and two Public Service Awards. He and his wife, Carolyn, KA5IJU, have four children. Son Eugene, WD5DBR, is an ARRL Life Member. Recognized as an outstanding graduate in May 1985 from the University of Southwestern Louisiana, Al entered graduate school in the fall of 1985.

K5DPG has served in many capacities at the local, section and national level. Locally, he's served as President of the Lafayette Amateur Radio Club and the Iberia Amateur Radio Club. He has served for 15 years as Iberia Parish CD Communications Officer and ARES EC. On the Section level, Al has served as Assistant SCM, Assistant SEC and serves now as the Affiliated Club Coordinator. He is chairman and founder of the Louisiana Council of Amateur Radio Clubs, and is the Louisiana Frequency Coordinator.

Great Lakes Division

For Director: George S. Wilson, W4OYI (unopposed)

Returning to the Directorship of the Great Lakes Division, George is an "on the air" operator in almost all modes. He's 53 years of age and is married, with two children at college. George is an attorney in general Civil Practice. He graduated from Washington & Lee University (BA, JD, magna cum laude). Past SEC, SCM (Kentucky) and Vice Director (1983-84), George holds DXCC, A-1 Op and the BPL Medallion. As part of his involve-

ment in emergency and public service communications, he is a director advisor to State Government during major disasters.

George Wilson was one of the first Vice Directors to serve on a major Board Committee (Volunteer Monitoring), and was later chairman of that committee. Now, he's Chairman, Volunteer Resources Committee. As an active Volunteer Counsel, he helps defend antenna rights. He continues to work to facilitate interregional repeater coordination. On the future of the League, he writes: "Although we have stayed the sharp drop in licensed amateurs, we need to increase the amateur population. I hope to help in this improvement by helping improve the visibility and attractiveness of Amateur Radio—not only to attract, but to retain active amateurs."

For Vice Director: Allan L. Severson, AB8P—3017; Carolyn S. Elliott, KA4JMZ—1305.

Allan Severson was appointed Vice Director of the Great Lakes Division and now returns to that post by popular demand. He belongs to five clubs and holds a life membership in the ARRL; he served as EC and DEC for Cuyahoga County from 1978 through 1980, and as Assistant Director 1980-1984; he was Ohio SCM and SM for two terms. Allan's club activities have included trusteeship, and the presidency and vice presidency of the Erie Amateur Radio Association.

AB8P's activities primarily have been in the public service areas, and continues there. He is active on all bands, 1.8 through 440 MHz, including packet radio on VHF.

Midwest Division

For Director: Paul Grauer, WØFIR—1808; Robert S. McCaffrey, KØCY—1075.

Paul Grauer returns as Director of the Midwest Division after having held the office for 12 years. He's a Life Member of the ARRL, QCWA and AMSAT. Licensed in 1982, he holds an Extra Class license, as well as a commercial license; he owns and operates a repeater, and is a regular net check-in, having made BPL many times. As a member of MARS, he made over 19,000 phone patches for servicemen, particularly those in Southeast Asia. Paul was awarded the Raymond E. Baker Ham of the Year Award and also VOSH (for Volunteer Optometric Services to Humanity). He has a Golden Anniversary Award from QCWA and belongs to four chapters.

*For Vice Director: Richard W. Ridenour, KBØZL—*1739; Dick L. Eilers, WØYZV—1114.

First licensed in 1955, Richard holds the Advanced Class and commercial radiotelephone licenses. He is a Life Member of ARRL and QCWA, and also holds membership in the RSGB. He reports in regularly to the Kansas and Missouri traffic and weather nets, and can be found ragchewing on 80 and 2 meters. Richard considers the local radio club to be the backbone of Amateur Radio, and has been active in local radio club administration. He served two terms as Assistant Director. Now, he has been reelected to the Vice Directorship.

Richard grew up in Ohio, enlisted in the Navy, graduated from the US Naval Academy, Annapolis, and served in the Navy Supply Corps, including a tour in the Navy Department as Program Officer for the Navy Shore Electronics Program. Following Naval Service, he returned to Ohio State University for an MBA in Administrative Management, then entered the military electronics industry. Presently employed in the Electronics and Space Division of Emerson Electric Company, St Louis, he has been Project Engineer for communications systems and support equipment, high-reliability integrated circuits and classified electronics intelligence equipment. He is a member of the Association of Old Crows.

Pacific Division

For Director: Rodney J. Stafford, KB6ZV (unopposed)

Rod steps up to the position of Director of the Pacific Division after serving as Section Manager, Santa Clara Valley Section, since 1983. Aged 42, he lives in San Jose, California, is married (wife N6KLI) and has been a lawyer in practice for 13 years. Writes KB6ZV, "It's the Director's duty to be available to League members to discuss their concerns, to provide useful information to clubs and members, to represent the Division and to provide leadership in conducting League affairs."

For Vice Director: Kip Edwards, W6SZN—1301; Cynthia Delauney, W6PHT—1061; Glenn E. Koropp, W6YFW—612; Jettie B. Hill, W6RFF—487.

Kip Edwards returns as Vice Director of the Pacific Division after a two-year term filled with work organizing support for PRB-1 and opposition to several cities' efforts to restrict or eliminate radio amateurs' antennas. He has also been involved with stopping malicious interference and in legislative attempts to increase the penalties for jamming.

Kip, 38, is married, has two children, and practices law in San Jose. He is an ARRL Life Member, President of the Northern California DX Club and a Director of the Northern California DX Foundation. He holds an Extra Class license (first licensed 1958), with awards 5BWAS and 5BDXCC. Kip has been on the other end of pileups as FOØKP, VP5KP, W6SZN/TI2, TI1C, G4/W6SZN and FM/W6SZN.

Southeastern Division

For Director: Frank M. Butler, Jr, W4RH—3777; Carl D. Henson, WB4ZNH —1345.

Frank M. Butler returns as Director of the Southeastern Division; he's held that position since 1980. He served as North Florida SCM 1957-1980 and Vice Director 1979-1980. While on the Board, he has served on all Standing Committees, including a Chairmanship on the Membership Affairs Committee. Presently, he's Chairman of the Publications Committee, Board Liaison to the VHF Repeater Advisory Committee, and US representative on the IARU Region 2 Executive Committee. Frank was first licensed in 1950 as W4RKH. Upgrades followed (Advanced 1951, and Extra 1952), and when FCC offered a choice of calls in 1976, he became W4RH. Frank also holds First Class Radiotelephone and Second-Class Radiotelegraph Operator licenses.

Born in Anniston, Alabama, Frank moved to Fort Walton Beach, Florida, his present QTH, in 1951. He attended the University of Alabama, graduating with a BSEE degree; he has done graduate work at Ohio State and Florida State Universities. Since 1951, Frank has held various positions at Eglin Air Force Base as an electronic engineer. Presently, he is responsible for planning, conducting and reporting on field tests of various military radio and radar systems.

Frank is a member of numerous radio amateur and professional organizations, including the Eglin ARS, Playground ARC, AF MARS, CD, QCWA, AFCEA and IEEE, having held office in several. Active on HF and VHF, he has received public service awards for work in numerous emergencies.

For Vice Director: Evelyn Gauzens, W4WYR (unopposed)

Evelyn Gauzens returns to the Vice Directorship of the Southeastern Division for a fourth term. She was first licensed in 1952 and holds an Advanced Class license. She has been Chairman of the Tropical Hamboree and ARRL Conventions for 25 years, and served as an Assistant Director for 16 years. Evelyn has assisted with IARU Region 2 organization, and worked with IARU representatives at the Triennial Conference at Miami Beach in 1976. Her responsibilities have included a stint as TVI Chairman, Dade County, for 21 years, QSL manager for AI4ARU, and an ARRL Assistant Directorship for 16 years.

Presently, Evelyn is serving as ARRL Public Information Officer for South Florida; as public relations contact for FCC, Volunteer Exam teams and the local news media; as an Assistant SEC (South Florida); and is also an NCS for FPTN and the ARRL Information Net. She is an ARRL Life Member in addition to her membership in QCWA, RCA, QCWW, YLRL, Floridoras, Dade Radio Club, Dade County ARPSC, the Flamingo Net and the Florida Phone Traffic Net.

MORE ABOUT RADIOLOCATION ON 160

December League Lines carried the news that radio amateurs may have company between 1900 and 2000 kHz as early as 1987—"company" in the form of radiolocation stations displaced by the projected movement of the upper limit of the medium-wave broadcasting band from 1605 to 1705 kHz. Acting in PR Docket 84-874 on October 31, FCC gave nongovernmental radiolocation primary status at 1900-2000 kHz, effective December 9. Our allocation in that segment has since been secondary; we must not interfere with radiolocation and must accept any interference it may cause us. Softening the blow, perhaps, was the fact that until at least July 1, 1987 (when applications for 1900-2000 kHz operation from stations being displaced from 1605-1705 kHz might first be accepted), we were to have "virtually exclusive nongovernment use of 1900-2000 kHz until private radiolocation transmitters become operational," as FCC put it. Well, "virtually" is one of those words you come across in the output of Madison Avenue, and for good reason: It translates roughly to "giving the appearance of but not actually being in fact." And that's just the way it may

be with our "virtually exclusive nongovernment use" of 1900-2000 kHz—we may think we're alone there, but by the time you read this we may be rubbing elbows with radiolocation signals we can't even hear!

"Fine print" in the text accompanying the actual Part 97 amendment had said: "Also, wideband systems can be authorized immediately in the 1900-2000 kHz band since relocating displaced systems from the 1605-1705 kHz band will not begin until July 1, 1987." Wow! Would we really be sharing 1900-2000 kHz as early as mid-December? HQ staff had a hard time believing their eyes, and asked for clarification.

Yes. An Erratum correcting a few glitches in the 84-874 *Report and Order* clarified this by stating that " ... as stated in paragraph 25 [of the Report and Order], wideband systems can be authorized immediately in the 1900-2000 kHz band and need not wait until the dates indicated for existing and new radiolocation systems ... applications for wideband systems in this band will be accepted beginning *December 15, 1985.* [emphasis added]" The thought-provoking part of this is whether we may be able to detect aurally the presence of wide-band radiolocation if it arrives at 1900-2000 kHz. "Wideband" here means "spread-spectrum," and it remains to be seen if such a signal would rise much above the high atmospheric and man-made noise levels at most QTHs.

ARRL continues to investigate grounds for a request for partial reconsideration in PR Docket 84-874. The initial aim of the proceeding was the relocation of *extant* stations displaced from 1605-1705 kHz—not the immediate placement of new wideband systems at 1900-2000 kHz! And there's the question of whether the expansion of broadcasting to 1705 kHz will occur at all in ITU Region 2, because such expansion must be approved at upcoming conferences before it may proceed, and it's far from a shoo-in. Nonetheless, the fat's in the fire at 1900-2000 kHz. We're secondary there *now.* Has the company arrived?

Copies of the *Report and Order* and *Erratum* in PR Docket 84-874 are available from HQ for a 9 × 12" SASE bearing 73 cents postage. To update your copy of the *FCC Rule Book,* make these changes to Part 97:

Section 97.7 is amended by revising the table in paragraph (a) to show two separate entries for 160 meters (1800-1900 and 1900-2000 kHz) under the General, Advanced and Amateur Extra control operator license classes, in place of the single 1800-2000 kHz entry shown before. These frequencies are unavailable in ITU Region 1. After each 1900-2000 kHz entry, add a new limitation (16). In paragraph (b), add this text for Limitation 16:

> (16) Amateur stations operating in this frequency band must not cause harmful interference to the radiolocation service and are afforded no protection from interference due to the operation of stations in the radiolocation service in this band.

WHAT THE LEAGUE HAD TO SAY ON AUXILIARY OPERATION "EVERYWHERE"

In last September's Happenings, we detailed an FCC proposal (in PR Docket 85-215) to allow auxiliary operation on all amateur frequencies with the exception of 431-433 and 435-438 MHz. Auxiliary operation is defined in Part 97.3 of the Rules as "radio communication for remotely controlling other amateur radio stations, for automatically relaying the radio signals of other amateur radio stations in a system of stations, or for interconnecting with other amateur radio stations in a system of amateur radio stations." Currently, auxiliary operation is allowed only on frequencies above 220.5 MHz. Here are the highlights of the League's comments in 85-215.

The Quarter Century Wireless Association had petitioned FCC to delete the frequency restriction ("all amateur frequency bands above 220.5 MHz, except 431-435 and 435-438 MHz") from Part 97 because "the technological state of the art has made restrictions on auxiliary operation unnecessary." The League sees that the FCC proposal does not deal with spectrum management issues, however. How has technological development had any effect on the need to limit auxiliary operation to certain VHF and UHF frequencies? How will such expansion permit increased flexibility in auxiliary operations? It appears that the proposal would have the effect of shifting auxiliary operations to lower, *more congested* frequencies.

ARRL comments continue with a discussion of how crowding on the medium- and high-frequency bands makes them unsuitable for auxiliary operation, with the added headache of MF/HF propagation disallowing local frequency coordination of links on those frequencies. Many auxiliary operations, such as remote control of an HF station, require a high duty cycle, which could only make interference worse in the more crowded bands. Why use long-haul frequencies for short-haul auxiliary links? 2 meters is another bad candidate for auxiliary work; it is fully loaded in many areas of the country. ARRL comments that the Commission is correct in protecting the weak-signal and satellite bands at 431-433 and 435-438 MHz, but similar segments should be protected on *all* bands.

For these reasons, ARRL has requested that the Commission not permit auxiliary operation on frequencies below 220.5 MHz, that Section 97.86 of the Rules not be modified as proposed, and that the proceeding be terminated without further action. A copy of the League's comments in 85-215 can be had from HQ for a business-sized SASE bearing 22 cents postage.

QCWA REQUEST FOR EXTENSION OF TIME TO FILE COMMENT IN DOCKET 85-215 DENIED

On October 18, the Quarter Century Wireless Association (QCWA) asked FCC to extend the time in which to file comment in Docket 85-215 (see previous item, "What the League Had to Say ... ") on the grounds that detailed comment in 85-215 would require time-consuming analysis, and that the Association did not feel it could respond meaningfully within 30 days. QCWA requested that this period be extended to 60 days. FCC denied this request on October 31, pointing out that an across-the-board extension of time to file was unwarranted. The Commission suggested that a motion to accept late-filed comments would be more appropriate, and that FCC would be favorably disposed to accept late QCWA reply comments upon a showing of good cause for the lateness of the filing.

ARRL COMMENTS ON VEC MAINTENANCE OF EXAM QUESTION POOLS

If the Notice of Proposed Rule Making in PR Docket 85-196 is adopted as proposed, Volunteer Examiner Coordinators would be allowed to maintain their own question pools used to create examinations for amateur licenses. (See Happenings, August 1985 *QST.*) This maintenance is presently performed by the FCC, and VECs design written examinations by choosing questions from the FCC-issued pool.

ARRL adheres to the principle that the Commission, and not Volunteer-Examiner Coordinators, should retain responsibility for all Amateur Radio examination question pools. " ... It appears that it was intended by Congress that the Commission should be the entity which is responsible for maintenance of the question pools. It is questionable whether the delegation of authority to maintain question pools—the most basic level of Commission supervision over examination quality—is statutorially permitted ... as recently as July 20, 1984, the Commission specifically clarified the rules to require 'that questions chosen for written examinations must be taken verbatim from FCC-approved lists.' Nothing has changed since then to moot that laudatory objective."

The opportunity for Commission review of questions submitted for inclusion in the question pool provides an undeniably beneficial filtering process for the varied type and quality of questions. Since FCC itself has stated that its maintenance of the pools is now mainly a custodial function, it cannot be argued that Commission maintenance of question pools is a significant regulatory burden. Assigning VECs the responsibility for maintaining question pools would be a step away from uniform standards and fairness; it would be a step toward allowing "shopping for the easiest examination."

The second proposal contained in the NPRM is the acceleration of the authority for Volunteer Examiners to design individual examinations for each examination element. While the preparation of individual examinations by VECs has worked out well, it is neither necessary nor desirable to permit individual examiners to prepare examinations from the question pools. If VEs are permitted to create the examinations, it would be possible for them to "teach to the test." VEs would not even have to divulge the contents of an upcoming examination—they would be authorized to create the same. VECs must erect a "Chinese Wall" between trainer and examiner functions. This principle would be impossible to enforce at the local club level. The advantage of the present system is that no one in the field knows the contents of a particular examination until shortly before the test date.

There is no unreasonable delay in obtaining examinations; there is an ample number of VECs to create them from the question pool. Paperwork is already time-consuming for Volunteer Examiners. Asking them to prepare examinations on top of this is more of a burden than is advisable. Overall, the League adheres to the principle that VECs, but *not VEs,* should be authorized to prepare individual examinations from the Commission-maintained question pool. A copy of the

League's comments in 85-196 are available from HQ for a business-sized SASE bearing 39 cents postage.

WATCH THAT FORM 610

FCC has released a Public Notice alerting Amateur Radio Service applicants that editions of Form 610 prior to that of June 1984 would no longer be acceptable for filing. Effective January 1, 1986, only the June 1984 and later editions of FCC Form 610 may be used to obtain an amateur license. Applying on earlier editions of the form after January 1 will delay issuance of your license: Your application will be returned *without action* and you will be required to refile on a current form.

Be a Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution *now*.

If your contribution is $25 or more, we will list your name and call in *QST*. If your contribution is $100 or more, in addition to your name and call appearing in *QST*, you will receive a signed photograph of the Senator, suitable for display in your ham shack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST*.

We welcome all contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being? Please make your check payable to the ARRL Foundation Goldwater Scholarship Fund, and send to ARRL Foundation, 225 Main St, Newington, CT 06111.

Recent contributors of $25 or more include: James and Elizabeth Youse, N7GGE and KD7VR; Kenneth V. Hardman, W2DV; Hugh Unger, WB4UHN; Sherwin Goldman, WR4N; In memory of W. Garth Harris, W8GIE; Hal G. Syptak, KB4KMY/AA; Robert R. Rathbun, W8THH; Arthur B. Lyon, KC4OM.

SECTION MANAGER ELECTION RESULTS

Balloting results: In the Alabama Section, Joseph E. Smith, Jr, WA4RNP, received 315 votes, and Hubert H. Wheeler, W4IBU, received 270 votes. Mr. Smith was declared elected.

In the Alaska Section, James L. Moody, Jr, NL7C, received 147 votes, and David W. Stevens, KL7EB, received 71 votes. Mr. Moody was declared elected.

In the Delaware Section, Harold K. Low, WA3WIY, received 83 votes, and Robert "Buck" Rodgers, WA3ADS, received 59 votes. Mr. Low was declared elected.

In the New Mexico Section, Joe T. Knight, W5PDY, received 325 votes, and Robert A. Scupp, WB5YYX, received 127 votes. Mr. Knight was declared elected.

Their terms of office begins January 1, 1986.—*Arline Bender, WA1VMC*

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Wisconsin, Illinois, Northern Florida, Santa Clara Valley, Indiana, Vermont, Maine and Oregon Sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page 8 of this issue.

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

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

(Place and date)

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

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

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

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

Petitions must be received at Headquarters on or before 4 PM Eastern Local Time, March 7, 1986.

Whenever more than one member is nominated in a single Section, ballots will be mailed from Headquarters on or before April 1, 1986. Returns will be counted May 20, 1986. SMs elected as a result of the above procedure will take office July 1, 1986.

If only one valid petition is received for a Section, that nominee shall be declared elected without opposition for a two-year term beginning July 1, 1986.

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

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

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

Richard K. Palm, K1CE
Field Services Manager

SECTION MANAGER APPOINTMENT

In the Santa Clara Valley Section, Glenn Thomas, WB6W, has been appointed to complete the term (until June 30, 1986) of Rodney Stafford, KB6ZV (resigned).—*Arline Bender, WA1VMC*

LEAGUE REQUESTS PARTIAL RECONSIDERATION IN 30-DAY RETEST ISSUE; REQUEST FOR STAY DENIED; FCC AFFIRMS NOVICE INTEGRITY PROBLEM

Effective November 8, 1985, applicants failing exams for Amateur Radio licenses are no longer required by FCC to sit out a 30-day wait before retesting; in fact, FCC made it clear that a waiting period of *any* length was not required at all. (See Happenings, November 1985 *QST*.) Serious questions remained as to what may happen to the integrity of Amateur Radio licensing without a retest waiting period, particularly with respect to the Novice license.

ARRL has filed a *Request for Partial Reconsideration* addressing these problems; a *Request for Stay* of the November 8 effective date of the change was denied by FCC. ARRL notes in its *Request for Partial Reconsideration* that FCC's three premises in axing the 30-day retest wait— (1) that the waiting period was a carryover of what had been merely an FCC administrative expedient; (2) that there is no persuasive evidence that any given waiting period will result in better preparation by an applicant; (3) that adequate protection against a candidate possibly being retested with exactly the same set of questions—fail in several respects to justify the deletion of *any* waiting period, and fail especially to take into account the integrity of the Novice examination program, which is not part of the Volunteer Examination program.

FCC's instructions to VECs require that the same set of questions not be used in successive exam sessions—this, FCC had said, guarantees the continued integrity of the exam process. But *Novice* license exams aren't given by VECs! With the 30-day wait in effect, everyone, including Novices, had to wait 30 days before being retested for a failed exam element. With the 30-day wait gone, and with the integrity of the exam process guaranteed only by the prohibition against successive identical exams in FCC's Instructions to VECs, Novice applicants appear to be able to take and retake *the same exam*—code or written—because Novice exams are not given by VECs! A loophole, indeed!

In addition to this, the League opined that the 30-day wait was actually a benefit to the VEC program because it permitted a VEC to offer examinations on a more-frequent-than monthly basis without the added burden of changing the exams for each session. The waiting period limited the *individual's* ability to take the same test but facilitated the *examiner's* ability to offer a smaller number of tests *more often* to *more, different* people.

Though FCC denied the League's *Request for Stay* in 30-day retest wait issue, and has yet to act on the League's *Request for Partial Reconsideration*, it has indicated that ARRL's point on the integrity of the Novice exam is a good one. In a November 13 letter to the League's Counsel, Robert S. Foosaner, head of FCC's Private Radio Bureau, wrote:

> We appreciate your bringing the matter of the integrity of the Novice examination program to our attention. The point you make, that instructions to the VECs concerning examination retakes do not apply to examiners in the Novice program, is a good one. We are correcting this omission by revising PR Bulletin 1035A (Element 2 Examination Questions) to address this matter. Future editions of that bulletin will instruct a volunteer examiner giving Novice examinations not to use the same questions or the same telegraphy test when retesting an applicant.

How's DX?

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

Reading the Mail

Admittedly, conditions leave something to be desired. (It doesn't help much to remember the "good old days," when 20 was open for DXing 24 hours a day! In fact, it doesn't even help to remember when 20 was open half the day!) In truth, there is some decided merit in getting bitten by the DX bug now because you will surely appreciate the days still ahead when conditions will truly be super!

Some recent correspondence indicated that I've been remiss on what was supposed to be a regular "How's" feature—updating the "printed word" column appearing "just a short time back." When the bands are dry and the desire is high, you naturally want to read about where you might find some DX to work. It should come as no surprise to anyone though that the column I "thought" I did just recently turned out to be one I discussed in June of 1981! This is a sign of something or other, but not necessarily indicative that the bands are hot! In four-and-a-half years there have been some changes in what's available for the DX-interested audience and some changes in individual editorial styles, a natural evolution (I think!) in anyone's writing.

Most of the monthly, weekly and biweekly DX newsletters develop specific formats, indicating a personal choice of the writer. What might please one reader might not necessarily fit another's wants. The best bet, of course, is to send an SASE to the bulletin editor requesting a sample copy.

A rather varied assortment of DX-related mail arrives in our mailbox on a pretty regular basis, sometimes (no doubt) making our rural mailman wonder about those exotic return addresses! DX newsletters can generally be categorized in one of just two ways: those written specifically for DX-minded readers in a wide geographical area, and those of a club-newsletter format, dealing heavily in DX (obviously a prime club interest). The "pure" form, of fairly widespread domestic distribution, include the following (more on the market, I'm sure, but these are representative of what this writer sees on a regular basis):

QRZ DX (DX Tips for Big Guns and Little Pistols) is a weekly, running four sides. A recent issue carried a photo of V3CQ on the front page and interesting DX tidbits re Heard, Marianas, Cape Verde, Curacao, Thailand, Republic of Guinea, etc. About a quarter of a page was devoted to current QSL routes. A regular feature is W6RQ's sunspot sketch, with hints of the sunspot-cycle trend. A full page features calls/frequency/time, date and reporter's call area, so you can determine what you might be missing from your own specific area. In this specific issue, the back page had a calendar of who was supposed to be operating from where (mostly during the contest season). A regular highlight is KH6BZF's weekly review of date, solar flux, K-index and notes, and N4XX's forecast (based on KH6BZF's data). Get your sample copy (SASE, please) from editor Bob Winn, W5KNE, Box 834072, Richardson, TX 75083.

The Long Island DX Bulletin has been around a very, very long time, with W2IYX furnishing inspiration and constancy. This biweekly, two-sided, legal-size sheet carries an abbreviated N4XX monthly propagation forecast, a full-page rundown of doings by country name, Part 1 of a QSL update to help you route your new ones and sections titled "Notebook" and "Mailbag," which can keep you current on the news. Harvey will be glad to furnish a sample copy via your SASE to *The Long Island DX Bulletin,* PO Box 173, Huntington, NY 11743-0876.

The DX Bulletin, published 50 times a year by K1TN, follows the 4-page format and includes N4XX and KH6BZF propagation information. In fact, the early-November issue noted that KH6BZF indicated that the bottom of the current cycle is still expected to occur around the end of 1986 (sigh). Page 1 tidbits indicate current "hot" news. Page 2 carries photos of WØMLY (the W9DXCC 1985 "DX Hog of the Year") and Kirsti Jenkins-Smith, VK9NL, who operated in splendid fashion from Heard Island almost three years ago. A bit of nostalgia in Jim's publication includes "Five Years Ago in *The DX Bulletin*"—an interesting feature. This issue quoted December 1979 as being the peak of the cycle. The "Bandpass" feature is categorized by specific bands/frequencies, showing calls, frequency, UTC, day of the month and state. Page 4's calendar is a synopsis of "what's happening" by country name. *The DX Bulletin*'s address is Burnap Brook Rd, Andover, CT 06232.

The W6GO/K6HHD QSL Manager List is a monthly, 4-page newspaper-style publication, concentrating on a computerized listing of about 5000 DX calls and managers. The purpose of the publication is to be a source of current and accurate information on the easiest way to get those needed DX cards. Small back-page items catch the flavor of editor K6HHD's style and include award information, special notes, specific QTHs. A stamped envelope should bring you a sample copy pronto: *The W6GO/K6HHD QSL Manager List,* Box 700, Rio Linda, CA 95673-0700.

The DX Family News Letter, by the DX Family Foundation, is a monthly in small format. The September 30 edition contains 10 pages, in an interesting eclectic style: extensive information on call areas in Taiwan and a report from Ham Fair '85 (Tokyo, last August). An assortment of items reported VU2GO's wedding, JH1RNZ's success with the Shuttle *Challenger* on 2-meter phone and color SSTV, how you can operate in Japan, N4NW's visit to Japan, how to work 100 countries on 75/80 from Japan and a goodly assortment of photos. The newsletter's style reflects the enthusiasm of editor Mike Watanabe, JH1KRC. More details from The DX Family Foundation, PO Box 12, Shinjukukita-Ochiai, Tokyo 161, Japan.

QSL Report, by the QSL Management Association in Japan, is a succinct small-format QSL rundown for the month in question. Concise, it lists current DX stations with QSL manager, foreign and USA QSL manager addresses and addresses of about two dozen DX stations. Your queries should go to *QSL Report,* Hiromichi Katsurashima, JH1HWN, Editor, No 2 Kikyo-bldg 401, Miyamae-ku, Kawasaki-city, Kanagawa 213, Japan.

A new item on the market, just seen by your reporter, is SM5CAK's *QSL Info* and *The Most Complete QSL Managers List Ever Published.* WA9AEA feels that Lars's lists are unique in that they offer accurate info on managers and direct routings, but also acknowledge cards recently surfacing from bureaus and direct routes. The *Most Complete* series is an incredible undertaking, tracking DX all the way back to the early '60s, with verified and reliable routing data. Further details from Bill Early, WA9AEA, 501 North Hill Rd, McHenry, IL 60050.

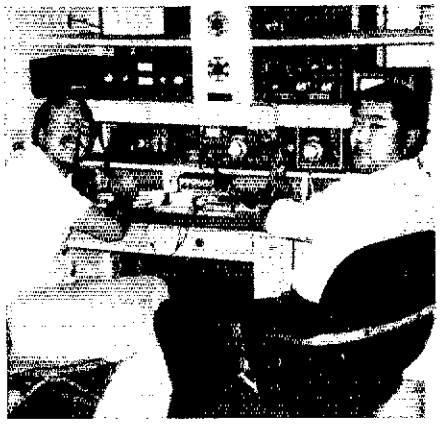
Next month, we'll detail various organizational DX newsletters, such as The Canadian DX Association *Long Skip, The Totem Tabloid* of the Western Washington DX Club, Inc, *The NCDXC DXer* of the Northern California DX Club, the Southern California DX Club *Bulletin,* the *Kansas City DX Club Newsletter, Carascope* of the Columbus (OH) Amateur Radio Association, *Worldradio* and *The Alaskan Goldpanner* of the Alaska DX Association.

At about the time most readers receive this, a brand new year will be ready for our shaping. In our eternal vigilance for "new ones," let's not forget one of the very basic tenets of our Amateur Radio Service—our unique ability to foster and enhance international goodwill. May 1986 fulfill our expectations for this present to the world.

Troster's Tips for Easy Listening

Context of QSO: If the DX station is working "contest style" (i.e., report only), do not begin your QSO with him with your QTH, name, weather, rig, etc. This DX station is trying to accommodate as many stations as he can. He wants to give out contacts and should control the pileup. Do as he wishes. Otherwise, you are back to the semi-lid-like category, and about 500 operators who are trying to work the station will all know your characteristics (in a big hurry!) If the DX station wants to exchange such items, he will do so, and you may be justified also in so doing. Otherwise, be humble and give only what he does, and then move out.

More next month from W6ISQ.



Above are KG6IP and WD6M operating from VP2M. QSLs via KG6P *(photo by Gail Mason).* Below is Bobby Martin, VP2MO, at his Montserrat operating position *(KH6IP photo).*

THE NONES OF APRIL

[The following is courtesy of W6BDN—Ed.]

Absolutely brilliant. Perfect timing. We must arrange for this every year!

What is this guy talking about?

What were *you* doing the first two weeks last April? It was time for *me* to be working on my income tax, better late than never. Usually it's a boring, wrenching and tedious task. Not last year. 1985 was positively exhilarating! The technique was to try to complete a form or schedule before (or just after) the operation got to the fives. Then, I'd put all the papers aside, move over to the rig, don my headset with the high-articulation-enhanced-sibilants' boom mic, curl my toes around the footswitch, and wait for the voice to say, "OK now, QRZ sixes." I'd holler my head off along with everybody else for about 10 minutes. Then the voice would say, "QRZ sevens." At that point, it was time to shut off the high voltage and return to my 1040 (no, that's *not* a new Kenwood!). This was my routine late afternoon and evening Saturday, all day Sunday, Monday and Tuesday evenings. By then, all the forms were completed, signed and ready for the mail (almost a week before the deadline). From that standpoint, the DXpedition was a great success. For my country tally, though, not so good. The pileups were *rather* large. With all the uproar, I never was able to find the station being contacted. (If there was any pattern, it eluded me.) I was, after all, just one of the sheep bleating my call. I bleated a whole lot, but no luck.

Discouraged, but not daunted, it was time for a new tactic. I zipped home from work at lunchtime on Wednesday. Now, this was a precarious maneuver. What if the sevens or eights were being processed as the rig warmed up? There wouldn't be enough time for a whole rotation. Luckily, the operation was on the fours. The pileup was smaller. I was about the third six summoned. My mouth dropped open in surprise upon hearing my call. It was almost a letdown after all that raging conflict.

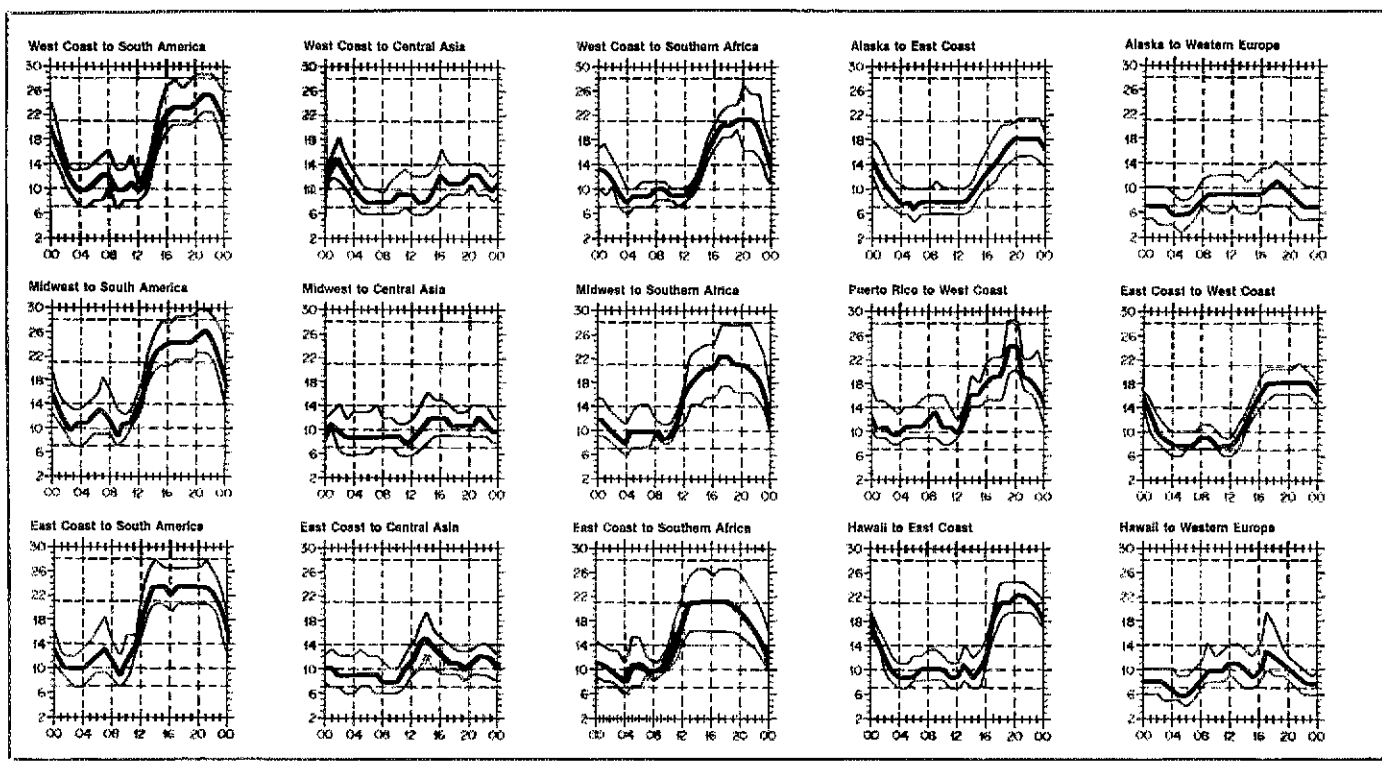
Thanks to the FOØXX gang for making tax time '85 so much more palatable. Let's encourage all DXpeditioneers, DX Foundations, etc., to make the first two weeks in April a regular DXpedition time slot.

HZ1AB

Improvements planned for the Dhahran Airport will shortly result in the removal of the building that housed HZ1AB. Lacking other suitable quarters (at least for several months), the Dhahran Amateur Radio Club disassembled the station this past mid-August. All equipment, antennas and furnishings have been placed in secure storage near its longtime home as one of Saudi Arabia's most active Amateur Radio stations. Negotiations for a new operating site are being actively pursued, but a date for regaining operational status has not yet been projected. Copies of all available station logs are in the hands of HZ1AB's very capable QSL Manager, Leo Fry, K8PYD. DARC will keep Leo informed on the progress of events.

FIVE BY FIVE

Thanks to ZL3GQ, we're reminded that there certainly *is* an award for working the same country on five bands! The New Zealand Amateur Radio Transmitting Society (NZART) offers this premier award. The initial award requires that the same station be contacted on five bands repeated with five different DXCC countries. First endorsement after a further five have been contacted (total of 10), with the 20 endorsement requiring another ten, and so on to 100. Certified list with full QSO data and fee of NZ$2 (which includes all endorsements). The certificate is outstanding and is overprinted in embossed gold. The contacts must have been made since 1945. Applications to the durable ZL2GX, Jock White,



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

152 Lytton Rd, Gisborne, New Zealand. Peter, ZL3GQ, believes the only 100-qualifiers include W1AX, himself and now Rudi, DL7AA.

NZART's WAP (Worked All Pacific) requires contacts with 30 different "Oceania Countries." Note that the point of eligibility is the country, not the prefix. Five-Band WAP goes one better requiring 30 Pacific countries on each of five different bands (a total of 150). Additional information from ZL2GX.

THE CIRCUIT

☐ **ON4UN:** ON4UN, featured speaker at DXPO, took his US license exam, administered by the Southeastern DX Club VE team. John went from unlicensed to Extra in one sitting, and awaits a new AA4 call.

☐ **8Q7CG:** At year-end, 15JHW expects to be active from the Maldives (same as Feb 1985). Cards go to Giovanni Bini, via Santini 30, 51031 Agliana Pt, Italy.

☐ **W6KG/ZS:** The Colvins operated W6KG/ZS during October, working about 6500 of the faithful in 143 countries. Lloyd gives high marks to the Johannesburg Branch of the South Africa Radio League and, in particular, to ZS6s AKV and AF. Cards for this Yasme DX travel venture and upcoming operations go to the Yasme Foundation, Box 2025, Castro Valley, CA 94546.

☐ **South Orkneys:** AZ1A should be active through March, particularly on Teletype (60-WPM Baudot), with some CW and sideband. Juan, LU8DTQ, an electronics engineer for the Argentine Navy, should be operating near 14.090 and 21.090. Cards go to Juan Carlos Parra, LU8DTQ/AZ1A, Box 5, 1636 Olivos, Buenos Aires, Argentina. (Juan took a KWM-2A, C64, MFJ 1224 interface and some homemade software, and planned a rhombic pointed north.)

☐ **J6L:** WA4TII and AA4VK operated from St Lucia Oct 22-28, totaling over 2500 two-ways (mostly during CQWW). Pasteboards go to the respective home addresses.

☐ **4U1ITU:** K4IIF planned to be active from Geneva at the end of October. Cards for that operation go to Leo Haijsman, W4KA, 1044 SE 43rd St, Cape Coral, FL 33904.

☐ **P44B:** This CQWW Bonaire operation was operated by N3ED, WA3LRO, K3EST and N7ZZ. The mult-single effort resulted in over 7200 contacts and over 11.5 million points. If you worked P44B, QSL via N2MM. If you worked the operators as /PJ4 before or after the contest, cards go via the individual *Callbook* addresses.

☐ **J28EM:** W4FRU notes that he is Henri's QSL Manager for all countries *except* France. (J28EM's previous calls include FB8ZM, FØAAE, FL8BH, FB8WJ, 5T5AY and F6EAY.)

☐ **Lost and Found:** KB6DRW recently received some cards from the bureau and notes that two were not destined for him. Both were for CW contacts with UL8GAD in March of 1984. Want to claim 'em? Contact Craig Williams, 376 Lomax, Idaho Falls, ID 83401.

☐ **ZL3GQ:** Peter notes that living in the country helps him clear down to 160; and he now has 30 countries with the *same country* on six bands! He comments, too, that last summer (our previous winter) was a great DX season. At the time of his note, he was awaiting Wyoming and Utah for a sixth-band WAS!

☐ **CX2AAL:** Carlos notes that he is active on phone (and sometimes RTTY) all bands, particularly on 10 and 20. Cards for CX2AAL go via Carlos Carrara, PO Box 4, Montevideo, Uruguay.

☐ **8R1Z:** Carol Shrader, WI4K, notifies that she is the QSL manager for 8R1Z (for the CQWW phone contest from Guyana, by NQ4I). Carol's address is 4065 Ophie Dr, Marietta, GA 30066.

QSL Corner

Administered By Joanna Hushin, KA1IFO

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

FOØLG (K6ANP)
HC8X (K8CW)
HH5CB (K9WJU)
HI3RST/KP5 (WØJRN)
HI8GGL (KZ8Y)
J34PN (N4PN)
J34UEE (K4UEE)
J87A (N4PN)
J87DX (K1AR)
OA4SS (KB6J)
P42J (W1AX)
P48K (I8MPO)
SVØDV/9 (WB4TDB)
TD4NX (KZ8Y)
TG9NX (KZ8Y)
TZ6FE (DL4BC)
VP2ET (K5RX)
VP2VCW (N6CW)
V2ACW (WB4OSN)
V44KAC (WB2LCH)
XX9SP (KS7P)
ZC4MR (G4SDJ)
3XØHAB (DL8CM)
4S7NMR (KZ8Y)
4U40UN (W2MZV)
5B4MF (IK8DYD, after July '85)
5X5GK (JA1BK)
6Y3M (KT3M)
6Y5DA (VE4JK)
7P8BE (VE3FXT)
8P9AG (K6ZM)
8P9AK (AK6T)
8Q7AZ (KZ8Y)
8R1Z (WI4K)

QSL Manager Volunteer

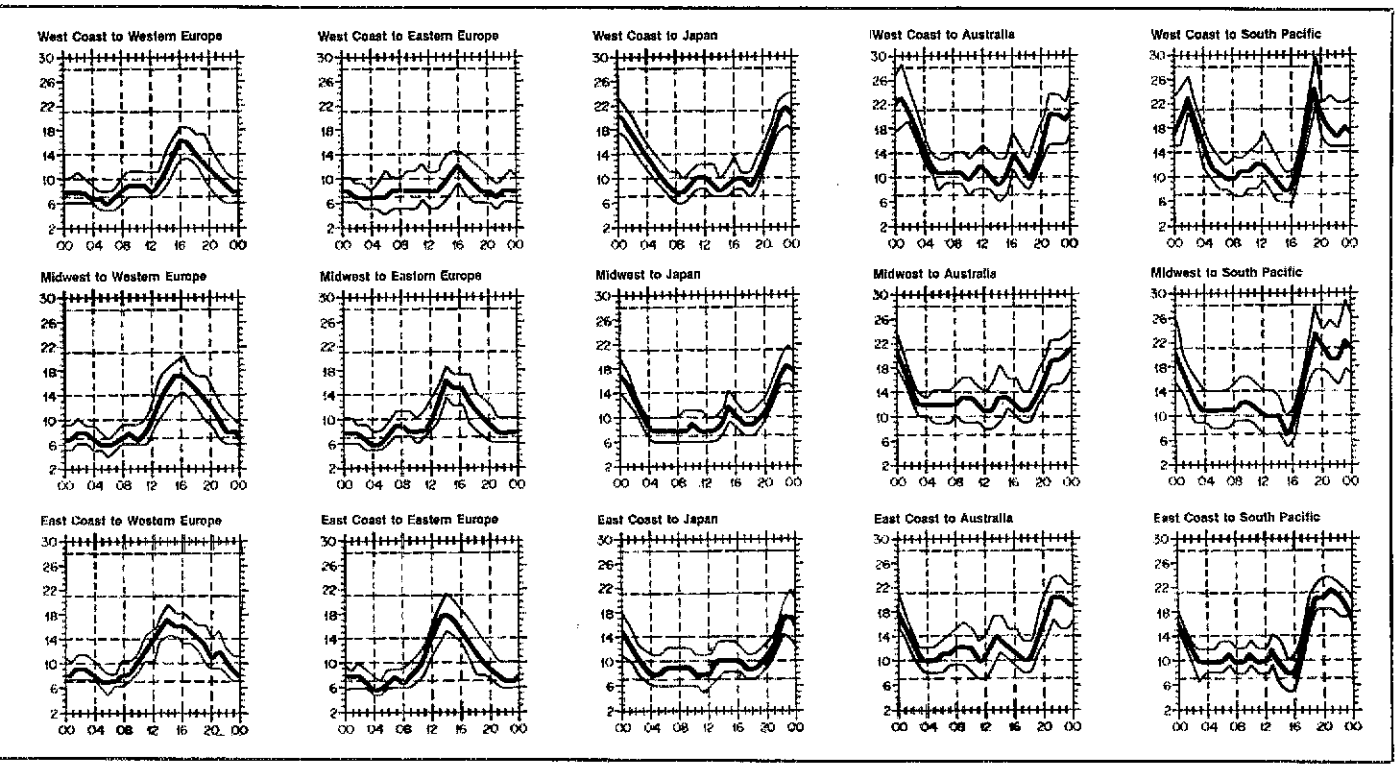
WB5KHD

Special Notes

☐ W2ZL is not the manager for 5U7AD.

☐ AF2K is not the manager for 8P6HA.

☐ QSL Corner, Dec 1985 *QST*, contains information and addresses for ARRL Incoming Bureaus. Sep 1985 *QST*, page 63, contains information on the operation of the ARRL Outgoing Service. For additional information on bureau operations (Incoming and Outgoing), send an SASE to ARRL QSL Bureau, 225 Main St, Newington, CT 06111.



the lowest curve (optimum traffic 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 January 16 to February 15, 1986, assume a sunspot number of 11, which corresponds to a 2800-MHz solar flux of 73.

DX Century Club Awards

Administered By Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300 and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from August 1 through August 31, 1985. An SASE will bring you the rules and application forms for participation in the DXCC program.

New Members

Mixed

AL7FG/139 JK1PTF/221 OK2RN/302 9K2QL/109 K3TRM/277 WJ4S/100 W6KG/CEØ/111 WA6NFC/104 WB8PRK/102
DL2KBH/105 JM1KNT/109 PY2ZM/255 KA1CSL/107 KS3L/199 WW4Q/107 W6KG/CP/100 WA7HHX/101 N9ACD/173
F6BKI/317 JE2PKD/204 SM6MNH/133 KA1DE/306 KF4CM/103 KF5AL/102 W6KG/HC8/106 AI8M/300 KC9DL/100
F6FNU/242 JE3ENP/110 SM6NFK/132 KA1LEV/106 KI4LP/107 N5GGO/105 W6KG/HKØ/111 K8BXD/110 N9DPL/199
FD5IGX/133 JH4RHF/101 VE7FJE/105 K2OMQ/103 N4KMY/174 WA5NTI/100 W6QL/CEØ/105 K8WW/311 NC9N/102
FY5BO/117 JA7AZY/142 VK4ATQ/121 KA2NRR/101 N4RK/100 KD6WW/256 W6QL/HC1/102 KC8PG/274 WD9INF/114
GD3AAE/102 JRØAMD/108 VO9DG/119 NJ2D/171 WA4EMF/140 N8IFD/104 W6QL/HK3/110 KC8ZO/100 KDØHN/151
HA2KMR/105 JY8KG/111 YU3KD/109 WA2RKO/115 WA4PEE/100 W6KG/A4/109 W6QL/ZP/107 NK8Q/100 WØOOO/107
IK1ADH/126 OH9SC/107 ZS6AE/105 WA2VJD/116 WF4E/110 W6KG/A7/116 W6RCL/164 W8DN/151 WAØUHQ/145
J28DU/125 OH9TJ/106 4T4WCY/108

Radiotelephone

A35SA/138 F6FNU/241 JRØAMD/108 6W1LL/102 W1WAI/106 KS3L/194 N5GGO/105 AI8M/289 N9DPL/196
DL5SBA/108 G4TLZ/100 LA1XDA/100 6W1NQ/102 N2BFH/149 KF4CM/100 WB5NVZ/138 KC8PG/175 WB9LAI/110
EA2QC/112 I6KYL/110 ON5WQ/267 8P6QI/100 WA2RKO/110 KI4LP/107 KD6WW/247 WA8SXM/100 WD9INF/104
EA5BW/256 JK1PTF/210 YO4PX/109 KA1DE/296 AI3Q/291 N4KMY/134 W6RCL/155 N9ACD/162 KDØHN/151
EI9FE/112 JM1KNT/109 YV5IMF/103 KA1HME/107 K3WGR/151 WW4Q/107 WB7VON/110

CW

DF1PN/102 JA8KSF/181 SM6MNH/123 AI3Q/253 N4KMY/123 W6CTL/135 KC8PG/252 KB9XG/212 KSØX/115
I1QGZ/172 KP4GJ/100 SM6NFK/128 W3GXK/104 WF4I/104 W7OAX/116 W8DN/119 N9ACD/102 WØUFO/107
JA7AZY/138 ON5WQ/226 WA2VJD/103 K4GFH/100 KD6WW/125 AI8M/122 AI9J/197 KØOST/103 WAØUHQ/117
JA7WJU/101 SM6LWH/128 AA3O/101

RTTY

N5DSK/101

160 Meters

G3YUV/105 K2RIH/100 W3UM/101 W8JIN/101 WØGYH/100

Satellite

DC9ZP

5BDXCC

UQ2GDQ KT4G YO4PX N2ATD UC2LBE 6Y5DA KG9N T77V OK2RN
W4BKP HA3KNA NA5C UB5ZEL K5ANB K2TK

Endorsements

Mixed

DJ1XP/338 JA3DY/349 SM5BDV/225 K1YHM/276 W2LZX/318 K4YKZ/151 KE5CK/348 W7CMO/351 KV9V/201
DJ6KH/327 JA4FHE/322 SM6CKS/337 KB1ER/161 W2MZV/340 KA4S/317 KE5TF/284 W7KS/325 N9AIB/268
DK9FB/327 JA6CNL/321 SM7ASN/336 KS1G/201 W2RC/224 KG4W/311 KR5D/277 W7LR/313 W9CA/292
DKØKO/226 JA6GXP/318 SM7BYP/314 KY1O/167 W2SUA/334 KV4F/306 KX5V/290 W7MCU/262 W9DC/338
DL1EV/251 JA8BKI/203 SMØAJU/354 N1CLC/129 WA2MID/302 N4FKZ/300 N5AX/305 W7NP/296 W9DE/326
DL3IE/308 JA8KSF/299 SMØMC/314 W1JNV/357 WA2UZB/239 N4FKZ/EA4/156 N5DVY/129 W7OAX/289 W9ROK/225
DL7CS/334 JA8MS/331 SP9PT/329 W1KDD/151 WA2VEE/309 N4FKZ/HR/257 NA5S/225 W7OM/334 W9TX/288
DL7XS/292 JA8XJF/316 TF3SV/319 W1OR/325 AI3Q/303 N4FKZ/I0/130 NJ5X/233 W7ZI/296 W9WY/332
DL8MAG/302 LA4CW/222 UA3FT/300 W1JZ/333 AI3R/302 N4HBD/205 W5JC/341 W7ZR/313 WB9EEE/250
DL8ZAW/186 LA5HE/349 UB5WE/328 WA1AER/320 K3AV/345 NQ4K/124 W5YH/293 KA8OUT/124 WB9KOY/158
F2IU/336 LA7SP/188 UB5WF/353 WB1AJG/149 K3KP/340 W4HLY/225 WB5NAA/200 KW8T/310 WB9RNF/255
F5DE/170 OE2VEL/311 VE3FIU/154 WB1DQC/309 KB3J/137 W4HY/310 WB5ZDP/177 N8MC/308 WD9GQV/276
G2DMR/332 OE6MKG/320 VE4OX/341 WB1GDG/296 N3CYC/152 W4JD/331 K6WR/347 W8YAH/293 AKØM/252
GU3HFN/183 OE8RT/335 VE7AAQ/351 AA2A/304 W3CDG/325 W4JVU/340 N6OZ/305 W8LKH/361 KØBUR/336
GW3AHN/358 OH2KI/320 VK3YL/349 K2FL/358 W3EVW/362 W4QM/349 W6AYQ/283 AI9J/341 KØCVD/296
GW4BLE/300 OH2QV/347 VK6HD/332 K2ON/309 W3GH/357 W4SSU/349 W6DSY/199 K9ECE/351 KØHQW/276
HB9CDZ/233 OH5OZ/262 XE1MMD/207 K2PK/271 W3HMR/150 W4VN/307 W6MUS/307 K9HMB/318 KØKTP/315
HB9DX/349 ON4SH/298 XE1OD/205 K2TK/293 W3HNK/323 WA4CCP/260 W6PHF/337 K9MFI/310 KØQQ/308
HB9KC/300 ON5WQ/279 YU1GMN/300 K2UFM/323 W3OP/337 WB4VKW/184 W6SC/340 K9MNT/296 KC0Q/300
HB9RX/326 ON7EJ/306 YU3DJK/305 KB2CB/291 W3TV/343 WD4NBX/306 W6YO/338 K9QXY/309 N0AT/309
I2LAG/333 ON7WW/305 YU7ORS/217 N2ATD/306 W3UM/307 WF4G/295 WB6ZUC/317 K9RA/334 NAØY/348
I3EVK/334 OZ1CTK/309 YV6ABM/139 W2BTG/275 WB3CQN/303 WT4T/304 WD6DKG/284 K9UWA/320 WØELA/365
IV3TQE/300 OZ5EDR/153 ZL1AH/341 W2BXC/322 AB4D/331 AE5B/318 K7UT/319 KA9MCQ/130 WØJM/157
I7ZPB/345 PAØTAU/339 ZL1AMO/334 W2FCR/315 AK4H/173 K5AQ/333 KI7X/178 KC9JP/307 WØLNZ/233
I8MMI/273 PY1HX/355 ZS6BCR/224 W2GW/359 K4CM/242 K5FJ/354 KY7M/230 KF9D/276 WØNS/312
JE1QYI/154 PY2JSF/249 9Y4VU/316 W2HUG/291 K4FJ/342 K5KX/326 N7EB/353 KG9N/296 WØPGI/358
JE1TTI/253 PP5UG/336 K1CC/323 W2IIX/229 K4JLD/291 K5RE/308 W7BCT/309 KM9G/160 WØRT/290
JA2BHG/331 SM5AKT/297 K1EFI/316 W2JGR/307 K4MPE/339 KC5CR/261 W7CB/336

Radiotelephone

AL7FG/138 JA8KSF/282 VE3UX/332 WB1AJG/148 KB3PD/201 WF4G/276 WA5BBR/262 W7OAX/274 W9DC/335
CT1TM/179 JA8XJF/315 VE4JK/295 WB1DQC/309 W3CDG/309 WT4T/298 WB5CBJ/305 W7OM/325 W9DE/292
CX4HS/225 KV4JC/151 VE4OX/322 WB1GDG/296 KB3PJ/321 AE5B/318 K6EDA/306 W7ZR/300 W9LA/331
DF4PL/284 LA1ZI/327 VK6HD/329 AA2A/293 W3DHM/356 K5AQ/327 K6WR/347 K8REG/176 W9MMZ/319
DJ1XP/327 OE2VEL/309 XE1MMD/205 AG2K/224 W3EVW/346 K5FJ/341 KB6HW/159 W8MAK/225 W9QQ/320
DJ6KH/263 ON7EJ/304 XE1NI/317 K2FL/349 W3GH/351 K5TV/320 N6BAK/280 W8QHG/274 W9ROK/158
DK2BL/332 ON7WW/302 XE1OD/205 K2TK/277 W3HNK/319 KA5DNP/205 W6FAH/227 WA8VPN/264 W9TC/308
EA1AWW/208 OZ1BNZ/250 YS9RVE/311 K2UFM/321 K4FJ/334 KA5GRP/207 W6MUS/298 WD8PUG/294 W9TX/270
EA8VV/257 OZ1BOD/253 ZL1AH/306 KB2CB/289 K4JLD/278 KC5CR/261 W6NGZ/175 AI9J/322 WD9GQV/274
F5JA/324 PY2JSF/249 ZL3QN/330 KC2JA/250 K4UAS/308 KC5PR/250 W6PKB/199 K9ECE/350 AKØM/184
F6FWW/275 PY2WT/276 ZP5CF/357 KZ2W/195 KG4W/302 KC5WJ/226 W6SN/306 K9HMB/317 KØBUR/335
HB9RG/291 PP5UG/335 ZP5MJO/250 N2ATD/303 N4FKZ/295 KR5D/161 W6YO/307 K9MFI/296 KØHQW/276
I1TLJ/265 PY6ACP/205 ZS6BCR/173 W2FCR/315 N4HBD/200 N5WH/225 WA6BIE/202 K9ZO/298 KØJS/291
I2LAG/333 SM6CKS/337 3D2DM/205 W2GBC/333 NW4K/253 NA5C/284 WA6DTG/290 KC9JP/306 KØKTP/315
I3EVK/322 SMØAJU/340 9Y4VU/311 W2IIX/229 W4BIM/300 NA5S/225 WB6VIN/268 KC9YX/175 KØQQ/306
IV3TQE/300 SMØMC/306 K1EFI/302 W2JGR/302 W4EPZ/337 NJ5X/233 K7ICW/305 KD9EB/204 KBØZZ/128
I4USC/312 TG9HH/198 K1YHM/266 W2LZX/313 W4HLY/223 W5UAW/337 KC7XB/226 KU9I/312 N9AT/308
JA3DY/315 UB5WE/327 KY1O/155 W2QWS/342 W4JVU/339 W5VUZ/226 KI7X/177 N9AIB/249 NAØY/340
JA4FHE/317 UB5WF/337 W1JNV/321 W2SUA/332 W4PDL/350 W5VVD/253 W7BCT/308 NE9I/208 WØJM/135
JA6CNL/299 UW4NH/323 WA1AER/320 WA2MID/302 W4SKO/355 W5WJQ/300 W7CMO/342 W9ABM/320 WØPGI/348
JA6GXP/315 VE3FIU/153 WA1PEL/280 WA2VEE/309 WD4FHD/231 W5YH/272 W7DSZ/303 W9CA/266 WØYMH/320

CW

DF3FJ/252 JA3DY/287 OZ1CTK/303 VE7AAQ/283 WA1AER/302 KB3J/124 K5YY/284 W7LR/299 KF9D/264
DJ1XP/295 JA4FHE/217 OZ1FRR/293 XE1XF/150 AA2A/198 W3EVW/296 KO5D/212 W8WW/307 KG9N/185
DL1EV/228 JA7FS/262 SM5AKT/292 YS9RVE/292 K2FL/313 K4FJ/290 KR5D/255 KB8KW/282 KM9G/153
F2IU/278 LA7SP/175 SMØAJU/310 ZS6BCR/174 K2PK/259 K4JLD/249 W5HFN/151 N8MC/290 W9TX/202
F5DE/157 OH5OZ/225 TG9NX/308 ZS6BSZ/226 K2TK/227 K4MF/176 K6ZUR/203 K9IL/281 AKØM/204
HB9ALO/294 ON4SH/274 TI4BGA/163 9Y4VU/262 KB2CB/165 W4MPY/265 N6OZ/228 K9MFI/293 KØCVD/284
HB9CDZ/230 ON7EJ/304 VE3CKF/305 AA1K/303 W2LZX/291 WF4G/218 WB6ZUC/303 K9ZO/271 KC0Q/286
JH2TPI/202 ON7WW/298 VE4AEX/176 K1YHM/127 K3UA/296 K5AQ/300 N7AIH/130

RTTY

JA8ADQ/192 WA2JBV/125

160 Meters

AA1K/173

Canadian NewsFronts

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

Affiliate with CRRL

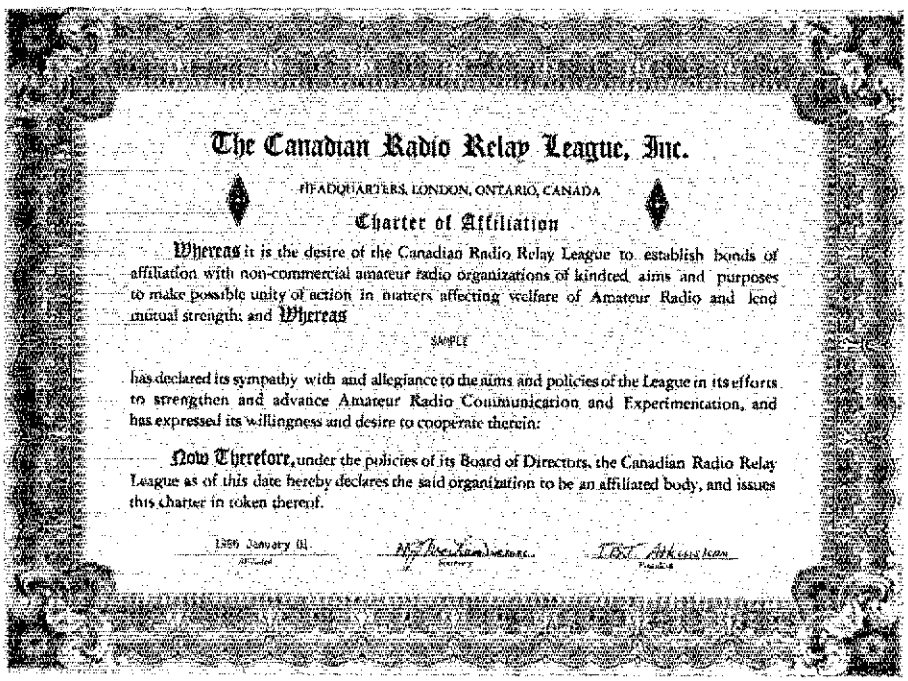
Happy New Year! For several years now, CRRL reps and workers have been receiving letters asking, "How can our organization affiliate with CRRL?" CRRL reps and workers have always appreciated receiving those letters. Each letter was an indication that Canadian amateurs continue to appreciate the values for which CRRL stands and the good work that CRRL and its predecessor, the Canadian Division of ARRL, has done for 65 years. Each letter is also an indication that many amateurs want to identify with those values and, in a formal way, express support for that work.

Organizations can now affiliate with CRRL. Guidelines, originally proposed by a committee headed by Western Director Bill Kremer, VE7CSD, were discussed, amended and ratified at the 1985 Annual Meeting of the CRRL Board. These guidelines are designed to make affiliation with CRRL as simple as possible, and yet still be meaningful.

How can your organization affiliate? Just have your organization's secretary write to CRRL for an application form. On that form, your organization will be asked to classify itself as a provincial society, local club, special-interest group, student group or senior citizens' group. Your organization will also be asked to supply the names and addresses of its executive, and the name and address of someone who can become a CRRL contact person. No money will change hands. There is not even a requirement that a certain number in your organization must be CRRL members, though there is a strong hope that many will be, and there is a very strong hope that being affiliated, your organization will promote individual membership in CRRL.

What will your organization get out of affiliation? A Charter of Affiliation that will certainly look good on the wall of wherever your organization holds its meetings! Regular mailings of the *CRRL News* bulletins. Other mailings having to do with developments in DOC, free materials available from CRRL, contests and other operating activities. Also, there are special offers on materials for your licensing classes, and special offers on certain ARRL and CRRL publications. Your organization may even get a few new members out of the deal. Each week, CRRL receives several letters asking, "How can I become a radio amateur?" CRRL plans to send the authors of all such letters to the nearest CRRL-affiliated club!

Affiliation is a good deal. It costs nothing and can bring many benefits. Let's hear from your organization soon. Affiliate with CRRL.



The Canadian Radio Relay League, Inc.

HEADQUARTERS, LONDON, ONTARIO, CANADA

Charter of Affiliation

Whereas it is the desire of the Canadian Radio Relay League to establish bonds of affiliation with non-commercial amateur radio organizations of kindred aims and purposes to make possible unity of action in matters affecting welfare of Amateur Radio and lend mutual strength; and Whereas

SAMPLE

has declared its sympathy with and allegiance to the aims and policies of the League in its efforts to strengthen and advance Amateur Radio Communication and Experimentation, and has expressed its willingness and desire to cooperate therein:

Now Therefore, under the policies of its Board of Directors, the Canadian Radio Relay League as of this date hereby declares the said organization to be an affiliated body, and issues this charter in token thereof.

1986 January 01

This Charter of Affiliation would look great on the wall of wherever your club or group holds its meetings. Affiliate with CRRL!

DOC NEWS

☐ Last month, we noted that DOC had announced a new third-party-traffic agreement with the UK. There are some strings attached. Traffic can be exchanged only with UK special-event stations using a GB (but not a GB3) prefix.

☐ DOC has become concerned about a number of stations that were assigned Q signals as part of their call signs. ITU recommends against this practice. The matter has now been resolved. Stations with Q signals as part of their call signs will be "grandfathered." Call signs such as VE7QRP, VE3QSL and VO1QST, now in use or reserved, will be "safe." Beyond that, DOC will not issue call signs that use Q signals.

☐ When DOC removed the frequency and power restrictions on 160 metres, it removed the no-mobile restriction as well. Happy mobiling!

☐ This year, DOC will conduct Amateur Radio examinations on February 12, April 16, June 18 and October 15. Deadlines for submitting an application to write are January 22, March 19, May 21 and September 17, or about one month before the date of each writing.

CRRL NEWS

☐ DOC released its discussion paper on *Restructuring the Canadian Amateur Service* on November 16. (You read about it here first, in the December issue of *QST*.) Even before it was released, DOC gave CRRL officials permission to publish details of the proposal in the *CRRL News* bulletins and to discuss the proposal with clubs. What's been the initial reaction? So far, most amateurs are in favour. They are saying, however, that the examination for Certificate A should be substantial. The Canadian Amateur Service does not need a "CB-type" or "giveaway" Amateur licence. (Apparently, DOC agrees. They specify that Certificate A should require 40 hours of study.) There should be some provision for a 5- or 6-WPM code test, which, when used in conjunction with Certificate A, would give CW privileges below 30 MHz. Finally, distinctive call sign prefixes that would indicate an amateur's class of certificate might be desirable. What do you think?

☐ Congratulations to Jack Strangieman, VE3GV, who was named 1985 CRRL Amateur of the Year. Jack was responsible for developing the emergency communications plan for London, Ontario—a plan that has become a model for emergency-communications plans all over Canada.

IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

ITU Secretary-General Addresses WIA's 75th Anniversary Banquet

As the grand finale to a year-long celebration of its 75th anniversary, the Wireless Institute of Australia held a gala banquet on the evening of Saturday, November 9, 1985. About 150 guests from Australia and overseas (representing five of the six continents) were present to participate in the ceremony. WIA is the oldest Amateur Radio society in the world, and it was entirely fitting that the guest of honor was ITU Secretary-General Richard E Butler, whose address to the banquet attendees is reproduced here.

UNION INTERNATIONALE DES TELECOMMUNICATIONS
INTERNATIONAL TELECOMMUNICATION UNION
UNIÓN INTERNACIONAL DE TELECOMUNICACIONES

75th ANNIVERSARY OF THE
WIRELESS INSTITUTE OF AUSTRALIA

Mr. Chairman,
Your Excellency,
Distinguished Visitors,
Ladies and Gentlemen,

I am deeply honoured for the invitation to speak at the 75th commemorative Dinner of the Wireless Institute of Australia, the oldest Institute of its kind in the world, and to bring the greetings of the ITU as well as many amateur radio enthusiasts in contact with 4U1ITU.

Amateur radio is the only hobby provided for by the International Treaty, i.e., the Radio Regulations annexed to the International Telecommunication Convention. The Radio Regulations define amateur radio as "a service of self-training, intercommunication and technical investigations carried on by amateurs, that is, by duly authorized persons interested in radio techniques solely with a personal aim and without pecuniary interest."

Furthermore, in 1971 the World Administrative Radio Conference for Space Telecommunications provided for the Amateur Satellite Service.

Those of you who are familiar with international legislative processes would realize that these unique world-wide recognitions as well as accompanying obligations did not emerge over a few months, years or even decades. They emerged from the character, and I may add, the reliable and solid contribution of the renowned radio enthusiasts pursuing their curiosity into the radio frequency phenomenon investigation and practical operation experience, as well as a wealth of dialogue and community experience with others locally, regionally and indeed globally. These characteristics have always been manifested in the energies of your Institute, indeed the history of telecommunications in Australia is studded with the contributions of the Institute's founding fathers and its members to radio branch of telecommunications. Even before the formal establishment of the Institute, the example and brilliance of Sir Charles Todd and his team for the completion of the overland telegraph, began to orientate attention to wireless transmission. Professor William Bragg gave the first public demonstration of wireless telegraph apparatus at the University of Adelaide in September 1897, and then, in 1899, after correspondence with Marconi and financial assistance from Postmaster-General Sir Charles Todd (as always the 'Post Office' was a big help in advancing new communication ideas), wireless telegraphy messages were successfully transmitted from West Terrace to Hewy Beach in South Australia.

Let us reflect, too, on the significance of H. W. Jenvey's contact with the Duke of York's escort in external waters during the Royal visit in 1901. It was an early beginning of what we now describe as the Maritime Mobile Service.

The names of Bartholomew, MacLurccan, Read, Allsop, Coxon, Davis, Tregear, Rev. Flynn, and Sidney Witt (later to become a Member of the International Frequency Registration Board) also come easily to mind - a nucleus only of names, who without Fisk and Hooke and a legion of talented engineers and administrators, radio would not have developed so quickly and contributed so much to the development of the Australian Nation. The Flying Doctor's Service, School of the Air, Civil Aviation and the Public Telegraph Service and many towns and outback centres services, owe much to the cooperation stimulated or provided by those personalities and the Institute.

Reverting to the international elements, the young Institute and its band of radio activities, along with their colleagues in other countries concentrated on the study of the ionosphere, making the first inroads into space and prepared the way for the systematic division of the radio frequency spectrum, as we know it today.

Radio amateurs were thus involved in the exploration of space long before its material use with space stations and satellites.

Always evident by an active presence in world administrative radio conferences, they have earned their formal recognition in the ITU statutes. Conscious also of the importance of sharing their knowledge with others, the IARU, of which your Institute is an active member in Region 3, is now cooperating with the ITU with a view to organizing training courses concerning the administration of amateur radio in Africa and Asia and the Pacific.

Allow me to salute the predecessors who set the promotion of the radio techniques in action and I wish the Institute long service and prosperity.

Melbourne
9 November 1985

R. E. Butler
Secretary-General

Washington Mailbox

Conducted By Katherine Hevener, WB8TDA
Information Services Assistant, ARRL

Antenna Structures

Most amateurs probably will not come up against antenna restrictions specified in Part 97—unless they plan to erect an antenna in excess of 200 feet in height or live near an airport. Many amateurs *are* faced with city ordinances, and/or covenants that limit the location and height of antennas, however. This month, we will examine the effect of these restrictions on those who contemplate that "Big Gun" antenna installation in the backyard.

Q. My city has an ordinance that clearly prohibits Amateur Radio antenna installations. Are there any federal rulings that preempt such ordinances?

A. Yes, there is a Commission declaratory ruling that announced a *limited* preemption policy: "State and local regulations that operate to preclude amateur communications in their communities are in direct conflict with federal objectives and must be preempted."

Q. Does this mean I can ignore the "no antenna" clause in my apartment lease?

A. No. The Commission exercises no federal preemption over restrictive covenants and *private* contractual agreements, such as your lease. Also, the decision does not cover restrictions found in homeowners association agreements and deed restrictions *(Memorandum Opinion and Order in Docket PRB-1).*

Q. My antenna would exceed the height limitation specified in my city ordinance. Am I protected by federal preemption?

A. It depends. The Commission stated that it would not specify any particular height limitation below which local governments could not regulate (*Memorandum Opinion and Order* in Docket PRB-1). It noted, however, that: " . . . Local regulations which involve placement, screening, or height of antennas based on health, safety, or aesthetic considerations must be crafted to accommodate reasonably amateur communications, and to represent the minimum practicable regulation to accomplish the local authority's legitimate purpose." The line between legitimate amateur communication goals and the local authority's interests should be determined at the local level.

Q. In filling out my Form 610, I noticed that Item 9 of Section 1 asks if a Commission grant of the proposed communication facility would constitute a "major action." What is meant by "major action"?

A. According to Section 1.1305 of the Commission's rules, a "major action" is defined, among other things, as: (a) antenna towers or supporting structures which exceed 300 feet in height; (b) facilities which are located in officially designated wilderness areas, or in areas whose designation as wilderness areas is pending consideration, wildlife preserves, or a nationally recognized scenic or recreational area, or facilities which will affect sites significant in American history; (c) construction which involves extensive changes in surface features.

Q. What must I do if my antenna installation constitutes a "major action"?

A. You must submit an environmental impact narrative statement along with your application Form 610. This statement must include all of the information in Section 1.1311, including: a description of the antenna design and the surrounding environment including power lines and access roads, local use of the surrounding area, zoning classification, rationale for selection of the site, a statement as to whether the construction of the communications facility has been a source of local controversy, and a discussion of steps you took or could take to minimize the adverse environmental impact of the proposed communications facility.

Q. I live near an airport. What regulations must I keep in mind when erecting my antenna?

A. If you live near an airport that has a long runway (3200 feet in length or more) and/or is listed in either the *Airport Directory* or the current *Airman's Information Manual,* or is under construction by a Federal military agency, you must file FAA Form 7460-1 (available at FAA regional offices) and FCC Form 854 (available from your nearest FCC Field Office) with the Commission if your antenna construction will exceed the height of an imaginary surface extending outward and upward from the nearest runway at a slope of 100 to 1. For example, your tower, 5000 feet away from the nearest runway, must not exceed 50 feet in height if you wish to avoid notifying FCC. A convenient equation for calculating these height limitations is: distance from nearest runway in feet divided by slope equals antenna height limitation. From the example, 5000/100 equals 50 feet. If you live near an airport with its longest runway *under* 3200 feet in length (excluding heliports and seaplane bases without specified boundaries), then the limiting slope is a figure of 50 to 1. Using the equation, if you live 5000 feet away from the nearest runway, you may install an antenna up to 100 feet in height without notifying FCC on Form 854 or FAA on Form 7460-1. If you live near a *heliport* listed in the *Airport Directory* or operated by a Federal military agency, the slope is 25 to 1. This means that if your antenna will be constructed 5000 feet away from the nearest take-off and landing area of the heliport, your tower must not exceed 200 feet unless you submit the required forms. (See subsection 97.45 of the amateur Rules and *The FCC Rule Book,* 4th ed, page 3-11, for additional details.)

Q. The phrase "near an airport" is very vague. Can you be more specific?

A. Yes. Actually, what you are concerned with is the distance your antenna installation is from the nearest point of the nearest runway of each airport or heliport. In the first case where at least one runway is longer than 3200 feet, you're affected by these restrictions if you live within 20,000 feet of the nearest point of the nearest runway. In the second case, where the longest runway is less than 3200 feet long, you're concerned with the antenna restrictions if you live within 10,000 feet. And, finally, in the third case, you're again affected if you live within 5000 feet from the nearest point of the nearest take-off and landing area of a heliport (97.45[a][2]).

Q. But what if my tower will be shielded by trees in my backyard?

A. You may wish to apply for an exemption. If your antenna will be shielded by existing structures such as buildings, trees or hills—so that air traffic would not be adversely affected—file FCC Form 854 requesting exemptions with the Antenna Survey Branch, FCC, Washington, DC 20554.

Q. Are there any other cases in which it is not necessary to file the FAA or the FCC forms?

A. Yes. It is not necessary for antennas of 20 feet or less, except one that would increase the height of another antenna structure (97.45[b][2]). Further details as to whether an aeronautical study and/or obstruction marking and lighting are required may be obtained from Part 17 of the Commission's rules, "Construction, Marking, and Lighting of Antenna Structures."

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 FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.

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	Sep 1985, p 60
Affiliated-Club Coordinators	May 1985, p 71
Club Contest Rules	This issue, p 94
International Humanitarian Award	Dec 1985, p 57
License Renewal Information	This issue, p 62
Major ARRL Operating Events and Conventions —1986	This issue, p 61
MARS Information	Jul 1985, p 46
QSL Bureaus	
Incoming	Dec 1985, p 73
Outgoing	Sep 1985, p 63
VHF Sweepstakes Rules	Dec 1985, p 94
VUCC Awards	Dec 1985, p 61
902-MHz Interim Band Plan	Oct 1985, p 51

The World Above 50 MHz

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

Let's Get Started on 33 cm

As announced in October *QST*, the world above 50 MHz now includes some new territory for us to explore. Yes—what so many had said would never come to pass—we have a new band with a whole 26 MHz of spectrum space from 902 to 928 MHz to use for a variety of purposes. This is a much-sought-after slot in the electromagnetic spectrum. Commercial interests, from cellular telephones to other kinds of CB, were out in force lobbying for this valuable prize for their pet uses. But we won, and now it's up to us to make good use of the prize.

First, I must hasten to point out that everything is not all peaches and cream. There are restrictions of which we must be aware and by which we must abide. Some amateurs, including one individual who did a great deal to promote the 33-cm band and is continuing to do so, will not be permitted to use it unless some type of special authorization is granted or a change occurs in the announced provisions. Along with a number of other good VHFers, WØPW is unlucky enough to live within the area in which the band is unavailable for amateur use, namely Colorado and Wyoming, bounded by 39 to 42 degrees North latitude and 103 to 108 degrees West longitude. There is also no 33-cm operation in the vicinity of White Sands Missile Range, bounded by Latitudes 31 degrees 41 minutes and 34 degrees 30 minutes North and Longitudes 104 degrees 11 minutes and 107 degrees 30 minutes West. In addition, within 150 miles of this box around White Sands, transmitter power is restricted to 50-W PEP output.

There is one more negative. Our use of 902 to 928 MHz is on a secondary basis to government services operating in the band and to Automatic Vehicle Monitoring (AVM) systems. This means we must accept interference from these users and must not cause interference to them. In addition, Industrial, Scientific and Medical (ISM) devices, including some microwave ovens, operate at 915 ±13 MHz, and we must be prepared to accept interference from any such devices.

Otherwise, 33 cm is open to all US licensed amateurs holding a Technician class license or above and operating in ITU Region 2 with transmitter power of up to 1500-W PEP output. The authorized list of emissions is lengthy, and those interested in some of the less well-known types should consult October *QST* and the FCC rules. Suffice to say that our weak-signal favorites are on the list.

The band plan, shown in the accompanying sidebar, was drawn up by the VHF/UHF Advisory Committee (VUAC). Like other Advisory Committees established by the ARRL Board of Directors, the VUAC is charged with making recommendations to the Board on matters of importance to various facets of Amateur Radio. In the case of the VUAC, that facet is operation above 50 MHz. Another Advisory Committee with which the VUAC works closely is the VHF Repeater Advisory Committee, or VRAC. Note that the VUAC band plan suggests that 903.1 MHz be used for the CW/SSB calling frequency, with the area between 902 and 903 reserved for weak-signal experimental modes.

ARRL 902-MHz Interim Band Plan

Segment	*Use*
902-904 MHz	Narrow-bandwidth, weak-signal communications
902.0-902.8	SSTV, FAX, ACSSB, experimental
902.8-903.0	Reserved for EME, CW expansion
903.0-903.05	EME exclusive
903.07-903.08	CW beacons
903.1	CW, SSB calling frequency
903.4-903.6	Crossband linear translator inputs
903.6-903.8	Crossband linear translator outputs
903.8-904.0	Experimental beacons exclusive
904-906	Digital communications
906-907	Narrow-bandwidth FM-simplex services, 25-kHz channels
906.50	National simplex frequency
907-910	FM repeater inputs, paired with 919-922 MHz, 119 pairs every 25 kHz, eg 907.025, 050, 075, 908-920 MHz uncoordinated pair.
910-916	ATV
916-918	Digital communications
918-919	Narrow-bandwidth, FM control links and remote bases
919-922	FM repeater outputs, paired with 907-910 MHz
922-928	Wide-bandwidth experimental, simplex ATV, spread spectrum

This seems to make sense when we consider that on some of the other bands, such as 6 and 2 meters, a debate invariably develops as to where such modes as FAX and ACSSB should be accommodated. The rest of the band affords ample space for such interesting pursuits as ATV, digital communication and conventional voice-modulated FM. As the article in October *QST* points out, an emission type new to Amateur Radio is authorized on the new band. It is designated F8E and allows multiplexing of information, in addition to that contained on the main carrier, to be sent on a subcarrier. This is the way in which stereo sound is transmitted by FM and TV stations, and is also the technique used to carry background music and more recently data such as stock-market quotations on FM broadcasting stations.

Construction articles for 33-cm equipment have already begun to appear in amateur publications. October 1985 *QST*, in addition to the announcement of the band's availability, features an article by Don Hilliard, WØPW, detailing the construction of a 902- to 144-MHz receive converter. The following month, the same author described the construction of a 33-cm loop Yagi. Other articles are sure to follow in *QST* and the other amateur magazines in the months to come. It shouldn't be too long before commercial equipment appears. Already, there are solid-state amplifier blocks built for the nearby Land Mobile service band. These should prove quite useful on 33 cm, especially in applications in which linearity is not required.

Whether your interest is weak-signal terrestrial propagation, moonbounce, FM/repeater operation, amateur television, packet radio or possibly some new not-yet-heard-of modes, 33 cm may be just the place to try your hand. Whatever your choice of modes, drop a line to the address at the top of this page and let me know what and how you are doing. I'll make it a point to give 33-cm reports an airing. Standings information for the band, at least in the immediate future, will be carried, along with those for 23 and 13 cm, in the April and October issues. Deadlines for these submissions are February 10 and August 10. Let's get this box off with a roaring start.

Incidentally, in spite of the typo in the December column, it is the *70-cm* standings box that appears in the March and September issues, not one for "77 meters." The World Above 50 MHz is not branching out into the HF realm.

ON THE BANDS

Operating reports are somewhat sparse this month, what with the summer E_s a thing of the past and the splendid fall tropo, which many enjoyed, giving way to "normal" winter conditions. But, things are not all bleak. By the time you read this, the winter E_s season should be well underway. From the regular 6-meter get-together, which meets on 3782 kHz Tuesday evenings at 2000 EST, I learned from K1ZFE that the band has been open in New England several nights during the first week of November—nothing outstanding in the way of rare DX, but a chance to say hello to old friends and meet some new ones.

At the time this is being written, in mid-November, the Leonids meteor shower is in progress. W2RS northern New Jersey reports that it was productive for him in the form of a MS contact with KØALL North Dakota for state number 38 on 2 meters. All of these have been worked by terrestrial means only, and Ray wonders if this may be the highest number of states worked from his part of the country without the use of moonbounce. Can anyone

2-Meter Standings

For WAS holders, listings is WAS number, call, state, call areas worked and grids worked. For others, call, state, US states worked, call areas worked and grids worked. Call areas are the 10 US call areas plus KH6 and KL7 plus each VE and XE call area plus DXCC countries not located within the continental limits of the US, Canada or Mexico. Grids are those Maidenhead designators worked since the VUCC Award was instituted, January 1983. In order to make the standings a true reflection of stations currently active on 2 meters, those not reporting activity within the past two years are subject to being dropped. They will be reinstated upon written presentation of continuing activity. WAS holders are listed in any case. Compiled November 15, 1985. Deadline for next update is May 1, 1986.

WAS Holders

1	KØMQS*	IA	—	—
2	K5CM	OK	—	—
3	NØJA*	MO	—	—
4	KØHMB*	IL	—	—
5	K1WHS*	ME	—	—
6	WA4MVI*†	(1)	—	—
7	K5JL*	OK	—	—
8	WA9DOT*†	WI	—	—
9	WBØZXU*	IA	—	—
10	K9CA	IA	—	—
11	WØSD*	SD	—	—
12	WØRRY*	(2)	—	—
13	K5GW	TX	—	—
14	WB5LUA*	TX	23	—
15	K4GL*	SC	23	—
16	WØVB*	MN	14	—
17	WB5LBT*	LA	20	—
18	K4PKV*	NC	—	—
19	WØRWH*	MO	23	—
20	W8IDU*	MI	23	—
21	K1MNS*†	NH	48	—
22	WB9VEN*	IL	—	—
23	K5FF*†	NM	18	—
24	W5FF*†	NM	20	107
25	W7FN*	WA	—	—
26	W1JR*	MA	33	130
27	WBØQMN*	CO	—	—
28	WB4EXW*	NC	18	—
29	K9KFR*	IN	—	—
30	K3VGX*	PA	—	—
31	SM7BAE*		21	—
32	WA7BJU*	OR	—	—
33	VE7BQH*†		57	—
34	W6PO*	CA	—	—
35	WA3VSJ*	PA	27	—
36	WAØLPK/KL7	AK	20	—
37	WBØYSG*	NE	—	—
38	N7NW*	WA	—	—
39	W5LUU*	TX	—	—
40	W4JHQ*	KY	—	—
41	K5UGM*	TX	—	—
42	W5UN*	TX	—	—
43	WA4LYS*†	FL	49	—
44	WA1JXN/7*†	MT	58	—
45	W5JTL*	MS	14	—
46	WAØANH*	MN	—	—
47	WA4NJP*	GA	—	—
48	W5HM*	NM	—	—
49	W7CI*	AZ	26	—
50	N5KW*	OK	13	—
51	WBØTEM*	IA	23	—
52	WDØFOY*	IA	23	—
53	WØRWG*	MO	16	—
54	WB5ERD*	TX	—	—
55	W4WD/7*	UT	—	—
56	KE5C*†	TX	—	—
57	WA4CQG*	AL	—	—
58	WB9CAS*	IL	—	—
59	W2CNS*	NY	28	—
60	Deleted			
61	KØALL*	ND	26	—
62	K9XY*	WI	29	—
63	K1FO*	CT	18	98
64	W4DFK*	VA	—	—
65	WD5CRK*	OK	—	—
66	WB8PAT*	OH	49	39
67	KXØO*†	CO	30	103
68	W7HAH*†	MT	35	43
69	K7KOT*	WA	—	—
70	KB8RQ*	OH	—	—
71	WA7BBM*	AZ	—	—
72	SM2GGF*		—	—
73	KD8SI	OH	—	—
74	K2OS*†	NY	17	—
75	K1GVM*	MA	34	—
76	WA9OZN*	IL	—	—
77	WA6MGZ*†	CA	49	176
78	WD5AGO*	OK	38	—
79	WD4DGF*	TN	26	145
80	VE1UT*		—	—

K1BKK*	VT	43	14	—
WA1OUB*	NH	40	19	104
WA1JOF*	MA	40	19	—
K1PXE	CT	35	13	—
N1AIS	MA	34	12	—
W1AIM*	VT	32	11	—
K1VMI	CT	31	12	—
W1GXT	MA	30	11	—
KA1YQ	MA	30	11	—
W2SZ/1	MA	28	19	154
W1RIL	MA	28	12	—
KA1DHO	MA	28	11	33
WA1AYS	MA	26	10	—
WA1LOU	CT	25	11	—
KA1BRD	CT	24	11	—
W1HDQ	CT	24	7	—
W2PGC*	NY	47	16	—
WA2GSX*†	NY	46	27	—
K2QR*	NY	45	28	66
WA2PVV*	NY	40	13	—
K2TXB*	NJ	39	—	117
W2RS	NJ	38	13	—
W2BLV	NJ	37	12	—
W2ORI	NY	37	10	—
W2CRS	NY	37	8	—
WB2CUT	NJ	36	13	—

K2OVS	NY	36	12	—
WA2TIF	NY	36	11	—
KE2N	NY	35	12	96
NB2T	NY	35	12	—
WA2FGK	NJ	35	11	—
K2GK	NY	34	11	91
N2BJ	NY	34	11	79
W2MPK	NY	31	11	—
W2HRW	NJ	29	—	—
W2DWJ	NJ	27	11	—
KA2BTD	NJ	26	10	—
K2YCO	NY	26	10	—
W2WW	NY	24	10	44
WA2DKB	NJ	23	11	—
AB3D*	DE	48	22	—
WB3JHP*	MD	45	19	—
K3MD*	PA	42	26	112
W3XO	MD	37	12	38
W3RUE	PA	37	11	60
W3RX	PA	37	10	130
K3QCQ*	PA	37	8	—
WA3HMK	PA	37	—	100
W3IWI	MD	37	—	—
WA3FYJ	PA	36	10	96
W3ZZ	MD	35	12	100
WB3LJK	MD	35	11	45
WB2RBG/3	PA	35	11	—
W3CLQ	PA	35	10	—
W3CWG	PA	34	12	89
W3OTC	MD	32	11	51
WA3DMF	MD	32	11	47
W3LNA	PA	29	8	43
W3IWU	PA	28	11	—
KC4EG*	KY	41	13	—
W5HUQ/4*	FL	40	16	—
WS4F	GA	40	14	135
WA4PCS	KY	40	11	—
WB4NMA	GA	40	10	—
W4GJO	GA	39	11	—
WA4DKH	KY	39	11	—
K4CAW	NC	38	12	—
W4CPZ	SC	38	11	20
W4HHK	TN	38	9	—
WA4OWC	FL	37	10	—
W4ISS	GA	37	8	—
K4QIF	VA	37	8	—
K4KAE	SC	36	13	—
W4LNG	GA	36	8	30
W4ZD	FL	35	13	—
WA4SBC	VA	34	13	—
W4FJ	VA	34	8	—
K4CKS	GA	31	11	100
WB4KNF*	TN	31	11	33
WB4NXY	KY	31	9	—
N4VC	TN	31	8	—
W3ZR/4	FL	30	9	77
K1FJM/4	FL	29	9	—
WA4OFS	FL	27	7	15
NA4I	GA	24	10	—

WB4RUA	GA	22	7	69
NI4Z	FL	21	9	—
K4LFF	GA	19	9	56
N4EJW	FL	18	11	56
W5RCI*	MS	49	12	—
WØRRY/5*	OK	48	30	—
K5WE*	OK	47	13	—
K5SW	OK	47	12	170
K5YY	AR	46	12	198
W5UWB*	TX	44	15	—
W5HN	TX	42	12	—
KB5MR	OK	40	14	140
WA5DBY*	TX	40	11	—
W5HFV	OK	38	10	—
NR5O	OK	38	9	109
WB5JAR	AR	37	10	—
WA5HNK	TX	36	10	—
AA5V	OK	36	9	—
K5UR	AR	35	11	156
K5VVV	TX	31	10	—
N5BBO	TX	31	10	—
K5DHU	TX	30	10	50
WA5IYX	TX	27	9	—
W5DFU	OK	26	7	—
W5NZS	OK	25	7	—
N6AMG*		32	37	—
W6XJ*		29	12	—
WB6NMT*		26	13	—
K6PVS*		24	—	—
K6JYO*		23	7	—
K6QXY*		16	12	—
WA6LHD		16	6	35
N6TX*		9	8	—
K6GAO		9	6	—
WA6LLY/6		9	4	14
N6CA		8	3	—
K6HXW*		7	6	8
WA6HXM		6	3	16
WA7JUO*	NV	45	16	—
KB7WW*	OR	32	10	—
WA7ADK	UT	25	7	—
K7ICW*	NV	23	9	—
WA7JTM	AZ	21	6	—
N7BHC*	UT	21	6	—
N7EIJ	ID	13	6	—
WA7EPU	AZ	12	6	—
K8EUR*	OH	41	11	—
NI8O	OH	40	12	145
K8WKZ	MI	39	14	—
K8RZB	OH	39	10	—
W7EKI/8	OH	38	8	—
WB2DIN/8	WV	36	13	—
KJ8S	MI	34	10	—
W8NJR	OH	32	11	95
KB8SG	MI	28	8	—
W8CAP	MI	26	11	—
W9BOZ	IL	47	21	—

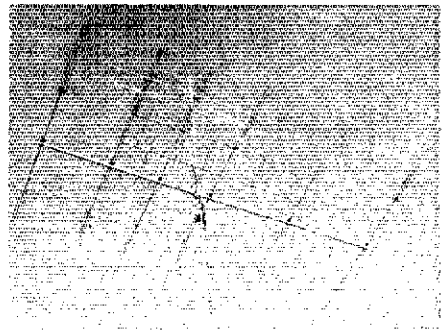
W9UD	IL	45	12	—
KB9NM	WI	43	14	—
WB9MSV*	IL	42	12	158
N9AQ	IL	42	11	150
W3EP/9	IN	41	13	105
N9KC	IL	41	11	130
K9SM	IL	36	8	—
W9HAD	IL	33	9	112
KD9JQ	IL	31	—	106
N9CUE	IN	27	10	28
N9CEX	IL	26	9	—
K9BQL	IL	23	8	40
W9YCV	WI	18	—	18
WAØTKJ*	KS	48	25	171
WØEMS	NE	48	11	—
KØDAS*	IA	47	13	—
NØLL	KS	46	10	140
WØOHU	MN	45	12	—
KFØM*	KS	44	18	151
WØPN	MN	43	11	52
WØFY	MO	43	10	124
WBØDGF	NE	43	10	85
KØTLM	MO	42	10	132
KMØA	MO	42	10	126
WAØSJR	MO	41	9	—
KCØQR	NE	40	11	132
WBØDRL*	KS	39	34	116
WØRAP	IA	39	10	114
WØPW	CO	38	9	—
WBØSIL	MO	38	13	—
WBØZKG	IA	36	10	—
WAØVJF	KS	34	11	59
WØRWC	IA	34	8	—
KØUDZ	SD	33	10	—
NØAJU	NE	32	9	102
WBØYZN	NE	31	11	107
WBØZAH	MN	29	9	79
WØJRP	MO	26	7	80
KCØOG	NE	25	8	60
WØKEA	CO	22	6	50
NØBTN	NE	20	9	85
VE1AHM	NB	21	10	—
VE2DFO*		48	30	—
VE3EMS		38	11	—
VE3DSS*		37	12	—
VE3FN		37	11	—
VE3ASO*		35	12	—
VE3FKX		35	10	—
VE3DTQ		31	12	—
VE3EQQ*		20	16	—
VE4MA		14	9	—
VE4AQ		11	5	7
PA2VST*		28	—	—
WA1JXN/C6A*		23	28	—
KG6DX*		22	—	67

(1) WAS completed in NC; now in SC.
(2) WAS completed in IA; now in OK.
*One or more contacts were made via EME.
†WAC.
—Information not provided.

shed some light on this? W2RS has now worked one station via EME, although not for a new state. Illustrating the truth of a last month's column lead, "Moonbounce for Everyone," Ray (after considerable effort on both his and W5UN's part) managed to complete a contact with that Texas station on a horizon moon. As an illustration of his "average station" status, W2RS notes that he runs just 135-W output to a single Cushcraft Boomer and employs a preamp in the shack.

Over the past few months, several readers have written mentioning that they are new to the world above 50 MHz, having recently migrated up from the tumult of the HF bands. One of these is long-time DXer K5UR Little Rock, AR. In his first seven weeks on 2 meters, Rich has worked 35 states, 11 call areas and 156 grids. Understandably, he has been very pleased with his new venture in Amateur Radio and has expressed amazement at the level of activity. Nor could his installation be considered a "big" station. For his first four weeks on the band, he ran 25-W output to a 16-element Yagi at 29 feet. Since then, he has upgraded to 160 W and put the antenna atop his HF tower at 125 feet.

Another newcomer, in this case to 70 cm, is NI8O Galion, OH (EN8ØOR). Bob started on the band at the beginning of 1985 and, by the end of October, had completed his 100th grid along with working 28 states and 10 call areas!



This collection of aluminum at N6AMG sits atop a 60-foot tower. At the bottom is a tri-band KT-34XA. Just below the KLM 8-element for 6 meters is a four-foot loop Yagi for 23 cm. These are followed by a 2-m 11-element Lunar and 17-element Cushcraft for 1¼ meters. Topping off the stack is a 30-element KLM LBX for 70 cm.

Actually, the 100 grids were bagged in just 140 days, from June 8 to October 26. Complicating the accomplishment is the fact that, during most of this period, Bob was on the 4 PM to 12:30 AM shift. Nice work, Rich and Bob, and let's hear more stories like these two.

A not-so-newcomer, K2UYH, reports on the success he had on 23 cm during the big September 30 tropo opening. Al brought his state total on the band up to 22 with a contact with WS4F in Georgia. He also worked VE1UT for his first VE, and had a good SSB QSO with W4OJK North Carolina.

N2WK writes from the Rochester, NY area that he is active on 1¼ meters, 70 cm and 23 cm, and is seeking skeds on all or any of these bands. Wayne can be reached at 716-247-7283.

W6PJA turns in a very interesting and complete report on the KH6 beacons and their reception on the West Coast over the past few years. It will be featured in a forthcoming column.

Don't forget the VHF Sweepstakes on January 11-12. With winter conditions being what they usually are, this 'test provides a chance to see what your station is routinely capable of doing. It is also the only League-sponsored VHF contest during the year that gives awards to participating ARRL-affiliated clubs. As such, the January VHF Sweepstakes offers a fine opportunity for your local club to sponsor an activity that ought to be fun for all and possibly gain some new recruits to the world above 50 MHz. No, your club may not be able to rival the Pack Rats or the Rochester group, but how about challenging the gang in a neighboring city. Chances are they face a situation similar to yours in terms of activity level and propagation conditions, so it should be a relatively even match. See December *QST*, page 94, for contest rules.

On Line

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

Survey Results

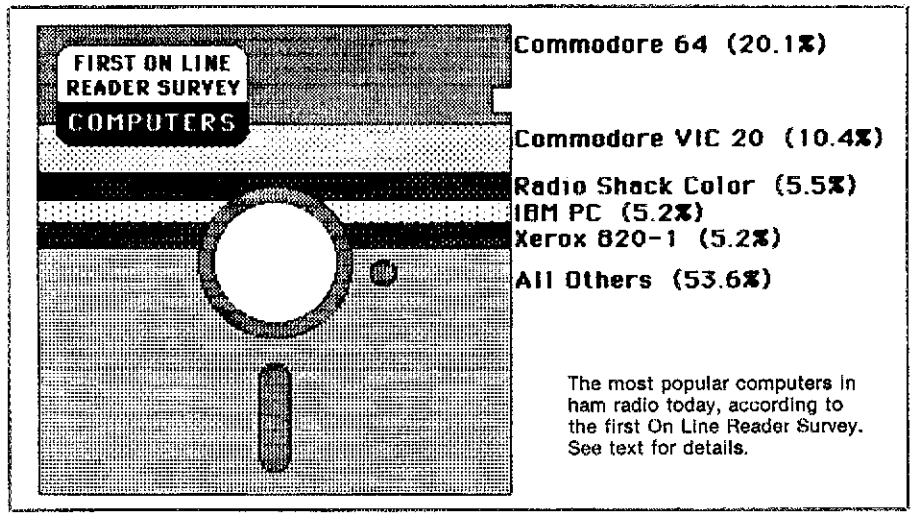
One of five hams who own a computer own a Commodore 64 computer, and 43% use their computers for RTTY communications. These are some of the results of the first On Line Reader Survey, conducted in the September 1985 installment of this column. RTTY communications was followed in popularity by CW (39%) and packet radio (a surprising 30.8%—when you consider the relative infancy of the amateur packet communications mode). Also, the average ham who owns a computer uses it for ham radio applications 41.2% of the time the computer is in use.

The surveyed usage of computers falls into the following order of popularity:

1) RTTY (43.1%)
2) CW (39.0%)
3) packet radio (30.8%)
4) general logging (28.7%)
5) antenna bearing (24.1%)
6) propagation forecasting (21.5%)
7) contest duping (18.5%)
8) antenna design (17.4%)
9) contest logging (15.9%)
10) circuit design (15.4%)
11) award tracking (14.4%)
12) AMTOR (10.4%).

The most popular computers owned by the approximately 250 hams who responded to the survey are:

- Commodore 64 (20.1%)
- Commodore VIC 20 (10.4%)
- Radio Shack Color Computer (5.5%)
- IBM PC and Xerox 820-1 (5.2%)
- Apple II+ (3.4%)
- Texas Instruments TI-99/4A (3.4%)
- Radio Shack TRS-80 Model III and Sinclair ZX81/Timex 1000 (3.1%)
- Apple IIe and Radio Shack TRS-80 Model 100 (2.8%).



The most popular computers in ham radio today, according to the first On Line Reader Survey. See text for details.

Some readers may be surprised to find the Xerox 820-1 so high in the list. Other readers may have never heard of it. The 820-1 is a full-fledged CP/M computer that was available for a number of years as surplus equipment for $50. Because of its cost and capabilities, it is very popular among packet-radio enthusiasts and is the heart of almost every packet-radio BBS on the air today, thanks to the packet BBS software written for the 820-1 by Hank Oredson, WØRLI.

The computer peripherals used by hams broke down as follows:

1) printers (79.5%)
2) disk drives (71.8%)
3) ham interfaces (55.9%)
4) modems (51.3%)
5) cassette players/recorders (47.2%)
6) mouse (or should I say mice) (6.2%).

Just as hams often own more than one radio, they also often own more than one computer. Of survey respondents, 34 confessed to owning two computers, 17 owned three, 6 owned four, 1 owned five, 2 owned six, and 1 busy fellow has eight computers!

As a sidelight, I tried an experiment to see how well packet radio works by announcing on some BBSs that survey respondents should try to send their responses to me via packet radio. As a result, 33 responses came via packet, some from across the country.

Thanks to everyone who responded to the survey.

HELP (OFFERED AND SOUGHT)

☐ Jack Owens, K6PWY (1626 Del Dayo Dr, Carmichael, CA 95608), offers the following: "A couple of years ago, I purchased a HAL CT2100 for RTTY. After using it for a while, I wanted to be able to use it with the printers connected to my CP/M system. I installed device drivers for the INP: and OUT: functions, which allow sending files from the CP/M system to the HAL and downloading from the HAL to a CP/M file. The drivers use a four-shift Baudot code, which allows the sending and printing of nearly all ASCII characters with the five-bit Baudot code. If anyone has a use for something like this, I am happy to provide the assembly language source code."

☐ A disk full of ham radio-related programs, written by Harv Nelson, N9FHO, for the Commodore 64 computer, can be yours by sending a blank diskette and a self-addressed, stamped disk mailer to Harv at PO Box 736, Stevens Point, WI 54481.

☐ MINIPROP, a new propagation prediction program written by Shel Shallon, W6EL, and mentioned in the November installment of On Line, is now available in a PC/MS-DOS version. MINIPROP has been uploaded onto various BBSs; anyone who desires a copy should be able to download it without much difficulty.

PX: More TRS-80 Software

Last time, software for the Radio Shack TRS-80 Models I and Color Computers was offered. This time, TRS-80 Model III and IV programs are presented for your use and entertainment.

Program 99: K7VBY's antenna bearing program modified for the Model III by Joe Simpkins, WD4R.

Program 100: WA1LOU's QSL-card program modified for the Model III and Radio Shack Line Printer VIII by Arch Doty, K8CFU.

Program 101: W4PNY's Worked All States program modified for the Model III by Sonny Williams, W4KJV.

Program 102: DXCC award tracking program (Model III) by Jack Baldwin, VE7RG. (For a blank diskette and SASE, Jack will provide you with a copy of the program, saving you the time of typing the program into your computer.)

Program 103: Field Day logging program (Model III) by John Campbell, KØPUX (56 cents postage).

Program 104: antenna-modeling program (Model IV) by William Rowlett, WB5IRI.

Program 105: formatted call sign input program (Model IV) by Joe Etheridge, W4WXH.

Program 106: ham radio mailing-list program (Model IV) by W4WXH (56 cents postage).

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111. Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

A list of all 106 programs in the PX library is available by sending a business-size SASE with 22 cents postage to WA1LOU (address at top of this page).

Program 84 Fix

A minor bug in PX program 84 was discovered by Mike Wilson, KB3OQ. According to Mike, program lines 410 and 420 should be changed to the following:

410 W. Coast Africa 420 E. Coast Africa

FM/RPT

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

A Model Repeater

W6FNO/R is a repeater that fulfills one of the primary reasons for the existence of our hobby—public service. In the following account, Bill Carpenter, WA6QZY, tells how this West Coast 2-meter machine goes about serving the public. This repeater serves as a model for others.

Located in San Bernardino County, up on Onyx Peak, W6FNO/R (146.22/146.82 MHz) has been in operation for over 20 years as a repeater dedicated to providing public-service communications via Amateur Radio. As the system has grown in users and capabilities, this concept has always been the governing force. Today's W6FNO/R system, utilizing multiple remote transmitters and receivers, covers most of Southern California as well as parts of Arizona, Nevada and Mexico.

The stated policy is that the repeater be used for emergency traffic and as a calling channel. This facilitates the monitoring of the channel by stations because the channel is quiet and the radio can be left on without being a constant source of background chatter.

The repeater supports local ARES activities, several Red Cross chapters, and three search-and-rescue teams, and is used by several levels of government to coordinate emergency activities in areas where other radio services are nonexistent. From the beginning, a continuing activity of the repeater has been the forwarding of calls from the motoring amateur to agencies such as the California Highway Patrol (CHP) and the reporting of traffic accidents and other emergencies. Over the years, we have met with representatives of CHP and other agencies and have developed a set of guidelines for handling this type of traffic. Excerpts from these guidelines follow.

What Should You Report?

Common sense should govern your decision. Remember, when reporting a problem, provide the following data:

1) a description of the problem.

2) location of the problem (get it before you make the call). Use the next off-ramp as a reference or use a call box number.

3) Are there any injuries?

4) Identify yourself: "This is an Amateur Radio Operator. My name is . . ."

When reporting a problem, be aware of the following:

1) Freeway traffic lanes are numbered from the lane closest to the center, which is lane number 1.

2) The painted island that guides traffic on or off the freeway ramp is called the "gore point."

3) A vehicle is not on a shoulder or center divider unless it is completely out of a traffic lane.

With these points in mind, consider the following situations and the appropriate response on the part of the Amateur Radio operator reporting the situation.

Objects in roadway: Will it dissipate? A cardboard box, glass or even nails will be long gone by the time a police unit can arrive on the scene. Report the following as nonemergency traffic: bricks, rocks, other immovable objects.

Live animals: The freeway is a limited-access area. Live animals should be reported, particularly if located on the center divider.

Dead animals: If the animal is the size of a medium-sized dog or larger, it should be reported as a hazard, not an emergency. Anything smaller will disappear quickly.

Stranded motorist: Look for a tag on the vehicle; this indicates that police have noted the problem and summoned aid. If the vehicle is on the right shoulder where call boxes are available, don't make the call. If it is nighttime and the driver is female, or if the vehicle is on the center divider, make the call.

Accident: Report accidents if there are injuries or lanes blocked. Don't report accidents that look "old" or if persons are exchanging names. Don't stop unless instructed to by a police officer.

Drunk driver: Don't get involved. Don't follow or stay with a vehicle. Police do not want Amateur Radio operators involved in this type of call.

Hit and run: Don't pursue the vehicle. Get a description of the vehicle or the license number.

AAA service: Don't stop on the freeway to render aid. Call AAA directly if the problem is off the freeway. Get the number from the directory or directory assistance.

Fire emergency: The quickest way to obtain aid for a fire emergency is to call the fire agency directly. In most cases, a call to the appropriate county fire department will result in the request being routed to the correct local agency faster than by calling police first.

Always remember that your function is to observe and report. Never become involved in pursuit, investigation or other law-enforcement action. These are the responsibility of the police. Do not endanger yourself in any way.

CVRA-SERA WELCOMES ALL FREQUENCY COORDINATORS

CVRA-SouthEastern Repeater Association, one of the largest coordinating entities in the nation, representing approximately 1000 repeaters in seven states, welcomes all frequency coordinators to the CVRA-SERA Board of Directors' semi-annual meeting in order to get a chance to meet and know their counterparts from other parts of the country. The meeting is on January 19, 1986 in Knoxville, Tennessee at Howard Johnson's North (118 Merchants Rd, Exit 108 off I-75). Informal talks will begin Saturday evening, January 18, with the formal meeting being held on Sunday, January 19, beginning with breakfast and continuing through midafternoon. For further information, contact Jean V Giesler, Jr, W4TYU, 4544 Lyons View Pike, Knoxville, TN 37919, tel 615-525-5781.

REPEATER LOG

According to reports received in October, repeaters were involved in the following public-service events: 7 weather emergencies, 15 medical emergencies, 251 vehicular emergencies, 18 fire emergencies, 2 search and rescue, 14 public-safety events, 20 drills and alerts and 1 power failure.

The following repeaters were involved (followed by the number of events): WA1DGW 16, W2ODV 21, W2VL 16, W2KB 6, WA2ZWP 2, WD4JWO 4, WB4UDS 4, WA4SWF 1, W6FNO 230, WA6BJY 4, KH6HHG 2, KH6H 1, K7OMR 7, K7HSG 1, K8DDG 13.

Strays

***QST* congratulates...**

☐ the following radio amateurs on 60 years as ARRL members:

• H Charles Kaetel, W9SNK, of Menomonee Falls, Wisconsin

• Phil Keast, W6DD, of Grass Valley, California

☐ the following radio amateurs on 50 years as ARRL members:

• John Salin, W3FKT, of Chatham, New Jersey

• Larry Smith, W3LNA, of Greenville, Pennsylvania

• Reno Goetsch, W9NA, of Wausau, Wisconsin

• John Fulmer, W4YF, of Ponte Vedra Beach, Florida

• Charles Calhoun, W2EG, of Verona, New Jersey

• Frank Altdoerffer, W3APO, of Lancaster, Pennsylvania

• Glenn Moltrup, W3BPA, of Hyattsville, Maryland

• Ben Rulf, W4HDK, of Longview, Texas

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

Microwave Amplifiers

Amplifiers are a common component in microwave systems, whether as RF preamplifiers, power amplifiers or IF amplifiers. Usually, such amplifiers are built from discrete components (transistors, capacitors, inductors, etc) to accomplish a particular function.

There does exist an alternative, however, and that is the use of modular amplifiers, usually consisting of an MMIC (Monolithic Microwave Integrated Circuit). Such an amplifier module consists of a complete amplifier circuit on a single silicon (or GaAs) chip and has only two terminals—RF input and RF output (plus ground and power supply). Many MMIC amplifiers are expensive devices manufactured for specific applications and, as such, are not generally accessible to amateurs. Avantek, however, has a line of such amplifiers packaged in inexpensive plastic packages priced in the $2-$3 range. These amplifiers (called MODAMPS™ by Avantek) are wideband devices covering from dc to 5 GHz, with gains between 3 and 19 dB, power outputs up to 20 mW and input/output VSWR of <2:1, depending on the model.

Fig 1 shows the power gain of four of these devices. Table 1 gives some typical device parameters. As can be seen, there is a compromise to be made between gain, frequency range and power output. Avantek data sheets are available on these devices showing their electrical specifications in much more detail (see Amplifier Specifications). Fig 2A shows the lead identification of these amplifiers. The ground leads should be well grounded, as shown in Fig 2B, which represents a cross section (A-B) of the stripline circuit of Fig 3B. A hole is drilled through the board in which the amplifier sits, and the top and bottom ground planes are joined using a small strip of copper foil.

The stripline shown in Fig 3B should be 0.1 inch wide on G10 epoxy board for a 50-ohm line. Input and output coupling capacitors should be chip capacitors of about 50 pF or so. The decoupling capacitor (C in Fig 3A) should be around 1000 pF, and connects between pads 1 and 2. The RF choke is optional (yields slightly higher gain), and can be a small UHF type. The resistor R (between pads 2 and 3) is chosen to select the correct bias current for the particular amplifier. For a 12-V supply, suitable values would be: MSA-0104, 412 ohms (17 mA); MSA-0204, 280 ohms (25 mA); MSA-0304, 114 ohms (35 ohms); and MSA-0404, 60 ohms (60 mA).

These amplifiers can be cascaded for increased gain, but doing so will also degrade some distortion parameters. Two suppliers of Avantek MODAMPS are Technical Marketing Associates, Hackensak, NJ (201-342-4008) and Sertek, Inc, Los Angeles, CA (213-477-9051). Most commercial distributors will have a minimum order (typically $25). The use of these amplifiers can simplify equipment design. It should be noted, however, that with such a wide bandwidth the amplifier may amplify undesired frequencies along with the desired signal, so some applications may require additional filtering.

Table 1
Typical Device Parameters

Device	Gain (dB)	Gain (dB)	NF (dB)	P(1 dB) (dBm)	VSWR <2:1
MSA-0104	19(0.1)	3(5)	5(0.5)	1.5(0.5)	5 GHz
MSA-0204	13(0.1)	3(5)	6(0.5)	4.0(0.5)	3 GHz
MSA-0304	13(0.1)	3(5)	6(0.5)	10(0.5)	3 GHz
MSA-0404	8.5(0.1)	2(5)	6(1)	12(1)	2 GHz

Note: Figures in parentheses are frequencies in GHz at which the particular device parameters are specified.

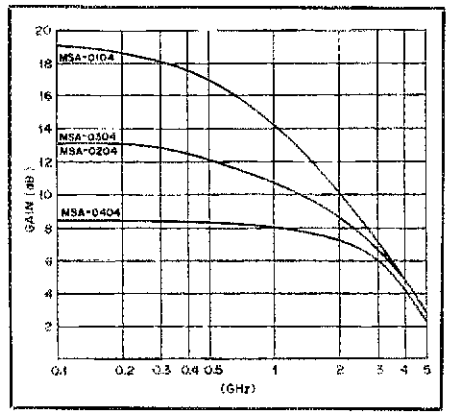


Fig 1—Gain versus frequency for Avantek MODAMPS.

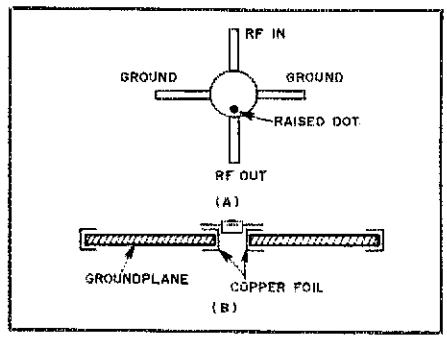


Fig 2—MODAMP lead identification (A) and the grounding scheme (B) for MODAMP cross-section A-B in Fig 3B.

AMPLIFIER SPECIFICATIONS

All amplifiers introduce distortion into the signals they amplify. The amount of distortion is usually given in specification sheets, using such terms as "power output at 1-dB compression," "second-harmonic intercept point" and "third-order (two-tone) intercept point." These numbers can be confusing at first, but are really quite straightforward. The meaning of these terms is shown graphically in Fig 4.

The power output at 1-dB compression is the power output at which the amplifier gain drops by 1 dB from a linear extrapolation of its low power behavior. As input power is increased beyond that required to produce the 1-dB compression output, power output may approach a constant level (saturated) or may even decrease, depending on the amplifier.

The second- (or third-) harmonic intercept point is the power at which the second (or third) harmonic of the input signal would have the same power as a linear extrapolation of the fundamental signal, if no gain compression occurred. Similarly, the second- (or third-) order two-tone intercept point is the power output at which the second- (or third-) order two-tone distortion products would have the same power as the fundamental signal in the absence of gain compression. The second-order harmonic and second-order two-tone intercept points are often very close. Similarly, the third-order harmonic and two-tone intercept points are often within a few decibels of each other. If the intercept point

(continued on page 96)

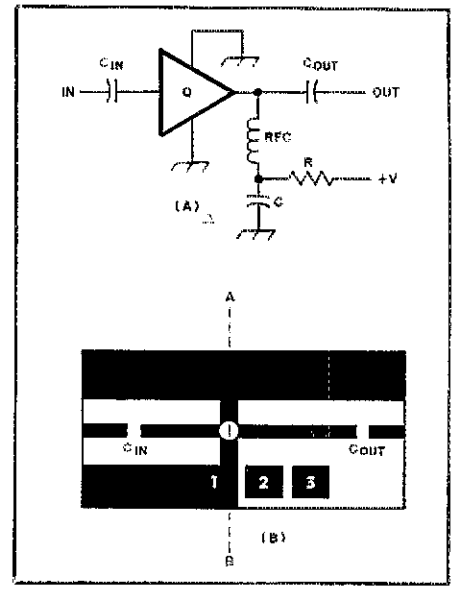


Fig 3—MODAMP circuit (A) and the stripline layout for the MODAMP (B).

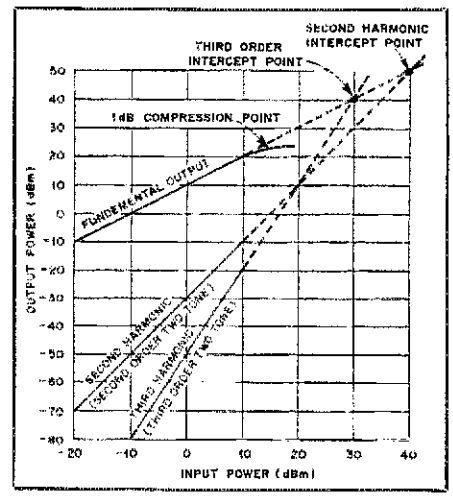


Fig 4—Amplifier distortion parameters.

YL News and Views

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

"Pitcairn Island? I've Been There," Says WD9GQV

With a twinkle in her eye and a big, broad smile, Betty Reich, WD9GQV, proudly sports a T-shirt that says "Pitcairn Island, I've been there!" And *there* she really was, on January 1, 1985, in time to hear the ringing of the bells in the Pitcairn Island Square to honor the new year, as well as to celebrate her 70th birthday. "Amazing feat," say her friends. "What's so amazing?" says Betty, "I have researched and read everything ever written about Pitcairn, so I just had to go there to see for myself."

Pitcairn Island has been the object of intrigue and endless interest for Betty ever since she saw the original *Mutiny on the Bounty* movie in 1922. The story of Fletcher Christian and the *HMS Bounty* so captivated her that she has had a continuing fascination for new information about the island, its history and its natives. The libraries and their personnel, friends and teacher colleagues helped Betty find new information about Pitcairn. But it was Amateur Radio and its operators that assisted her and made it possible for her to step foot on this most unusual island.

During the mid-seventies, when Betty was approaching her retirement, she began looking for a new challenge. Her friend, WD9GPN, suggested that she might enjoy Amateur Radio. Betty's love of geography, coupled with an interest in meeting new people, made radio a natural choice for a new activity during a time she would not be committed to the demanding schedule of teaching. She became WD9GQV in September 1977. All those years of teaching paid off when Ray Morales, AK9B, a former student, returned to Betty's life and became her Elmer. Jodi, KA9W, her longtime friend, helped her with the theory. In September 1982, she passed the Extra Class exams.

Once on the air, she was bitten by the DX bug and discovered the joys of finding a DX station who would take the time to talk about his or her QTH, family, local history and customs.

When she wasn't running phonepatches and traffic for US servicemen Betty was overseas looking for DX, keeping her CW in shape and working toward what now totals 38 certificates, including DXCC (279 confirmed), WAZ no 2760, WAC, Worked the Caribbean, Worked the Pacific, WAS/40/CW and the Antarctic Puckered Penguin Award! In 1979, she went to Montserrat Island and operated as VP2MFT, a call she continues to retain. There, she met VP2MO and his XYL, VP2MN. Today they continue to correspond and meet on the radio. Two years later, she spotted an article in *QST* entitled "China's Ham Radio Slightly Closer," and this was enough to make her feet itch to explore another corner of the world. She joined a group of amateurs planning to visit China. In preparation, she took a course in Mandarin Chinese so she would know a few courteous phrases when meeting her hosts and new Chinese friends. She and the group spent 12 days on Mainland China and then went on to Hong Kong. There, she met VS6CT, who presented her with a special Firecracker Award, which she had earned during her many QSOs with Phil. She was to return Phil's hospitality two years later when VS6CT came to the US and visited Betty in Illinois.

Jodi Henderson, KA9W (left), and Betty Reich, WD9GQV, rejoice in the success of Betty's adventure. *(KG1F photo)*

The wanderlust continued. In July 1983, Betty could be heard as WD9GQV/EA8. As the guest of EA8ADP, another friend from the high bands, Betty and Jodi, KA9W, made a DXpedition to the Canaries to operate and practice her newly acquired conversational Spanish. The vacation consisted of operating when time and conditions permitted, as well as sightseeing and meeting the friends and family of Emeterio, EA8ADP.

Despite her travels to points in Europe, Asia and the Caribbean, Betty's desire to visit Pitcairn Island continued. One day, she met up with well-known station VR6TC, operated by the equally renowned Tom Christian, direct descendant of the *HMS Bounty's* Fletcher Christian. The initial contact and eventual QSOs with Tom's wife, Betty, VR6BC, led WD9GQV to a meeting with Kari Young, VR6KY, and her OM, Brian. A warm friendship and subsequent schedules naturally followed. These newly found friends on the island of her lifelong fascination caused Betty to renew her search for information about Pitcairn. Much to her delight Kari and Brian issued an invitation for her to visit the island. That was all Betty needed to start making plans.

Reaching Pitcairn Island, however, is not a simple matter of calling your favorite travel bureau and booking passage on a luxury liner or sleek jet. These modern methods of transportation do not touch Pitcairn. There is no airstrip on the island. The only means of reaching Pitcairn is by the scarce seagoing freighters or yachts that travel that part of the world. The trick is to find one that is willing to take a passenger. But if you are WD9GQV and you've been waiting for most of your lifetime for such an opportunity, nothing is impossible. Betty was able to find a yacht sailing for Pitcairn; through a friend, passage aboard a yacht in a Panamanian port was secured. She did set sail from Panama, but never reached Pitcairn. Because of illness and the need to return to the US for treatment, her first attempt had to be terminated.

This did not deter her from planning for another trip. A couple of years later, with the help of AH6H and several other ham friends, Betty secured passage on the Norwegian freighter *Dyvi Teal*. WD9GQV became the ship's second radio officer and lived in luxurious quarters. After weeks of exciting and fun-filled moments, she awoke at 5:30 AM December 21 to see Pitcairn Island on the horizon. Since the Pitcairn harbor cannot dock large ships, the Pitcairners came to the *Dyvi Teal* in their longboat to take on cargo, as well as to pick up their most-excited visitor. Betty spent approximately six weeks with her new family and friends, was welcomed in their homes, and celebrated Christmas and New Year's with the 42 inhabitants of the island. The days were filled with hikes around the island, inspecting all of the terrain and simply enjoying the Pitcairners and their generous hospitality. "I had to soak up everything," Betty says.

Betty became the proud ticket holder of VR6BR, and those who worked her during her visit were truly fortunate. Since there is no electricity on the island, radios are powered by privately owned generators and, as one might expect, fuel is a precious commodity. Betty did operate Brian and Kari's station, but for only short periods of time. During the course of her stay, she worked some 1500 stations. Those stations who received the coveted VR6BR QSL card have Jodi, KA9W, to thank for her tireless efforts as Betty's QSL Manager.

Now back in Illinois, life goes on as usual in the WD9GQV style. Betty keeps her weekly skeds with Brian and Kari, but the tone of those QSOs is a bit different. The flavor and mood strongly intimate that Pitcairn is now her home away from home, and the Pitcairners her family on a faraway shore.

Silent Keys

Administered By Nancy A. O'Neill

It is with deep regret that we record the passing of these amateurs:

W1BES, Lewis S Bellem, Jr, Scituate, RI
N1BNE, Arline I Wilkins, West Yarmouth, MA
W1DXM, George F Richards, Stoughton, MA
W1EAL, Walter A Pillsbury, Derry, NH
W1FOB, Albert E Goldstone, New Hartford, CT
KA1JRM, J Chisholm, Norwood, MA
W1JTG, Charles E Lillie, Westwood, MA
K1LBH, Raymond "Russ" Norton, Jr, Westbrook, CT
K1SAU, Albert E Sutherland, North Tewksbury, MA
W1TJM, Michael A Cotter, Revere, MA
W2ADT, Charles Freund, Bayport, NY
W2BXD, Charles J Fink, Tuckahoe, NY
*N2CW, Gary I Medford, Ship Bottom, NJ
KA2DXS, William A Austin, Jr, Old Bridge, NJ
W2EQ, M Joseph Bonsted, Moorestown, NJ
WB2EVF, Robert J McGarvey, Kendall Park, NJ
KD2HM, Owen R Musgrave, Johnstown, NY
W2JJQ, Thomas F Sawyer, Hillsdale, NJ
W2RBM, Charles "Bill" Blauvelt, Sr, Cinnaminson, NJ
*WA2TDI, Ernest L Garside, Pine Hill, NJ
W2YLW, William H Crow, Ballston Lake, NY
W2ZI, Edward G Raser, Ewing Township, NJ
W2ZOO, Robert N McConnell, Niagara Falls, NY
W3EXC, Carl R Nelson, Oakdale, PA
K3HFV, Guy T Little, Hyattsville, MD
WA3KGP, Vince Caciola, Lexington Park, MD
W3KIR, John R Struthers, Havertown, PA
W3LZM, John A Hickman, Glen Burnie, MD
KS3R, William E Futrowsky, North Versailles, PA
W3RIL, Robert D Hatcher, Washington, DC
*K4AKP, Johnny B Thurmond, Atlanta, GA
N4BAU, Daniel M Leininger, Jacksonville, FL
WB4BHY, James L Mann, Sr, Newnan, GA
N4CAW, Ardith V Shorter, Waynesboro, VA
WA4CBM, Ebbe Curtis Hoff, Richmond, VA
KB4DJQ, J Stanley McIntosh, Sarasota, FL
N4EHW, Russell Latta, Springfield, VA
KA4FCW, Jack H Howell, St Augustine, FL
W4GIS, Laurens F Barker, East Point, GA
WA4GUH, Michael R Klein, Port St Lucie, FL
WA4HEC, Willard S Denning, St Petersburg, FL
WD4HFI, Kenneth T Walsh, Elm City, NC
W4HOD, Carey M Smoak, Jr, Neeses, SC
K4JC, Robert E Fitz, Springfield, TN
*WD4KLX, Henry Suydam, Jacksonville, FL
WA4MBA, Harold E Williams, Fort Myers, FL
WA4MCX, Hugh F Gilmore, Powell, TN
W4NUI, Walter K Koch, Bradenton, FL
W4VJB, Thomas G Clarke, Fairfax, VA
W4WI, Richard P Bradley, Alexandria, VA
*W4WWB, Richard W Mitchell, Zephyrhills, FL
NG5C, W F Ossenfort, MD, Houston, TX
K5DW, Donald W Whitney, Osceola, AR
K5TLO, Harold C "Pete" Peterson, Orange, MA
W5UBH, George A Staub, San Antonio, TX
WB5VSL, William A Bily, Bella Vista, AR
W5WOL, R A MacArthur, Roswell, NM
W5ZZG, J Clint Griffin, Del City, OK
*K6AHK, Taylor E Huston, San Bernardino, CA
W6CPV, William H Aderhold, Santa Monica, CA
W6CS, DeForest "Bud" Baldwin, Escondido, CA
W6FGN, Roger Alexander, San Diego, CA
W6IPK, Richard C Frey, Carmel, CA
K6MQ, Theodore R Jacobs, Rosburg, WA
W6MZO, Leland A Marks, Scotts Valley, CA
KA6NAI, Herbert B Harris, Jr, Ventura, CA
W6PBX, Robert G Slick, Santa Cruz, CA
K6QVB, Bruce W Gillanders, Sacramento, CA
K6SQ, Louis A Cartwright, San Diego, CA
KA6YGU, William H Oliver, Los Angeles, CA
N7ABO, Norman C Hurter, Lafayette, OR
KA7ADJ, Samson Stein, Las Vegas, NV
W7BBB, Charles A Sather, Seattle, WA
NJ7F, William E Campbell, Wenatchee, WA
N7FMC, Alexander M Henderson, Florence, OR
W7LVT, Donald J Turner, Benson, AZ
WA7MHX, William B Hume, Cottage Grove, MN
W7MW, Herbert W Edmondson, Corvallis, OR
W7ONW, Herb M Musclow, Seattle, WA
W7WU, Thomas H Lowery, Blaine, WA
W8AZ, James E Terry, St Petersburg, FL
N8AZG, Anthony F Skok, Euclid, OH
WD8BIA, Edmund A Klein, Wooster, OH
K8DGJ, Louis L Powers, Beachwood, OH
W8EML, Donald L Clark, Glen Dale, WV
KA8KOJ, Harry H Mills, Martins Ferry, OH
W8KQF, Raymond J Schneider, Elkridge, MD
WA8LIA, Roy M Meredith, MD, Marietta, OH
W8LZK, Carl A McCullough, Toledo, OH
WA8MKI, Laurance S Phillips, Mentor, OH
W8NWO, Bart Rypstra, Charlotte, MI
W8RD, Winslow "Pete" Peterka, Cincinnati, OH
KM8Y, Cornell A Varsogea, Monroe, MI
W9AEB, Jay J Winer, Elkhart, IN
WB9CBC, Edward P Curtis, Marion, IN
*K9DNI, Casimir A Tomczak, Chicago, IL
K9DQO, William J Dres, Palos Heights, IL
W9IBQ, Carl W Selbrede, West Salem, WI
W9JDT, Roger J Jensen, Racine, WI
W9LX, Hugo C Wenzl, Chicago, IL
W9VGN, Eugene S Alexander, Sr, Maywood, IL
KAØAQA, Newton Jerome, Lawrence, KS
WDØFMX, Ken W Reynolds, Kansas City, KS
KØQVN, James D Short, Lincoln, NE
*WAØRIQ, Lorin L Dobson, Sioux Falls, SD
WØSEJ, Byron W Mann, Des Moines, IA
WØTAN, Margaret D Nelson, Elsberry, MO
WAØTDV, Channing K Champie, Durango, CO
WØVUO, Thomas J Morris, Fremont, NE
*KØZPG, Edward T Pompea, Colorado Springs, CO
KP4DQC, Allen E Pripps, Utuado, PR
KH6CXJ, Henry W Heuer, Hilo, HI
DL1OJ, Wolfgang Lenz, Bad Liebenzell, West Germany
F8DR, Guy Du Bourg De Boza, Paris, France

*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

January 1936

☐ Editor Warner suggests that a CQer end his call by indicating where in the band he will tune for responses (since most of us are crystal-controlled—"rock-bound"). But the crystal ball is clouded when he says, "We might even develop a technique where the receiver itself is the exciter for the transmitter, with transmissions thus automatically on the frequency of the CQ to which we are listening. But after about sixty seconds of that, with 200 fellows answering a CQ on the same frequency ... No, that idea is decidedly out."

☐ Dr. Dellinger of the National Bureau of Standards has concluded that at least some of the periodic blackouts of radio communication are due to solar flares. He thanks amateurs for their helpful reports.

☐ Ten-meter activity is at an all-time high, with 21 stations reporting WAC—W6FQY even doing it on voice. W9NY wins the 1935 award for "the most valuable and consistent communication work in development of the ten-meter band." George Grammer caters to growing interest, with designs for several low- and medium-power rigs on breadboards.

☐ An unusual hamfest was sponsored by the Washington Radio Club—in that top brass from the military and regulatory authorities addressed amateurs on the subject of the forthcoming (1938) international radio conference in Cairo, Egypt. Each pledged full U.S. support, but underscored that most other nations do not have the same enthusiasm to encourage civilian personal use of radio techniques.

☐ Our Communications Department announces a new Worked-All-States award, available to any amateur who submits confirmations of QSOs with each of the 48 states.

☐ The National Company's ad in this issue is most unique—53,000 Christmas Seal stamps were bought from the National Tuberculosis Association, and were individually licked and applied to the ad page in that many copies of *QST*.

☐ Looking beyond today's high interest in ten meters, the Milwaukee Radio Amateurs' Club announces a cup to be awarded for the most outstanding performance during 1936 on the 56-Mc. band. Basically, one point will be earned for each 100 miles of DX.

☐ W9IU has now won the Official Relay Station trophy three times in succession, and so gets to keep it permanently.

☐ League Hq. solicits contributions of early wireless gear, looking toward an eventual museum of amateur radio.

☐ The Federal Communications Commission has ruled that the secrecy provisions of the law apply to amateur communications also, except when transmitted for the use of the general public (e.g., emergency communications warning of a hurricane).

25 Years Ago

January 1961

☐ A. L. "Bud" Budlong, W1BUD, is retiring after 37 years on the Hq. staff, the last 13 as Secretary and General Manager. Skilled in many areas, his forte was international radio regulation, which served amateur radio particularly well in such instances as the recently concluded Geneva conference.

☐ K6UQH and KH6CYI have designed a parametric amplifier that will "bring in signals you never knew were there" on 1296 Mc. Cost is kept down by use of a surplus klystron pump oscillator and X-band waveguide.

☐ It is as desirable for the Novice as much as others to use the same antenna for receiving and transmitting, so W1ICP describes a basic version of a t.r. switch that any newcomer can build—and at minimum cost.

☐ Members of the Polytechnic Radio Club of Brooklyn worked 500 feet on 52,000 Mc.—the highest frequency yet used by amateurs. Conversion of a chrome-plated copper searchlight reflector to a "dish" substantially aided the project.

☐ Photographs of WØKQZ's deluxe transmitter show superb craftsmanship and may indeed inspire us to more home construction of our own.

☐ W6EI has constructed his loaded dipoles for 80 through 10 meters in telescoping fashion sufficient to carry in a briefcase—a truly portable antenna.

☐ Two-thirds of current applicants for an amateur ticket fail to pass the code test, a situation decried by Communications Manager Handy in view of all the effort put forth by W1AW in practice transmissions nightly at a variety of learning speeds.

☐ WØPME gives us hints and kinks to facilitate our mobile operation, gathered in over 50,000 miles of motor vehicle travel, working mostly 7 Mc.

☐ Slow-scan pioneer WA2BCW has improved his basic designs by using frequency modulation for the subcarrier video information and sync pulses, replacing the original amplitude system.

☐ Despite the basic success of the recent Geneva world radio conference, some sticky items in the 4 to 27.5 Mc. range were unsolved, and a "Panel of Experts" advisory committee is to be formed. Hq.'s W1BUD and W1LVQ are among those on the committee to select a U.S. member of this important panel.

☐ The Editor's review of 1960 highlights selects the moonbounce work of W1BU and W6HB as the year's outstanding technical event.

☐ Get ready for the DX Contest set for February and March weekends.—*W1RW*

Hamfest Calendar

[*Attention*: The deadline for receipt of items for this column is the 15th 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.]

†**Florida (Sarasota)—Jan 11-12:** The 7th Annual SARA Hamfest, sponsored by the Sarasota ARC, will be held at the Sarasota Exhibit Hall, Civic Ctr, 801 N Tamiami Trail. Hours: Sat, 8:30 AM-4:30 PM; Sun, 9 AM-3 PM. Admission: $4 in advance, at the door $5. ARRL and other forums, FCC exams, exhibits and sales. Talk-in on 31/91. Information: Art Herrald, AA4AN, 5161 Oxford Dr, Sarasota, FL 34242, tel 813-349-1367.

Florida (Inverness)—Feb 8: Hamfest sponsored by Sky High ARC, to be held at the Citrus County Fairgrounds Auditorium, one mile south of Inverness on US 41. Hours: Sat, 9 AM-4 PM. Admission: $1.50 in advance, $2.50 at door. Tables $5. Dealer/vendor setup at 7 AM; ac power at wall tables. Food, coffee, soft drinks. Plenty of free parking. Talk-in on 146.955. FCC Exams—Tech through Extra, at county courthouse downtown Inverness. Bring check for $4.25, payable to ARRL/VEC, and copy of license. More info: Send SASE to Sky High ARC, PO Box 572, Lecanto, FL 32661.

†**Florida (Miami)—Feb 8-9:** The Tropical Hamboree, sponsored by the Dade Radio Club, will be held at the Dade County Youth Fairgrounds-Tamiami Park, 10901 SW 24 St. Hours: Sat, 9 AM-5 PM; Sun, 9 AM-4 PM. Admission: $5 in advance until Jan 20; $6 at the door and after Jan 20. Manufacturers' exhibits of Amateur Radio equipment, computers and consumer exams (walk-ins welcome), 800 swap tables, dealer specials. RV campground, hookups—$10/night. Talk-in on 16/76, 40/00, 81/21 and 13/73 (Spanish). For complete brochure, maps of area and hotel reservation cards, write to Dade Radio Club, PO Box 350045, Miami, FL 33135; Evelyn Gauzens, W4WYR, Chrmn, tel 305-642-4139 (during show, 305-223-7060).

†**Illinois (Wheaton)—Feb 2:** The Hamfest-86, sponsored by the Wheaton CRA, will be held at the Odeum Exposition Center. Hours: Sun, 8 AM-5 PM. Admission: $4 at the door, $3 in advance. Commercial booths, hundreds of flea market tables. Talk-in on 01/61. Information: Send SASE to Wheaton CRA, PO Box QSL, Wheaton, IL 60189, tel 312-629-8006.

†**Maryland (Greenbelt)—Jan 26:** The Goddard ARC will hold its second annual Swap-Meet minifest on Sunday at the Goddard Rec Center across from the Goddard Visitor Center on Soil Conservation Road. Doors open for all at 8 AM-4 PM. Admission $3; tailgating space $5, and indoor tables (limited number) $7. Talk-in on 52 and 146.235/835 from WA3NAN. Food and refreshments. Women and children under 12, accompanied by paid admission, are free. For table reservations and/or further information, contact Frank Bauer, KA3HDO, PO Box 86, Greenbelt, MD 20770, tel 301-577-0271.

Massachusetts (Marlboro)—Feb 16: The Algonquin ARC will hold its annual Hamfest/Swapfest electronic flea market on Sunday in the Marlboro Junior High School Cafeteria. Doors open for sellers setup at 8:30 AM; for buyers at 10 AM. Talk-in on 01/61 and 52. General admission $1; sellers' tables $7.50 before Feb 9, or $10 at the door. Food. For table reservations or more information, write to AARC, PO Box 258, Marlboro, MA 01752, tel 617-393-9920.

†**Michigan (Oak Park)—Jan 12:** The Oak Park ARC Swap and Shop Hamfest, sponsored by the Oak Park ARC, will be held at the Oak Park High School, Coolidge and Oak Park Blvd. Hours: Sun, 7:30 AM-4 PM. Admission $2.75; children under 12 free. FCC exams, ARRL table, food. Talk-in on 52. Information from Oak Park ARC, 14300 Oak Park Blvd, Oak Park, MI 48237, tel 313-968-7239.

Minnesota (Fridley)—Feb 22: The 5th Annual Midwinter Madness Hobby Electronics Show, sponsored by the Robbinsdale ARC, will be held at the Totino-Grace High School, 1350 Gardena Ave, NE. Hours: Sat, 7 AM-2 PM. Admission: $3 in advance, $4 at door; half tables for $4. FCC exams. Manufacturers, dealers, flea market of radio, computer, satellite TV, etc. Seminars, including packet radio. Talk-in on 60/00 and 52. To register, send SASE and fees to Robbinsdale ARC, PO Box 22613, Robbinsdale, MN 55422, or call Bob at 612-533-7354. FCC exam registration send completed Form 610, photocopies of current license and code credit, and check for $4, payable to ARRL/VEC, to Neil McMillin, 11132-97th Pl, Maple Grove, MN 55369. Register by Jan 22. Walk-ins limited.

†**New York (Yonkers)—Jan 26:** Hams, computer and electronic wizards, CBers: Come to the Yonkers Electronics Auction, sponsored by the Yonkers ARC, indoors at Lemko Hall, 556 Yonkers Ave. Plenty of seats and parking. Bring equipment (new or used) you want to auction; bid on equipment you want to buy. Sunday, 9 AM-3 PM. Inspection from 9 AM-10 AM, auction starts at 10 AM sharp. Admission $3 (buyer and seller); children under 8 free. Club commission on successful sales only: 10% on first $100, 5% on remainder. Talk-in on 265/865, 440.15/5.15 and 52. Information: YARC, 53 Hayward Ave, Yonkers, NY 10704, tel 914-969-1053.

Ontario (St. Catharines)—Feb 8: The Niagara Peninsula ARC, Inc, will hold its annual Hamfest and Flea Market at the UAW Hall, Bunting Rd, Sat at 8 AM. Talk-in on VE3NRS, 24/84.

†**Texas (Harlingen)—Feb 8:** The STARS 2nd Annual Swapfest and Communications Exposition, sponsored by the South Texas ARC, will be held at the Casa de Amistad. Hours: Sat, 9 AM-5 PM. Admission $3 per person or $5/couple. Swapfest, dealer exhibits, ARRL forum, women's activities, license exams. Talk-in on 99/39 and 52. Information: Bob Tichenor, 213 N First St, Harlingen, TX 78550, tel 512-423-6407. Reservations required for swapfest table only.

Virginia (Norfolk)—Jan 24: The 19th Annual Winterfest of Hams, sponsored by the VADX Century Club, will be held at the Diamond Club, Met Park, for all Amateur Radio operators, spouses or friends. Experimenters, ragchewers, traffic handlers, VHF-UHF buffs, DXers and all others. Speaker: Hope C Mihalap. Hours: Friday—6:30 PM for cocktails (cash bar); dinner 7:30 PM. Admission $12.50. Tickets: Gus Brewer, W4FPW, 1359 Eagle Ave, Norfolk, VA 23518 (SASE please). Respond by Jan 20.

†ARRL Hamfest

Coming Conventions

February 21-23
Great Lakes Division, Sharonville, OH

March 7-9
Florida State, Orlando

April 5-6
Nebraska State, Kearney

April 11-12
Michigan State, Saginaw

April 12-13
Missouri State, Kansas City

April 13
North Carolina State, Raleigh

ARRL NATIONAL CONVENTIONS

September 5-7, 1986—San Diego, California
July 10-12, 1987—Atlanta, Georgia
August 19-21, 1988—Portland, Oregon

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 some other VECs.

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. 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. 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. 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.

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 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. Information will be sent via *Third Class Mail*, which may take about three weeks to arrive.

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 a cost-effective and accurate way.

Amateur Satellite Communications

Conducted By
Vern "Rip" Riportella, WA2LQQ
PO Box 177, Warwick, NY 10990

NEXT Generation Satellites on the Horizon

Despite the enjoyment derived in tracking satellites, there are circumstances when it's inconvenient to wait for OSCAR to appear. To the beginner, moreover, it's unclear why the satellite need move at all. "Hummingbirds and balloonists remain motionless, don't they?"

A satellite needs motion to stay in orbit. Without a velocity component away from earth, it would plummet.[1] When a satellite's motion away from earth and gravity are in balance, the trajectory closes on itself to become an "orbit."[2] The higher the satellite, the less velocity it need have to remain in orbit.[3] Today's "stationary" geosynchronous satellites are in orbits 22,300 miles over the equator. But even though they appear stationary, they too have a significant velocity component directed away from earth.

After two decades of experimenting in lower orbits, AMSAT is now charting new conceptual grounds for the next-generation OSCARs. Will they be Phase 4 geosynchronous satellites? What could a Phase 4 satellite system do?

You're motoring down the San Bernardino Freeway. You pick up your radio, punch in a few numbers and instantly you're in contact with your cousin, who's also motoring down the highway. Not really exciting, you say. You already do that? Did I mention that your cousin was motoring down the Trans-Canada highway west of Montreal? A satellite gateway in the San Gabriel mountains and another in the Gatineaus has linked these two motorists through an AMSAT geosynchronous satellite high over Ecuador.

You're sitting at your computer whacking out a reply to an electronic-mail QSL card. You hit the return key and a "MSG DELVD" advisory appears on your screen. The QSL card now resides in an accountable processor in Tucson. When the addressee, a Boston amateur, comes on frequency, the QSL will be forwarded automatically. The 9.6-kbit/s channel is provided by AMSAT's AMSTAR, placed high over the Andes.

A severe earthquake hits coastal Mexico. Normal communications are obliterated. Soon a portable AMSTAR terminal at the site is on the air and a high-quality channel is available from the disaster site to every capital in the Western Hemisphere. Voice and packet data flow continuously for days.

Sitting in the canoe you avoid making any sharp movements. The lake is calm; anchors are positioned to hold the canoe steady. The small dish clamped to the bow rail is pointed right at Orion's belt where, you figured out earlier, AMSTAR would be. Your digital watch beeps in the dark to announce the hour. Donning your headset, the cosmic noise of innumerable stars supplants the din of an apparently equal number of katydids. As you fiddle with the squelch, your lake transforms to a tranquil, 75-acre hamshack. The voice in your ear announces, "Here are tonight's Amateur Radio bulletins via AMSTAR."

These four examples typify system capabilities being considered for the next generation of OSCARs. But to get there will require a much larger support base—a base comprising a larger portion of the Amateur Radio community than is now involved.

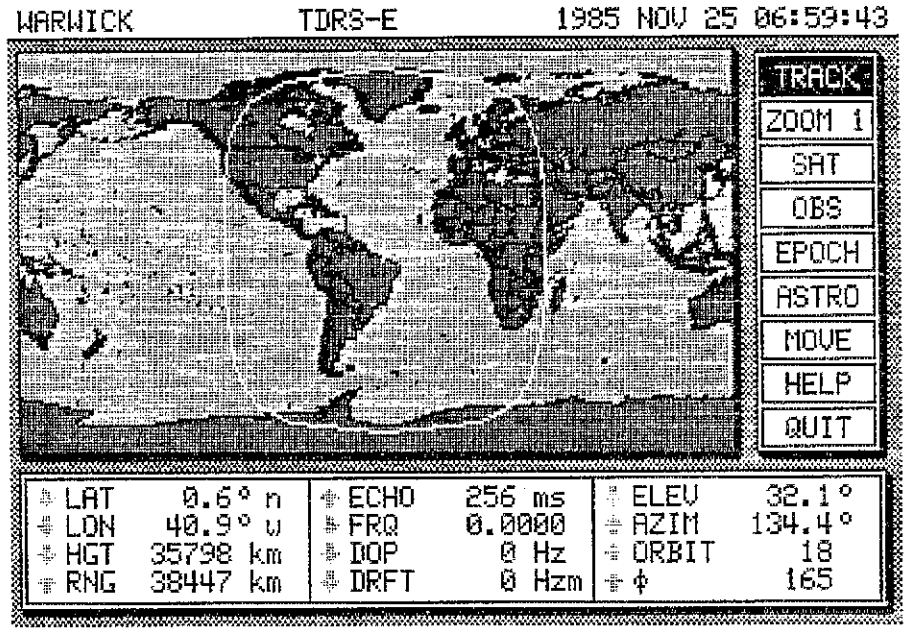
The motions of OSCARs are determined by physics. In confrontation with Newton and Kepler, user convenience is subordinate. For amateur satellites to reach their full service potential, however, they must serve the much larger community which, surveys indicate, places a premium on access convenience. Furthermore, while those currently on OSCAR often have an abiding interest in the medium itself, i.e., OSCAR, many others would prefer to ignore the medium entirely and get on to the matter of communicating. They seem to be saying, "One needn't get into the clockworks to be interested in the time of day!"

In response, AMSAT is engaging in some healthy introspection. Many are coming to feel what is needed now is a "utility satellite" system. In this line of thinking, advanced capabilities are provided through simple, convenient access enabled by superior engineering. In the months to come, AMSAT will weigh concepts for the next generation of satellites. It will study tentative goals for spacecraft design, user capability, financial resources, and others.

It is timely for current OSCAR user and potential user suggestions. Those experienced on OSCAR have a special perspective since they've conquered the beast; done it the hard way. But those who've never worked OSCAR also have something to say here. It would be helpful to have your ideas, too. How would you like OSCAR to perform, and how much would you be willing to put into your current station to achieve that new capability?

Amateur Radio will have geosynchronous satellites sooner or later. Given their druthers, many would have it sooner rather than later! If you would like to participate in the next-generation OSCAR planning, we'd be glad to hear from you. Meanwhile, AMSAT's Project Linkup will demonstrate the feasibility of bulletin delivery both directly and through gateway repeaters. Concept validation will lead to possible regular service before the end of 1986 using current-generation Phase 3 satellites. Want to be a part? An SASE will bring you information on getting started now. Avoid the last minute rush!

Next time we'll discuss potential Phase 4 system capabilities in detail.



Geosynchronous satellite coverage is typified by this plot of the footprint of TDRS East. It is positioned just north of the coast of Brazil. Areas within the curve can intercommunicate via the satellite.

Notes

[1]Similarly, a hummingbird *sans* aerodynamic lift and a balloonist without buoyancy would plummet.

[2]On the other hand, some situations result in starkly different trajectories. A particularly rude one on the low end of the velocity scale ends with a rather direct path to Mother Earth—reentry the hard way ... at Mach 25. At the other end of the scale, we find trajectories that are described by unique S parameters: Space Sayonara Syndrome, aka escape velocity.

[3]Very low satellites, i.e., about 100 miles, orbit in about 1.5 hours. At 900 miles, orbital periods are about 2 hours. At 22,300 miles, geosynchronous altitude, the orbital period is 24 hours. That's why it's "geosynchronous." At 230,000 miles, the moon's orbital period is about 28 days.

Affiliated Clubs in Action

Conducted By Leo D Kluger, WB2TRN
Club Program Manager, ARRL

THE 1986 ANNUAL REPORT

Sometime during the next few weeks your club's ARRL contact person will receive your 1986 Annual Report. You'll immediately notice a major difference from previous reports: the 1986 form is a prebound NCR (self-carboning) set of five pages. The first four pages should be sent back to the Club Program at ARRL HQ. We'll send the appropriate copies to the Affiliated Club Coordinators, Section Managers and Directors, and keep a copy for your club's file here at HQ. The last page is for your club's records.

Another change you'll notice is that we're not asking for club officers this year. We've asked for two names and addresses: the club newsletter editor and the club president. With this information on our computer, we can send newsletters and other releases to the person who can use them the most—the newsletter editor—while sending business-related correspondence to the club president.

We're also requesting day and nighttime telephone numbers for the two contact people. Here's why: Prospective radio amateurs turn to ARRL HQ. as a source of information on local radio amateurs; it's important to encourage these folks by having a telephone number for a club in their area.

If you want to qualify as a 100% ARRL Club in 1986, be sure to include a membership list with your annual report. You'll also find a Club Supplies Request Card in the annual report mailing. It's postcard size, so when you need something for your club from ARRL HQ, fill out the mailer label on the card, add a stamp, and drop it in the mailbox. It's preaddressed, so it'll go directly to the Club Program at ARRL HQ.

Renewing Special Service Clubs

After completing a year of Special Service, SSCs go through a review process with their respective ACCs. With successful programs behind them, they plan their next 12 months of activities.

SSCs that recently renewed this status are:
American Red Cross ARC, Jamaica, NY
Blue River Valley ARS, Shelbyville, IN
Central Georgia ARC, Bonaire, GA
Mecklenburg ARS, Inc. Charlotte, NC
Polytechnic ARC, Glendale, NY
Silver Springs Radio Club, Inc. Ocala, FL

MORE GREAT IDEAS FROM KB9UM

Details on Stanley W. Henson's booklet of "14 Ideas for More Radio Club Fun" were given in last month's column. Here's the next idea from the Meetings and Members heading:

Member Information

Radio club officers are forever being asked questions about club members, such as: How many are ARRL members? Does anyone operate on 30 meters? Which members are contesters? Does anyone know anything about handling traffic? Unless the officer knows all club members very well, much of this type of information is just not available. So let's ask! A membership information form distributed at the first meeting or two of the club year will collect a lot of useful data about the activities and interests of the club members without a lot of work. And, of course, it helps planning fun club activities if you know what your members really do in Amateur Radio.

CONGRATULATIONS TO ...

Members of WB2YCR, the Maple Hill High School ARC, Castleton, NY, who recently celebrated their club's 10th anniversary. The club became affiliated with the League in 1975, and has been going great guns ever since under the trusteeship of John Kienzle, WA2OUN. Current activities include receiving video signals from Shuttle mission 51-F, along with operating a newly installed commercial satellite receiving station. Club members are also the High School Media Staff. For a glimpse of their QSL card, in full color, take a look at the cover of March 1984 *QST*.

ANOTHER CLUB IDENTIFIER

Keeping your club foremost in your members' minds is a good way to ensure its longevity. The South Jersey Radio Association (Glendora) has come up with a neat way to further this goal: self-adhesive club labels, three-quarters of an inch in diameter, perfect for pasting on QSL cards. The club logo, name and call sign are reproduced on the blue-and-white stickers. A sample is pictured. The club charges $1.20 for a sheet of 30, covering their costs.

W0ORE/SAREX Project List of Call Signs Worked

Here is an account of the stations Tony England, W0ORE, worked during the Shuttle Amateur Radio Experiment (SAREX) on the August 1985 flight of the Space Shuttle *Challenger*. The experiment not only was deemed a tremendous success by NASA and will help obtain similar flights in the future, it also enabled countless young people around the world to enjoy an experience of a lifetime. Reports on this historic flight appear in October and November 1985 *QST*.

Copies of the tapes can be obtained from the ARRL Circulation Department for $5 each. Please specify tape number when ordering.

Criteria

If the call sign can be identified on the tape, it counts whether Tony acknowledged or not. Where more than one operator is under a call sign, this is indicated. "Guests" in the shack are not listed. Slow-scan contacts, one-way or two-way, are indicated with an asterisk (*). The index number, (as indicated on Superscope recorder C104) indicates where the contact starts or where the call sign can be most readily identified. Partial call signs are indicated. A question mark (?) indicates considerable doubt as to the call sign.

Tape 1: (6) GW6GW, op Norman; (23) GW6GW, op Brian; (125) *W5RRR; (246) WA3NAN; (270) KA4__I or Y

Tape 2: (4) *EI3ISJ; (21) __LA/portable ?; (22) G1GJY; (38) *GB3RS, G4FRX op; (59) __SCX; (89) F__BZH ? (in French); (141) 4Z4ZB

Tape 3: (58) JH1RNZ

Tape 4: (27) WA9BZW; (45) K8ORW; (47) KW2J; (48) W8LNJ; (60) W3VC; (62) WB1FFZ; (136) *K3TC (slow-scan fragmented); (168) KG3N; (168) W8__; (180) KB2EN

Tape 5: (1) *W5RRR; (37) WA3NAN; (39) AA3O; (57) WA2UFO; (77) W2RS; (376) W6VIO; (415) WA2KDL; (418) __QDF; (424) __GP; (427) WB9KMD; (432) N9EGE; (437) KA4KVC; (444) KD9FC; (446) KA9LQG; (452) VE3KLW; (454) __IB; (455) KE9C

Tape 6: (2) JH1RNZ; (275) KJ6K; (275) Dallas TX Area Boy Scouts; (278) KA6PJL; (300) KA6VNU; (304) N6KBN; (310) NX6M; (347) K7PRS; (349) WA2KDL; (374) N6NR; (379) NJ7E

Tape 7: (4) KH6OB; (8) KH6IJS; (89) W7QLC; (93) NK7W; (103) KA6VNU; (104) KF6YG; (116) W7MCU; (117) N6HYM; (118) WB6TE__; (125) KE7FC; (127) __FA; (133) KC7HC; (134) K6OL; (134) N1HH; (136) WB5DSH; (139) N6QP; (141) KC__; (142) W7MCU; (142) __NI; (144) N7GZT; (145) AE0O; (150) KA9CSL; (154) KA9CFD; (155) WB9MJN; (158) N9EEO; (160) WB8NNI; (162) KE9C; (168) KA9JLT; (172) WB9HAD; (173) __9EHA; (179) __8FP__; (181) KA9OGK; (182) K9JK; (186) WB8OTS(?); (186) KA9__; (187) WB0EQX; (191) WB4ZQB; (195) NC9FN; (196) VE3KXF; (199) WB9GLB; (204) VE3KPK; (209) __GP; (211) __HSQ; (212) VE3BF__; (215) KI4LQ/Mobile; (220) WB1FFZ; (225) WA1FCK; (233) KE2N; (245) K3TC; (257) KG3N; (260) __QL; (266) Cadet Evan(?) Christianson, CAP at WB1FFZ; (274) Mike Sinisko(?), CAP at WB1FFZ; (288) KW1I; (297) W3YC op Joe; (304) W3YC op Howard, Trustee; (327) N1AIS

Tape 8 (Side 1): (194) KH6IBA (Morse); (463) WA4C (J or k)

Tape 8 (Side 2): Several stations copied operating autopatch, but are not listed since they were not calling Tony.

Tape 9: (101) *W5RRR; (231) N1FZ; (242) __ZW; (246) WB2S__W; (250) WB2JSJ; (258) __8ORW (Morse); (267) KG3N; (275) K__2S; (282) WB1FFZ; (285) WA1FCK; (299) W2FPG(?); (443) I0LYL

Additional Calls Logged by Tony

I8WY VE3AP __A1BPT WA3Y__ W1KWC K1VOY KA1IYR WA1W__ W1BYK K2OIJ WA3DS__ W1HUC WA1UQC WB2JSJ W8KEL W9KMD N9EGE KA4KVC KD9FC VE3KLW AG9U W3E__ KH6IBA N9EJU WB9KMD K0RZ W9ODI KA9LQG N9ETE VK2DFY VK__ASB VK2BXQ N1HH W4MOP N4KZZ K4OZQ KA1KRJ W8WLJ K8ORW W4AQL KE4NS WB4TOP N4JVY KG3N N4JQD __LYV W2WHD KH6CC KH6WA NJ6L W6SG WB6NOA AG1U

Correspondence

Conducted By Bruce Kampe, WA1POI
Information Services Assistant

RESTRICTIVE COVENANTS

☐ The ARRL has done a fine job in getting a favorable preemptive ruling regarding local antenna ordinances. However there is still one area of concern to me and I think ultimately to all radio amateurs. The FCC ignores the effect that deed covenants have in circumventing laws. During the period in which racial equality was a leading national issue, the use of covenants was a means of achieving segregation in residential areas. These restrictions were struck down by the courts because they had the same effect as laws and ordinances.

Having recently purchased a house in Knoxville, I found every new development in which I was interested was "restricted" with covenants prohibiting outside antennas of any kind. For the FCC to say that this is a matter between the seller and the buyer to negotiate, and that the buyer is free to live elsewhere ignores the realities of the situation. The original perpetrators of the covenants have taken their money and run, and going elsewhere can be a rather dismal choice. I ended up buying a house on a hill, overlooking the lake and with mountains in the distance. Every deed of the 400 lots in the area references 13 pages of restrictions, one of which prohibits amateur antennas.

Certainly a buyer is free to go to a rural area without sewers, garbage collection, underground utilities, effective security, cable TV, good schools, and a number of other items which he may not wish to do without. To uphold the restrictive covenants will eventually relegate ham operators to a ghetto area where there may be no covenants, but also none of the other civilized services he might feel necessary and may wish to purchase with his home.

The FCC has determined that it is wrong to restrict amateur antennas with state and local laws which are passed by elected representatives of the people. Certainly, it is even more wrong to uphold similar covenants which were devised by real estate developers elected by no one, but having the same effect as law. I really think that the ARRL should carry this message to the FCC and request that they withdraw the exclusion of covenants from their decision.—*Chester Brent, N4TV, Knoxville, Tennessee*

FORWARD INTO THE PAST

☐ I'm writing this letter in reference to *QST* and Amateur Radio in general. The magazine is progressive. However, I've looked at older *QST*s and I feel they are really special. My argument is have we become too progressive?

My station is ancient and I really enjoy it, but I am sometimes looked upon by some hams as being not progressive. I admit that this is true. The solid-state units today have all the bells and whistles, but theyhave no *class*. The older manufacturers—Gonset, Johnson and others—are all but gone, but their rigs are still here and being used and repaired in the field. These units sell for only a few dollars today, but they really have class and much more than that: distinction.

Let's not forget where we came from. A good article now and then on the grand days of ham radio might help lighten the hearts of those who remember, and awaken those who have forgotten.—*William J Bruno, WB3IZX, Wayne, Pennsylvania*

WHERE WERE YOU IN '66?

☐ On September 21, 1966 I worked JA8QA. Two-and-a-half years later I worked him again. This is no great feat, however, it just so happens that I just received *both* QSLs from the bureau on September 9, 1985. QSL cards have been as late as seven or so years coming to me. But this time they took *nineteen years* to arrive. (I hadn't sent a QSL for either QSO to JA8QA.) Would this be some kind of record?—*Charles Taksony, W8FJK, Allen Park, Michigan*

THE BACKBONES OF RADIO RELAYING

☐ ARRL is currently urging the revampment of the Section News in *QST*. In the ARRL *Section Leader* of August 1985, SMs were discouraged from listing stations who handled less than ten, twenty, fifty, or more messages. The number of messages handled has nothing to do with the important issue of Public Service and the NTS. The key is availability and consistency. A person in New York City could conceivably attend one net session and handle more traffic than I do in a month or more. The point is that I was there nearly every day.

Are we improving *QST*'s appeal to all amateurs by leaving out one segment of the ham population? Do you know how boring the DXCC list is to those of you with no interest in DX? From now on, let's only include those who make 800, 900 or more in *QST*! How about a change of heart and continuing recognition of the backbone of radio relaying: the consistently available traffic handler who continues in spite of the low traffic counts? —*Rus Knight, KY1E, West Farmington, Maine*

PUTTING IN A BAD WORD

☐ The adrenaline was flowing in my veins as I carefully hunted a rare DX station from Mali. I listened to QSO after QSO while waiting for the US control station to open up the list of stations to work DX. Then, I saw my hours of endurance and waiting made useless. Two American amateurs (and I use the term loosely) broke into a screaming, swearing fight right over the DX station. One operator was proclaiming DXers to be useless and told the lot of us where to go in no uncertain terms. The other was shouting something mostly unintelligible and totally obscene. The event was totally uncalled for and really hurt a lot of people. I am 14 years old and one of the young people that Amateur Radio supposedly desperately needs. How many people will be attracted to ham radio by behavior like that?

I hope that the two operators mentioned see this and clean up their habits. I further hope that an FCC monitor heard them and throws the book at them.—*Brian Kirk, KB4NLH, Tabb, Virginia*

CONTEST CODE PRACTICE

☐ Monitoring and logging the ARRL CW Sweepstakes was like watching the World Series; exciting and educational!

Over the years my code has been mediocre, and I thought Sweepstakes was for the birds, but this year I decided to listen. And what a surprise! At first I had difficulty reading and logging the call letters, especially the new breed of call letters but before the contest was over, I was copying full texts. Sweepstakes is excellent code practice.

I am looking forward to next year's Sweepstakes, and if I overcome stagefright I shall plunge into the marathon—*Alvin C Holmes, W7CAP, Burley, Idaho*

WDIM (WHAT DOES IT MEAN?)

☐ Why not spell out an abbreviation when used in technical articles, to let some of us who are unfamiliar with them to better understand what was meant. For example; "While adjusting the VCO (Voltage Controlled Oscillator) . . ." Or add a dictionary at the end of the article.

It is most disturbing to stumble through an article and wonder what was meant and whether or not a suitable cross reference is available.

The upsurge of abbreviations in our daily reading material should stir the conscience of all authors to give the readers a break by spelling out what was meant.—*G Van Leersum, N6JGK, Claremont, California*

[Editor's Note: An extensive two-page list of all the abbreviations used in *QST* can be found in the January 1984 issue.]

CONTEST OPERATING

☐ To the CW contester who causes instant QRM, no matter how inadvertently, please take note. I refer to the operator who flits from one nice loud signal to the next arriving just in time to hear the last few characters transmitted and, with absolutely no regard for the working stations on the frequency, sends ĪMĪ. Now obviously this operator wants his information pronto since what he just heard might be a new conquest for him . . . This is unbelievably thoughtless and provoking interference and just plain rude. It is certainly an act not found in the repertoire of a good operator.—*Dean E Lewis, W7TC, Klamath Falls, Oregon*

Public Service

Conducted By Michael R Riley, KX1B
Public Service Manager, ARRL

Code Blue: Hams and Hospital Emergencies

If you've never worked in a large, busy hospital, you probably have no idea of the importance of the telephone and paging system. It calls doctors, lab workers and respiratory technicians to areas where they are needed. It dispatches everything from medicines to custodial services. And when a patient goes into cardiac arrest, it must summon the Code Blue team within seconds.

When such a system fails, the hospital administrator knows he has a small disaster on his hands. Imagine trying to handle all the communications in a six-floor hospital with runners, even if enough runners were available. A cadre of trained Amateur Radio operators could do the job much better. And that's just what happened at St Jude Hospital and Rehabilitation Center in Fullerton, California on October 22, 1985. At about 6 PM, all of the internal phones and the paging system in the 308-bed facility went silent. Only a few pay-phone booths, on separate outside lines, were functional. From a pay phone, the switchboard (PBX) supervisor hurriedly made three calls. The first was to the phone company. Then, even before calling the hospital administrator, she called the first name on her call-up list of Amateur Radio operators: April Moell, WA6OPS, Emergency Coordinator for the Hospital Disaster Support Communications System (HDSCS).

That call activated the system, which is part of the Orange County ARES. The first two ham operators arrived less than 15 minutes after being called. Soon, seven operators with hand-held radios and one base station were stationed in the most critical areas of the hospital, including the PBX (net control), Labor & Delivery, Emergency Room (ER), Laboratory, Intensive Care Unit (ICU) and two nurses' stations. As the phone company searched for the cause of the failure, the Amateur Radio operators kept the messages flowing:

"Prepare a room in ICU for an ER patient. He is a 48-year-old male. Diagnosis is rule-out-MI. Advise room number."

"Locate a respiratory technician and send to ER, stat!"

"Deliver Pyridium, 100 milligrams p o, from pharmacy to the 4-West wing. Patient is Sally Smith in Room 453."

"Locate a janitor and send to the Labor/Delivery area."

The traffic was almost nonstop. The hospital provided two runners to work directly with the hams. The runners were used to make the calls to doctors from the pay phones and to carry messages to areas not covered by ham operators. The ability of the net-control station at PBX to directly dispatch them kept the number of runners needed to only two. Communications within the hospital were done on 2-meter simplex. Meanwhile, from his home in Yorba Linda eight miles away, Assistant Emergency Coordinator Ted Kramer, NB6N, kept in touch with the group on the ARES repeater. It was Ted who kept making phone calls to line up relief operators for a possible second shift. Had the pay phones failed or been inadequate, he and others would have provided the telephone links to the outside world.

Several modules in the hospital's phone switch gear had failed, so the servicemen had to make several trips to the warehouse. As the evening wore on, uncertainty about the length of the failure increased. A second shift of operators was called out to arrive about 11 PM. They were just getting into place when the phones came back up. After a few minutes of waiting to be sure that the system was indeed fully restored, the net disbanded, to hear heaping praise from all the hospital people involved.

Some of the hospital employees wanted to know more about these Amateur Radio operators. How did they know just what to do in a hospital? They acted professionally and didn't get in the way. That wasn't by accident. This was an experienced group.

It was a phone outage at this same hospital in October 1979 that led to the formation of the HDSCS. Hospital employee WA6OPS found herself at that time calling for whatever help she could get from listeners on the repeater. Some of the responders had to come a considerable distance. And what if she hadn't been at work when the phones failed? The experience convinced her that there was a need for an organized group to help her hospital in "little disasters" such as phone outages as well as in major occurrences such as mass-casualty incidents and natural disasters.

The positive response by the hospital administration and its representative on the Orange County Disaster Committee led to inquiries from other facilities. Could they get some hams, too? A year later, there were seven hospitals being supported. Phone outages, both planned and unplanned, have been the most common call outs. There have been eight since the first. The most recent before this one was at Kaiser Anaheim Hospital, an eight-floor facility where five hams provided communications during two failures on successive days.

Working in a hospital isn't like doing communications for a bike-a-thon or even a hurricane. Just as in these other cases, hams in hospitals must be quick, brief and highly accurate. But they must also be knowledgeable of the special terminology they may encounter in a medical message. And in patient areas, a ham must prepare to see and cope with emergency medical care "in the raw," particularly in a mass-casualty incident. So the first half-dozen people to come "out of the woodwork" on the local repeater aren't necessarily the best ones to send. Advance training is very important.

Every ham responding to St Jude Hospital on October 22 was trained and experienced in the hospital environment. Drills by participating hospitals with the county police/fire/paramedic providers have included Amateur Radio for the past five years. Walk-throughs are held at the participating hospitals to check out in-building propagation and allow members to meet the hospital supervisors who are responsible for emergency preparedness. Membership meetings are held five times a year, with speakers on emergency-related topics ranging from disaster triage to the Incident Command System. The acceptance by the original hospitals in the system has been so great that there are now agreements with 23 hospitals in Orange County. The HDSCS provides two lists to each hospital. The *call-up* list gives day and night phone numbers of hams who live and/or work within just a few minutes of the hospital. They can activate the system and also personally respond with equipment within just a few minutes in the case of a phone outage or mass-casualty incident.

The second list assigns a *core team* to each hospital. Hams in the core teams have agreed that in an area-wide disaster they will go to the hospital with equipment as soon as their own families are secure. They don't wait to be called because in such a situation (an earthquake, for example) they know they'll be needed and that the outside phones may be down. To be a member of a core team, the ham should not have other emergency-related commitments to work, church or another agency. Two-ham families are often ideally suited for core teams.

Hospitals are so grateful to have the Amateur Radio volunteer assistance that they're eager to reciprocate. They sometimes offer payment to their emergency responders, which of course, must be politely declined. HDSCS asks instead that the money be spent to install Amateur Radio base-station equipment permanently in the facility, with ownership retained by the hospital to avoid potential disputes. Many of the hospitals have installed or are installing outside VHF antennas and coax runs, and a few have provided transceivers. But HDSCS never demands that hospitals provide any gear. Operators are trained to bring their own in an emergency, with the assumption that the hospital's set may be inoperative.

Other ways that hospitals reciprocate included providing rooms and speakers for membership meetings. They also have financed special ID cards for HDSCS members. The hospitals have also been advocates for Amateur Radio at meetings with other agencies in the county. Through the support of the hospitals, Amateur Radio is achieving greater recognition among emergency-service providers. This results in greater cooperation during both drills and actual emergencies.

While it might appear that the work of supporting hospitals could bring excellent publicity for our hobby, care must be exercised. Some hospitals may not like having the world know that their phone systems are failure-prone, for example. Remember that the good will of the hospital/ham relation-

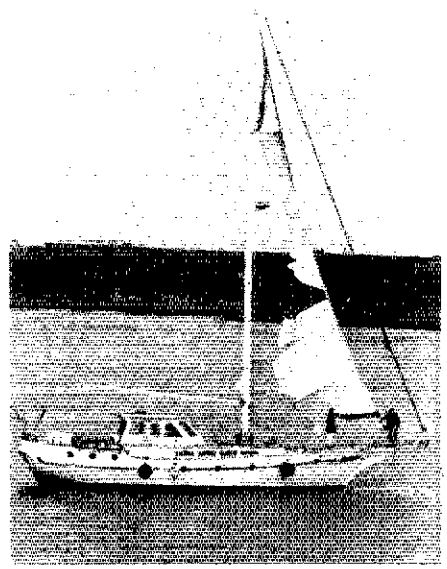
ship is worth far more than a few column inches in the local paper. Before publicizing any in-hospital activity, consult the hospital's public-relations department. The hospital PR people may even be willing to help spread the word about drills and disaster supports.

Like most areas of the country, Orange County has an elaborate commercial VHF/UHF radio repeater system for police, fire, paramedics and local/county governments. The hospitals, on the other hand, have only one simplex VHF channel, called the Hospital Emergency Administrative Radio (HEAR), to communicate among themselves. They have come to realize that Amateur Radio is a valuable addition, for in an emergency hams can contact the scene of the disaster and other agencies such as the Red Cross.

HDSCS has presented its capabilities to hospital emergency planners from all over the country by giving seminars at the Western Disaster Symposium. The response has almost always been, "This is terrific! How can I find some hams in my area?" Chances are your own local hospitals could benefit from the support of your ARES or RACES group, and they may be able to help your group with training. Ask them.

For more information about the HDSCS of Orange County, contact April Moell, WA6OPS, Box 2508, Fullerton, CA 92633.

The Mississippi Baptist Convention sponsored a disaster-relief van in Mexico City following the earthquake in September. The food-services van, equipped with Amateur Radio, was one of several in the Mexico City area. Operators from the Mississippi Baptist Hams Fellowship assisted from this post. *(photo courtesy KB5JN)*



Amateur Radio aboard the *Phoenix* proved itself invaluable after a typhoon in the North Pacific shredded the vessel's main sails last summer. Sailors on board contacted Sergeant Kent Reinke, KF7S, at Shemya AFB in Alaska. KF7S coordinated communication between the Coast Guard and the *Phoenix* until the boat arrived safely at Shemya's harbor three days later. *(photo by 1st Lt Bill Mahoney, courtesy US Air Force)*

IN SERVICE ...

☐ Northern Gulf Coast—August 29-September 2. Hurricane Elena caused havoc for the west coast of Florida and the Northern Gulf Coast prior to and during the Labor Day weekend before coming ashore over Mississippi. ARES teams throughout the coastline put emergency plans into action, working closely with civil defense and Red Cross authorities. Preparation for the emergency paid off, and Amateur Radio proved essential in handling communications throughout the region. (George L Thurston, III, W4MLE, DEC Capital District, FL)

☐ New Port Richey, FL—August 30-September 1. When Hurricane Elena threatened the west coast of Florida on August 30, Pasco County issued a warning at 7 PM and evacuation procedures started. Thirty-four radio amateurs in the county's ARES group teamed up to provide communication for area shelters, Red Cross and West Pasco County Disaster Preparedness Office. ARES and RACES operators remained on alert until Saturday evening when the storm moved northwestward. (Harry Matus, N4DWY, EC West Pasco County, FL)

☐ Long Lake, CA—September 1. A young man, camping in the rugged Sierra Mountains, became sick and suffered abdominal pain early in the morning. Fellow camper, Dr Richard Powell, W2FHW, a physician, came to the aid of the young camper. W2FHW contacted Ken Rice, WB6RHC, via the 147.975 repeater. WB6RHC placed a call to Enlo Hospital, and Dr Powell requested a helicopter to evacuate the victim from the mountains. The trip by vehicle to the nearest hospital would take over three hours.

The helicopter rescued the camper one hour after the first call for help. Enlo Hospital later reported the patient was treated for a kidney stone. (Walt Cross, KE6EP, EC Butte County)

☐ Sussex County, DE—September 26. Delaware was one of several states along the Atlantic Coast affected by Hurricane Gloria. Radio amateurs in Delaware were alerted to assist Red Cross evacuation centers, where nearly 2500 persons took shelter. Red Cross Headquarters and the Sussex Emergency Operations Center were kept informed by Amateur Radio operators throughout the state. (Harold Low, WA3WIY, SM Delaware)

☐ Bethel, CT—September 27. Hurricane Gloria continued up the Atlantic Coast and bore down on Long Island and Southern New England. Many communities were supported by emergency communications from radio amateurs. In Bethel, members of the Bethel Educational Amateur Radio Society (BEARS) responded by contacting emergency nets from their club station at school, providing back-up communications for local police, fire and civil defense departments. BEARS members are students and graduates of the Electronic Communication Program at Bethel Middle School. (Peter W Kemp, KZ1Z, Assistant Director, New England Division)

☐ Biwabik, MN—September 28. Six radio amateurs played key roles in communication for the "Giants Ridge Triathlon 1985." This event included a four-mile canoe race on Wynne Lake followed by a four-and-one-half mile foot race. A 22½-mile bicycle race capped the competition. Two-meter simplex was utilized during the successful triathlon. (G L Van Dervort, WDØGUF, EC Northern St Louis County, MN)

☐ Columbus, OH—October 4-6. Amateur Radio supplied communications for the Columbus 500 Road Race. Thirty-one amateurs supported Red Cross first-aid teams serving the spectators. At one point during the race, commercial track communications failed, and Amateur Radio operators were in position to back it up until the commercial net was re-established. (Robert R Adams, W8BKO, DEC COARES)

☐ Kansas City, MO—October 13. Radio amateurs provided communications for the 1985 CROP Walk, officially known as the Heart of America Walk for the Hungry. The 10-mile walk was sponsored by Church World Services. Twenty-one amateurs assisted by observing and reporting walk status and obtaining medical help when needed. (Mike Bellinger, KØUAA, PIA MO)

☐ Woonsocket, RI—October 14. Communications for the Autumnfest Parade were coordinated by 20 radio amateurs. Two-meter FM was used to assist the staging of 10 divisions and to report the movement of the parade along the four-mile route. Amateurs also linked Red Cross and first-aid stations. (F S Jasinski, W1XA, EC Bellingham, MA)

☐ Hancock, Ohio and Brooke Counties, WV—October 28. Long-distance telephone-service cables were accidentally cut in Ohio County at 3:40 PM, knocking out phone service that Hancock County Emergency Communication Center has with Beaver Valley Nuclear Power Plant and the state capitol. Radio amateurs notified the power company of the telephone outage, and the power company switched to their back-up radio system. Ten radio amateurs established and maintained a net between the EOC and power company until telephone service was restored around 11 PM (George Puzzuola, K8QEW, SEC WV)

YOUR CONDUCTOR'S CABOOSE

And they say that opportunity only knocks once! Earthquakes, hurricanes and volcanoes recently provided ample opportunities for Amateur Radio to prove its worth. Did we open our door? We swung it wide open. We may have, however, forgotten to sweep the dust under the carpet in expectation of guests. If you noticed an area in which we could use a little help, please let us know. We hope you're hearing a knock on your door.

ARRL SECTION EMERGENCY COORDINATOR REPORTS
October 1985

Thirty-five SEC reports were received, denoting a total ARES membership of 18,707. Sections reporting were: AB, AZ, CO, EMA, ENY, EPA, GA, IA, KS, MDC, ME, MI, NFL, NH, NNJ, NV, OH, OK, ON, ORG, PAC, SC, SCV, SD, SDG, SF, SFL, SJV, SK, SNJ, VA, WMA, WPA, WNY, WV.

SEC monthly reports for January should be received in the Public Service Branch at ARRL HQ no later than Feb 12. Late, illegible or incomplete reports will not be published.

Transcontinental Corps October 1985

January reports should be received in the Public Service Branch no later than Feb 12th.

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	115	92.7	526	1065
TCC Central	83	89.0	357	784
TCC Pacific	118	95.2	540	1032
Summary	316	92.3	1423	2881
Cycle Four				
TCC Eastern	140	90.3	643	1295
TCC Central	54	87.1	324	644
TCC Pacific	117	94.0	300	676
Summary	311	90.5	1267	2615

TCC Certificates Issued This Month

WA2FJJ, K8OZ

TCC Roster

KA1AE, N1AWX, N1BHH, W1CE, W1EFW, K1EIR, WA1FCD, K1GRP, WB1GXZ, W1ISO, KN1K, KI1M, W1NJM, W1QYY, KT1Q, KA1T, KW1U, W2AET, W2CS, WA2FJJ, W2FR, W2GKZ, KB2HM W2RQ, K2SB, W2VY, W2XD, N2XJ, W2YGW, K2ZM, W3ATQ, VE3AWE, N3COY, KC3DW, VE3FAS, WB3GZU, W3PQ, K3RZR, KQ3T, WD4ALP, WD4ALY, AA4AT, WA4CCK, N4EXQ, WD4FTK, N4GHI, AA4GL, W4JL, WA4JTE, WB4PNY, WB4UHC, W4UQ, K4WJR, N5AMK, N5BT, W5CTZ, W5GHP, W5KLV, KD5KQ, WB5OXE, KD5RC, ND5T, KB5UL, K5UPN, KS5V, WB5YDD, N6ANQ, VE6CHK, W6EOT, K6LL, W6INH, W6UYK, W6VZT, KA7CPT, N7EP, KD7EY, W7GHT, NN7H, K7HLR, W7LYA, WB7WOW, W7VSE, KA8CPS, N8CW, K8OZ, W8PMJ, W8QHB, AF8V, WB8YDZ, KA9FEZ, N8XX, KW9J, W9JUJ, AD0A, KC0D, K0EZ, KA0EPY, KJ0G, W0GRW.

National Traffic System October 1985

January NTS reports should be received in Public Service Branch no later than Feb 12.

Net	Sess	Tfc	Avg	Rate	% Rep	% Rep to Area
Cycle Two						
Area Nets						
EAN	31	839	27.1	.571	95.1	
CAN	31	671	22.0	.474	100.0	
PAN*	59	683	11.6	.438	94.0	
Region Nets						
1RN	62	676	10.9	.440	96.5	100.0
2RN	46	154	3.4	.252	57.1	100.0
3RN	31	228	7.4	.400	97.0	100.0
4RN	62	628	10.1	.403	82.0	100.0
RN5	62	575	9.3	.414	90.0	100.0
RN6	55	361	6.6	.450	100.0	98.3
RN7	60	322	5.4	.274	78.1	98.3
8RN	58	290	5.0	.297	93.0	100.0
9RN	61	267	4.0	.274	87.0	100.0
TEN						100.0
TWN	62	327	5.27	.371	88.7	100.0
TCC						
TCC Eastern	115	1065				
TCC Central	83	784				
TCC Pacific	118	1032				
Cycle Three						
Area Net						
EAN	31	252	8.13	.466	74.7	
Region Nets						
1RN	31	81	2.61	.210	90.0	93.5
2RN	31	206	6.60	.454	86.5	80.6
3RN						90.3
4RN						80.6
8RN						35.8
ECN						77.4
Cycle Four						
Area Nets						
EAN	31	1330	42.9	1.13	96.2	
CAN	31	923	30.0	1.07	100.0	
PAN	31	969	31.3	.85	100.0	
Region Nets						
1RN	62	386	8.90	.490	93.7	96.8
2RN	61	229	3.75	.342	88.2	93.5
3RN	61	230	3.77	.312	94.0	90.3
4RN	62	566	9.10	.360	100.0	—
RN5	60	602	10.00	.500	87.9	100.0
RN6	62	486	7.50	.550	98.0	100.0
RN7	62	408	6.40	.554	92.2	100.0
8RN	59	324	5.50	.324	91.0	—
9RN	62	431	6.95	.440	92.7	100.0
TEN	62	291	4.70	.356	77.2	100.0
ECN	59	193	3.30	.340	90.4	96.8
TWN	56	320	5.70	.347	83.25	100.0
TCC						
TCC Eastern	140	1295				
TCC Central	54	664				
TCC Pacific	117	676				

*PAN operates both cycles one and two.
ARRL Section Traffic Managers reporting: AB, AL, AR, DE, EPA, EMA, GA, IA, IL, IN, KS, MDC, ME, MI, MN, MO, MT, ND, NE, NFL, NH, NLI, NNJ, NTX, NV, OH, OK, ONT, OR, ORG, RI, SC, SDG, SFL, SJV, STX, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA, WV.

Note: January Section Traffic Manager reports should be received in the Public Service Branch no later than Feb 12. Incomplete, illegible or late STM reports will not be entered in the Public Service column.

Public Service Honor Roll October 1985

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, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points, max; (9) Participating in a public service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

January reports submitted for this column should be received at ARRL HQ no later than Feb 12. Late, illegible or incomplete reports will not be published. PSHR reports should be listed separately from Section News reports.

210
K7VW
184
K5CXP
165
KK3F
159
KB1PA
156
WB1HIH
148
K4SCL
147
WX4H
144
KA8CPS
143
KA3DLY
141
KB0Z
VE4AJE
138
N4NLK
137
WA4CCK
136
WA4QXT
133
W7LRB
WB1CMQ
127
WB2VUK
123
N4GHI
121
KW1U
120
KD7ME
119
N4EXQ
118
KA2MYJ
117
W9YCV
116
KB4WT
N4KFU
K2YQK
115
KA0EPY
114
KC3Y
WA4JDH
113
W7VSE
WB9ESM
112
K4ZK
WB4WYG
110
NC9T

KT5Y
KA9FFO
KD0CL
N8EFB
108
W9JUJ
KF4U
NN2H
WB1GXZ
KD8RD
107
KB7FE
WF6O
AG9G
W2MTA
KK1A
WB4HRR
106
KA8VOZ
W3FA
KB1AF
KD8KY
W0OYH
KA1KPS
105
WA2ERT
KB5EK
104
VE2EDO
WA2FJJ
W0HOJ
103
KA4RSC
AA4AT
K8UYK
N1AKS
KS5V
WB2OWO
102
N4KSO
K4JST
101
KA8GJV
WB7WOW
W4ANK
N8FXH
KZ8Q
WD8LDY
KT5Y
W6VOM
100
W4PIM
KA2SPH
W2PKY
99
WA4PFK
K5OAF
W0LAE
98
AE5I
K0SI
WD8RHU
WA1FCD
WB2MCO
97
N1CPX

KS7I
N9BDL
K2VX
VE4RO
96
N1DMU
N7FXJ
WB8RFB
W6INH
WB8JGW
WD5GKH
94
NO0A
WD8KQC
KC4VK
NK8B
K8ND
VE3BDM
N3COY
KA3ETC
93
N0EVC
K4JUM
K6UXO
W4CKS
WB6DOB
92
K4EV
W6RNL
91
KW9J
W7JMH
K7GXZ
90
N3EGF
W7GHT
89
NG2T
NM8I
KA8KHS
VE3DPO
N2XJ
88
WA1YNZ
KJ3E
WA4EIC
AA4HT
VE3GT
KI4YV
KC2TF
KF8J
87
K3JL
KA0BCB
NT4S
AF8V
W9DM
VE3WM
WD0AIT
KA1GWE
86
KA5SPT
WA2KOJ
85
W0KK
N6AWH

WD9FRI
84
WA7VTD
K3NNI
W5CTZ
K0GP
83
N0BKE
K2YQK
K2YAI
82
WD4KBW
WB2IDS
VE4IX
81
KB5UL
KJ9J
WA0TFC
ND2S
K6TP
N8FXH
80
WD0BOX
WB4ADL
K6YD
WB6QBZ
K4ZN
79
WD8PAF
WB0WNJ
K2ZVI
78
N0CLS
N2BFG
77
N7BGW
KA4GUS
N6HYM
VE3KK
N2AKZ
KA4EYF
K6AGD
76
AL7W
N1BJW
N0GCC
WB2QMP
75
K1MZB
WB4FDT
WD0GUF
KN1K
74
WA4EYU
NF8B
W4ZJY
KA2UBX
WB4WII
N0DZA
73
KA4ERP
KI1M
KB4LB
N4JRE
72
W5VMP

NI0R
K4VWK
KA4YHS
N4PL
W5KLV
KA2DQA
W0FRC
W9NXG
71
W3DKX
KA0ODQ
KD4KK
W7LG
WD4NYL
W2RRX
VE3KK
70
W1RWG
WB4VMX
KA4YEA
69
W7LNE
WD4ALY
WA4RNP
K4VHC
KB4BZA
NC0R
68
KB9LT
WA2YBM

67
WD6BZO
KK1E
WA3CKA
N8GJO
KA1KTH
66
AA4GL
KA4FZI
W4HON
WB4UHC
65
K0PCK
NJ8R
W8EK
KP4DJ
W4FMZ
WA3UNX
64
WA4TVS
NN4I
KC3AV
N1NH
W1TN
N1CVE
WA4RUE
KA8TNT/T
WB5YDD
KB4JPN
K6TWJ

KB4IVV
63
AJ0X
WD8KBW
K4MOG
62
KA7KAI
NZ5J
K7OVK
WD9IID
61
KL7IJG
ND9V
WB8KWC
KC8WH
WA6QCA
KA0KPY
K0ZBJ
WA4MNR
W1YOL
60
W0OUD
WA8DHB
WD8EIB
N4JOA
WA4PUP
WD4HBP
N8AEH
K8JDI
KD8WH

WA6WJZ
KG2D
KD0YL
59
N9EJO/T
56
KA6HJK/T
53
KA1MAM/T
KB4MHH/T
52
KA9RNY/T
51
N8FWG/T
48
KA1HPO/T
N2EVG/T
43
KA7RFD/T
N5EZM/T
WB1CBP/N
KA7TCE/T
40
WB4HXS/T

Brass Pounders League October 1985

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.

January reports submitted for this column should be received in the Public Service Branch at ARRL HQ no later than Feb 12. Late, illegible or incomplete reports will not be published. BPL reports should be listed separately from Section Traffic reports.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	800	791	1353	72	3016
N0BQP	32	1571	67	900	2570
WA0HJZ	0	881	28	530	1439
KW1U	2	515	401	15	933
KA9CPA	28	805	73	15	919
KK3F	113	440	305	54	912
W3VR	246	231	383	31	891
K6UYK	107	391	354	14	866
WA4JDH	1	445	397	8	851
WX4H	0	378	352	6	736
W9JUJ	1	357	347	7	712
N4GHI	45	299	282	24	650
N4PL	111	174	289	18	592
WA4QXT	76	215	252	40	583
W6INH	11	267	247	22	547
N4EXQ	39	236	224	45	544
K0RXK	0	259	11	270	540
WB0WNJ	0	325	210	0	535
W7VSE	4	268	255	7	534
W0ACH	0	266	266	0	532
WD4IIO	185	75	228	22	510

BPL for 100 or more origination plus deliveries:

KA0EPY	241
KA0CZW	216
KC3Y	186
K0JAN	147
W0QBK	145
W7GAQ	133
K5CXP	114
N8AKS	103

Independent Nets October 1985

January reports submitted for this column should be received in the Public Service Branch at ARRL HQ no later than Feb 12. Late, illegible or incomplete reports will not be published.

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	62	343	210
Central Gulf Coast Hurricane Net	31	336	5812
Early Bird Net	31	401	879
Empire Slow Speed Net	31	54	358
Golden Bear Amateur Radio Net	31	94	1887
Hit and Bounce Slow Net	31	351	620
IMRA	27	851	1554
Midwest RTTY Net	28	26	104
Mission Trail Net	31	154	1014
New England Novice Net	31	59	160
North American Single Sideband	27	98	—
NYSPTEN	31	76	606
Southwest Traffic Net	31	256	1251
20ISSBN	27	500	310
75 Meter Interstate SB Net	31	229	930
7290 Traffic Net	50	338	2967

THIS FAMILY HAS WATTS TO TALK ABOUT

☐ It seemed I was forever mad at my husband. Every time I needed Bob, I found him in our son's bedroom with those funny headphones on and this terrible clutter all over the desk. If I called him to empty the garbage or let out the dogs, he would have a grumpy look on his face. I couldn't figure out what was happening.

One afternoon, I went into Chris' bedroom and went directly to the desk to see what the big attraction was. On a sheet of paper I saw this peculiar message: "RST is 599. QTH hr is Vancouver, BC." What in the world was RST and QTH?

I began to notice other strange things happening in our home. Instead of having a normal conversation at the dinner table, I heard odd sounds between my son and husband like, "Dad, pass the ---- . -- ... ---- -.-- . -. ... -." It made me very uncomfortable when those two communicated in a language I didn't understand.

I began reading the radio books on Chris' desk. They were difficult to understand and seemed to be in a foreign language, yet something made me go back again and again to see what I could find out. After finding a copy of the dots and dashes, I asked Chris if this was what he and his dad were saying to each other so often at the dinner table. He laughed and answered, "Yes, Mom, and it would make Daddy so happy if you would learn it, too."

Curiosity really got the best of me, and I wanted to know more about ham radio. There was a Novice class being taught at the nearby high school, and I surprised the family by signing up for it. Outnumbered by men 17 to 1, I thought I might as well stick it out for a few classes at least.

With support from my instructor and classmates, I began to look forward to each class. Before long, I was learning things I'd never thought would interest me. Bob was thrilled with my new interest in ham radio, and Chris encouraged me to keep trying. Many times I would come home and cry out, "I can't do it! I don't understand it." But my husband would patiently sit down and review the lesson with me, and Chris would try so hard to cheer me up that I just had to go back one more time.

Before long I was halfway through the course and gaining more confidence every day. When Chris talked to his dad in code at the table, I found I could understand it as quickly as he could say it. Joining Bob and Chris in their "shack" to hear some "ham talk" became a top priority, and Bob and I had more and more to talk about besides the home and kids.

Soon the classes were over, and it was time to take the Novice test. I was very nervous, as it had only been a short time before that I knew nothing at all about ham radio. Deciding it was now or never, I took the test. Words cannot adequately describe the feeling of accomplishment that came with passing that one test!

Next came the push to upgrade. Bob urged me to continue studying and go for General. I hesitated because it had only been a few weeks since passing the Novice, and I had just five contacts under my belt. However, he was sure I could do it, so I decided to give it a shot. I studied hard because I wanted to take the test the same day as Bob and Chris (then 11 years old), who were going for their Extra. The big day arrived; we were all nervous and doubtful. I came out of the room first, my smile telling the story. I had passed the General! Bob came out next with a loud sigh of relief, and I knew at once he had passed the Extra. We paced the hall waiting for Chris, still in the testing room. As he came through the door, his braces shone as the smile broke over his face. We grabbed one another and started dancing in a circle, shouting and laughing with relief and joy. We drove the 50 miles back home singing and praising each other.

Today our greatest joy is sitting in the shack sharing our hobby. We spend hours together listening to one another get a contact or listening to Chris work as substitute net controller. By the way, Bob, AA4DY, and Chris, AA4DW, are having so much fun as Extras that N4KQI is getting jealous again. So what do you think? Should I?—*Judi Brown, N4KQI, St Petersburg, Florida*

Through ham radio, the Browns of St Petersburg, Florida have become a closer-knit family. From left to right are the licensed members of the family: AA4DY, N4KQI and AA4DW. Son Nick has yet to catch the ham radio bug.

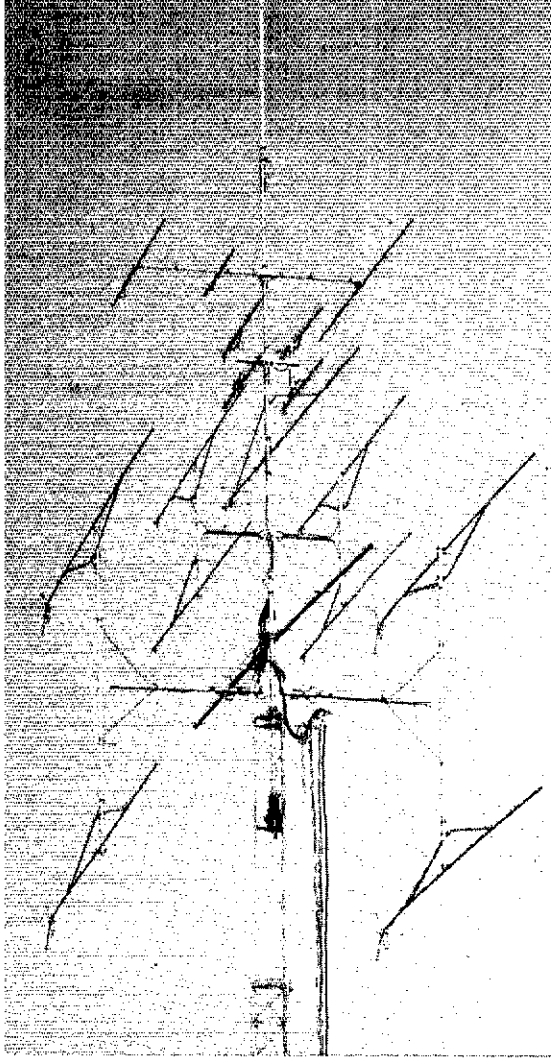
NOTED WIRELESS MEMORABILIA COLLECTOR SILENT KEY

☐ Edward G. Raser, W2ZI, of Ewing Township, New Jersey, became a Silent Key October 22, 1985. He was 86. A former ARRL Atlantic Division Director and five-time recipient of the ARRL Public Service Award Certificate, Ed was also an avid collector of early-day wireless memorabilia and artifacts. Organized into one of the largest private collections in the US or Canada, the museum is located at the AWA Historical Museum in East Bloomfield, New York.

Hola, Colombia! Curren Skutt, W8FSZ (left), and Don Devendorf, W8EGI, welcome Fernanda Guertas, HK6JMQ, as guest speaker at a Mid-Michigan Chapter 135 QCWA meeting in Lansing. With the help of W8FSZ, the 17-year-old exchange student in Sheridan kept skeds with her all-ham family in Neiva, Colombia. She plans to attend the University of Bogota this month.

Results, 1985 September VHF QSO Party

By Billy Lunt,*KR1R and Mike Kaczynski,**W1OD
*Assistant Contest Manager, ARRL
**Contest Manager, ARRL



This array enabled WD6CHL to set a new Pacific Division record.

The weekend of September 14-15, which denoted the 1985 September VHF QSO Party, has come and gone. Receivers, whose front ends were pushed well beyond their dynamic range limits by the plethora of activity, now breathe a sigh of quiet relief. Antennas that protrude from mountaintops all over North America have come to rest, in silent tribute to the harried contacts made during the contest's closing moments. Mobile and portable stations that spent the weekend seeking high spots in rare grids, as well as operators temporarily manning monstrous home stations, have all packed up and gone home after running this 33-hour marathon.

With the fight for QSOs and the hunt for multipliers behind us for another year, we enthusiastically proclaim this event an eminent success. Whether battling for a top spot or just giving out QSO points for others to tally in the end, all but a few participants reported having a good time.

Propagation was a mixed bag in September—some reports of outstanding conditions were received (several Orange County and Los Angeles stations reported hearing Hawaiian beacons on 144 and 432), while others were more of the "Why me?" variety, with only marginal openings at best. Whatever the case, the leaders earned their points by breaking pileups, copying the weak ones and not missing any multipliers while plowing their way through the 434-log field of thick competition to end up in the top spots.

Single-operator scores were led by Dennis, N8FCJ, from the FM08 hills of West Virginia. Dennis's outstanding effort in '85 made it two in a row. As you may recall, he also took top honors in the September 1984 contest. This time it was a photo finish, however, as K2LNS (operating WA2FGK from FN20) was right on his heels, only 1.3k behind.

Meanwhile, the multiops battled it out, with the fight so fierce that no one knew who was ahead until the final scores were tallied. Now that the dust has settled, W2SZ/1 has once again claimed the throne, with W1VD edging out third-place K3YTL by 4.6k.

Multioperator competition was also fierce on the West Coast, with Santa Barbara's W6TRW nipping Santa Clara Valley's WB6KBZ by less than 2 kilopoints for top California honors.

The 1985 ARRL September VHF QSO Party claimed some other superstars, as 5 single operator and 6 multioperator Division records fell. New single operator Division records are held by WØXG (Dakota), WA8TXT (Great Lakes), WD6CHL (Pacific), KXØO (Rocky Mountain) and K6HXW/6 (Southwestern). Multioperator stations K3YTL (Atlantic), K9HMB (Central), KCØP (Dakota), N4DT (Delta), N2BOW (Hudson) and K5CM (West Gulf) all put in outstanding efforts for a place in the Division Leader's box.

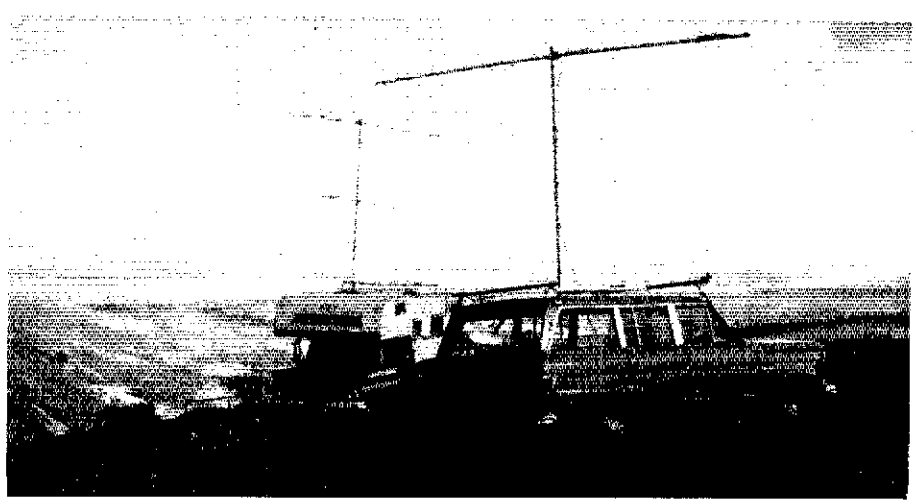
Top single-band scores were up on 144 and 432. Lack of propagation on 6 meters severely affected top scores on that band—the average 1985 score on 6 was only one-third that of 1984.

UHF activity is on the increase, with more activity (in the shape of both multipliers and QSOs) resulting in larger band scores. We're sure to see more microwave dishes on the horizon soon!

The January VHF Sweepstakes will be held on January 11-12. QSO-point values have been changed, so be sure to see the rules, published in December 1985 *QST*, page 94, for details before entering. Also, don't overlook the 902-MHz band for increasing your score, as each QSO on that band will be worth 4 points. See you on January 11-12. Good hunting!

SOAPBOX

Grids are just what was needed to put excitement in every QSO ... Thanks to Tom, WB1FVS, who put up antennas to get me back on the air (KA1ZE). Seems impossible, but I beat last year's 432 score (K1FO). First 2-meter contest, it was fun (KG1D). Seemed real quiet from Bolton (WA1ZNT). Improvement over last year was borrowing an all-mode rig (WA1NLD). Poor conditions, low 2-meter activity, disappointing contest (K5MA/1). After using grid squares in several contests, I definitely like it! (KX1C). One hour after the contest started it sounded like Sunday afternoon activity (K1DAT). Heard lots of W2s—what do you have to do to get them to point their antennas to northern New England? (KA1QG). Sunday night 2-meter tropo to WI and IL! (WA1OUB) First September VHF Contest for us—lots of fun—lots to learn!



WØKEA and crew operated from DM69 in Colorado.

Division Leaders

Call	Score	Division	Call	Score
WA2OMY	74,400	Atlantic	K3YTL*	362,700
VE3ASO/2	39,376	Canada	VE3LNX	79,310
WB9MSV	38,862	Central	K9HMB*	172,638
WØXG*	10,048	Dakota	KCØP*	576
K5UR	26,596	Delta	N4DT*	107,151
WA8TXT*	42,721	Great Lakes	W8VP	172,596
WA2FGK (K2LNS)	80,847	Hudson	N2BOW*	109,624
KØTLM	15,300	Midwest	WBØDRL	31,590
KA1ZE	45,612	New England	W2SZ/1	374,934
W7ZSL	5,220	Northwestern	KE7P	1,188
WD6CHL*	20,604	Pacific	WB6KBZ	29,760
N8FCJ	82,198	Roanoke	WB4SLM	227,715
KXØO*	19,530	Rocky Mountain	WØKEA	2,280
WA4NJP	23,876	Southeastern	K4CKS	12,212
K6HXW/6*	11,024	Southwestern	W6TRW	31,552
KE5EP	26,788	West Gulf	K5CM*	49,149

*new Division record

Top Ten

Single Operator		Multioperator	
Call	Score	Call	Score
N8FCJ	82,198	W2SZ/1	374,934
WA2FGK (K2LNS)	80,847	W1VD	367,290
WA2OMY	74,400	K3YTL	362,700
KC2PX	66,331	WB4SLM	227,715
W9IP/2	60,345	WB2NPE	202,807
WA2TEO	59,385	W1TKZ	199,092
W2CRS	57,960	K1TR	180,900
K2SMN	55,714	K9HMB	172,638
WA3FYJ	53,992	W8VP	172,596
W3IP	46,640	N2BOW	109,624

Top Single-Band Scores

50 MHz		432 MHz	
WA1OUB	4,200	K1FO	17,820
W9IP/2	2,960	NI8O	7,560
N8FCJ	2,888	K8WW	5,920
WA4NJP	2,664	WB9MSV	5,670
WA2TEO	2,610	WA2FGK (K2LNS)	4,860
KC2PX	2,465	K2SMN	4,224
W3WFM	2,146	KA1ZE	4,094
WA2OMY	2,132	WA2OMY	3,850
K1DAT	2,070	W3IP	3,650
W3IFM	2,002	WA3FYJ	3,584
*W1VD	20,803	*W1VD	15,120
*W2SZ/1	15,456	*K3YTL	14,520
*K3YTL	13,608	*WB4SLM	12,992
*WB4SLM	11,248	*W2SZ/1	10,412
144 MHz		**1296 MHz**	
N8FCJ	32,676	W1RIL	1,845
K2SMN	18,468	WA1JOF	1,224
AF9Y	15,631	K2SMN	1,188
KD8SI	14,835	K8WW	1,020
WB2QOQ	13,029	WA2FGK (K2LNS)	960
N2AHN	12,936	K1PXE	840
N4AR	12,804	W2CRS	780
K1RZ	11,750	WB2YEH	744
WA1VTA	11,552	WA2OMY	648
WA1OUB	10,280	WA3JUF	624
*W2SZ/1	40,803	*K3YTL	4,485
*W1VD	35,712	*W1TKZ	2,052
*WB4SLM	34,470	*W1VD	2,016
*K9MRI	33,184	*WB2NPE	1,677
220 MHz		*W2SZ/1	1,485
KA1ZE	3,200		
WA2TEO	2,640		
WA3FYJ	2,378		
W9IP/2	2,106		
WA2FGK (K2LNS)	1,980		
KC2PX	1,920		
WA2OMY	1,848		
W2CRS	1,794		
K2GK	1,634		
K1PXE	1,462		
*K3YTL	10,656		
*W1VD	7,560		
*WB2NPE	6,400		
*W2SZ/1	6,072		

*multioperator station

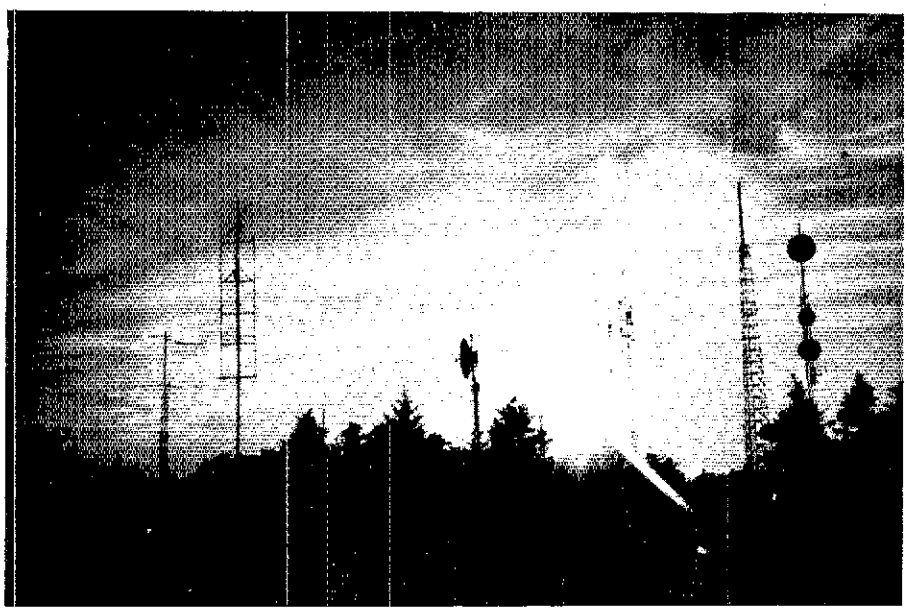
Multiplier Leaders—Single Operator

50 MHz		1296 MHz	
WA1OUB	40	K8WW	17
W9IP/2	40	W1RIL	15
N8FCJ	38	W2CRS	13
WA4NJP	36	WA8TXT	13
K5UR	36	WA1JOF	12
NØLL	30	K2SMN	11
144 MHz		K1PXE	10
N8FCJ	84	WA2FGK (K2LNS)	10
KD8SI	69	VE3ASO/2	10
N4AR	66	W3IP	9
AF9Y	66	KE5EP	9
PE1AHX/W4	57	W9IP/2	9
WB9MSV	55	**2304 MHz**	
K2SMN	54	WA2FGK (K2LNS)	4
W9IP/2	51	WA5VJB	3
WB9OJR	49	WA3JUF	2
WB8DRR	48	WA2OMY	2
220 MHz		WB2YEH	2
WA3FYJ	29	WB5AFY	2
W9IP/2	27	WA8TXT	2
KA1ZE	25	WA1TFH	1
W2CRS	23	WA2TEO	1
WA2FGK (K2LNS)	22	VE3ASO/2	1
WA2TEO	22	**10 GHz**	
K8DIO	22	W2CRS	2
WA2OMY	21	VE2DUB/2	2
WA8TXT	21	K1KG	1
N1DPM	20	K2DNR	1
KC2PX	20	K4KAZ	1
432 MHz		WA5VJB	1
K1FO	45	W7PUA	1
NI8O	43	KXØO	1
K8WW	37	VE3ASO/2	1
WB9MSV	35	VE3BFM	1
WA3FYJ	32		
KD8SI	31		
K5YY	30		
WD5BKV	29		
WA8TXT	28		
WA2FGK (K2LNS)	27		
K5UR	27		

Multiplier Leaders—Multioperator

50 MHz		1296 MHz	
WB4SLM	74	K3YTL	23
W1VD	71	W1TKZ	19
W2SZ/1	56	W1VD	18
K9HMB	56	W2SZ/1	15
K3YTL	54	WB2NPE	13
N2BOW	50	W8VP	13
W8VP	47	VE3LNX	12
W0UC/9	47	WBØDRL	11
WB2NPE	46	K1TR	10
K5CM	46	W2DMC	9
144 MHz		WB4SLM	9
WB4SLM	90	**2304 MHz**	
W8VP	89	W2SZ/1	9
N4DT	74	K3YTL	7
K9HMB	74	WB2NPE	4
K9MRI	68	KD5RO	3
W2SZ/1	67	W1TKZ	2
N4EQT	67	K1TR	1
W1VD	62	WB4SLM	1
K3YTL	61	VE3LNX	1
W4BFB	60	**10 GHz**	
220 MHz		W2SZ/1	7
K3YTL	37	K3YTL	4
W8VP	37	W1VD	3
W1VD	36	K1TR	2
W1TKZ	33	W1TKZ	2
W2SZ/1	33	N4DT	1
WB2NPE	32	WB4SLM	1
K9HMB	31	WA6IJZ	1
K1TR	27	VE2FUT/2	1
N2BOW	25		
K2QR	23		
N2WK	23		
N4DT	23		
VE3LNX	23		
432 MHz			
WB4SLM	56		
K3YTL	44		
N4DT	44		
K9HMB	44		
W1VD	42		
W8VP	42		
W2SZ/1	38		
W1TKZ	34		
N2WK	33		
WB2NPE	32		
W4BFB	32		

(WA1YZN). Murphy! Murphy! Murphy!—but only on 1296! Finally got going after realizing the preamp had too much gain for our 15-W output . . . the coax connectors were poor (don't use BNCs on 1296!!) . . . The IF strip was shot! Took down mast 7 times, converter and relays are mast mounted! (K1DS). Had K1TR in line of sight 4 miles to west (WA1VTA). Always enjoy VHF Parties even if conditions are flat (K1ISW). Poor conditions and especially low activity on 50 and 220 (N2BJ). Had a lot of trouble with equipment, relays and a fuse (KA2Q). First VHF contest in over 10 years (WB2ZSY). With a last name like Murphy, you would have thought I would have avoided setting up antennas on a hilltop Friday the 13th! (N2WM). Band conditions were great!—Love the contest (WB2ODH). We almost tripled our score from last year, and Murphy was kind to us this time—only lost one 4CX250B (N2WK). New 1.3-meter antenna didn't get us more contacts but it sure made 'em easier (K2QR). Picked up four new grids in the last hour on 2 meters and two in the last ten minutes! (W9IP/2) My best thrill was working stations on CW (KA3KHZ). Where was the south? Lots from the north (KB3HH). My first VHF contest—great group, great fun, when is the next one? (N3DZH). I like the grid squares (N3DUE). Was not able to get my new tower up in time, but I'll be ready next time (NA4O). Tried to work N4DT several times finally made it 28 minutes before end of contest—who says persistence doesn't pay off! (WB4NXY). High power-line noise and XYL invited a couple over and they stayed all day Sunday! Grrrr! (N4KCM). Where did all the RF go? Worst conditions this year (N4EQT). Good time had by all—very, very cold but we made it anyway! (WI4M). As before, I tried and will continue to try for a higher score (KA4WNX). Why weren't there more DX stations—turn the beams south, folks (WD4AHZ). Five by nine noise level—wait til next one—you ain't seen nothin' yet! (WZ4K). Conditions were about as poor as I have seen in years—really made us all get down and dig for points (W5FYZ). Never thought I'd see the day when I made more contacts on 432 than 50 MHz! (W5FF). This was a real learning experience—was surprised to find 2-meter ops friendly and willing to help each other (KA5SUN). Suggest stations in rare grid listen for weak signals after working the loud ones (N7AIH). Where were all the conditions that we had in the June contest? (KE5EP). 2304 had some activity for a change! QRM on 1296! It was tough at times (WB5AFY). My first September contest—had great time—looking forward to June! (WBØCGH). Last time I'll operate with indoor antennas! Still was a great way to get my feet wet (K5EI). First VHF contest from the West Coast—very different and fun (K9AKS). Conditions lousy but looking forward to January (K6PFW). Unfortunately no 6-meter openings, even at 8000 ft. However, the other bands were productive. We had a great time on our first mountaintop trip—we will definitely do it again (W6TRW). Went two hours without any contacts (WA6IJZ). The contest was fun and looking forward to next year (WD6EPV). An early fall snowstorm made things interesting at 8400 ft—had to leave early Sunday missing quite a few (NR6E). First VHF contest—great fun. Needs



Sunset over the FN32 QTH of W2SZ/1. This outstanding shot was taken by WA1ZAM.

more activity (KI6O). Good activity! Got CW working on rig, but then had to leave for business trip (WF6J). Grid squares are better, especially in the larger western states (K2DNR). Where was 6 meters? (KD7IY). We ran out of QSOs and 807s early in the contest—not necessarily in that order (N7AMA). Yes, world, there is activity in the Boise area (KA7KGF). Some wonderful surprises—Boise, ID on 144; Yakima, WA and Mary's Peak on 1296 (K7HSJ). Reasonable scatter conditions Sunday morning on 6 meters (N7DB). N7BSN created a lot of activity on four bands in western WA and BC operating from CN78 (W7ZSL). My best 432 score yet (WA7KYM). It was a very enjoyable contest, but it took a lot of hard work and determination—it was worth it (KD8SI). Hats off to everybody that operated from normally silent grid squares (NI8O). Good conditions Sunday morning—lot of new stations on 432 (K8YAH).

FEEDBACK

Please refer to September 1985 *QST*, pages 81-86, for the following corrections. In NYC/LI, KA2VKO was really KA2VKD. In the Idaho Section, W7ID was the 2-meter winner, and WAØDYU was a 6-meter single-band entry. W6UE really was in Orange, and they were the Southwestern Division Leader. WA5WCP, not W5NZS, was the West Gulf single-op winner. W9UD was the multiop winner in the Central Division. WØIJR was the Rocky Mountain Division winner.

Scores

Scores are listed by ARRL Section. Within each Section, single-operator scores are listed first and then multioperator scores. From left to right, each line lists: call, score, QSOs, multipliers and bands operated (A—50 MHz; B—144 MHz; C—220 MHz; D—432 MHz; E—1296 MHz; F—2.3 GHz; G—3.4 GHz; H—5.7 GHz I—10 GHz; J—24 GHz). Among the single-operator stations, the overall Section winners and single-band winners are indicated by bold-faced type for the call sign of the Section winner and for the one letter(s) denoting the bands won. For example, in Connecticut, KA1ZE is the overall Section winner as well as the single-band leader on 144 and 220 MHz. W1GRW is the single-band leader on 50 MHz, while K1FO took 432 MHz and K1PXE won on 1296 MHz.

W/VE

1

Connecticut

KA1ZE	45,612	390	84-BCD
K1PXE	39,840	310	83-ABCDE
K1FO	17,820	198	45-D
AB1U	10,858	162	48-ABCD
W1GRW	9116	192	43-ABD
K1GX	7656	232	33-B
WB1BXS	5292	196	27-B
KG1D	3772	164	23-B
AA2Z/1	1406	73	19-ABD
WA1ZNT	1334	58	23-AB
WA1NLD	620	62	10-B

W1VD (+ K1JX, KA1GD, W1OD, WA1STO) 367,290-1203-231-ABCDEIJ

W1QK (+ KA1ECL, N1ABY, W1NG, WA1WXV, WB1CVW, WB3JYO, KF6AJ) 47,241- 453- 87-ABCDE

Eastern Massachusetts

K1KG	23,014	241	74-ABCDEI
WA1JOF	18,054	186	59-ABCDE
WB1FKF	15,120	150	60-ABCDE
W1GXT	9540	145	45-ABCDE
K1SRZ	8702	169	38-ABCD
KA1DHO	8184	135	44-ABCDE
K5MA/1	7524	228	33-B
K1VZI	4770	103	30-ABCDE
W1QXX	4488	106	34-ABCD
W1AX	3828	132	29-AB
K1TQ	2784	68	32-ABCD
KY1C	2660	66	28-ABCD
K1DAT	2070	90	23-A
AJ1E	702	37	13-BDE
W1FM	675	39	15-ABD
W1JOT	392	31	7-BDE
W1QHB	270	18	5-E

Maine

W3HQT/1	15,189	167	61-BCDE
WA1TRE	2324	83	28-AB
W1PLX	1113	53	21-B
WA1AYT	620	31	10-D
K1BZ	170	17	10-B
KA1QG	154	13	11-ABD
K1TMM	24	6	4-A

New Hampshire

WA1OUB	28,960	362	80-AB
WA1TFH	15,576	164	59-ABCDEFJ
W1EJ	11,232	134	52-ABCDE
AC1J	8557	167	43-ABCD
KA1BJ	3818	79	23-BD
KA1CDZ	1826	67	22-ABCD
W1JSM	1280	68	16-BD
WA1GDR	374	34	11-AB
WA1TDA	138	23	6-B

WA1YZN (+ N1BAC, WA2VSN, WB8BTH) 13,850- 245- 50-ABD

Rhode Island

K1DS (+ K1s CH, PAM, KB1KA, KM1X) 29,181- 301- 71-ABCDE

Vermont

K1LPS	13,359	161	61-ABCDE
WA1ZOJ	1281	61	21-B
K1ZRD	624	39	16-B

W1TKZ (K1TK, KA1s LDV, MZJ, N1CPE, W1s EGE, GCI, IJO, WB1BUM, WA2TIF, G3VVH, oprs.) 199,092- 804-188-ABCDEFI

Western Massachusetts

N1DPM	34,020	280	90-ABCD
W1RIL	29,768	319	61-BDE
WA1VTA	11,552	304	38-B
K1ISW	9198	172	42-ABCD
K1COW	656	41	16-AB
W1NMQ	476	32	14-ABC
WA3EEC	416	32	13-AB
K1JG	105	15	7-AB

W2SZ/1 (K1DH, KA1DZV, KY1H, N1s DJE, DJG, WA1s UGE, ZAM, WB1EYL, AB2I, KJ2B, N2BNY, W2ARQ, WA2s AAU, SCA, WB2s CFP, KMY, N4FFD, WA6USA, oprs.) 374,934-1182-237-ABCDEFGHI

K1TR (+ AK1J, K1s BA, EA, N1s AFQ, AUP, BEM, WA1PBU, K3WM, K5ZD) 180,900- 895-150-ABCDEFGHI

2

Eastern New York

WA2TEO	59,385	430	107-ABCDEF
W2CRS	57,960	328	120-ABCDEI
W1XX/2	46,248	392	94-ABCDE
N2BJ	25,844	250	71-ABCDE
KA2JUV	2912	104	28-B
WB2NJD	1281	61	21-B
WA2ALV	1239	57	21-ABD
KD2IX	638	58	11-B
KA2Q	555	32	15-BD

W2DMC (K2s CIB, EV, MME, KA2LBG, N2s BJ, DL, DVX, W2GQ, WA2s EHI, FWZ, WB2s IEE, NEC, oprs.) 69,696- 518- 99-ABCDE

New York City & Long Island

WB2KEC	4669	161	29-B
K2OVS	4560	100	38-ABD
KE2N	2688	112	24-B
WA2GEZ	923	71	13-B
WB2ZSY	248	31	8-B

WB2PWR (+ KA2ZGZI) 7640- 164- 40-ABD

Northern New Jersey

WA2FGK (K2LNS opr.) 80,847- 474-117-ABCDEF

KC2PX	66,331	433	113-ABCDE
K3QM	14,175	256	45-BD
WB2QOQ	13,029	303	43-B
KA2IVS	2232	124	18-B
WA2ALM	1120	80	14-B
WV2ZOW	297	27	11-A

N2BOW (+ N2s CEI, EOC, WB2ULI, KT3U) 109,624- 617-142-ABCD

N2WM (+ KA1LHZ, N2s CJS, ERH, WA3WUD) 45,720- 398- 90-ABCD

Southern New Jersey

K2SMN	55,714	466	89-BDE
WB2YEH	23,626	212	66-ABCDEF
W2EIF	17,228	187	59-ABCDE
W2HRW	15,228	261	54-ABCD
N2AHN	12,936	294	44-B
N2BYE	2024	88	23-B
WB2EYX	931	49	19-B

WB2NPE (+ N2SB, WA2VYA, WB2YHA, WB8ZAR) 202,807- 780-179-ABCDEF

K2BWR (+ K2ZRJ) 29,014- 228- 89-ABCDE

Western New York

W9IP/2	60,345	309	149-ABCDE
K2GK	31,104	239	96-ABCDE
WA2BPE	8909	151	59-AB
WB2SZY	5860	149	40-B
WA2CBU	5850	100	50-ABC
NA2A	3091	117	41-BCD
NA2O	2850	95	30-B
KU2A	2592	36	27-ABCD
W2WGL	2320	80	29-B
WB2ODH	2000	80	25-B
N2DIT	912	48	19-B
W2AW	270	28	15-B
KC2AW	200	20	10-AB

N2WK (+ KA2s HSK, MRP, PXZ, KX2J, WA2s LAQ, MOP, SHN, WB2MKN) 75,308- 410-134-ABCD

K2OR (+ KX2I, N2AU, WA2GBG, WB2WBT) 73,809- 431-139-ABCD

3

Delaware

N3EET	23,976	218	81-ABCDE
KA3KHZ	4089	141	29-B
KB3PD	3944	138	29-B
KA3B	952	56	17-A

Eastern Pennsylvania

WA2OMY	74,400	430	120-ABCDEF
K3HP	40,824	348	84-ABCDE
WA3NWL	16,995	220	55-ABCDE
K3IWK	10,850	209	50-ABD
N3ET	9964	163	49-BD
WB3IGR	8200	175	41-ABC
WA3JUF	4176	68	24-CDEF
N3EAX	3360	112	30-B
W3CWG	2002	77	26-B
W3CL	1000	39	20-ABCD
K3RTU	333	33	11-AB
WA3KFT	26	13	2-AB

K3YTL (K3MKZ, KA3EEO, KB3QI, N3s CXB, DAP, WA3s JWP, JWV, NVS, YON, WB3s FAA, FKQ, FYT, IWZ, oprs.) 382,700-1057-234-ABCDEFIJ

W3LP (W3s GFN, JUZ, WA3CUQ, oprs.) 12,824- 174- 56-ABCD

W3HZU (K3GOI, WA3s AXC, SST, WB3BWG, oprs.) 3861- 93- 39-ABD

WA3KEY (+ WA3RXP) 3500- 100- 35-AB

W3UU (KA3NDC, KC3s KN, MG, oprs.) 1700- 85- 20-B

Maryland & DC

W3IP	46,640	308	106-ABCDE
W3WFM	38,096	302	96-ABDE
K3ZO	17,664	256	69-AB
K1RZ	11,750	250	47-B
WA3UJE	7770	149	42-BCD
WA3FAE	5705	163	35-B
K3AKR	5504	109	43-ABCD
N3DOU	5143	113	37-BD
KB3HH	3108	83	28-BD
KE3A	2958	102	29-B
N3DZH	2418	93	26-B
W3IFM	2002	77	26-A
K3YDX	1320	66	20-B
N3DUE	840	60	14-B
K3EI	777	37	21-AB
WA3EOQ	400	20	10-C

WA3GYW 290- 29- 10-AB
K3ONW (+WB3LJK)
51,092- 341-106-ABCDE

Western Pennsylvania

WA3FYJ 53,992- 300-136-**ABCD**
K4JSI/3 9164- 119- 58-BCD
KA3KZF 2220- 74- 30-B
W3KWH (KA3OIX opr.)
1320- 55- 24-B
WB3EUM 779- 41- 19-B
W3HDH 640- 32- 20-A
W3KJM 330- 22- 15-A
N3EMO 130- 13- 10-B
W3GNR/3 (KA3DWR, WA3s FFC, JBV, oprs.)
41,536- 267- 118

4

Alabama

WB4NJG 14,040- 148- 78-**ABD**
WA4VUG 72- 12- 6-B

Georgia

WA4NJP 23,876- 209- 94-**ABCDE**
K4KAZ 704- 32- 16-ABDEHI
NA4O 300- 25- 12-B
WB4RUA 108- 9- 6-D
K4GKS (+WA4YGG)
12,212- 162- 71-ABC

Kentucky

WB4NXY 13,098- 128- 74-**ABDE**
N4AR 12,804- 194- 66-B
N4KCM 6754- 91- 61-ABD
AA4FQ 1488- 48- 31-B
N4EQT (+KA4AEP, WD4HPL, WF4R, KA8s SSB, ZKY, W8ULC)
40,135- 307-115-ABCD
WI4M (+KB4EES, N4IZD)
3320- 68- 40-ABD

North Carolina

N5AYD 1809- 67- 27-B
N2CJP 1456- 48- 28-**ABD**
WB4SLM (+N3AHI, W3ER, K4MSK, N4HSM, WA4s DFS, OYH, WB4NMA, WD4s IIS, MBK, WS4F, GW3NJY)
227,715- 703-255-ABCDEFGHI

Northern Florida

K4RZB 4032- 80- 42-ABD
W8HUQ 3990- 77- 42-ABD
W4ZGS 325- 25- 13-AB

South Carolina

PE1AHX/W4 9690- 170- 57-B
WA4LDU 984- 35- 24-ABD
K4KAE 748- 28- 22-ABD
WD4JQV 88- 10- 8-BD
KA4WNX 32- 8- 4-B

Southern Florida

KC3CL 4958- 107- 37-**ABCD**
WD4BYK 1005- 58- 15-BD
K4DZP 672- 33- 16-ABCD
WD4AHZ 600- 34- 15-BD

Tennessee

WB4JGG 11,661- 169- 69-**AB**
WA4QYK 3280- 64- 40-ABCDE
WA4GBE 2291- 55- 29-ABD
WD4DGF 1276- 29- 22-CD
N4DT (+AJ4N, KJ4s BF, X, N4SZ, WQ4V)
107,151- 417-191-ABCDEI
W4BFB (AA4ZZ, K4TP, KA4WYC, KU4V, WA4UNZ, WB4s GFJ, PCS, QCS, TLX, WD4ABZ, KA8GGI, oprs.)
53,468- 448-154-ABCDE
WB4KNF (+N4VC)
7196- 97- 61-ABCD

Virginia

K2UOP/4 29,014- 235- 89-ABCDE
N4MM 19,182- 205- 69-ABD
WB4CTW 18,070- 220- 65-ABCD
WA4SBC 15,378- 183- 66-ABCD
AA4KP 4672- 146- 32-B
K4FTO 4578- 96- 42-ABD
K9OYD/4 3360- 91- 32-BD
K3ZJ/4 2280- 95- 24-B
N4HB 2000- 80- 25-B
WZ4K 1540- 70- 22-B
KB4CMF 1496- 68- 22-B
KB4EUZ 840- 39- 15-BD
AB4L 714- 21- 17-D
WA4MMP 252- 19- 12-ABD
KF4KI 96- 24- 4-B

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Arkansas

K5UR 26,596- 203-109-**ABD**
K5YY 21,112- 187- 91-ABD
WB5JAR 2112- 59- 32-ABD
WB4LHD/5 (+KB4s GGD, GGE, KU4K, N4FAC)
75150- 81- 50-ABCD
WD5CAP (+KA5NTT, WD5CAN)
5150- 81- 50-ABCD

Louisiana

KB5PX 12,000- 128- 75-**ABCD**
WB5NAA 1539- 57- 27-B
K8KFY 1300- 50- 26-AB
W5FYZ 1254- 57- 22-B
WA5UFH 1127- 44- 23-ABD

New Mexico

W5FF 2345- 55- 35-**ABD**
KA5EBL 1189- 41- 29-**AB**
KA5SUN 279- 31- 9-B
W5RKS 144- 14- 9-ABD
W5IXR 104- 12- 8-ABD
K5MAT 54- 7- 5-ABD
N7AIH 24- 6- 4-B

Northern Texas

KE5EP 26,768- 254- 74-**ABCDE**
WA5VJB 13,630- 186- 47-ABCDEFI
K5IS 5355- 78- 51-ABCDE
NW5E 5160- 129- 40-**B**
WB5AFY 4061- 56- 31-DEF
N5WS 3400- 100- 34-B
WB0CGH 1050- 50- 21-AB
K5EI 352- 34- 8-BD
KB7IJ/5 160- 20- 8-A
KD5RO (+opr.)
20,832- 234- 62-ABDEF

Oklahoma

WD5BKV 21,840- 189- 91-**ABD**
K5SW 4848- 72- 48-ABCDE
KA5PUB 1464- 61- 24-B
WB5DSH 782- 34- 23-A
KA5J 247- 19- 13-AB
K5CM (+N5s CG, KW, WD5AGO, W8RRY)
49,149- 308-129-ABCDE

Southern Texas

WB5RUS 4680- 111- 39-ABD
N5HHS 3465- 99- 35-**AB**

6

East Bay

WD6CHL 20,804- 267- 51-**ABCDE**
N6AMY 9555- 131- 49-ABCDE
KN6S 1365- 65- 21-AB

Los Angeles

WB6FCS 4830- 184- 23-**BD**
N3EG 4263- 127- 29-ABCD
W6PFE 3820- 118- 26-ABCD
K9AKS 1377- 81- 17-B
N0KV/6 (+K3FWD, K5KT, AJ6F, N6DBS, WA6HXM)
14,112- 205- 49-ABCDE

Orange

K6PVS 4438- 111- 34-**ABDE**
K6IBY 2220- 51- 30-ABCD
K6PFW 1995- 84- 19-ABD
WA6SNN 1274- 70- 14-BD
KB6XG 546- 28- 14-ABCD
N6ME (+K6LPF, KA6s BRU, QJS, KG6MZ, N6LXH, WA6s OQC, PMX, WD6GSH)
17,394- 307- 39-ABCDE
KA6ZVP (+N6s HKF, KHT, WD6DPG)
14,352- 232- 46-ABCD
K6BPC (WA6HXD, WB6YVP, oprs.)
8440- 157- 40-ABCD
KA6PYA (+KA6RIK, N6s LRY, MEJ)
1818- 101- 18-AB

Santa Barbara

K6HXW/6 11,024- 158- 53-**ABCD**
WD6BGN 2208- 76- 24-ABD
NS6X 1485- 99- 15-B
K6LMN 378- 22- 14-ABCDE
N6VR 19- 6- 3-A
W6TRW (WA2KDL, WA5DJJ, K6AWO, W6YLZ, WA6RAY, oprs.)
31,552- 350- 64-ABCD
WA6IJZ (+N6MA, WA6FPX)
12,595- 171- 55-ABCDEI

Santa Clara Valley

W6RXQ 17,808- 235- 56-**ABCDE**
WA6QAK 12,740- 161- 49-ABCDE
K6KLY 9595- 208- 35-ABCD
WA6QDP 1168- 73- 16-B
WA2YWP 1071- 52- 17-ABCD
K6BDK 645- 43- 15-AB
WD6EPV 576- 53- 8-BC
KK6C 273- 39- 7-B
WB6KBZ (+KE6D, WA6AZP)
29,760- 341- 62-ABCDE
KU6U (+KG6MW, W6YLL)
15,510- 200- 55-ABCDE

San Diego

WA6BNH 10,626- 198- 42-**ABCD**
N6CW 3048- 127- 24-**AB**
W6OYJ 1230- 74- 15-BC

San Joaquin Valley

WB6DTA 6028- 105- 44-**ABCDE**
NR6E/6 4584- 89- 36-ABCDE
WB4AYE 2500- 88- 25-ABC

Sacramento Valley

N6IGA 9819- 172- 39-**ABC**
KI6O 583- 53- 11-B
WF6J 540- 45- 12-B
WA6OSX 516- 43- 12-A
WB6VYH 152- 19- 8-A
W6YKM (KE6NS, KF6GY, WB6YIY, oprs.)
24,360- 302- 80-ABCDE

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Arizona

K2DNR 900- 51- 15-**ABEI**
WB7OHF 225- 22- 9-ABD
N7AMA (+WA7JTM)
2542- 82- 31-AB

Idaho

N7BI (N7EIJ opr.)
864- 50- 16-**ABD**
KD7IY 308- 20- 14-ABD
KA7KGF 126- 14- 9-B

Oregon

K7HSJ 2121- 74- 21-ABCDE
W7PUA 1872- 72- 18-BCDEI
W7TYR 1207- 51- 17-ABCDE
N7DB 1028- 50- 18-ABC
W7JXY 750- 39- 15-ABD
KE7P (+WA7s TDU, TDZ)
1188- 51- 22-ABCD

Utah

WA4GPM 133- 19- 7-B

Washington

W7ZSL 5220- 146- 30-ABCD
NF7X 4134- 143- 26-**ABD**
W7IDZ 78- 13- 6-B

Wyoming

WA7KYM 3060- 96- 25-ABCD

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Michigan

KM8U 6996- 159- 44-**B**
NE8I 5280- 83- 40-ABCDE
N8DEJ 4452- 106- 42-B
KB8JI 2077- 61- 31-ABCD
WB8CPW 1674- 62- 27-B
W8OOI 36- 6- 6-A
KA8AOB 6- 3- 2-A

Ohio

WA8TXT 42,721- 239-119-ABCDEF
KD8SI 39,050- 281-110-BCDE
K8DIO 17,301- 149- 79-BCD
KB8ZW 15,622- 214- 73-BCD
K8WW 11,880- 100- 54-DE
NI8O 7568- 88- 43-D
N8BJN 7250- 93- 50-BCD
K8TL 6615- 97- 49-BDE
WA8RCN 5194- 106- 49-AB
WB8PAT 4510- 74- 55-ABCD
W8HBG 4452- 106- 42-B
K8LMN 3300- 100- 33-B
WD8CTX 2244- 56- 35-ABD
N8CCC 1239- 47- 21-ABCD
K8YAH 280- 27- 21-ABCDE
W8VP (KA2IOQ, W5UA, K8s AL, YY, N8s COX, GUS, GUV, W8PR, WA8FHF, WB8s DQE, ERB, WD8EMS, WB9YCZ, ZL3KA, oprs.)
172,596- 595-228-ABCDE
WD8ISK (+KA8IFC, KC8RD, WA8OGS, WB8GEX, W9VNE)
58,515- 347-141-ABCD
K8CQA (+WB8s JAY, TEI)
8082- 109- 58-ABD

West Virginia

N8FCJ 82,198- 514-146-**ABD**
WB8DRR 5616- 117- 48-B
W8TN 924- 33- 22-ABD
N8DKL (KC8OQ, N8s BZS, FWL, oprs.)
27,840- 250- 96-ABD

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Illinois

WB9MSV 38,862- 287-102-**ABCD**
WD9IIX 12,600- 177- 60-ABD
AA9D 10,395- 159- 55-ABCD
KA9BGC 8508- 189- 45-B
K9MBX 7995- 157- 41-BD
NC9F 6975- 113- 45-ABCD
WB9OJR 5831- 119- 49-B
WB9QBU 5661- 120- 37-BD
W9UO 4929- 74- 53-ABCD
KB9QC 4795- 137- 35-B
W9JGV 4602- 118- 39-B
WD9FSA 3916- 124- 43-AB
AB9W 2480- 80- 31-AB
KA9QIK 1625- 55- 26-BD
WD9ARK 1540- 68- 22-BC
N9AO 989- 43- 23-B
KY9Y 943- 41- 23-B
KR9G 572- 22- 13-D
K9EOM 351- 27- 13-B
WD9FJF 316- 21- 15-B
WB9KYC 84- 12- 7-B
N9ERE 24- 8- 3-B
K9HMB (+WB4YVO, K9s RS, NO, GL, PW, KA9CJG, NA9D, WB9TIY, WD9IIC)
172,638- 670-207-ABCDE
KA9SRK (+N9FFM)
3332- 98- 28-BD

Indiana

KA8MRI/9 16,340- 182- 76-ABCD
AF9Y 15,631- 236- 66-B
K9DZS 4845- 86- 51-ABD
W9ERW 546- 26- 21-B
W8UT 374- 17- 11-D
K9MRI (+K9TVZ)
29,779- 277- 97-ABCD
W9YB (KA9COR, KC9RG, N9s FIK, NB, KS9J, oprs.)
2200- 84- 25-ABC

Wisconsin

W9UB 4480- 128- 35-B
WA1UJU/9 2632- 94- 28-B
KA9OBL 2552- 88- 29-B
W9YCV 2368- 74- 32-B
N9TD 1988- 80- 35-BD
W9CBE 966- 46- 21-B
K9GDF 21- 7- 3-B
N9DIJ 6- 3- 2-B
W8UC/9 (+KB9NM, K0s FVF, GJX)
28,531- 235-103-ABDE

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Colorado

KX0O 19,530- 217- 70-**ABCDEI**
KD0GS 6726- 34- 38-ABCDE
W0KJY 2523- 57- 29-ABCDE
KA0NNO 406- 29- 14-A
KE0ST 40- 6- 4-AC
W0KEA (+K0VNF, N0s BRI, DVL)
2280- 61- 30-ABCD
W0IA (W1XE, KA0s DXM, QPT, N0FZB, NN0Y, W0JF, oprs.)
1095- 54- 15-ABCD
N0GEL (+WB0ZCV)
205- 41- 5-B

Iowa

K0DAS 12,670- 131- 70-ABCDE
WB0ZKG 6943- 131- 53-**AB**
K0CQ 5040- 74- 48-ABDE
N0CIH 4440- 97- 37-BCD
N0EKT 4128- 75- 43-BD
W0IZ 2233- 77- 29-B
W0RAP 126- 7- 6-E

Kansas

W0RT 10,752- 133- 64-**BDE**
N0LL 8228- 121- 68-AB
K0VUA 4312- 74- 44-BD
WB0ISW 2940- 69- 30-ABCD
WA0VJF 2079- 49- 27-BD
KC0ZR 945- 45- 21-B
WB0ORL (+WA0TKJ)
31,590- 202-117-ABCDE

Minnesota

W0XG 10,048- 138- 64-**ABCD**
KC0P (+KA0CRO)
576- 32- 18-B

Missouri

K0TLM 15,300- 136- 85-**ABCDE**
WA0NOK 5618- 106- 62-ABCD
KM0A 5150- 103- 50-AB
W0JRP 3570- 71- 42-ABD
AK0M 330- 22- 15-B

Nebraska

KC0QR 11,316- 117- 69-**ABCDE**
W0EMS 1736- 56- 31-B

South Dakota

WB0HHM 464- 29- 16-B

VE

Maritime-Newfoundland

VE1UT 3720- 81- 30-**ABCD**
VE1AHM 104- 13- 8-B

Quebec

VE3ASC/2 39,376- 260-107-**ABCDEFI**
VE2FUT 798- 28- 19-ABCD
VE2YB 396- 22- 18-AB
VE2DUB/2 60- 5- 5-ABI
VE2FUT/2 (+VE2DUB)
13,225- 88- 52-ABCDEI
VE2CUA (VE2s EWH, HAK, oprs.)
2464- 77- 32-AB

Ontario

VE3BFM 26,784- 201- 93-**ABCDEI**
VE3HRJ 6943- 109- 53-ABD
VE3OSG 1972- 54- 29-ABD
VE3IXU 1104- 46- 24-B
VE3CIE 902- 41- 22-B
VE3LNX (+VE3s ADJ, NSQ)
79,310- 447-154-ABCDEF

Saskatchewan

VE5LY 40- 7- 5-**ABD**

Alberta

VE6AFO 190- 13- 10-**BD**

British Columbia

VE7ASI 588- 35- 13-**ABCD**

Checklogs

WB3DNA, WB4ZWK, WF4G, N8DJB, N0ALX

Late

WB2EBS, N4MW, W7UDM, N9EEE

1986 Novice Roundup Announcement

Now that you have your ticket, are you hesitant to get on the air at only 3.5 WPM? Are you spending hours tuning up and down the dial listening for a CQ that's slow enough to copy? Relax. All new hams, from old to young, are in the same boat of new-ham-awkwardness. Novice Roundup is your chance to dive into the airwaves and drown yourself in QSOs. If you're a really shy person, find a ham buddy and jump in together as a multiop station.

Although the Novice Roundup is aimed primarily at Novices and Techs, the more hams participating the merrier the game will be. All amateurs are encouraged to join the fun. The good news for Novices and Technicians is that you are eligible for the handsome certificate awarded to each single-operator station who submits a valid entry of 200 or more QSOs. If the rules seem complicated at first glance, try reading them two or three times. They need to be followed with precision if your entry is to qualify. Feel free to contact us here at ARRL HQ if you have any questions. When you're ready to put your contest entry form and logs in the mail, double check to make sure all the information is included and your handwriting is legible.

FUN-damentals of the Novice Roundup

The 1986 Novice Roundup lasts an entire week, including two weekends: 0001 UTC Saturday, January 25 (Friday local time), to 2359 UTC Sunday, February 2. To keep contesters from killing themselves, participants are limited to 30 hours at the most. Write to ARRL for your entry forms, and put a bookmark in your *QST* so the rules will be easily accessible when the forms arrive. Entry forms include three or more (specify quantity) log sheets with room for 100 contacts on each, a summary sheet (one needed) and a dupe sheet to keep track of the stations you've worked. Run your self-addressed, stamped envelope to the mailbox now, and you'll have the forms in time to start the Roundup. The address is ARRL, 225 Main St, Newington, CT 06111.

Your goal in the contest is to work as many stations as possible, in as many different ARRL Sections and DXCC countries as possible. ARRL Sections are listed on the Novice Roundup entry form and on page 8 of every *QST*. (If you're not sure which Section you're in, write to ARRL.)

Each station you work may be counted only once. Short QSOs work best, so don't discuss grandma's rhubarb pie with another contester or repeat anything unless asked. Here's a typical Novice Roundup QSO:

CQ NR CQ NR DE KA1KHR/N KA1KHR/N K
KA1KHR/N DE KA9PUB/T AR
KA9PUB/T DE KA1KHR/N 579 CT KN
KA1KHR DE KA9PUB R 569 IN KN
KA9PUB R 73 DE KA1KHR/N K

To streamline the QSO, the license class can be dropped after the contact has been established.

Happy Contesting!

Rules

1) **Object:** For Novice and Technician operators in the United States (and possessions and territories) to exchange QSO information with as many stations as possible on the 3.5, 7, 21 and 28-MHz Novice/Tech bands. Others work Novices and Technicians only.

2) **Contest Period:** The week that spans the end of January and the beginning of February, including both weekends. Begins 0001 UTC Saturday, January 25, 1986, and ends 2359 UTC Sunday, February 2. Operate no more than 30 hours. Off periods must be at least 15 minutes; listening time counts as operating time. Times on and off must be indicated in your log.

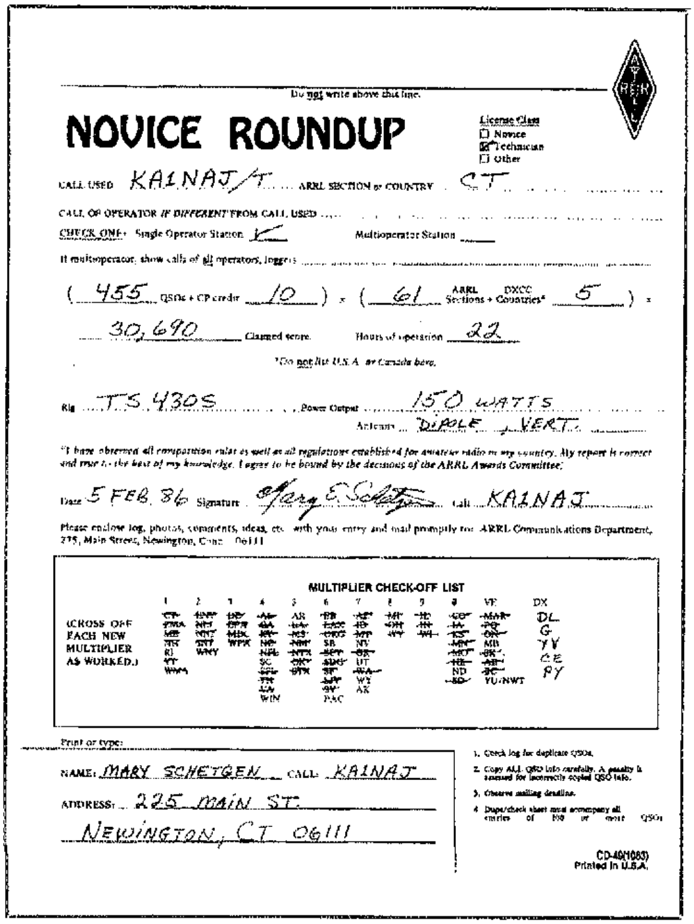
3) **Categories:**

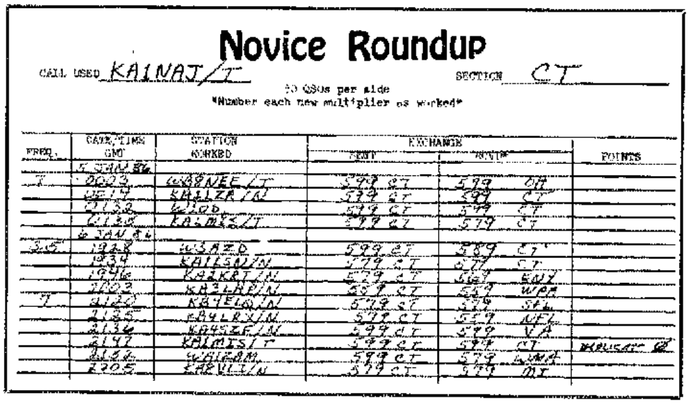
(A) Single Operator: One person performs all transmitting, receiving and logging functions.

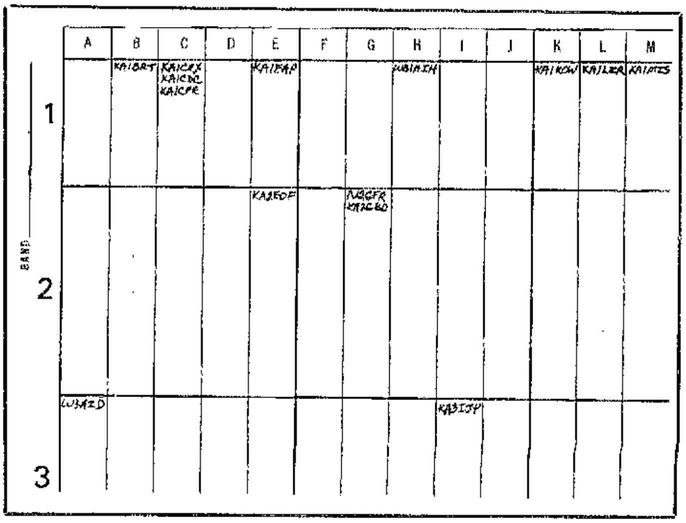
(B) Multioperator: Single transmitters only. Those obtaining any form of assistance, such as relief operators or logging.

4) **Exchange:** Signal report and ARRL Section or country for DX stations. Novices should send /N and Technicians /T after their call sign so others will know their license class.

5) **Scoring:**







(A) QSO Points: Count one point for each complete two-way QSO. Work each station once, regardless of the frequency band.

(B) Multiplier: Each ARRL Section (listed on page 8), plus VE8/VY1, plus each foreign country.

(C) Code Proficiency: Additional points can be earned if you have qualified for an ARRL (not FCC) Code Proficiency certificate. CP credit equals the speed in words per minute indicated on the latest certificate or sticker held by the entrant. For more details on the Code Proficiency program, see Contest Corral, this issue.

(D) Final Score: Add your Code Proficiency credit to your total number of QSO points. Multiply that by your ARRL Section/country total for your final score. For example, if you work 100 stations in 31 Sections + 3 foreign countries and have an ARRL Code Proficiency credit of 10 WPM from W1AW or W6OWP, then your score is 100-plus-10 × total multipliers (31 + 3) or 34, for a total of 3740 points.

6) **Miscellaneous:** Crossband contacts are not permitted. Novices and Technicians work any amateur stations; others work Novices and Technicians only.

7) **Reporting:** Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL HQ for an SASE. Official forms are recommended. Any entry making more than 200 QSOs must submit duplicate checking sheets (alphabetical listing of stations worked). Incomplete or late entries will be classified as check logs. Logs should include dates, QSO times, on and off times, complete exchange sent and received, and band. Postmark your entry within 30 days after the contest (March 4, 1986).

8) **Awards:** Certificates to the top Novice and Technician in each ARRL Section and each single-operator Novice or Technician who submits a valid entry with 200 or more QSOs. Multioperator or General class licensees and above are not eligible for awards.

9) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his/her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: See below.

Club Competition Rules and Contest Disqualification Criteria

The 1986 contest season is upon us. Three of the ARRL-sponsored contests during 1986 include an ARRL-affiliated club competition—January VHF Sweepstakes, February/March International DX Contest and November Sweepstakes. There are a few ground rules to follow to ensure that your club's scores are properly credited (and to ease the log checker's burden). These are detailed below.

From time to time it becomes necessary to consider disqualifying an entry to an ARRL contest. The particulars are listed below. Most of the time the reason is simply that the person submitting the entry was not accurate in copying call signs or contest exchanges. As long as you are careful only to log QSOs when you are sure of the information, you should have nothing to worry about. [The use of standard ARRL contest forms will help to ensure that your score is figured properly and speed up the publication of contest results in *QST*.]

Don't hesitate to call or write if you have a question about the rules listed here or the rules for any particular contest. The time to ask is before the contest, not afterward.

Club Competition

Only ARRL-affiliated clubs may participate in the club competition. A member must be listed in the regular score listings to be counted for a club.

For a club to be listed, two conditions must be met:

1) At least three different entries from members of the club must be submitted.

2) All members wishing to be included in the club scores must indicate the club name on their summary sheet, *and* the club secretary must send a list of all club members eligible to compete for the club and which level (unlimited, medium, local) they wish to enter for *each* competition. Remember to meet the mailing deadline!

There are three levels of club competition:

1) *Unlimited.* Any club submitting 51 or more *entries* is in this class. (One station can submit two entries—one on phone and one on CW in the November Sweepstakes and the DX Contest.) All stations and all operators must reside within 175 miles of the club's center. All members more than 50 miles from the club's center must attend at least 50 percent of the club's meetings to be eligible to submit an entry. If, however, they have not been a member for a year's time, they must have attended at least 50 percent of the meetings since becoming a member. There is no attendance requirement for those members within 50 miles. However, to be considered bona fide, a member must be active in club affairs. Members living outside of 175 miles and/or members operating stations outside of 175 miles may not compete in the club competition. The club must be ARRL-affiliated.

2) *Medium.* Any club submitting fewer than 50 entries falls in this class, except as noted in local club criteria, below. The same mileage and attendance requirements apply as the unlimited class club. The club must be ARRL-affiliated.

3) *Local.* Any club submitting 10 entries or less is in this classification. All members must reside within 20 miles of the club's center. There is no attendance requirement. Again, the club must be an ARRL affiliate.

Single- and multioperator station scores may be counted. At a guest-operated single-operator station, both the guest operator and the station licensee must be members of the same club in order to count the score for that club. At multioperator stations, at least 66 percent of the operators must be members of the same club for the score to count for that club.

In conjunction with the 50-percent attendance rule, the club must hold *at least* four in-person meetings per year. A club's entry classification may be changed if, in the opinion of the ARRL Awards Committee, the club has manipulated its number of entries to fall into a lower classification (e.g., if a club with 100 members submits only the 50 highest scores, even if more than 50 of its members wish to compete.)

It is not within the intent of these rules that a club should vote out a member or that a member resign and then be voted back into the club later so the 50-percent attendance rule can be met.

The highest affiliated-club entry will be awarded a gavel in each category (unlimited, medium, local).

The highest single-operator CW score and the highest single-operator phone score in any club entry will be awarded with a club certificate when at least three single-operator CW and/or three single-operator phone scores are submitted.

Disqualification

If the claimed score of a participant is reduced by two percent or more, the entry may be disqualified. Score reduction does not include correction of arithmetic errors.

Score reductions may be made for taking credit for unconfirmed QSOs and/or multipliers, duplicate contacts, and/or other scoring discrepancies.

An entry with more than two-percent duplicate contacts left in the log or an entry in which more than two-percent "rubber clocking" (altering the actual time to increase the operating time so that it is greater than the allowable limit) is detected *will be automatically disqualified.*

If a participant is disqualified, he or she will be barred from submitting an entry in the next annual running of that specific contest, e.g., disqualification from the 1985 phone SS prohibits submission of an entry for the 1986 phone SS, but 1986 CW SS participation is okay.

The calls of all disqualified participants will be listed in the *QST* contest report.

Any participant on the borderline of disqualification, but not actually disqualified, may receive a warning letter.

For each duplicate contact or miscopied call sign that is removed from the log by HQ, three additional contacts will be deleted as a penalty. The penalty will not be considered part of the two-percent disqualification criteria.

In all cases of question, the decisions of the ARRL Awards Committee are final.

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

JANUARY

Dec 31-Jan 1

ARRL Straight Key Night, Dec *QST*, page 92.

1

West Coast Qualifying Run, 10-35 WPM, at 0500Z Jan 2 (9 PM PST Jan 1). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send it to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

5

ARRL Midnight Special, from 0400Z to 0600Z Jan 5 (11 PM EST Jan 4 until 1 AM EST Jan 5; 10 PM CST Jan 4 until midnight CST Jan 4; 9 PM MST Jan 4 until 11 PM MST Jan 4; 8 PM PST Jan 4 until 10 PM PST Jan 4). First hour, 80 CW; second hour, 75 phone. Work stations once on each mode. Suggested frequencies: 3.540-3.570 and 3.855-3.895. Exchange a 3-digit consecutive serial number (beginning with 001) and name. Example: W1OD might send 019 Mike. No multipliers. Final score equals the total number of QSOs worked. Mail entries by Feb 3 to ARRL HQ. Top scores will be listed in *QST*.

9

W1AW Qualifying Run, 35-10 WPM, at 0300Z Jan 10 (10 PM EST Jan 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Jan 1 listing for more details.

11

40 Meter World SSB Championship Contest, Dec *QST*, page 96.

11-12

ARRL January VHF Sweepstakes, Dec *QST*, page 94.

Michigan QRP Club CW Contest, Dec *QST*, page 96.

Hunting Lions in the Air Contest, Dec *QST*, page 96.

12

75 Meter World SSB Championship Contest, Dec *QST*, page 96.

18-19

160 Meter World SSB Championship Contest, Dec *QST*, page 96.

AGCW-DL QRP Winter Contest, Dec *QST*, page 96.

North Dakota QSO Party, sponsored by the Red River Amateurs, from 0000Z-0800Z and 1600Z-2400Z Jan 18 and 0800Z-1600Z Jan 19. Work stations once per band and mode. Exchange signal report and QTH (county for ND stations; state, province or country for others). Suggested frequencies: phone—1.835 3.905 7.280 14.295 21.380 28.500; CW—1.810 3.540 and 35 kHz up from band edges; Novice—25 kHz up from band edges. Count 10 points per phone contact, 20 points per CW contact and 50 points per RTTY contact. ND stations add 250 bonus points for working 5 Novices. Multiply by number of states/provinces/countries worked per band and mode. Others multiply by total ND counties worked (max. 53). Mail logs by Feb 28 (include a large SASE for results) to Mike Beaton, KDØA, 2267 Flickertail Dr, Fargo, ND 58103.

Rats Nest & Crooked Stick Contest Sprint, sponsored by the the Issaquah ARC, from 2300Z Jan 18 until 0400Z Jan 19. Phone and CW. Work stations once per mode, exchange name, QTH, type of antenna, IARC member (yes or no). Max. 250-W dc input. Antenna—homebrew wire antenna, in any configuration as long as it includes a crooked-stick support. QSO points: CW—5 pts; phone—2 pts. Multiply by 2 for each state, province or country. Bonus: to encourage "Elmering" contacts made with apprentice's assist +2 pts; contacts made by apprentice +5 pts. Frequencies: CW—7.050 to 7.150; phone—7.225 to 7.300. Send log by Feb 1 to Steve Pack, WB7VAS, 4609 158th Ave SE, Bellevue, WA 98006.

21

W1AW Qualifying Run, 10-35 WPM, at 2400Z (7 PM EST). See Jan 1 and 9 listings for more details.

24-26

CQ WW 160-Meter Contest, CW, sponsored by *CQ* Magazine from 2200Z Jan 24 until 1600Z Jan 26. CW only (phone, Feb 21-23). W/VE stations count 2 points per W/VE QSO, 10 points per DX QSO. DX stations count 2 points per QSO with own country, 5 points with another country and 10 points for W/VE. Multiply by sum of states, provinces and DXCC countries (incl. KH6/KL7). Exchange signal report and QTH; W/VE stations also send state/province. Avoid the 1825-1830 and 1850-1860 DX windows. Mail entry by Feb 28 (phone, March 31) to Don McClenon, N4IN, 3075 Florida Ave, Melbourne, FL 32901.

25

15 Meter World SSB Championship Contest, Dec *QST*, page 96.

25-26

REF French Contest, CW, sponsored by Reseau des Emetteurs Francais, from 0600Z Jan 25 until 1800Z Jan 26 (phone, 0600Z Feb 22 until 1800Z Feb 23). 3.5, 7, 14, 21, 28 MHz. Single and multioperator; multioperators must remain on a band for a minimum of 15 minutes. Work French stations, including overseas territories and DA1/2 French military stations. Exchange signal report and serial number. Count 1 point for QSOs with own continent, 3 points for other continents. Multiply by total of French departments per band (Corsica has 2 departments, 2A and 2B) FFA (DA1 or DA2)—DOM/TOM. F6REF/OO one special point. Mail entries by March 15 (phone by April 15) to REF French Contest, 53 Rue Marceau, 91120 Palaiseau, France.

25-26

Michigan YL QSO Party, sponsored by the TASYL from 1800Z Jan 25 until 1800Z Jan 26. Phone and CW. No crossband, net or repeater QSOs. Work stations once. Exchange call, signal report, QTH and TASYL number if working a member. QSO points: ×2 for CW, ×2 for working TASYL member. Multiply by number of different ARRL Sections and DXCC countries worked. Send logs to be received by Feb 28 to Verline Ferris, KI8V, 308 E. Harry, Hazel Park, MI 48030.

26

20 Meter World SSB Championship Contest, Dec *QST*, page 96.

26-27

Classic Radio Exchange, sponsored by the Southeast ARC from 2100Z Jan 26 until 0400Z Jan 27. Object is to restore, operate and enjoy old equipment built since 1945 but at least 10 years old. Exchange name, signal report, state/province/country, receiver and transmitter type. The same station may be worked with different equipment combinations on each band/mode. Suggested frequencies: phone—3.910 7.280 14.280 21.380 28.580; CW—60 kHz up from lower band edges; Novice—20 kHz up from lower band edges. Add the number of all the different transmitters and receivers worked plus the different states/provinces/countries worked per band. Multiply that number by total number of QSOs. Multiply that total by total years old of all your transmitters and receivers used (minimum three QSOs per unit). For transceivers, multiply years old by 2. Mail logs (include SASE for results) to Stu Stephens, K8SJ, 1407 Hollyrood Rd, Sandusky, OH 44870.

25-Feb. 2

ARRL Novice Roundup, this issue, page 93.

FEBRUARY

1

AGCW-DL Handasten Party (Straight Key Party), sponsored by the AGCW-DL, from 1300Z until 1600Z Feb 1. Frequencies: 3530-3580 kHz. Only straight keys (no bugs). Exchange RST, QSO no, class, name and age (XYLs use XX). Example: 579001/A/John/23. Classes: A = 3-W output, B = 10-W output, C = 150-W output, D = SWL. Scoring: class A with class A = 9 points, with B = 7 points, with C = 5 points; class B with A = 5, with B = 4 points, with C = 3 points; C with C = 2 points. Certificates. Send logs by Feb 28 to Friedich Fabri, DF1OY, Von dem Steintor 3, D-3017 Pattensen 1, Fed Rep of Germany.

1-2

RSGB 7 MHz Contest, phone, sponsored by the Radio Society of Great Britain, from 1200Z Feb 1 until 0900Z Feb 2. Phone only (CW, Feb 22-23). Single operator only. Exchange signal report and serial number starting with 001. Suggested frequencies: phone—7.040-7.100; CW—7.000-7.030. Non-European stations count 15 points per QSO with G, GD, GI, GJ, GM, GU, GW stations (not GB). Multiply by number of G prefixes worked. Mail by March 31 (April 20 for CW) to RSGB HF Contest Committee, PO Box 73, Lichfield, West Midlands WS13 6UJ, England.

New Hampshire QSO Party, sponsored by the NH ARA, from 1900Z Feb 1 until 0700Z Feb 2 and 1400Z Feb 2 until 0200Z Feb 3. Work stations once per band and mode. Exchange signal report and QTH (county for NH stations; state, province or country for others). Suggested frequencies: phone—1.875 3.975 7.235 14.280 21.380 28.575 50.115 144.205; CW—1.810 and 55 kHz above band edges; Novice—30 kHz above band edges; RTTY—3.625 and 85 kHz up from lower band edges. NH stations count 1 point per QSO and multiply by total NH counties/states/countries worked. Others count 5 points per QSO and multiply by total NH counties worked. Count 20 bonus points each for working WB1CAG, W1OC, WB1FFZ, K1RD and W1WQM. Logs must be postmarked by March 15 (include SASE for results). Send logs to Great Bay RA, PO Box 911, Dover, NH 03820.

2

North American Sprint, CW, sponsored by the National Contest Journal, from 0000Z to 0400Z Feb 2 (phone contest 0000Z-0400Z Feb 9). Contests are separate; 80, 40, 20 meters only. Suggested frequencies: CW—3.530-3.550 7.030-7.050 14.030-14.050; phone —3.870-3.910 7.210-7.240 14.260-14.290. For a valid QSO, you must send and receive all of the following information: other station's call, your call, serial number (consecutive starting with 001), your name and state (or province/country). An operator may use only one call sign during the contest. Multiply valid QSOs by sum of states, provinces and North American countries (not W/VE). KH6 is not counted as a state or as an NA country. VE mults. are Maritimes (VE1, VO1, VO2) and VE2 through VE8 (8 max.) Non-NA countries do not count as multipliers. Special QSY rule: Stations soliciting a call by sending CQ, QRZ, etc., are permitted to work only one station in response to that solicitation. They must thereafter move at least 1 kHz before working any other station, or at least 5 kHz before again soliciting calls. Team competition: Each team has a maximum of 10 members as a single-entry unit. Clubs having more than 10 members may submit more than one team entry. To qualify, the name and call sign of each operator (and station operated if a guest op) must be registered with W6OAT. The team information may be contained either in a letter received by W6OAT before the start of the Sprint or in a Western Union mailgram dated at least 24 hours before the start of the Sprint. There are no distance or meeting requirements for a team entry. CW and phone teams are separate. Entries must be received no later than 30 days after the Sprint. Mail CW entries to Rusty Epps, W6OAT, 948-H Kiely Blvd., Santa Clara, CA 95051. Phone entries go to Rick Niswander, K7GM, 4520 N Central Ave, Suite 500, Phoenix, AZ 85012.

4

West Coast Qualifying Run, 10-35 WPM, at 0500Z Feb 5 (9 PM PST Feb 4). See Jan 1 listing for more details.

8

W1AW Qualifying Run, 10-40 WPM, 0300Z Feb 8 (10 PM EST Feb 9). See Jan 9 listing for more details.

8-9

YL-OM Contest, phone, sponsored by YLRL, from 1800Z February 9 until 1800Z February 9 (CW portion will be 1800Z February 22 until 1800Z February 23). Phone and CW are separate contests. YLs work OMs, OMs work YLs only. Use all bands; no cross band operation. No net contacts or repeater contacts. Work stations once only. Exchange QSO number, signal report and ARRL Section or country. Count one point

for each station worked and multiply by the total number of ARRL Sections and countries worked. Suggested frequencies: phone—3.940-3.970 7.240-7.270 14.250-14.280 21.350-21.380 28.580-28.610; (CW—3.540-3.570 7.040-7.070 14.040-14.070 21.080-21.110 28.080-28.110). Awards. Logs must be postmarked by March 15. Mail them to Mary Lou Brown, NM7N, 504 Channel View Dr, Anacortes, WA 98221.

PACC Contest, sponsored by VERON, from 1200Z Feb. 8 to 1200Z Feb. 9. CW and phone, 160-10 meters. Work PA PB PI stations. Single and multioperator categories. Exchange signal report and serial number. Dutch stations will send report and province (GR FR DR OV GD UT YP NH ZH ZL NB LB). Work stations once per band, regardless of mode. Count one point per QSO and multiply by number of provinces worked per band for final score. Mail logs by Mar 31 to PACC Contest, F. Th. Oosthoek, PAØINA, PO Box 499, 4600 AL Bergen op Zoom, The Netherlands.

YL-ISSB QSO Party, phone, coordinated by Bill Early, WA9AEA, from 0001Z Feb 8 until 2359Z Feb 9. (CW is from 0001Z Mar 15 to 2359Z Mar 16.) Frequencies are the General portion of all bands. Single operator, DX-W/K partners, YL-OM teams. Exchange signal report, state/province/country, name, ISSB number (if member) and DX-W/K partner. Score 3 pts per member QSO within same continent, 6 pts per member QSO in different continent, 1 pt per nonmember QSO. Member stations only count as multipliers. Multiply by 1 for each DX-W/K partners; YL-OM team; US, VK, ZL, VE state or province; DXCC country. Multiply by 2 per each contact between DX-W/K partners; dc input under 250 W throughout contest. Mail logs before April 30 to Bill Early, WA9AEA, Box 401, McHenry, IL 60050-0401.

9

North American Sprint, phone, see Feb 2 listing.

15-16

ARRL International DX Contest, CW, Dec *QST*, page 93.

19

W1AW Qualifying Run, 10-35 WPM.

21-23

CQ WW 160 Meter DX Contest, phone.

22

RTTY World Championship Contest

22-23

Alabama QSO Party, sponsored by the Birmingham ARC from 1600Z Feb 22 until 2300Z Feb 23. Work stations once per band and mode. Work mobiles and portables again as they change counties. Exchange signal report and QTH (county for AL stations, state/province/country for others). Suggested frequencies: CW—1.810 3.550 7.050 14.050 21.050 28.050; phone—3.900 7.260 14.300 21.360 28.600 50.110 144.20 146.52; Novice—10 kHz from low end. Count 2 pts for phone QSO and 3 pts for CW QSO. AL stations multiply by total states/provincies/countries. All others multiply by total AL counties (max. 67). Multiply score by 1.5 for 200 W or less and multiply by 1.5 for noncommercial power (mobiles excluded). Mobiles add 500 bonus points for each county from which 10 or more QSOs were made. Trophies for top out-of-state score, AL portable and AL mobile. Certificates. Mail entries by March 15 to Bill Levey, WA4FAT, 3629 Dabney Dr., Birmingham, AL 35243.

YL-OM Contest, CW

REF French Contest, phone

RSGB 7 MHz Contest, CW

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Junction City, Kansas: In celebration of the 125th anniversary of Kansas, KDØZK will operate in the General and Novice bands for the entire month of **January**. For a certificate send QSL and a large SASE to Barry Horowitz, KDØZK, 715 West 5th St, Junction City, KS 66441.

Malibu California: The Courage HANDI-HAM System QSO Party will be held **Jan 12-16**, 2200Z-0400Z each day. HANDI-HAMS will operate radio camp station WØEQO/6 from Malibu, CA. Operation will be 3.925 7.260 14.307. All HANDI-HAMS are invited to participate by calling CQ HANDI-HAMS.

Apache Junction, Arizona: The Superstition ARC will operate WB7TJD during **Jan 17-18**, 1500Z-2300Z each day, to commemorate Lost Dutchman Days. Operation will be 10 kHz from lower edge of 40-10 meter General and Novice bands. Certificate via WB7TJD, PO Box 1551, Apache Junction, AZ 85220.

Novice, Texas: The North Texas HF Assn. will operate N5NT in the Novice bands, working Novices from Novice. Operation will be 1800Z **Jan 18** until 1800Z **Jan 19**. QSL for cetificate to N5NT, 1331 Northlake Dr, Richardson, TX 75080.

Bellrose, New York: The Hall of Science ARC will operate WB2JSM from 1500Z-2100Z **Jan 19** in celebration of their 13th anniversary. Operation will be in the Novice bands and lower 25 kHz of the General phone bands. QSL with large SASE to Arnie Schiffman, WB2YXB, 81-22 250th St, Bellrose, NY 11426.

Concord, New Hampshire: Chris Merchant, KA1LMR, will operate **Jan 22** (or the first day of lift-off of the Space Shuttle) and the next two days, from 1300Z until 2000Z each day, from the Vocational Centers electronics class at the Concord High School to commemorate the first teacher in space. Frequencies will be 3.945 7.280 14.250 21.350 as band activity permits. For a certificate, send QSL and a large SASE to Dave Perrin/Chris Merchant, KA1LMR, c/o Electronics, Concord Vocational Center, Concord High School, Warren St, Concord, NH 03301.

Concord, New Hampshire: The Concord Brasspounders ARC will operate W1OC to commemorate Christa McCauliffe's first-teacher-in space flight. Operation will be from 1300Z Sat to 1300Z Sun during the first weekend following the launch of the Space Shuttle with Christa aboard. Anticipated launch date is **Jan 22**. Suggested frequencies: CW—7.050 7.105 14.050 21.050; phone—7.285 14.285 21.385. For certificate send SASE to W1OC, PO Box 2214, Concord, NH 03301.

Marshall Islands: The Kwajalein ARC will operate KX6BU from 0600Z **Feb 1** until 0600Z **Feb 10** to commemorate the 42nd anniversary of the Battle of Kwajalein and Roi-Namur. Frequencies: SSB—14.250 21.350 28.550; CW—7.025 14.050 28.050. QSL and certificate via KX6BU, Box 444, APO San Francisco 96555-008.

Note: The deadline for receipt of items for this column is the 15th of the second month preceding the publication date. For example, your information would have to reach HQ by Jan 15 to make the March 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.

(continued from page 78)

is known, then the level of distortion products can be found easily from the formula

$$S = (n-1)(IP-P)$$

where

S is the suppression of the distortion product below the fundamental output
n is the order of the distortion product
IP is the intercept point
P is the fundamental power output

Thus, an amplifier with a second-order intercept point of +50 dBm operating at an output power of +10 dBm would produce a second-order harmonic suppression of

$$S = (2-1)(50-10) = (1)(40) = 40 \text{ dB}$$

Therefore, the second-order harmonic output would be (10 − 40) dB = −30 dBm.

It thus becomes evident why cascading amplifiers results in increasing distortion products. The first amplifier in a chain will produce at its output not only the fundamental, but also lower-level second- (and third-) order distortion products. If this output is fed into a second amplifier, not only will the fundamental and distortion products be amplified and appear at its output, but it will itself produce distortion products that will add to those already present. Thus, overall distortion increases as amplifiers are cascaded.

ANTENNA-GAIN MEASUREMENTS

Al Ward, WB5LUA, has passed along the following results of the microwave antenna-gain measurements made at the Central States VHF Society Conference held in Tulsa, Oklahoma on July 27, 1985. The results are based on rules established by the Central States VHF Society, not according to EIA standards, and the performances of the antennas are given for reader comparison.

1296-MHz Gain Measurements

Call	*Antenna*	*Gain (dBi)*
WA5DBY	7-ft Dish w/3-lb Can Feed	25.3
W5IU	4-ft Dish	19.5
WA5TKU	49-el DL6WU Yagi	19.0
K5IS	45-el Loop Yagi	19.0
WA5UNY	45-el Loop Yagi	18.5
WA5DBY	38-in Dish w/3-lb Can Feed	18.4
WA5TKU	43-el DL6WU Yagi	18.0
KF4JU	21-el Yagi	17.5
WA5TKU	24-el DL6WU Yagi	15.3
WBØTEM	Reference Yagi	14.5
KCØY	25-el Loop Yagi	14.0
K5DHU	12-turn Helix	13.9
KØJJQ	10-el Quagi	11.7
WB5LUA	2-3 lb Coffee Can Reference	7.5
WA5DBY	2-3 lb Coffee Can	7.5
WA5DBY	1-3 lb Coffee Can	7.5
WA5DBY	1-3 lb Coffee Can with extra Monopole for 2304 MHz	7.5
W5IU	2-Can Feed	6.9
WBØDRL	3-lb Coffee Can	6.9
KF5N	Alford Slot	2.5
WA5VJB	Halo	1.5

2304-MHz Gain Measurements

Call	*Antenna*	*Gain (dBi)*
WA5DBY	7-ft Dish w/1-lb Can Feed	29.0
WA5DBY	7-ft Dish w/3-lb Can with Dual 1296/2304 Feed	24.0
WA5DBY	38-inch Dish	24.0
WB5LUA	41-el Loop Yagi	20.0
WA5VJB	27-el Loop Yagi	17.0
WB5AFY	3-lb Coffee Can	9.6
WA5VJB	Rhombic (Unknown Origin)	9.0
WB5LUA	2-lb Coffee Can Reference	9.0
WA5DBY	3-lb Coffee Can	9.0
WB5AFY	2-lb Coffee Can	8.2
WA5VJB	Mobile Loop Antenna	1.5

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. STM/NM/DEC: VE6ABC. Election for SM deadlines December 6th. Current candidates Roy Ellis, VE6XC, and Bill Gillespie, VE6ABC. To assist in work load of VE6ABC, Gus, VE6CPE has taken over as net manager for Alberta Traffic Net (ATN) effective Nov. 1. Still looking for NM for AP8N and for STM. Traffic: VE6CHK 101, VE6CPE 31, VE6ABC 23, VE6CPP 6, VE6AVZ 1.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Corp net, after forty odd years, has been forced to change frequency from 3758 kHz to 3729 kHz. Thanks to PEP relinquish their emergency net to us, thanks. Now we are out of the heavy phone QRM, and we now report months check-ins 5368 High 218 Low 121. BCEN months check-in QNI 805 - QTC 400. Nice to have NCS to look after BCEN, if we can now obtain relief ops to represent BCEN on RN-7 would be wonderful. Steve, VE7AIO and Margaret VE7EYM congrats from us all on your fiftieth wedding anniversary. Traffic: VE7BNI 402, VE7DIR 150, VE7CDF 138, VE7EJW 84, VE7CCJ 44, VE7XA 38, VE7EGM 17, VE7BZI 16, VE7EJN 11, VE7FB 10, VE7EMO 4, VE7DG 2.

MANITOBA: SM, Jack Adams, VE4AJE—ASM: VE4IX. SEC: Vacant. STM: VE4OO. TC: VE4ALO. ATC: VE4ADP. OO: VE4FK. NMs: VE4ANR, VE4AFO, VE4IX, VE4TE, VE4VJ. Thanks to Max, VE4IX, for taking on the official appointment as my Assistant Section Manager, also a big thank you to Dave, VE4XN, Kevin, VE4MR, Dan, VE4CA, and Cecil, VE4AEE, for putting up antennas, etc. and getting Charlie VE4LB our white cane friend back on the air. May it be noted that Max VE4IX is also Net Manager for the MTN (cw) which meets daily on 3660 kHz at 0030Z. Walt VE4OO our other active white caner has taken on the official appointment as Section Traffic Manager, without your help fellas this section would be difficult to function: Section Net Reports MTN QNI 183 QTC 69 in 20 sessions MMWN QNI 737 QTC 34 in 31 sessions - WR1N QNI (Sept.) 353 Oct 353 in 18 sessions, CRRL evening phone net, QNI 21 in 31 sessions QTC Formal traffic by individual stns. Traffic: VE4AJE 134, VE4TE 33, VE4FK 31, VE4ANP 30, VE4AAD 23, VE4AFO 23, VE4BJ 18, VE4JX 18, VE4PG 18, VE4HL 9, VE4MG 8, VE4ADS 7, VE4XN 6, VE4AAU 4, VE4NE 4, VE4LB 2, VE4PA 2, VE4AEE 1.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. Niagara Peninsula ARC members VE3DSW VE3MFQ VE3MWS VE3OIG provided effective communications for the Boys and Girls club of Niagara at a bingo night fundraiser—that must have been a first for amateur radio. New appointees in the Section are VE3FOB, DEC for Metro Toronto and VE3FII, EC for Oakville. After many years of doing an excellent job as repeater chairman for the Ottawa ARC, VE3BNO has decided to step down. New chairman is VE3HYS. The new executive of the Windsor ARC, headed by prez VE3IHB are VE3IGI VE3EXT VE3FIO VE3LFV VE3BFO VE3NGC while the new slate for the Ottawa ARC led by VE3EBI is VE3OWY VE3JSP VE3MJV VE3GFI VE3MVV and VE3OWL. And congratulations to VE3OWL who has won the Joe Norton Award. Her entry was chosen by a panel of judges. VE3FAS has been named net manager of ECN replacing VE1WF who has decided to step down—and on the NTS, we are still looking for some packet enthusiasts who might like to start a Section packet traffic net. This mode is becoming more and more popular. London and Almonte amateur groups participated in successful "goblin" patrols. VE3GYQ is sporting a new FT-2700H. Rideau ARC, first place in class 2A for Field Day, enlisted the help of G4BXL while he was visiting with Club members VE3AJN and VE3GNW. For those Section RSGB members, G3VPK is the new president for 1986. This month marks a new era as we switch from ARRL to CRRL in Canada. At this time you might wish to review the important changes outlined in the November 1985 issue of QST that will take place this month. And, from all your Field Organization officials, Happy New Year. Traffic: VE3FAS 248, VE3KK 226, VE3GSQ 142, VE3DCX 140, VE3GT 134, VE3GNW 129, VE3DPO 96, VE3BCZ 85, VE3AJN 64, VE3BDM 61, VE3FGU 58, VE3GOL 44, VE3KCZ 42, VE3CYR 29, VE3BAJ 27, VE3WM 27, VE3EWD 20, VE3WV 14, VE3DZH 8, VE3JSM 6, VE3WG 4.

QUEBEC: Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED, A/TC: VE2CP. NM: VE2EDO. ORS are needed for the OQN, if interested, contact your SM or STM. Congrats to Sorel-Tracy ARC, VE2CBS for their Field Day high score. With regret, I have to report VE2HBM, VE2FJR and VE2UB as Silent Keys. VE2XZ aura 80 ans le 6 janvier, Longue vie Simeon. Traffic: VE2EDO 132, VE2BP 51, VE2EC 46, VE2EKC 34.

SASKATCHEWAN: SM, W. C. Munday, VE5WM—SEC: VE5CU. STM: VE5HG. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. NM: VE5EX, VE5HG, VE5AEJ, VE5AEM, VE5BAF. Net Reports: MJARC 2 meter - 29 sessions, 267 QNI; RARA 2 Meter - 29 sessions, 537 QNI; PWXN - 30 sessions, 728 QNI; SATN - 30 sessions, 735 QNI. 12 QTC. Amateur Radio Emergency Service played a large part in the municipal elections of October 23rd in Saskatoon and Moose Jaw. In both cities 2 meter nets were established to communicate the results from the polling stations to the command centres at the respective city halls. All members of ARES can be proud of belonging to and being part of, a large and efficient organization. Traffic: VE5BAF 12.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: W3DKX. SGL: AF3R. PIO: KC3TI. PSHR: K3JL, W3DKX. New DARC officers for 86. Pres. AE3H. V.P. KX3E. Treas. WB3GXD. SEC. K3HBP. Meetings 2nd Mon. New SARA officers for 86. Pres. W3CDY. V.P. KA3IXV. SEC/Treas. KA3DIQ. Meetings 3rd Wed. Oct. was a busy month. Lewes Crop Walk communications by SARA Oct. 5. Milford Halloween Parade on Oct. 29 by Nanticoke ARC and SARA plus amateurs around Milford. Instead of SET Delaware was active in the testing of Hope Creek Nuclear Plant Oct. 29. DTN: QNI 389. QTC 67 in 23 sessions. DEPN: QNI 67. QTC 9 in 5 sessions. SEN: QNI 52. QTC 3 in 5 sessions. Traffic: W3QQ 111, W3DKX 49, WA3WIY 28, K3JL 18, WB3DUG 19, N3AXH 12, KC3FM 11, KA3IXV 10, KC3JM 9, K3ZXP 7.

MARYLAND-D.C.: SM, John A. Barolet, KJ3E—ASM: N3EGF. OOC: KC3EK. AOC: KA3DRO. PIO: KA3DBN. SGL: KA3ERP. TC: W3VVN. SEC, STM, BM: Vacant. Participate in Straight Key Night this year and relive the fun you had starting out in ham radio. SKN is not a contest; it's a funtest! Operate at 5-20 WPM, whatever is comfortable. Remember, when your high tech gear quits you can fall back on the trusty old straight key. Check QST for details. There has been nothing but raves for ham radio operation in the National Disaster Medical System '85 operation on September 14. National, state and local government officials were impressed. As the appointed "project manager" of the MDC effort in NDMS '85, KN3U has been awarded an ARRL CERTIFICATE OF MERIT for planning, managing and reporting that exercise. K3OMN sends a full page story on the Mountain Amateur Radio Club which appeared in the Cumberland Sunday Times; the story was written by WB3DQY. Good publicity! It's obvious that we must provide our own publicity, we must write the stories and take supporting photographs. The ARRL Public Information Assistant appointment is a good starting point for this work. Info from the SM. I've received many newspaper clippings describing amateur radio activity in the MDC section during the Mexican earthquake and hurricane Gloria emergencies. Congratulations to all who were helpful at those times. Maryland Slow Net members sent 245 radiograms for the public at Chesapeake Appreciation Days. Univ. of Md ARA and BRATS have applied for ARRL affiliation. W3LDD sends newspaper reports from Havre de Grace about "ham radio interference" which ultimately was proven to be from a CB station; local hams DF'd the CB rig and put the police on the right track! The MEPN conducted 10 sessions during the SET weekend, passed 121 messages and had liaison with several 2-meter ARES nets. WA3UMY and N3EGE are packeteers in Lexington Park. Appointments: K3RXK, EC for Frederick County; KA1FPP, OBS; W3VVN, OES; KC3TS and KA3JJN, ORS; WB3EFG, OO. With the nets: net/mgr sessions/traffic/average checkins: MDD/W3FA 61/245/9, MEPN/WA2ERT 34/197/30, MSN/KC3Y 31/98/16, WRPON/WB3BFK 22/17/12, PGARES/KA3DUE 5/8/13, MDCPON/W3OYY 5/3/14, FREDCARES/K3RXK 4/2/5, WC2M/KC3DW 5/1/19, PSHR: KK3F 165, KC3Y 114, W3FA 106, WA2ERT 105, N3EGF 90, KJ3E 88, K3NNI 84, KC3AV 63. Traffic: KK3F 912, KC3Y 468, KC3DW 168, KJ3E 167, W3FA 151, KC3AV 140, WA2ERT 124, N3EGF 113, K3NNI 100, N3DE 80, KX3U 76, KC3NS 57, K3RXK 48, K3ORW 43, W3DQI 32, K3MR 29, WB3BFK 29, W3LDD 28, KA1FPP 25, W3YVQ 18, W3FZV 16, W3ZNW 14, WB3FUE 5, KA3IID 4.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2OIJ, STM: WB2UVB. ACC: K2IXE. TC: VACANT. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATC's N2BQT and K2JF. OO's: WB2UBG, WB2USF, W2MAS and WA2HEB. A very happy and healthy 1986 to you and your families. From W2JB comes the following information: the State of NJ is now offering to New Jersey amateurs FREE QSL cards. The card is of standard post card size, has the customary two way exchange information on the back and has an area on the front suitable for easy over printing of the amateur's callsign, address, etc. (December's QST was supposed to carry a picture of the card). The cards are issued in packages of 500. These cards are available for a $3.00 check (to cover postage and handling) made out to "The State of New Jersey." Send your requests to: The State of New Jersey, Department of Commerce and Economic Development, CN 820, Trenton, NJ 08625-0820. Allow approximately 2 to 3 weeks for shipping. Traffic: NG2T 164, K2SB 87, W2IU 9, WA2HEB 5.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—SEC: W2BCH. DEC: KB2KW and W2MTA thank K2CWD for his many years of service as EC of Broome; N2FMA, New EC, will have a big pair of flight boots to fill! Other APPTS: N2EZG (EC) Schuyler, W2VDX (ATC), KA2VEG (ATC), KA2VYW (PIA). DEC of Central is still Kay, but her callsign is now NN2H (former KA2BHR). New Officers: Orleans N2CUK N2HS N2CWG KA2BCF, RAGS K2SDD KD2OQ W2BCH WB2HGO WA2PUU, Rome N2FAO K2GVI KC2RN KA2JKA. CONGRATS: WB2IPX President QRP International, K2SDD on new Skyhook with 5 ton counterweight. OBS reports: K2KWK WB2DSR WA2ZPE. PSHR: KG2D KA2DQA N2EVG/T WA2FJJ NN2H WB2IDS WA2KOJ W2MTA WB2OWO ND2S KA2UBX K2YAI.

Net	Freq.	Time/DY	Mgr.	QNI-QSP-QND
NYS/M*	3677	1000/Dy	WB2EAG	342-171-31
WDN/M*	04/64	1100/Dy	WB2OWO	422-106-33
Mike Farad	3925	1300/Dy	VE2FMQ	-31
NYPON*	3913	1700/Dy	WA2KOJ	730-305-31
NYSPTEN	3925	1800/Dy	W2MTA	606-076-31
ESS	3590	1800/Dy	W2WSS	358-054-31
OCTEN/E*	34/94	1830/Dy	WB2HLY	658-086-31
Q Net	31/91	1830/Dy	KA2CMQ	352-004-31
WDN/E*	57/17	1830/Dy	WB2OWO	657-220-32
Blue Line	93/33	1900/Dy	WA2SEF	384-042-29
VHF Thin	04/64	2000/Tu	KA2DQA	051-000-05
NYS/E*	3677	1900/Dy	WB2MCO	446-212-31
JCARC Net	10/70	2000/Dy	WB2HBU	421-019-30
LCARES	415/015	1800/Sn	WA2OEP	083-002-06
OARC Net	25/85	2000/Wd	K2VTT	057-000-05
BRVSN	055/655	2100/Dy	WB2OFU	299-007-31
CNYTN*	90/30+	2115/Dy	WA2PUU	241-059-31
OCTEN/L*	28/88	2130/Dy	WB2HLY	224-023-31
STAR*	99/39	2130/Sa	N3DPE	011-001-04
WDN/L*	04/64	2130/Dy	WB2OWO	621-172-33
NYS/L*	3677	2200/Dy	WB2MCO	285-080-31
SLVARES	31/91	1930/Sn	WB2NAO	036-014-05

*NTS Nets. Field Day: 1A ARATS/W2SEX*20; 2A Battery Walton/W2LZ*8; 2A Salt City/W2FR 7, Roch DX/W2TZ 37, Utica/K2IQ*38, N2HR 125, Lockport/W2RUI*129, Massena/WA2USA 177, Fulton/W2CXV 185, Genesee/W2RCX 216, Ogdensburg/K2JPM 241, Oswegatchie/WA2NAN 257, Black River Valley/W2AWB*297, Jefferson/WA2TOJ 327; 3A K2MP 26, Rome/W2OFQ*29, K2SA*30, CVARC/W2UXC*55, Boonville/NC2O 164, RAGS/W2AE 166, Niagara/W2QYV 177, Cattaraugus/KA2OOA*111, STARS/WB2ELW 123; 3A Commercial RAWNY/W2PE*81; 4A Allegany/W2SAM 38; 7A Tioga/K2QR 6; NICE GOIN', also * means SM received ur message. W2BCH reminds us that the WNY EC Net meets the third Sunday at 2000 on 3955 kHz. Eastern Area Net has started a RTTY net on 7090 kHz at 11:30 A.M. as part of Cycle 1 of NTS on a trial basis. It may even operate in mailbox mode on some sessions. Traffic: WB2OWO 441, WA2FJJ 333, WB2IDS 308, WA2HSB 292, W2MTA 205, WB2QIX 198, ND2S 154, N2EVG 133, K2YAI 96, KA2DQA 83, NN2H 76, W2FR 74, KA2UBX 74, KG2D 67, WA2KOJ 54, KA2DBD 50, W2UYE 46, KB2KW 39, WA2SMZ 30, AF2K 29, WA2RXO 15, K2IUT 14, WA2QEP 11, K2GXT 6, K2VR 3, KC2SJ 2. (Sept.) K2GXT 6. HAPPY NEW YEAR TO ALL!

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB—STM & ASM: WN3VAW. SEC: WA3UFN. OO Coor: KJ3Q. PIO: WB3IZJ. SGL: K3HWL. TC: K3LR. BM: KR3P. ACC: AK3J. I have one Silent Key to report this month and I wish these items are not part of life. He is N3ACE, Bob Henry, who was very active in Beaver County amateur affairs his friends will miss him. I would like to thank KC3JQ who has resigned as NM for the WPAPTN he has done an excellent job and helped make the net better. WA3HLN has taken NM job and we welcome him may his term help make it even bigger. After 15 years as NM of the 3rd Region Net cycle 4 W3NEM has resigned due to circumstances that prevent him from being able to function the way he would like. His friends wish him well but he will still be on the air. His successor will be KQ3T who has been active on tfc nets and is qualified as a CW op. I would like to thank all the amateurs who helped to get info for the families concerned about relatives and friends in Mexico City. Has your club thought about a SSC application yet if not get in touch with AK3J the ACC FOR INFO, WA3UFN is trying to get a system to tie as many two mtr repeaters through the section for possible disasters such as the tornadoes that struck us this summer. He can use your help.

Net	QNI	QTC	Sess.	kHz	T/D	NM
WPACW	255	101	31	3585	7:00P	WA3UNX
WPAPTB	548	151	31	3983	6:00P	KC3JQ
WPA2MTN	560	81	31	145.28/88	8:00P	KA3BGC
NWPA2MTN	657	19	31	145.13/53	1400Z	KC3NY
PFN	189	99	31	3958	5:00P	WA3THT

Traffic: W3EGK 210, KQ3T 157, N3EMD 155, KA3ETC 126, W3OKN 88, WA3UNX 78, K3SMB 68, W3KMZ 61, WN3VAW 52, K3NPW 40, WA3DBW 38, W3NGO 35, KC3JQ 33, W3RUL 32, W3EKJ 23, W3KUN 22, KQ3M 19, N3FM 16, WA3QNT 8, K3LTV 7, KA3EGE 4, N3KB 4, N3CZW 2. (Sept.) KQ3T 208, N3FM 113, W3KWH 60.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH.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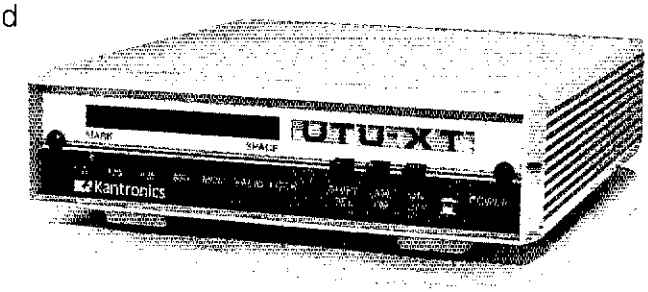

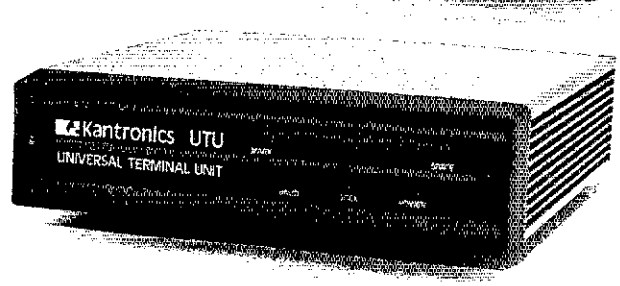

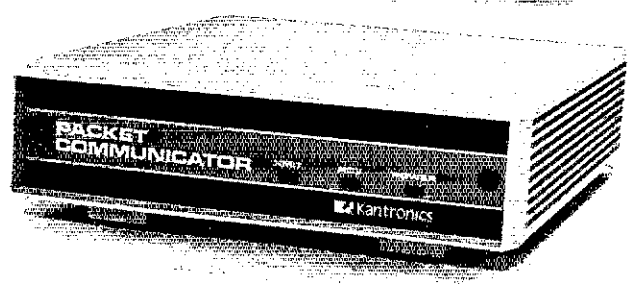

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Net	Freq.	Times (Z WIN)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	636	199	61
ITN	3705	0100 Dy	279	61	31
ILPN	3915	2230 Dy (X SN)	571	48	27
NCPN	3915	1300 Dy (X SN)	462	78	27
NCPN	7270	1815 Dy (X SN)	305	54	27
IEN	3940	1500 Sn	88	2	4
IARES	3915	2230 1 + 3 SN	67		2
ISN	3905	0000 Dy	212	170	30
CTN	147.69/09	0300 Dy	NEW NET - NO STATS		

Glad to receive a report from Elmer, W9DBO, that all is well and a new tower and antenna are going up at his QTH. Net regulars will note that Elmer was the 1984 recipient of the famed QLF award. Congratulations to KC9OA who is now NG9R. Morgan County EC W9OES reported a busy month - in addition to SET, ARES there had BLEVE, SAR, and HAZMAT training. Madison County EC NA9X has appointed two new Asst. ECs - KC9GL and KA9RLK, welcome aboard to Harold and Ray! ECs . . . SET reports have been kind of slim this year, be sure to file SET and year end reports on time with HQ with a copy to QBH. OOs . . . HQ has reported some perceived problems with discrepency reports going out to folks whose sigs were verified as OK . . . possibly due to deficiencies in the receiving equipment used by the OO. Advice? When in DOUBT, DON'T! Also, don't hesitate to call on TC N9RF and his crew for some expert help in calibration checking on equipment to be used for your OO work. SM WD9EBQ attended the semiannual meeting of the Illinois VOLAG (VOLunteer And Government agencies active in disaster) on October 30th. Also represented were Red Cross, Salvation Army, ESDA, FEMA, IL Dept on Aging, and the Mennonite Disaster Service. Main topics were the Mexico earthquake and flooding in southern states due to the hurricanes. Amateur communications supporting relief efforts in both areas were cited. KD9CO writes to remind us of the Displaced Peorians net which meets Monday thru Saturday on 14247.5 kHz at 1430Z. NCS is W9UWC in South Daytona and there are regular checkins from all over . . . so if you want to find out how things are back in good old central Illinois check in and join the fun. Traffic: KA9FEZ 477, KW9J 318, W9NXG 148, WB8RFB 124, W9HLX 87, NC9T 82, W9HOT 78, KA9EWN 76, W9JIJ 52, K9EHP 38, KZ9I 38, ND9V 35, W9KR 34, KD9K 26, W9LNQ 19, K9QEW 17, KA9BBV 17, W9KPI 16, KA9RBI 12, W9VEY/M 12, W9RTD 11, W9LDU 10, WA9SID 10, WD0AHO 10, NF9T 7, W9DBO 6, WA9RUM 6, WB9TVD 6, K9WMP 5, N9ELU 5.

INDIANA: SM, Bruce Woodward, W9UMH—SEC: WB9ZQE. STM: W9JUJ. SACC: K9TUS. STC: K9PS. SGLC: WA9VQO. SOBC: KC9TA. SPIO: K9DIY. SRC: N9WB. SOOC: KJ9G. Net Managers: ITN KD9DU, QIN KJ9J, ICN KW9D, IRN KB9SU, VHF W9PMT, IWN KA9ERC. October Net Reports:

Net	Freq.	Time Daily UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3665	564	2742	93
QIN	3656	1430/0000/0300	720	269	1781	93
ICN	3708	2315	80	39	632	26
IRN	3629	0000	21	257	215	10
IWN	3910	1310	1743	0	411	31
IWN	VHF	Bloomington	1017	0	168	31
IWN	VHF	Kokomo	1414	0	229	31

Hoosier VHF Nets for October QNI 6625, QTC 152. Bulletins 240, QTR 7913 in 222 sessions for 25 nets. D9RN 375 messages in 955 minutes. IN. 72% Stns. K9CGS, W9JUJ, N9DWU, KA9EIV. CAND 672 messages in 31 sessions. D9RN 100%. Stns. N9DWU, W9JUJ. 9RN Cycle 4 Report for October QNI 358, QTC 431, QTR 979 in 62 sessions. IN 100% Stns. N9HZ, KJ9J, W9JUJ, WB9OFG, WA9QCF, WB9UYU, K9WWJ. Appointments: DEC KA9KRE for Posey, Vandenburg, Warrick, Spencer, Perry, Gobson, Davies, Knox, Martin, and Pike Counties. Silent Keys W9KAS Indianapolis, WD9CJU Waterloo, WA9KWH Portland, N9EV Churubusco, and W9UPI Urbana. Robert D. Orr, Governor of the state of Indiana proclaimed the week of October 13-19, 1985 as Amateur Radio Appreciation Week and encouraged all Hoosiers to be cognizant of the important contributions made by these dedicated volunteers. MARK, Methodest Amateur Radio Koineba which means fellowship headed by Ralph Kerstead, KA9RPN, of Galveston are growing in number and success. Members of the Morgan County ARES and Radio Club assisted with the Fall Foliage Festival Parade in Martinsville. Thanks to W9ZSK, KC9LC, K9KGJ, K9BXF, WD9BFJ, KA9JRA, N9CYC, N9CPE, K9DIU, and N9ERH. Traffic: W9JUJ 712, W9CNE 320, W9JZV 256, KJ9J 210, W9UEM 128, KA9FFO 115, K9WWJ 101, WB9OFG 69, KW9D 64, KB9HH 63, WB9UYU 57, KD9ER 55, WA9QCF 55, K9DFK 52, N9DTG 50, WD9GWM 50, W9UMH 45, W9BRF 41, WB9AWI 36, N9HZ 36, K9KTB 32, N9DYC 29, WB9QZZ 27, WB9PFZ 26, WD9EIV 22, W9QYY 22, W9PMT 21, WD9HII 20, N9DHX 18, N9AEI 17, WA9OKK 16, KK9N 16, WD9DWD 16, KJ9G 15, K9QUP 15, W9BTZ 10, K9PS 9, W9ZGC 7, WB9IHR 7, KA9RBY 6, KA9SBW 6, KW9C 6, KA9RNY 5, KC9TA 2, N9CKK 1, N9FBD 1, K9ZBM 1, WA7OIZ 1, KC9ED 1, W9KMY 1, W9EI 1, W9BDP 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. Congratulations to new ATCs N9CCI, WB9FMU, WA9UVK, W9XT and WB9YSD. KD9FC, Space Shuttle mobile communicator, passed Extra. Amateur Television enthusiasts are AD9W and KC9NW. New Officers for Wisconsin Chapter QCWA Chairman W9VQD; V. C. W9FPA; Sec. W9YCV; Treas. K9GDF. Directors K9UTQ, W9IEM, K9YHO. West Allis RAC Midwinter Swapfest January 11th at 4-H Forum, Waukesha Expo. See you at the ARRL table. ARRL/VEC test on January 25th by Central Wisconsin RA, for info contact N9JW or K9UTQ. Silent Keys K9DD, W9DKH and AE9W. Eau Claire ARC held two-day exposition for Amateur Radio with 20 members using several modes. The Novice Roundup begins the end of January, let's all help them at their stations or on the air. I've been busy writing the Technical Coordinator Manual for the new ARRL Field Resources Directory and rewriting the Emergency Communications chapter for the 1986 ARRL Operating Manual.

BWN	3984	6 A.M.	WD9IID	1194-136-27
BEN	3985	Noon	WB9ESM	779-227-33
WSBN	3985	5:30 P.M.	WA9ZTY	836-232-30
WNN	3723	6 P.M.	KA9OBP	149-22-29
WSSN	3645	6:30 P.M.	N9BDL	136-53-30
WIN-E	3662	7 P.M.	WB9ICH	
WIN-L	3662	10 P.M.	KC9CJ	
NWTN	34/94	6:30 P.M.	W9JSF	423-101-31
WCWTN	31/91	6:00 P.M.	N9DHT	579-42-31

Traffic: KA9CPA 919, WB9YPY 301, W9YCV 255, K9GDF 253, KA9BHL 141, WA9WYS 135, KA9RII 126, WD9IID 117, W9CBE 116, W9JSF 113, N9BCX 110, W9UCL 107, N9BDL 104, WD9FRI 100, KA9OBP 99, N9AUG 98, W9DND 80, WB9ESM 72, W9IEM 72, AG9G 62, K9AKG 61, KA9JJY 25, KA9BHK 12.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. It's good to be back at the typewriter again after a two month absence. As I type this, I have not yet returned to the HF bands, KØOGI and KBØWV are loyal relay stations in keeping me loaded down with the monthly workload. My thanks to KCØT and his XYL Lee for their help with the Section Activities for August and September. In case you aren't aware, the managers of our section nets and I get together on the air regularly for meetings to discuss the nets and how we can improve them, work out any problems that may exist, etc. These meetings will be announced in advance and your input is welcome. Another meeting is planned with our division ARRL officials soon, so keep an ear open for further details. KAØEPY continues to solicit input for the MSN newsletter. Recent upgrades include: to Tech KAØLVK and KAØVLK, to General NØGHJ KA8GJZ and KAØSAI, to advanced NØAFH, to Extra KDØXP and KDØWR. The "Ham of the Month" award for October goes to KØOGI. Special thanks to the news media in Minnesota for its coverage of amateur activity during the Mexican earthquake. All amateur radio clubs are urged to send me copies of their newsletters. It's the best way I can be informed about your activities. Who knows, maybe your club will be saluted in a future Section News column. My sincere thanks to those of you who have commented to me concerning this column. I will do my best to implement all constructive ideas, meantime your continued interest in this column is appreciated and I want to hear more. Remember, this is YOUR Section News! Our regrets to the family of Stan Hegg, KAØLNQ who is now a Silent Key. A reminder that our statewide emergency frequency 3929 kHz will be active during any major winter storms, so tune in. Congrats to KAØEPY and WBØWNJ on BPL awards for October. I close this column with a sincere wish on behalf of the Section Leadership for a blessed holiday season and the happiest of new years to you all. 73 de KDØCI.

Net	Freq.	Time	QNI/QTC/Sess.	Mgr.
MSN/1	3685	6:30P	315/97/31	KAØEPY
MSN/2	3685	10:00P	198/38/31	NCØE
MSSN	3710	6:00P	241/22/31	KAØODQ
MSN/RTTY	3620	7:00P	78/11/11	WAØLUT
MSPN/N	3929	12:00P	527/132/31	WBØWNJ
MSPN/E	3929	5:30P	1186/173/31	WDØBGS
MNAMWXNT	3929	6:15P	561/247/28	KAØIZA
PICONET	3925	9:00A	NO REPORT	WDØBAC

MN/MSO: 3620 Tues & Thur 5-7 PM Sat & Sun 8-12 PM. MN EMERGENCY FREQ: 3929. BULLETINS: 3929 & 3685. Traffic: WBØWNJ 535, KAØEPY 462, WAØTFC 319, KDØCI. 235, KT9I 126, WØEHI 122, KAØIZA 119, KCØT 92, NEØD 83, WAØONE 62, NØCLS 52, WAØONJ 47, KØOGI 43, NB8G 42, WDØGUF 42, KAØODQ 38, W9DM 37, KTØR 36, WDØBGS 34, WØZSW 34, NØJP 32, KAØFQW 29, KAØARP 25, KØCVD 19, NIØX 17, KN9U 12, KBØWV 12, KDØCI 7, NØEWA 5, KAØAJF 2.

NORTH DAKOTA: SM, Michael Mankey, WBØTEE—I again want to say that in the event of a blizzard or a winter storm warning we will be passing information in the National Weather Service. The DATA Net freq. of 3883 kHz will be used. We will need snow depth, wind speed, and temps for the reports. Williston has a new machine for 34-94 which should increase their range. I am hoping to visit with each of the clubs in ND this year and would appreciate it if each of the clubs could let me know when they are meeting. Congratulations to Karl Silverman for receiving a bronze medal from the National Weather Service for his extensive work with SKYWARN. Rumor has it that KQØC, Dean is alive and well in New Jersey. Happy New Year and 73's Mike.

SOUTH DAKOTA: SM, Roland Cory, WØYMB—Ole Johnson, NØABE & Bob Olson, WAØFPR, Asst. SMs. KØERM has expanded the South Dakota CW net to Monday, Wednesday, Thursday and Friday. He will NCS this net on those nights and will run it at any speed from 13 thru 20 WPM that a station checks in at. The time is 0100Z on 3650 kHz. Looking for volunteers for bulletin stations and official observer stations. Anyone interested please contact WØYMB. Sioux Falls ARC meets at Old Court House at 6th & Main every Monday at 7:00 P.M. Months with 5 Mondays the 5th is auction nite. 73 WAØFPR. Traffic: WØHOJ 120, WBØLTV 99, WAØUEN 64, KØZBJ 40, WBØOMF 31, WØMZI 30, WAØVRE 30, KAØKPY 10, WØYMB 9, NØABE 8, KDØYL 6, NØCTK 4.

DELTA DIVISION

ARKANSAS: SM: Joel M. Harrison, WB5IGF. ASM: K5UR. SEC: N5BPU. STM: W9OK. TC: W5FD. ACC: NI5D. SGL: W5LCI. BM: W5HYW. Repeater Coordinator: WB5FDP. I want to take this month to focus on club activity. We have a new affiliated club coordinator, Dora Anna Graziani, who is making an attempt to boost the club activity in the state. Please contact her if you have not yet heard from her. We are trying to appoint an Asst. Technical Coordinator and an Official Bulletin Station for each club/repeater group in the section. TC W5FD and BM W5HYW are in charge of this effort and are interested in your input. Please take the opportunity to contact either of these people or myself for more information. You will be surprised at the benefits available to you. I would like to wish each of you the very best for the new year. 73's to all.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—SEC: KA5PFB. ACC: K5DPG. SGL: KD5SL. OOC: KE5OK. TC: N5JM. Southeast Louisiana ARC (Hammond) election of officers: Pres: Ray-K5AZU. V.P.: David-KA5AUI. Sec: Bob-WB5FBS. Treas: Ralph-K5CAV. Hope to see you at the 86 Hammond Hamfest on Sat. Jan. 18th at the SLU Campus. After attending most of the Louisiana hamfests in 1985 it is regretable to note a considerable decrease in participation. The reasons and some trends seem to be quite obvious. There is a significant decrease in the number of swap tables probably due to the limited availability of state of the art surplus parts and the increasing complexity of equipment. Dealers are becoming more selective or staying away because hamfest sales are less profitable as the larger mail order tax free discount houses capture an increased share of the market and a 2 day unprofitable weekend is not worth the effort. Fewer forums are being scheduled and all to frequently they are poorly attended or cancelled. Possibly they are the same subject warmed over each year. These trends may be just the swing of the times or maybe we need to reform our hamfests to make them a more interesting technical and social get-together. Maybe we need to go back to fewer,

one day hamfests without all the frills. Traffic: WA5V 46, N5ANH 22.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: AL7GQ. VHF Coord: N5DWU. ACC: KC5VD. STM: KB5W. Several new appointments this month: ASM: K5QNE. PIO: KA5VBE. ATC (TVI/RFI) AG5Z. ATC (Solid State) N5IEM. ATC (Const) WB5YKR. ATC (Packet) WA5DVV. ATC (New Hams) K5QNE. If you need help on any of these subjects, get in touch with these fine people. The VARC put on a fine demonstration for the Boy Scouts at the Andrew Jackson Council Fall Camporee in line with the annual Jamboree on the Air. This resulted in approximately 30 Scouts expressing interest in Amateur Radio. VARC members putting on the demonstration were: WB5YKR, WC5J, NZ5Z, N5IEN, K5VXV and WB5SXK. The MS ARRL info Net is getting good particlpation. Encourage everyone to join in each Monday night at 7:15 local time for latest information or if you desire answers to your questions. CAND (W5KLV) sess 31 QTC 671. DRN5 (WB5YDD) sess 62 QTC 575. MSBN (W5HKW) sess 31 QNI 2334 QTC 36. MMN (KF5GK) sess 31 QNI 688 QTC 8. MLEN (KE5WP) sess 4 QNI 102 QTC 0. HAEN (KA5ROA) sess 4 QNI 46 QTC 0. Traffic: K5OAF 229, KT5Z 98, W5WZ 39, W5LSG 20, KW5T 10.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS. OO/A: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J & TC: W4HHK. Have some new appointments I wish to pass atong to you—PIO for next two years is N7EJI. He has a Tech ticket but will be in the upgrade line very soon. Tnx Evert for joining the Team. All I want is that the Section to load him down with things to add to the much needed publicity for the Section. The other appointments are assistant CW net manager, W4TYU, and assistant Section Traffic manager, KB4UQ. Also many tnx to Jean and Tom for joining the team. How can we go wrong with these additions. It has been a very satisfying message that your SM is or has gotten about the many FCC exams given and the real fine conduct as they are given. Keep up the very fine job. You can not ask for anything better. I am again making a change back to including traffic for each station reported to me. Seems that the every three months pattern was interpreted to mean that they were not wanted. Far from it, we want all we can get to match the other traffic reported by the Section. Here is the various station activity for last four months. KE4LS 2735, NG4J 739, KA4RSC 713, W9FZW 675, W4DDK 364, WA4FMR 361, K4WWQ 294, K4WOP 169, NN4S 132, W4PFP 95, K4UMW 39, W3HET 38, W4TYV 35, WB4YPO 34, WD4GYT 24, KA5KDB 23, W4PSN 22, KB4UQ 16, W4TYU 14, NM4W 13, WA4RMP 8, W4MRD 7, N4KQX 4, KA4BSG 3. That is a good record but this doesn't seem to anywhere equal the amount of traffic that was handled by the Section. So will be looking for that activity report from each station. Sure would like to include yours. Traffic summary for the Section nets is as follows (same time period as included above) Low Frequency Nets-Sessions-303, QNI-15,408; VHF-Sessions-216, QNI-5112, QTC-1594; CW-Sessions-169, QNI 886, QTC-288; RTTY-Sessions-40, QNI-187, QTC-3. The RTTY Net was terminated for lack of interest. This report will begin as a monthly item in the next monthly section activity report. CUL. Traffic: KA4RSC 190, W9FZW 134, WA4FMR 132, W4DDK 68, K4WOP 25, W4PFP 21, W4TYV 19, NN4S 19, WB4YPO 14, KA5KDB 12, W4PSN 8, KB4UQ 6, NM4W 4, N4KQX 4, W3HET 3, W4TYU 2.

GREAT LAKES DIVISION

KENTUCKY: SM, Dale Bennett, WA4JTE—The ARRL National Convention went well at Lvl. We got to meet a lot of old friends, and make some new ones. Our thanks to all the fine people who worked to make it a big success. Thanks to the pork producers for some fine eating. Tnx Rosie for doing a fine job as SM. Thanks to all the clubs for sending me their newsletter. Our apologies to K4DMU for having his call incorrect in last month's column. Keep up the good work Joe. New digepeters in Elizabethtown W4BEJ-1 and Henderson K4DPP. A big packet meeting was held in Lexington on Oct. 24. Sounds like things are getting organized. Packet used during S.E.T. 85. Hope to see more use next year. S.E.T. 85 went well this year, but we need to do more planning next year. My thanks to all who worked S.E.T. 85. We need some help on D9RN during the day, so anyone wishing to help let me know. Bowling Green, E-town, Glasgow, and Lexington group's have been working several races and parades. If you have anything you want in this column send it to me and I will try and get it in. We need a new Public Information Officer anyone interested?

MICHIGAN: SM, James R. Seeley, WB8MTD—ASM: WA8DHB. SEC: WB8BGY. STM: WD8RHU. ACC: K8SB. TC: W8YZ. PIO: KC8K. OO Coord: NJ8S. SGL: N8CNY. You have to take the car out and drive it to find out how it runs. The response to the latest column format was generally approving, with the only serious (and many) objections being about the truncating of the traffic listings. A large share of the beefs came from those whose count normally is well above the limit of 20 that I established. You will see the full listing has been restored. Here is a sampling of the comments, of which Hq staff involved is welcome to take note. "You've saved three or four lines and hurt a lot of people." "I guess traffic isn't really important anymore." "It's no ego trip for me—I thought I really was doing a good service." "You keep preaching that 'every message is important,' but now the reports are not." "Hey, it's *our* column too, as you keep saying . . ." Etc. Majority wins, as usual—and as it should. Welcome back to the *Hertzian Herald*, the voice of the Monroe club. With KA8NCR at the helm, this one should continue as one of our better newsletters. TC W8YZ announces two new Asst. TC appointments, to veterans W8CUP and K8DD, both worthy additions to this important branch of our volunteer staff. Congratulations and thanks to WD8PAF of Munising, whose appointment as DEC for the U.P. has been made official by SEC WB8BGY. Gov. Blanchard is issuing letters of appreciation to Mexican amateurs involved in traffic handling for MI residents following the Mexico City earthquake. Recommendations for Mexican stations to receive letters should go to W8JRK, S. Joe Levine, 1952 Pawnee Tr., Okemos, MI 48864, and should include the Mexican station's callsign, full name and address, and frequency, date and time of contact. The MI traffic gang deserves much praise for the way they responded to the demands of the Mexican tragedy. Inflation is *not* rampant among MI clubs. In perusing the many bulletins I receive, I saw no dues increases in the past year, and in one instance (Catalpa ARS) the tab went down. (no, this is not the group that gave me an honorary membership and then started dinging me for past-due dues!) MCRC officers, all re-elected incumbents: Pres. KA8IKA; V.P. K8SB; Sec'y KA8GKV; Treas. KA8TWO. I note good cooperation this year with the Boy Scouts in the annual Jamboree, especially in the Detroit and Blue Water (thumb) areas. Nets (QNI/tfc): QMN 1075/261; MITN 655/812; MACS 495/105 GLETN 623/57; UPN 1176/53; 160-M 264/44; MNN 275/43; WSSBN 1018/32; VHF nets, 14 rpts, 855/27. Band conditions have brought the welcome and needed return of the 160-M net. Traffic: KA8CPS 468, AF8V 292, W8QHB 243, WD8KQC 133, KA8VOZ 115, WB8YDZ 110, KB8GT 72, K8GXV 68, NJ8R 57, WB8MTD 47, WA8DHB 44, WD8RHU 42, W8SCW 42, N8EXS 38, K8OCP 31, K8UPE 31, WB8WJV 27, WD8PAF 24, K8HAP 23, W8CUP 21, W8EOI 18, KI8Q 17, W8URM 17, K8ZJU 16, WD8MJB 15, W8RNQ 15, KA8UHW 9, K8EQO 8, W8VIZ 4, NM8Z 3.

OHIO: SM, Jeffrey A. Maass, K8ND—ASM: N8AUH. SEC: WD8MPV. STM: KF8J. BM: W8ZM. TC: KB8MU. OOC: AD8I. PIO & SGL: N8CVK.

NET	QNI	QTC	Sess.	Time(Local)	Freq.	MGR
BN(E)				1845	3.577	W8JMD
BN(L)	193	94	34	2200	3.577	W8BO
BNR	358	168	41	1800	3.605	W8EK
BSSN	480	387	66	0945, 1830	3.885	N8AKS
ONN	202	36	31	1830	3.708	WD8KBW
OSN	303	132	31	1810	3.577	N8AEH
OSSBN	2489	770	108	1030,1615, & 1845	3.9725	WB8MZZ
OSSN	158	80	31	0646	3.577	KA8GJV
O8MN	342	11	31	2100	50.16	WD8CTX

Happy New Year! January doesn't serve up any hamfests for Ohio, so you'll have plenty of time to consider how you will pay the public back for the privilege of using your Amateur Radio license. See last month's column for details! Clubs: as you schedule your hamfest for 1986-87, make sure that you send me a note so that I can include the correct date in this column and on my "Hamfest Schedule" sheet, which I distribute at club meetings and hamfests. Congratulations to the Central Ohio ARES and EC Bob Adams, W8BKO, for being awarded the 1985 Outstanding Achievement Award by the Board of Directors of the Central Ohio Chapter of the American Red Cross. This award is presented to the organization that is deemed to have made the greatest contribution to Red Cross activities in the past year. (COARES now has 37 experienced "Event Coordinators" available for future activities!) Portage County ARES provided support for the March of Dimes Bikathon October 6, involving 13 Amateurs and 67 man-hours of effort. OH-KY-IN provided 26 Amateurs all day in the rain for the Western Hills High School Band Invitational October 19. What is your club or ARES group doing for the community? Let me know, and advise ARRL HQ on form FSD-157 (copies available from me or SEC WD8MPV). Public service is for *everyone!* Triple States RAC's licensing Class XXVII has graduated, with 17 new Novice Class licensees. Of these, several are less than 16 years old, and 3 are YLs. The entire block of callsigns KA8YEQ through KA8YFG was distributed to this class: congratulations! The North Coast ARC sponsors a 2-meter fox hunt in the western Cuyahuga/eastern Lorain counties area on the second Saturday of each month. Contact NO8M (777-1177) or K8SCI (779-8999) for info. Earl, WA8AIU, has begun a code practice net in Northwestern Ohio Monday nights at 6:30 PM on 28.150 MHz. The net starts at 5 WPM and goes up from there. 57 ARRL Affiliated and Special Service Clubs filed their required 1985 Annual Reports with ARRL HQ, and many more are moved to the "inactive" file for failure to file. Did YOUR club's secretary remember to renew your club's valuable relationship with your League? Volunteer Examination sponsors are reminded to let Bob Johnson, K3RC, know your 1986 schedule as soon as it is known. Bob does us all a service by keeping a current list, and providing it on request (I have copies at the ARRL table at all hamfests). Bob can be contacted on the Ohio Single Sideband Net (OSSBN), and I will forward any information that I receive. The Buckeye Single Sideband Net (BSSN) has moved it's evening session up to 6:30 PM for the Winter season, at least through the end of March. The Ohio Section ARES Net (OSAN) has likewise moved up to 7 PM until further notice. New appointees: WB8YIH, EC Van Wert County; WB8KWC ORS. Traffic: W8BO 484, K8ND 288, WD8FKN 261, N8AKS 259, W8EK 240, K8JDI 236, W8SKP 207, K8TVG 190, WB8MEK 156, KD8KY 154, KA8KHS 139, KF8J 133, WB8DMF 130, WB8JGW 119, WD8RAO 118, KA8CGF 115, N8EFB 112, KD8KU 105, KV8Q 95, WD8KBW 93, W8QZK 93, KA8GJV 80, NJ8P 80, K8AN 79, WB8KWC 76, WD8JYE 70, N9EJO 69, WD8MPV 68, K8DXZ 67, NC8Q 66, WB8HHZ 65, K8EF 64, KJ3O 64, KA8JTT 63, NM8I 62, N8AEH 60, N8FPH 53, WA8DYS 51, WA8HED 50, W8WEG 50, N8CW 49, KD8WH 47, K8CMR 46, W8MVE 46, WA8GMT 44, N8DGO 41, KC8UZ 40, KD8XL 40, WD9RIB 36, KA8TNT 35, N8GOB 34, NF8B 32, W8BHL 28, KD8IC 28, WA8SSI 27, WA8HGH 26, KA8THO 25, K8CKY 23, WB8RSM 20, NK8B 18, KC8WH 18, KC8YV 17, WD8CSP 16, WD8OYK 16, N8FWA 15, KA8ICB 15, KD8WI 15, N8AJU 14, NK8C 14, K3RC 14, W8RG 14, KC8NM 13, WB8MRL 12, K8NJQ 12, KA8RIX 12, WD8JAW 11, WD8EKI 10, K8LQM 10, NI8W 10, W8FPA 9, KD8ZE 9, N8AUH 8, N8CJS 8, W8HVK 8, NC8M 8, WB8NHV 8, KA8OQF 8, K8VOY 7, N8GIY 6, KA8UYM 6, NE8X 5, W8DYF 5, KV8M 5, W8FUP 4, W8OQL 4, KA8MFG 3, N8GST 3, W8ZM 2, KA8MFH 1, WD8NED 1. (Sept.) WB8HMI 39, WB8RSM 15, WD8CSP 6, N8AUH 4. (Aug.) WB8HMI 21, N8AUH 6.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK—ASM: K2ZM. STM: WB2MCO. SEC: AK2E. ACC & SC: N2BFG. BM: WB2EAG. SGL: KB2HQ. TC: KC2ZO. ATC: WA2VGM. NET LISTINGS (QNI/QTC): AESN 80/3 ATEN 25/8 ESS 358/54 HVN 186/65 NYPON 730/305 NYS/E 447/212 NYS/L 285/80 NYS/M 342/161 SDN 288/108 Ulster RACES 33/3. NOTE: HVN now on 144.535/145.135 every night of week at 6:30 PM, 233OZ. CLUB NEWS: Albany ARA enjoyed annual auction Nov. 8. CCNR discussed ham radio for mariners. Saratoga RACES listened to meteorologist W2ZCV talk about upstate NY winters. Rip Van Winkle ARS had discussion by W2FMY on 10 meter FM operation. Schenectady ARA had W2FW and W2BSH speak about how amateur radio began. WARA heard W2IWH tell how to work DX with a short whip antenna. Ulster RACES had W2MU KA2TQW KC2IW WA2RUW handle comm. for Kingston bike race. WECA heard a former OK ham talk about ham radio in Czechoslovakia. AK2E reports more activity on behalf of DECs and ECs. W2YXZ is very active as net manager for C.D. Weather net-QNI 362; W2URP NM for Schen. Cty ARES net QNI-59. Reports indicate many counties active during Hurricane Gloria. All stations please note: I must have reports by the 10th of the month. Therefore you must get your reports to WB2MCO by the 5th at the latest. Otherwise, they will not appear in the column! N2BFG is now also coordination point for all testing. To prevent duplication of efforts

HI-Q BALUN

- For dipoles, yagis, inverted vees and doublets
- Replaces center insulator
- Puts power in antenna
- Broadbanded 3-40 MHz.
- Small, lightweight and weatherproof
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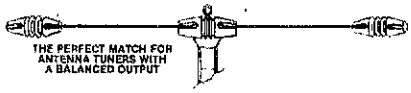

- Completely factory assembled ready to use
- Heavy 14 (7/22) gauge stranded copper antenna wire to survive those severe storms
- Center fed with 100 feet of low loss PVC covered 450 ohm balanced transmission line
- Includes center insulator with an eye hook for center support
- Includes custom molded insulators molded of top quality material with high dielectric qualities and excellent weatherability
- Complete installation instructions included
- Overall length 135 feet, less when erected as an inverted vee or sloper
- Handles 2 kw PEP & covers 160 through 10 meters
- May be trimmed to fit small city lots

Only $29.95

DIPOLES

MODEL	BANDS	LENGTH	PRICE
Dipoles			
D-80	80/75	130'	$31.95
D-40	40/15	66'	28.95
D-20	20	33'	27.95
D-15	15	22'	26.95
D-10	10	16'	25.95
Shortened dipoles			
SD-80	80/75	90'	35.95
SD-40	40	45'	33.95
Parallel dipoles			
PD-8010	80,40,20,10/15	130'	43.95
PD-4010	40,20,10/15	66'	37.95
PD-8040	80,40/15	130'	39.95
PD-4020	40,20/15	66'	33.95
Dipole shorteners — only, same as included in SD models			
S-80	80/75		$13.95/pr.
S-40	40		12.95/pr.

All antennas are complete with a HI-Q Balun, No. 14 antenna wire, insulators, 100' nylon antenna support rope (SD models only 50'), rated for full legal power. Antennas may be used as an inverted V, and may also be used by MARS or SWLs.

Antenna accessories — available with antenna orders	
Nylon guy rope, 450 lb. test, 100 feet	$4.49
Molded Dogbone Type antenna insulators	1.00/pr.
SO-239 coax connectors	.55
No. 14 7/22 Stranded hard drawn copper antenna wire	.08/ft.

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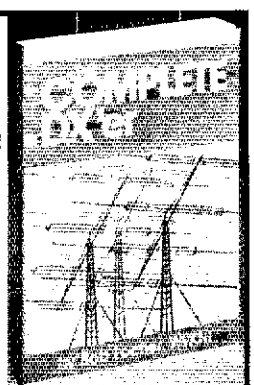
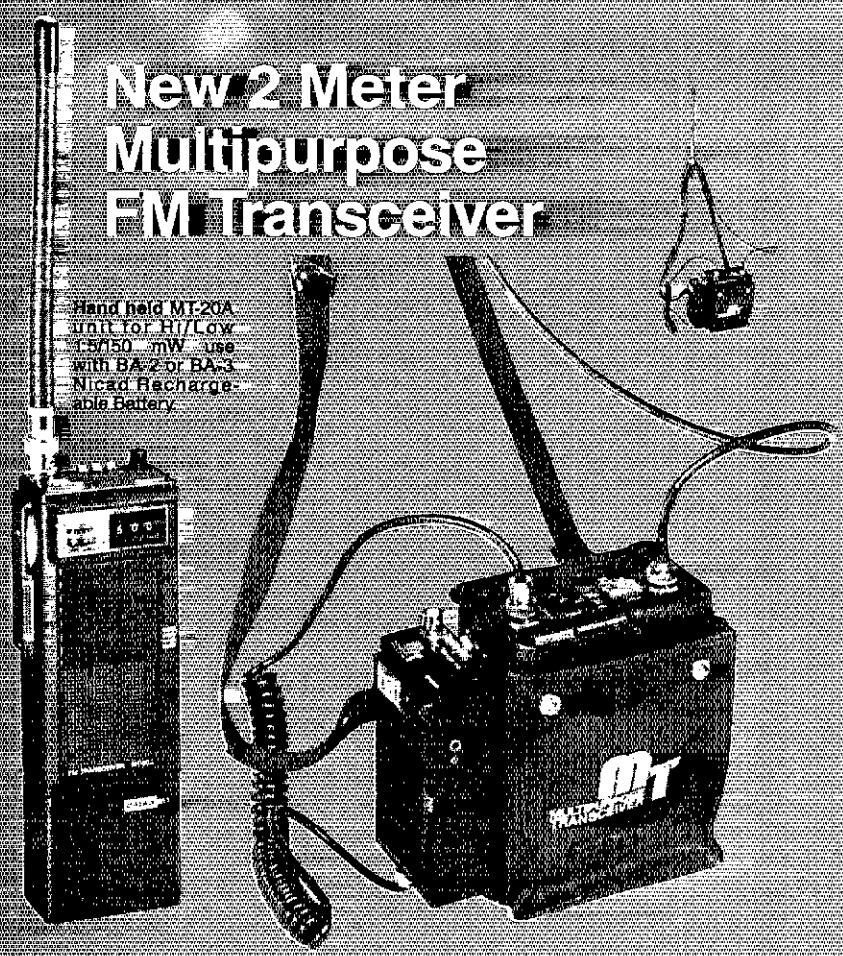
187 PAGES OF THE BEST DX INFORMATION AROUND! A. MUST FOR THE DX'ER! ONLY $10.00 FROM ARRL. SEE PAGE 166

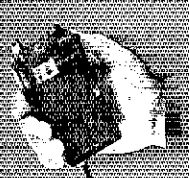


DX'ers!

New 2 Meter Multipurpose FM Transceiver



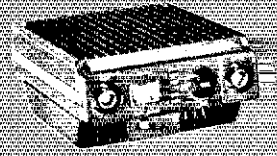
Hand held MT-20A unit for Hi/Low 1.5/150 mW use with BA-2 or BA-3 Nicad Rechargeable Battery.



Portable transceiver puts out 10 Watts ... ideal for amateur participation events such as emergencies ... athletic events ... marathons.

The new MT-20A transceiver can be used as a 10 W portable unit with carrying case, LA-20 Linear Amplifier and rechargeable Nicad Battery.

Easy to read thumbwheel digital switches provide complete coverage of the 2 meter band in 5 kHz steps.



In **mobile** operation, the MT-20A transceiver provides 20 W output when used with the LA-20 Linear Amplifier and plugged into the vehicle cigarette lighter through an SD-1 adapter.

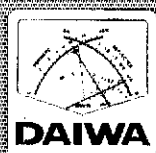
Use hand held transceiver for all functions ... Thumbwheel Frequency Selector ... Built-in S Meter ... Microphone ... Speaker.

For **base** operation, the MT-20A transceiver provides 20 W output with the LA-20A Linear Amplifier, or can be used with any linear amplifier connected through the SD-1 Adapter.

The new LA-20 2 meter linear amplifier provides 20 W at 13.8 VDC, 10 W with Nicad batteries of stable transmitting power using high performance transistors.

MT-20A SPECIFICATIONS

■ General		■ Receiver	
Frequency	144-148 MHz in 5 kHz steps	Circuitry	Double-conversion Superheterodyne
Emission type	(FM)	Sensitivity	Better than 1 μV for 20dB S/N
RF output impedance	50 ohm unbalanced (BNC socket)	Selectivity	Greater than ± 7.5kHz/ –6dB Greater than ± 15kHz/ –60dB
Power source	6.4V DC (5 x 1.2V DC)		
Current drain	150mA Max. on reception 28mA on reception with no input signal 500mA Max. on transmission	Image rejection	Better than –80dB
		Audio output	200mW (8 ohms)
Dimensions/weight	Main unit (without battery pack) 118mm(H) x 60mm(W) x 33mm(D)/230g Battery pack (Model BA-3/BA-3) 40mm(H) x 60mm(W) x 33mm(D)/120g	■ Transmitter	
		RF output power	High 1.5W Low 150mW
		Modulation	(FM)
		Spurious emission	Better than –60dB
Repeater device	Built-in – 600kHz transmit down shift switch + 600kHz transmit up shift switch	Microphone	Electret condenser Microphone, built in (Impedance 2K ohm)
		TU-1	CTCSS Unit optional
Illuminated Dial			



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please contact him prior to scheduling VE exams. Please help out as possible during holidays. Best of the season to all. OCT PSHR WB2VUK KA2MYJ W2PKY WB2MCO KC2TF K2ZVI N2BFG WA2YBM OCT. Traffic: KA2MYJ 245, KC2TF 205, WB2MCO 167, W2PKY 155, WB2VUK 138, K2ZVI 78, WA2YBM 33, K2HNW 24, N2BFG 14.

NEW YORK CITY—LONG ISLAND: John H. Smale, K2IZ — ASM/ACC: WB2IAP. SEC: KA2RGI. OCC: NB2T. TC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYX. The following are traffic nets in and around the section:

*NLI	CW	3630 kHz	1900/2200	WB2EUF
NOVHF		6.745 rpt	1930 M-F	K2MT
BAVHF		6.67 rpt	2000 M-F	K2YQK
SCVHF		5.37 rpt	2030 M-F	W2GZD
ESS		3590 kHz	1800	W2WSS
NYS/M		3677 kHz	1000	WB2EAG
NYS		3677 kHz	1900/2200	WB2EAG

*Denotes section net, all times are local, please try and help out by checking in whenever possible. LIMARC will continue to sponsor examination sessions on the second Saturday of the month at NY Inst. of Technology, Rt. 25A, Old Westbury, in Salten Hall, Rm2. Applicants are reminded to bring 2 forms of ID, orignal and a copy of your FCC license, check for $4.00 made payable to ARRL/VEC, 2 pens/or pencils, and a calculator for the math questions. For further info contact Woody Gerstner, WB2IAP, 42 Mohawk Ave., East Atlantic Beach, NY 11561. Tu Boro still has an active RTTY group on 145.620 simplex. Anyone interested in information on the "Packeteers of Long Island" should contact Leonard Jacobs, KA2EYW, 3 Gate Lane, Holbrik, NY 11741, or 516-472-3888. The following LIMARC members handled communications for the 2nd annual Long Island chapter to fight Hunger, Walk and Run: WB2IAP, KA2YMR, WB2VXX, KA2WWU. Kings county Radio Club runs a net on 144.97 simplex, most people congregate around that freq. about 2100 local. Congratulations to Tu Boro Radio Club. Oct. marked their 51st anniv. and 50th year of affiliation with the ARRL, the club also held its first Bunny hunt, winners were KA2WIJ and N2EZZ. LIMARC had a very successful bowling party with a total of 121 bowlers and spectators in attendance. High series was won by WA2DHF. Make plans to attend the next one. There are still a lot of very good reports coming in about the efforts of hams during the Mexican earthquake and Hurricane Gloria. If you discovered that you enjoy doing emergency work why not call Walter, KA2RGI and become a member of ARES. Traffic: K2YQK 270, W2GKZ 54.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM (VE liaison): N2XJ. SEC: KB2ZM. STM: KA2HNQ. OO/AA: N2WM. ACC: K2BJG. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. BM: N2CXX. OCTOBER 1985 appointments are: From the SEC, New: W2NKD DEC (Union), WB2HVF DEC (Essex); EC: KB2QO; OES's: KB2OO and W2NKD. From the STM, New ORS W2NKD. BM OBS's New: W2NKD and WA2CWA. From the TC New: ATC's W2JCI and WA2CWA. The NNJ Amateur Radio Emergency Service (ARES) now has District Emergency Coordinators (DECs) in place in 10 of the 12 counties comprising the NNJ section. These are: Bergen-W2CC, Essex-WB2HFV, Hudson-W2KB, Hunterdon-N2EP, Monmouth-W2ZEE, Morris-WB2VUF, Passaic-K2SE, Somerset-NE2M, Sussex-KX2O, and Union-W2NKD. More Emergency Coordinators and Official Emergency Stations are needed to cover municipal or other designated areas within these counties. Those interested in joining ARES should contact the DEC in your country. Middlesex and Warren counties still need DECs. Contact our SEC, if you are interested in any other NNJ ARRL field appointment, please contact the applicable leadership official listed above. Congratulations to the following who upgraded during October sessions of the NNJ VE Board, Bergen ARA, Ocean/Monmouth ARC, and Old Bridge RA. Novice: Henry Wyatt. Technician: KA2YOZ, KA2MMO, KA2STR, KA2WGZ, KA2WMR, Peter Teklinski, and Raymond Filler. General: WD2AHD, N2FVP, KA2OOG, KA2UFE, KA2WFH, KA2ZBN, N2FMZ, KA2UDO, KA2WXH, KA2UQW, and Kenneth Karluk. Advanced: WA2FYG, WA2YMK, N2FDK, WB2GOX, KA2QCY, KA2VSX, KA2QXE, and Tateshi Sunouchi. Extra: N2FRO, W2EJG, KA2HNY, KA2WPM, N2FMY, WB2RPW, WB2TTY, KC2ZV, and N3EHG. ASM (VE Liaison) N2XJ represented the NNJ section at a VE forum held at Westbury NY on Nov. 16th. The annual meeting of the Hudson Amateur Radio Council (HARC) will be held on January 18, 1986, 9:30 AM at the police headquarter training room, Englewood, NJ. All NNJ ARRL affiliate and other clubs are encouraged to send a representative.

October Data:

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1000 Dy	31	228	126
NJPN	3950	1800 Dy	Not	Available	
		0900 Su			
NJSN	3735	1830 Dy	31	170	45
NJN/E	3695	1900 Dy	Not	Available	
NJN/L	3695	2200 Dy	Not	Available	
NJVN	49/49	2230 Dy	31	226	69
OBTTN	147.12	2000 Dy	31	321	129
TCETN	146.685	1930 Dy	31	64	16
NJRTTY	147.51	Autostart	Not	Available	
NJPTN	145.01	WA2SNA-1 PBBS			

UPLINK Amateur Radio News call 201-735-8550. PSHR: KA2SPH 100, K2VX 97, N2XJ 89, WB2QMP 76, W2RRX 71. Traffic: N2XJ 178, KA2SPH 123, W2RRX 80, WB2QMP 76, K2VX 73, K2CS 64, W2XD 28, N2DXP 18, W2NKD 15.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY—SEC: KDØBG. OOC: KDØRT. ACC: WBØQAM. SGL: AKØQ. BM: KØIIR. PIO: NØEBA. TC: KØDAS. Hope everyone had a fine holiday season and looking forward to a good year ahead—THE SEC and myself attended an IVOAD (Iowa Volunteer Organizations Active during Disaster) meeting. Amateur Radio is the only communications group represented. District meetings are being planned, we will let you know of the dates so you might attend. Now I am accepting Nominations for the "1986 Iowa Ham of the Year"—Nominate that ham that you feel typifies the Iowa Ham! The paperwork has been sent to the Director for the Siouxland Amateur Radio Club to become the second SSC in Iowa. Congratulations to the folks in NW Iowa. Hope everyone can participate in the Iowa QSO Party in March, a club category is included this year.

Net	Freq.	UTC	DY	QNI	QTC	Sess.	Mgr.
75 mtr	3970	1830-2330	M-S	2038	129	54	WBØAVW
TLCN	3560	0030-0400	Dy	259	151	62	WØYLS
ITEN	3970	2330	SUNDAY	89	5	4	KDØBG
ICN	3703	8:00 PM	M-W-F	78	18	13	NCØR

Linn County ARES participated with the Palo Nuclear Plant exercise. Let's support the ICN. This month

represents the lowest number of reports that I have received in 5 years. Get those reports in, take credit for the work YOU do! Traffic: WØSS 206, WDØFWB 135, KØGP 100, W4JL 68, WØYLS 48, KØCY 37, WBØAVW 35, NCØR 30, KAØGSA 28, KCØXL 25, WØFQ 20, KØBRE 17, WØBW 16, KØHTP 13.

KANSAS: SM, Robert M. Summers, KØBXF—Regretfully, I inform you of another Silent Key. Willis, WAØIJJ, of Clay Center passed away Nov. 9. I have also been informed of the passing of the XYL of Ed, WØMYM. Effective November 1, 1985 we accomplished the changing of the guard so to speak. NØBLD Marshall Reece of Topeka became the Section Emergency Co-ordinator for KS. Perhaps now is the time to look at the ARES activity in your area. Or is there any?? If not maybe now is the time for someone to step up and volunteer to become an EC. Net activity for SEPT. KSBN QNI 1345 QTC 153. KPN 392/64. KWN 684/635. KMWN 906/713. CSTN 1650/58. OKS 265/54 and QKS-SS 54/21. Many tnx to WDØFIT and KAØPVY for keeping the slow speed net going while Ed, WØMYM, was occupied with family matters. The KS RTTY net seemed to drop out of existence for a bit but thanks to Bill, KAØCUF who will be picking up the loose ends and co-ordinating the RTTY activity for a while. New net times Mon and Wed at 7:15 P.M. local time, Sun 7:30 AM. The Hiawatha club provided communications for the Halloween Festival for the 19th straight year. KS Nebr Radio Club have elected as officers for the coming year, Marilyn KAØUAR Pres, Rick KAØRNI V. Pres. Don NØALB Sec. and Wilbur WØWNX treas. Late FLASH**KS Rtty net has adopted new hours due to skip etc. TUESDAY and THURSDAY at 6:30 AM local and SATURDAY and SUNDAY 7:30 AM local on 3605 kHz. Join the gang!! Traffic: WØQBK 499, WØFRC 194, WØFIR 185, KSØU 159, WØKL 145, WØHI 134, WØOYH 92, WØFDJ 78, KØBXF 68, NØGCC 49, WBØZEN 45, WAØHOZ 26, WØMYM 24, WØQMT 17, WØPB 8, NØAPJ 8, KAØE 4, WØRBO 2, NBØZ 1. (Sept.) WØHI 73, WØMTM 9.

MISSOURI: SM, Ben Smith, KØPCK—In conjunction with the World Series the Heart of America ARC operated a special event station on Oct. 19 and 20. Eight hundred QSOs were made. All 50 states were worked, six Canadian call areas and 16 DX contacts. The Emerson Electric ARC of St. Louis has a new repeater on the air. It is on 145.27/144.67. Clubs reporting their newly elected officers for 1986 are: Missouri Valley ARC of St. Joseph. Pres. KAØKCB, VP. WBØVRA, Sec. KAØIKS. Treas. WBØHNO and Board Members; WBØWXE, KAØKBY and KBØDE. Callaway Amateur Radio League ARC Pres. WØNUB, VP. KAØNMM and Sec-Treas. KSØM. The Kansas City ARC elected were: Pres. NØFTT, VP. KAØJLN, Membership Sec. KCØWX. Recording-Sec. KAØE and Treas. KØYLY. New Field Appointment for the month, ORS goes to NØBKE. On Oct. 19 the Heart of America ARC provided communications for the Armour Hills Run in Kansas City. Club members assisting were WBØEJJ, NØEBR, KMØL, WØAIB, KMØE, KAØQEX and NØJL. Silent Key reported WØCB. We hope all clubs will report their 1986 club officers and other club activities in 1986. On behalf of all the Missouri ARRL Section Officials we hope all amateurs and their families in the Section have an enjoyable Holiday Season and a great 1986.

Nets reporting:

Net	Sess.	QNI	QTC	Day	Time PM	Freq. MHz	Mgr.
MON	62	375	177	Dly	7:00/9:45	3.585	KØSI
MOSSB	31	859	104	Dly	9:00	3.963	KT5Y
MEOW	31	469	77	Dly	5:30	3.963	KØDSQ
HBN	23	370	19	Mon-Fri	12:05	7.280	KØDSQ
MTTN	28	122	13	Mon-Sat	6:30	3.970	KAØPGN
PHD	4	97	9	Mon	9:00	146.43	WAØKUH
PTN	10	18	7	MWF	9:00	21.114	WBØROQ
NEMOE	13	87	6	TTSat	7:30	144.53/5.13	KAØFTS
ZAEN	5	64	4	Tue	8:00	147.84/.24	K9OCU
RRABN	31	338	3	Dly	8:00	146.39/.79	KAØLLN
CMEN	6	72	3	Wed	9:00	145.16/.76	KØPCK
CCAN	6	72	3	Wed	8:30	146.46	WØNUB
CVE	9	33	2	MWF	7:00	3.710	KAØFTS
MCARES	4	48	1	Thu	8:30	146.52	WBØELJ
LOZFM	4	77	0	Sun	9:00	146.13/.73	WØRTL
SARN	5	48	0	Thu	9:00	146.43/7.03	WØENW
TCN	4	40	0	Thu	9:00	147.09/.69	KAØILD
JCCCN	5	38	0	Wed	8:00	146.40/7.00	WBØDZK
IFN	4	31	0	Wed	7:30	147.84/.24	WBØSZI
LARES	4	27	0	Wed	8:00	146.10/.70	WBØRHC
LOZCW	5	13	0	Sat	9:00	3.707	WØRTL

Traffic: KØSI 204, WØBMA 158, KCØAS 156, WAØYJX 130, KT5Y 117, KBØZL 102, KØPCK 70, K2ONP 59, NØEVC 49, NIØR 47, KØORB 38, NDØN 38, NØSS 36, KØDSQ 35, WØOUD 33, NØBKE 28, K9OCU 18, NP4D 10, WØVTF 6, WAØKUH 5, WBØCJB 1.

NEBRASKA: SM, Vern Wirka, WBØGQM. STM: Jerry Kohn, WDØEGK. SEC: Jim Sanford, NØAIH. Tim Hopkins, KABQDX, of Lincoln is now the Net Manager for the Eastern Nebraska Two Meter ARES net which meets Monday through Friday on the 146.16-76 MHz Beaver Crossing repeater at 0300 UTC. Scot Thompson, WBØWOT, of Omaha is the new emergency coordinator for Douglas County. The Nebraska CW NET now operates on 3647 kHz. The net times remain the same with the first session at 0100 UTC and second session at 0415 UTC. NCW Net Manager Grady Rea, WBØTED, of Lincoln is still looking for more Net Control Stations. The Western Nebraska Net which meets daily at 1400 UTC, except Sunday, on 3950 kHz has a daily average of 40 check-ins. The Pine Ridge Amateur Radio club reports that about 20% of the Western Nebraska net daily check-ins are members of the Pine Ridge Club. The long time editor of "Ham Hum," The monthly publication of the AK-SAR-BEN amateur radio club of Omaha, has retired. Dick Eilers/WØYZV has retired from the duties as editor after 35 years of dedicated service. "Ham Hum" has won several awards for being an outstanding ham publication during the years WØYZV served as editor. The new editor of "Ham Hum" is Mitch Gagne, NØAZF, Hamilton, NØCLW. Traffic: KØDKM 173, WØKK 77, NOØA 23, KAØBCB 14, WBØGQM 12, WAØBOK 9, WDØBOX 8, WDØBQG 4.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Robert J. Koczur, K1WGO—STM: K1EIC. SEC: KA1ECL. BM: K3ZJJ. ACC: KG1M. OO/RFI: NA1L. TC: W1HAD. PIO: KX1B. SGL: K1AH.

NET	FREQ	LOCAL TIME	QTC	QNI	NM
CN	3640	1900/2000	258	289	K1EIR
CPN	3965	1800 M-S	123	347	KA1BHT
NVTN	22/88	2130	24	190	WA1EMI
WCN	78/18	2030	211	465	WB1GXZ
RTN	13/73	2100	50	234	KA1JAN

Merry Christmas and a very Happy New Year to all in the Connecticut section. It has been a very busy and productive year with many services provided to the public by radio amateurs from all over. Keep up the good work. That is what our "hobby" is all about. WARC is planning their

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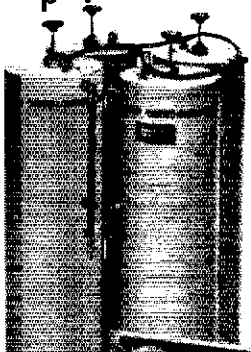

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(Reflected, 4/40/400 W)

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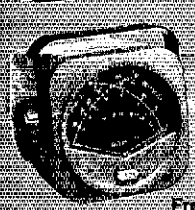
(N Type Connector)
Frequency Range: 140-450 MHz
Power: 2 Ranges (Forward, 20/200 W)
(Reflected, 4/40 W)



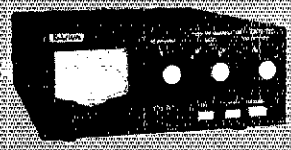
NS-448
900 MHz-1.3GHz
(Forward 5/20 W)
(Reflected 1.5/5.6 W)
Separate Sensor Type

	CN-520	CN-540	CN-550
Frequency Range:	1.8-60 MHz	50-150 MHz	144-260 MHz
Power Range:	200/2000 W	20/200 W	20/200 W

	CN-410M	CN-460M	CN-465M
Frequency Range:	3.5-150MHz	140-450 MHz	140-450 MHz
Power Range: Forward	15 W/150 W	15 W/150 W	15 W/75 W
Reflected	5 W/50 W	5 W/50 W	5 W/25 W

Back Lit, with mobile bracket.

ANTENNA TUNERS



Frequency Range:	CNW-518 3.5-30 MHz (8 bands)	CNW-419 1.8-30 MHz (17 bands)	CL-680 (no metering) 1.8-30 MHz (17 bands)	CNW-919 140-150 MHz
Power Rating:	1 kW CW (50% duty)	200 W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW (3.5-30 MHz) 100W CW (1.8-3.4 MHz)	200W CW 10-250ohm
Output Impedance:	10-250/25-100 ohm (On 3.5 MHz)	10-250 ohm	10-250 ohm	

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144 MHz 7/8λ
Double Capacitive Loading

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144/440 MHz
2 Bands

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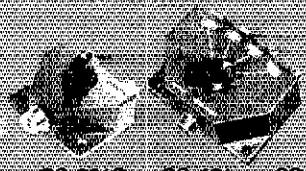

COAXIAL SWITCHES

PAT. No. 59-000803

	CS-201 2position	CS-201G 2position	CS-401 4position	CS-401G 4position	CS-4 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				

POWER AMPLIFIERS

	LA-2035	LA-2035R	LA-2065R
Band:	144-148 MHz	144-148 MHz	144-148 MHz
Input Power:	0.5-3 W	0.5-3 W	0.5-5 W
Max. Output Power:	30 W plus	30 W plus	60 W plus

POWER SUPPLIES

PS-30XM	Max 31A/Continuous 24A 1 VDC-15 VDC Variable	
PS-310M	Max 31A/Continuous 24A 3 VDC-14.6 VDC Variable	
PS-310MD	Max 31A/24A Continuous 13.8 VDC Fixed Plus sub-DC outlets. Max 5.6A/5A Continuous 3 VDC-14.6 VDC	**Heavy Duty Power Supply** PS-580MD Max 55A/44A Continuous Plus sub-DC outlet 10.6/10A 1 VDC-15 VDC

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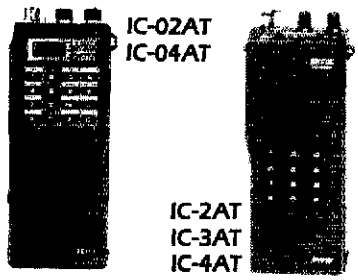

IC-02AT
IC-04AT

IC-2AT
IC-3AT
IC-4AT

VHF/UHF HANDHELDS

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Order your IC-745 with: Astron RS20A 20A power supply, ICOM SM-6 desk mic and ICOM FL-52A, 500Hz CW filter installed.

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BP-2 425mA 7.2V NICAD Battery	39.50
BP-3 250mA 8.4V NICAD Battery	29.50
BP-4 Alkaline Battery Case	12.50
BP-5 425mA 10.8V Battery	49.50
BP-7 425mA 13.2V NICAD Battery	67.50
BP-8 800mA 8.4V NICAD Battery	62.50
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HS10 Headset for HTs	19.50
HS10SA VOX Unit for IC-02AT	19.50
HS10SB PTT Switch Box	19.50

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New compact general coverage receiver/ham band transceiver.

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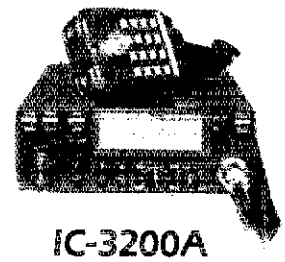

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2M and 70CM

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IC-R7000

25 – 1300MHz receiver direct entry and scanning

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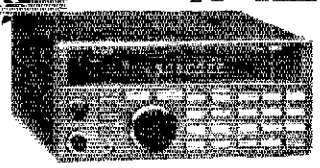

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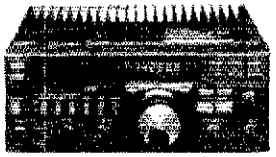

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Full featured HF transceiver with general coverage receiver

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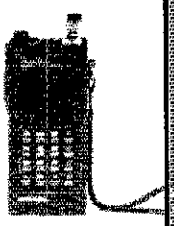

TR2600A
TR3600A

TH21AT
TH31AT
TH41AT

Full line of accessories available.

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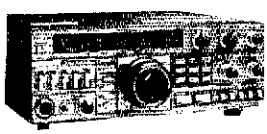

TS-430S

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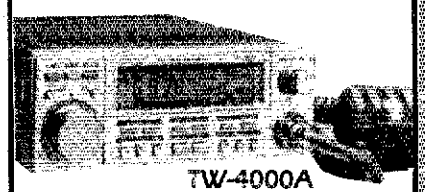

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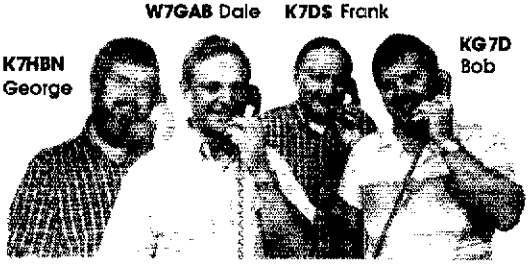

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IC-735

New ideas are a natural part of progress. No one is more aware of that fact than ICOM. We introduced fully solid state transceivers when others were still in the throes of vacuum tubes. Independent dual VFO's and tunable memories are two other ICOM innovations.

Whether you're interested in trying new areas, operating casually, or multi-multi contesting, we're ready to serve your needs with today's top quality gear...and we stand behind every unit after the sale. As we've learned through conversations with individuals around the country, however, new products can't be fully understood in a single advertisement. This page is intended to bridge that void and pique your creative thinking.

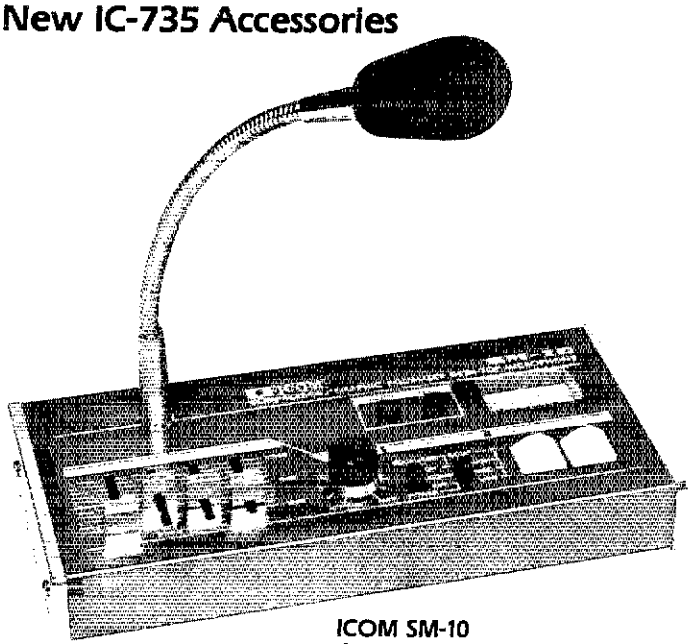
Our new ICOM IC-735 HF transceiver with general coverage receiver is, in our opinion, today's best features-per-dollar value in amateur radio. It's the ideal "no compromise" unit for experts or newcomers and its compact size is equally suited for home, mobile, or portable installations. Its trim cabinet design results from using a wide internal heat sink and a long horizontally mounted squirrel cage blower which provides quiet cooling and long term reliability. Other special features include a transmitted audio control which mates the unit and microphone to one's voice characteristics for superb sounding SSB, full break-in with optional narrowband filters and internal electronic keyer for top CW performance. Up front, there are dual VFO's and 12 memories that store both frequency and mode data.

How do you use 12 memories when there are only eight HF bands available at the present time? That depends, naturally, on personal preferences. You can casually operate with pushbutton ease, make it sing like a nimble sports car, or mix those capabilities. Suppose, for example, we store favorite operating frequencies in memories 5 through 12 and use memories 1 through 4 for a competing edge in weekend contests. We'll begin a morning's operation on 20 and 40 meters with VFO "A" on 7.150MHz and VFO "B" on 14.155MHz. Tuning VFO "B," a slightly weak FK8 is heard working a KL7 on 14.162MHz. If we sit and wait for the QSO's end, we could miss more or better DX, or become involved in a massive pileup. The FK's frequency is thus stored in memory 1 and tuning continues. A 3D2 is spotted calling CQ on 14.195MHz, and a memory 1 recheck shows the FK8 still in QSO. We call, but the 3D2 returns to a VK4. We store his frequency in memory 2, then switch operation to VFO "A." A VK7 is spotted chatting on 7.158MHz, and placed in memory 3. Further tuning reveals a JA2 on 7.180MHz. Meanwhile, the memory rechecked FK8 begins signing on 14.162MHz. We call and successfully contact the FK8, then as the QSO ends we recheck memory 2, 3, and VFO "A." The JA is contacted next, but we've still had time to tune 15 meters with memory 10, shift a spotted DX station directly to VFO "B," and continue the pursuit. Within a few minutes time, we've contacted several exciting amateurs while others are patiently awaiting their chance in a single frequency QSO.

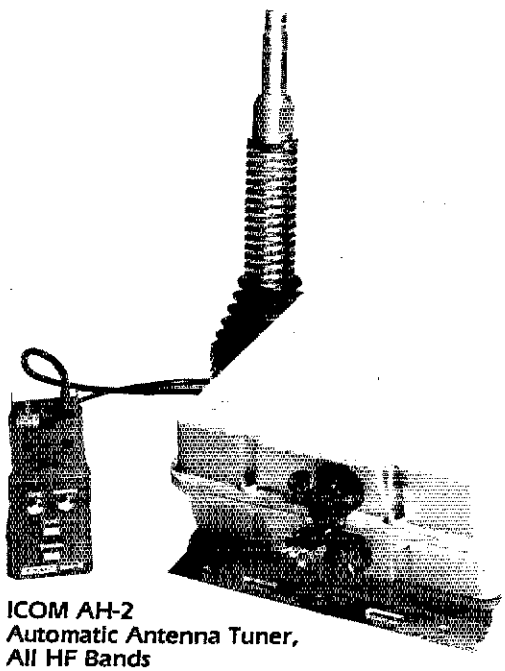
With slight changes, our previous example can be applied to emergency, newsworthy, or net-type operations. The flexibility of our solid state/broadband and microprocessor controlled designs are endless.

While the previous features are exciting and inspiring, they are meaningless if a unit becomes unexpectedly damaged or inoperative. That's why we're striving for the fastest and most effective service policy in the industry: service centers nationwide plus a main office "turn around time" not exceeding three working days as standard operating procedure. We understand your investment in amateur gear, we recognize the valuable service you provide to society, and we're devoted to serving your needs. After all, isn't that the main difference between a basic importer and a dedicated manufacturer?

New IC-735 Accessories



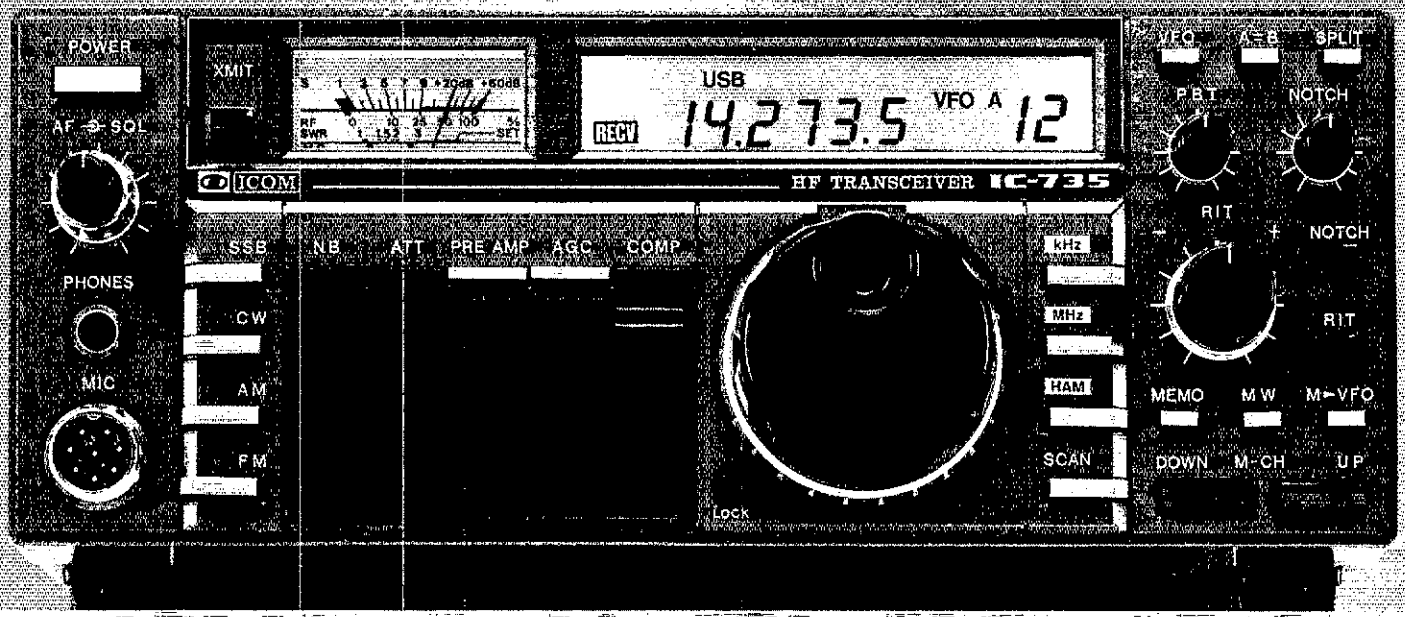
ICOM SM-10
Compressor/Graphic Equalizer
Desk Top Microphone



ICOM AH-2
Automatic Antenna Tuner,
All HF Bands

NEW!

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

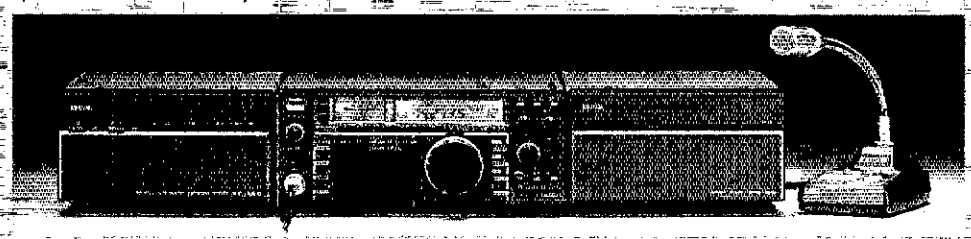
It's a high performer on all the ham bands, and as a general coverage receiver, the IC-735 is exceptional. The IC-735 has a built-in receiver attenuator, preamp and noise blanker to enhance receiver performance. PLUS it has a 105dB dynamic range and a new low-noise phase locked loop for extremely quiet 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 EXM-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, speech processor, 12V operation, continuously adjustable output power 5 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.

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COM Dual Bander

IC-3200A

The Most Compact Dual Bander at the Smallest Price

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25 Watts. The IC-3200A elivers 25 watts of output on oth bands. Or the low power an be adjusted to one to ten atts.

Compact. The IC-3200A is only 5½"W x 2"H x 8½"D.

Simple to Operate. With only 14 front panel controls, the IC-3200A is by far the easiest dual bander to use.

Memory Lockout. For scanning only certain memory channels, ICOM utilizes a memory skip (M SKIP) function.

10 Tunable Memories. To store your favorite frequencies, 10 memories are provided. Each memory will store the receive frequency, transmit offset, offset direction and PL tone. Each memory can be tuned up or down when selected, yet automatically returns to the original frequency when reselected. All memories are backed up with a lithium battery.

Scanning. The IC-3200A has four scanning systems... memory scan, band scan, program scan and priority scan.

Other Outstanding Standard Features:

- New, LCD display, easy to read in bright sunlight
- Tone encoder (all PL/subaudible tones built-in)
- IC-HM14 mic with up/down scan and DTMF
- One antenna connector. (Duplexer already installed!)
- Variable tuning increments 5 and 15KHz (2-meters) 5 and 25KHz (70cm)
- Frequency dial lock
- Dual VFO's
- Mounting bracket

Optional Accessories. An optional IC-PS30 system power supply, voice synthesizer and IC-SP10 speaker are available.

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 3200A185

AMERITRON

AL-1200

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1500 Watts Output—All Modes
160 Through 15 Meters

The **Ameritron AL-1200** Linear Amplifier is designed for 1500 watts output (over 2500 watts input) on all modes with high efficiency and total reliability. The **AL-1200** covers the amateur radio bands 160 through 15 meters. It also features wide frequency coverage for MARS and other services authorized to operate at high power.

The **AL-1200** uses the rugged, inexpensive Eimac 3CX1200A7 high-mu ceramic/metal triode in a Class AB_2 grounded grid circuit.

The built-in ALC circuit prevents the amplifier output from exceeding 1500 watts if the exciter gain is inadvertantly set too high.

The power supply has a commercial service rated 32 lb. hypersil transformer and heavy duty rectifiers in a full wave bridge circuit with computer grade capacitors. No load voltage is 3600 V. full load voltage is 3300 V.

Two bias settings allow either high efficiency RTTY and CW operation at 1500 watts of continuous output at nearly 70% plate efficiency or low distortion 1500 watt PEP, SSB, SSTV, or AM output.

AL-1200 SPECIFICATIONS:

Frequency Coverage: 1.8, 3.5, 7, 14, 21 MHz and WARC bands. Export model also includes 28 MHz.

Input Circuit: adjustable pi-network, VSWR 1.2:1 or less at resonance.

Input Bandwidth: 20% for 2:1 VSWR or better.

Drive Requirements: 90 watts typical for 1500 watts output.

Dimensions: 18½"D. x 17"W.x10"H.
Weight: 77 lbs.

AL-80A LINEAR AMPLIFIER

The Ameritron AL-80A combines the economical 3-500Z with a heavy duty tank circuit to achieve nearly 70% efficiency from 160 to 15 meters. It has wide frequency coverage for MARS and other authorized services. Typical drive is 85 watts to give over 1000 watts PEP SSB and 850 watts CW RF output. A new Pi-L output circuit for 80 and 160 gives full band coverage and exceptionally smooth tuning.

The AL-80A will provide a signal output that is within 1/2 "S" unit of the signal output of the most expensive amplifier on the market—and at much lower cost. Size: 15½"D.x14"W.x8"H. Weight: 52 lbs.

AMERITRON, DIVISION OF PRIME INSTRUMENTS, INC.
9805 WALFORD AVENUE • CLEVELAND, OHIO 44102 • (216) 651-1740

AMATEUR TELEVISION

BANKAMERICARD VISA

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Maryann WB6YSS
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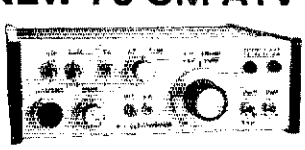
ARCADIA, CA 91006
Tom W6ORG

master charge

NEW 70 CM ATV TRANSCEIVER



$299 delivered
TC70-1

***FULL COLOR, SOUND & LIVE ACTION** just like broadcast TV. Get on this exciting amateur video mode at our affordable ready to go price.

***FEATURES:** small 7x7x2.5". Push to look (PTL) T/R switching. GaAsfet downconverter tunes whole 420-450 mHz band. Two switch selected video & audio inputs . . .10 pin color camera jack & RCA phone jacks. Xmit video monitor output. Over 1 watt pep RF output on one or two (add $15) selected crystal controlled freq. 439.25, 434.0, or 426.25 mHz.

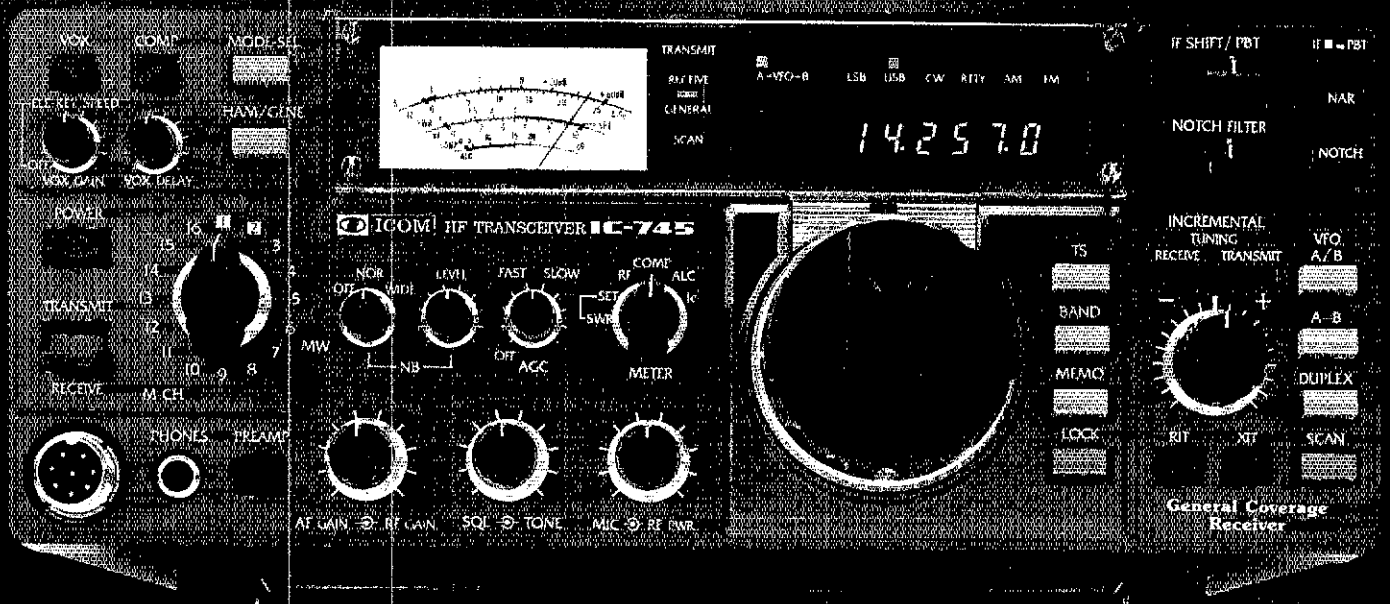
ATV APPLICATIONS: you can show the shack, projects, home video tapes, computer graphics & listings, repeat SSTV, or even Space Shuttle video & audio if you have a home satellite receiver. Do public service events such as marathons, races, parades, search & rescue, major fires, repeat weather radar, etc. DX depends on terrain and antennas, typ. 1 to 40 miles. For greater DX we have 20 watt amp for $109 and 50 watts for $185.

WHAT IS REQUIRED FOR A COMPLETE OPERATING SYSTEM? The TC70-1s downconverter outputs to any TV on ch 3 for receiving. Connect a good 70 cm antenna and low loss coax. Plug in camera, VCR, computer, etc. or any composite video source. Plug in mic for standard 4.5 mHz TV sound. Connect to 13.8 vdc for base mobile or portable. SEE Chapt. 20 1985 ARRL Handbook. That's it!

CALL (818) 447-4565 OR WRITE FOR OUR CATALOG, more info, or who is on in your area. Downconverters start at $49 to receive. We stock antennas, modules and everything you need for ATV. Prices include UPS surface in cont. US. Transmitting equipment sold only to licensed Tech class or higher amateurs verifiable in 85 callbook or copy of new license.

COM HF Transceiver

IC-745

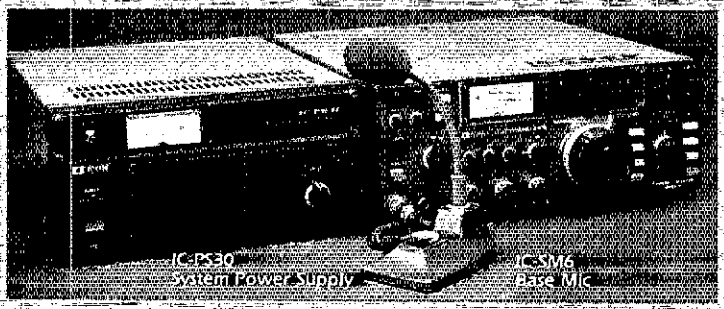


High Performance Maximum Flexibility

The IC-745 is a full featured, high performance HF base station transceiver with a 100dB dynamic range receiver. PLUS features usually found only in more expensive units.

Compare these exceptional standard Features:

- 100KHz – 30MHz Receiver
- 100 Watt RF output / 100% Duty Cycle
- Passband Tuning AND IF Shift
- Adjustable Noise Blanker (width and level)
- Adjustable AGC
- Receiver Preamp
- 16 tunable Memories with lithium battery backup



- Wide selection of filters and filter combinations (opt.)
- Continuously adjustable transmit power
- 10Hz/50Hz/1KHz Tuning rates with 1MHz band steps
- IC-HM12 Microphone with Up/Down Scan

Other Standard Features: Included as standard are many of the features most asked for by experienced ham radio operators: dual VFO's, RF speech compressor, tunable notch filter, program band scan, memory scan, all-mode squelch and VOX.

Options. IC-EX310 Speech synthesizer, internal IC-PS35 power supply, external IC-PS15 or IC-PS30 system supply, IC-SM8 two-cable desk mic, EX241 marker, EX242 FM module, EX243 electronic keyer, IC-SM6 desk mic, and a variety of filters.

Filter	6dB Width	Center Freq. MHz
FL45	500 Hz	9.000
FL54	270 Hz	9.000
FL44A	2.1 KHz	0.455
FL52A	500 Hz	0.455
FL53A	250 Hz	0.455

The IC-745 is the only transceiver today that has so much flexibility at a suprisingly low price. See it at your local ICOM dealer.

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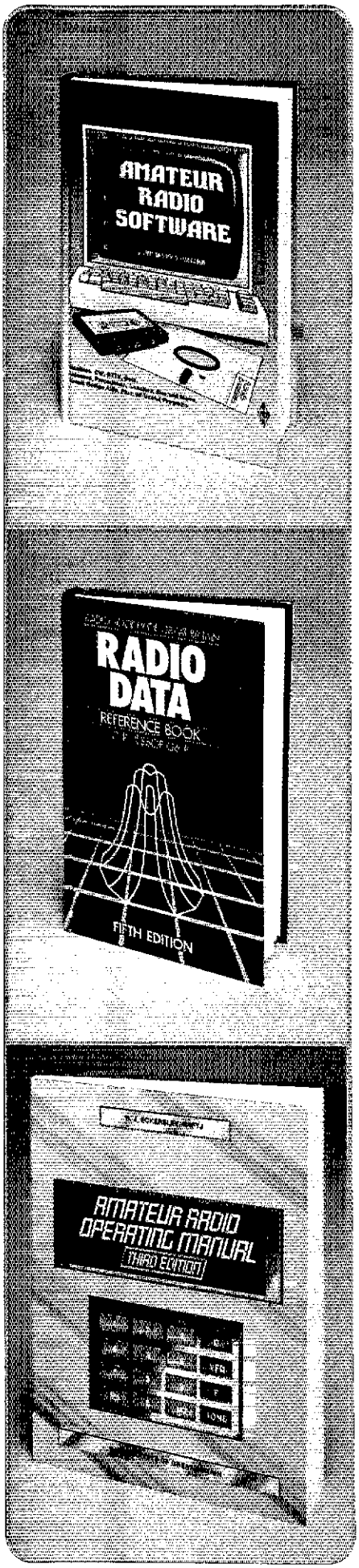


THE LATEST FROM RSGB

AMATEUR RADIO SOFTWARE by John Morris, GM4ANB. Designed to be a sourcebook for the radio amateur program. Contains 86 programs written in BASIC and 6 in assembly language. The introductory chapter describes the differences between various versions of BASIC so that the programs presented can be modified slightly in order to be used on as many types of computers as possible. The remaining 8 chapters cover: CW, sending and receiving; RTTY and Data including Amtor and packet; Antennas and Propagation, predicting path loss, propagation predictions; Distances, Bearings and Locators; Satellites, predicting elliptical and geostationary orbits; Sun and Moon; Circuit Design Aids, filters and matching networks; Miscellany, a simple data base system and network analysis package. Copyright 1985, 328 pages, $15.00 hardbound. First Edition.

RADIO DATA REFERENCE BOOK by G.R. Jessop, G6JP. This handy publication is divided into 9 chapters: Units and symbols, Basic calculations, Resonant circuits and filters, Circuit design, Antennas and transmission lines, Radio and TV services, Geographical and meteorological data, Materials and engineering data, and Mathematical tables. You'll find hundreds of useful tables, charts, and formulas. Fifth Edition, Copyright 1985, 244 pages, $15.00 hardbound.

AMATEUR RADIO OPERATING MANUAL by R. J. Eckersley, G4FTJ. The latest edition just off the press. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. Third Edition, Copyright 1985, 204 pages. Softbound $10.00

THE AMERICAN RADIO RELAY LEAGUE, INC.
225 MAIN STREET
NEWINGTON, CT 06111

ICOM 440MHz

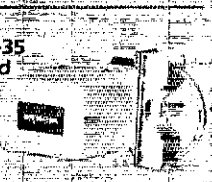
For a Total UHF System, Choose ICOM

ICOM offers a variety of UHF gear to meet your operating requirements... the IC-471H base station transceiver, IC-47A compact mobile, IC-04AT or IC-4AT handheld transceivers, and the RP-3010 crystal controlled repeater.

The IC-471H all mode 430–450MHz base station transceiver provides 10 to 75 watts of adjustable power. With 32 full-function memories, 32 PL tones, memory scan, mode scan and programmable band scan, the IC-471H provides maximum UHF base station performance. The IC-471A 25 watt version is also available.

The IC-47A 25 watt 440–449.995MHz ultra-compact FM mobile provides superb performance in the mobile environment. Measuring only 5½" wide by 1½" high by 9" deep, the IC-47A also features nine full-function memories, 32 built-in PL tones and a complete scanning system. Each unit comes standard with an HM-23 mic with up/down scan and a mobile mounting bracket.

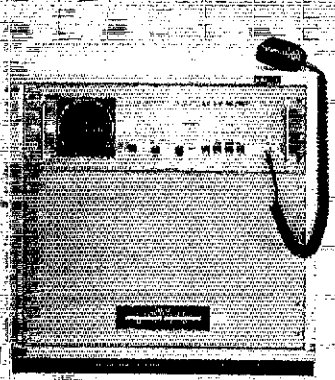
Optional AG-35 Mast Mounted GaAsFET Preamplifier for IC-471H



The IC-04AT top-of-the-line UHF handheld features DTMF direct keyboard entry, LCD readout, 32 PL tones, 3 watts standard (5 watts optional) and 10 memories which store duplex offset and PL tone.

The IC-4AT handheld features 440–449.995MHz coverage, a DTMF pad, 1.5 watts output and thumbwheel frequency selection.

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.



The RP-3010 crystal controlled UHF repeater covers from 430–450MHz and includes CTCSS, 3 digit DTMF decoder and CW ID'er.

See ICOM's full line of UHF gear at your local ICOM dealer.

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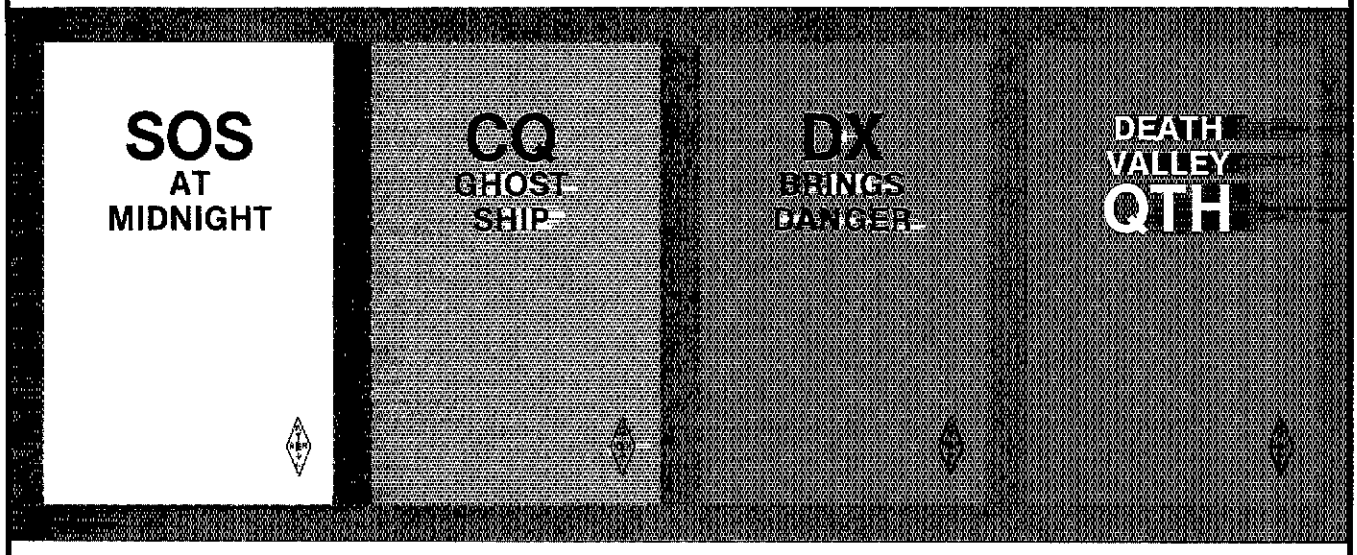
K6ATX IS BACK!



GREAT HAM RADIO ADVENTURES!

Tommy Rockford, K6ATX is back on the trail of high adventure! ARRL is proud to bring back updated editions of Walker Tompkins' exciting classics plus the *brand-new* thriller, **Death Valley QTH.** Newcomer and oldtimer alike will find that you just can't put these books down; and what a way to spark an interest in Amateur Radio among unlicensed individuals as well!

In **Death Valley QTH,** what starts out to be a typical field day operation becomes a matter of life and death for K6ATX and the members of the Santa Bonita Amateur Radio Club. **SOS at Midnight** finds Tommy up against the Purple Shirt Gang. Spark Gap Gallagher seems 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 conslusion to **DX Brings Danger.**

These new ARRL publications represent the efforts of accomplished TV screenwriter, newspaper columnist, historian, and biographer Walker Tompkins who is K6ATX in real life.

Each title is $5.00. Please add $1.00 for shipping and handling on orders under $10.00. Expected shipping dates: *SOS at Midnight* and *CQ Ghost Ship*, December 1. *DX Brings Danger* and *Death Valley QTH*, December 15. Available from: ARRL, 225 Main Street, Newington, CT 06111.

OM 2-Meter Mobile

IC-27H

Compact Size No Compromise

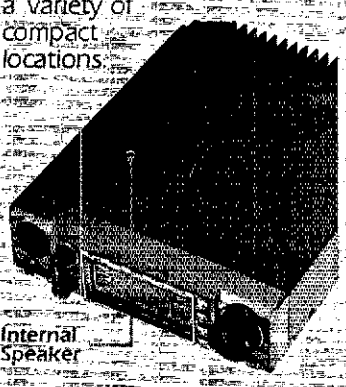
ow ICOM offers the best ices in compact 2-meter mobiles...the IC-27H watt compact and the 7A 25-watt ultra com- t mobile.

ze. The ICOM IC-27A IC-27H measure only W x 1½"H x 7"D (IC-27H is leep).

asy to Operate. Even ugh the IC-27A and IC-27H the smallest mobiles they e large operating knobs ch are easy to use in the ile environment.

2 PL Frequencies. The pacts come ready to go with 32 PL frequencies.

Internal Speaker. The compacts feature an internal speaker which allows the mobiles to be mounted in a variety of compact locations.


Internal Speaker

9 Memories. The compact mobiles have 9 memories which will store the receive frequency, transmit offset, offset direction and PL tone. All memories are backed up with a lithium battery.

Speech Synthesizer. To verbally announce the receive frequency, an optional UT-16 voice synthesizer is available.

Scanning. The ICOM compacts have four scanning systems...memory scan, band scan, program scan and priority scan. Priority may be a memory or a VFO channel...and the scanning speed is adjustable.

More Features. Other standard features include a mobile mount, IC-HM23 DTMF mic with up/down scan and memory scan and internally adjustable transmit power. An optional IC-PS45 slim-line external power supply and IC-SP10 external speaker are also available.

See the IC-27A/H compact mobile transceivers at your local ICOM dealer. For superb performance and reliability your only choice is an ICOM.

Also Available are the IC-37A 220MHz and IC-47A 440MHz 25 watt compact mobiles.

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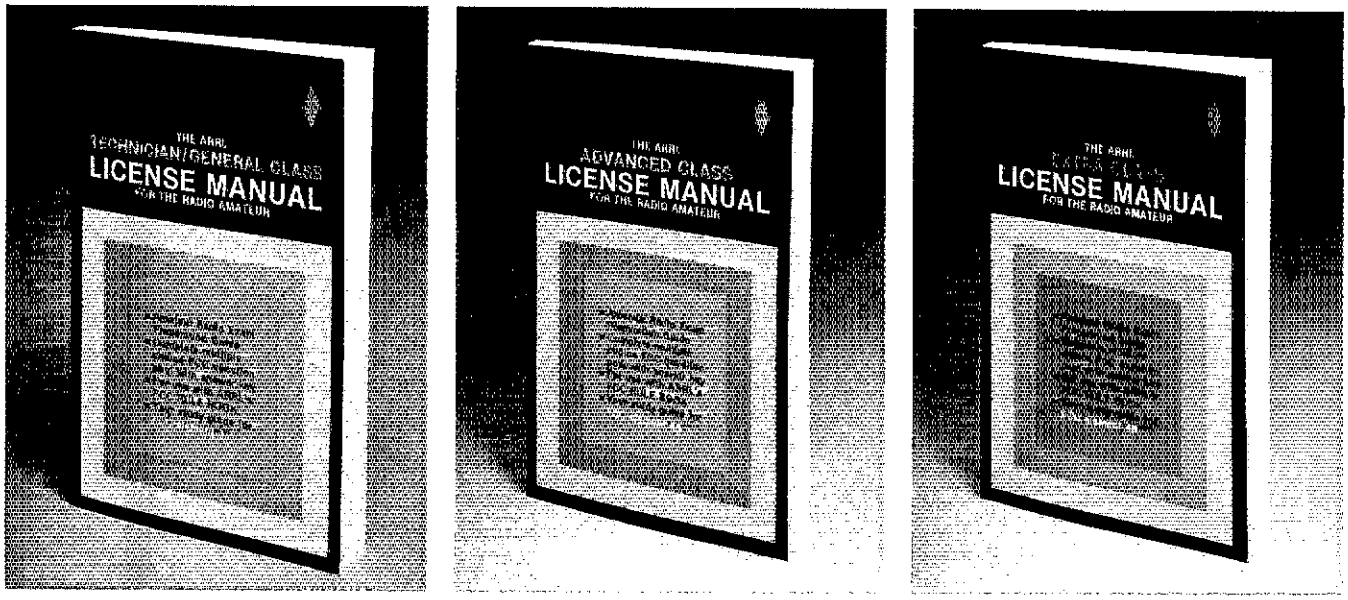
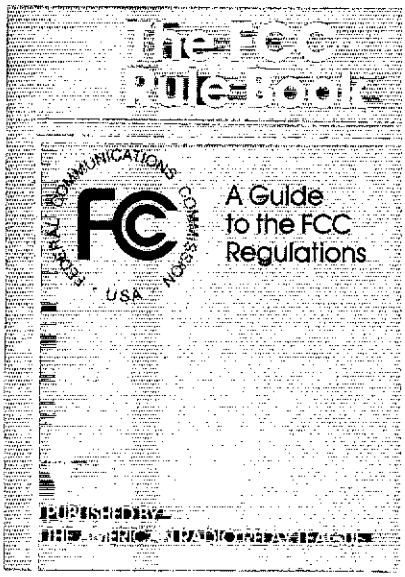


NEW, EXPANDED 5TH EDITION

TUNE IN THE WORLD WITH HAM RADIO

Tune-in the World with Ham Radio has been expanded by 48 pages and presents the most up-to-date information the student needs in order to understand the basics of Amateur Radio and pass the Novice exam. Material is organized into 12 chapters (double the number of the previous edition) and it is presented in easy to understand "bite-sized" sections. A code learning cassette is included in the package. **Tune in the World** and the highly acclaimed **ARRL License Manual Series** contains accurate text explanations along with FCC Question pools and answer keys. Every amateur needs a current copy of the FCC rules and interpretations, and **The FCC Rule Book** fills this need besides being "must reading" as a study guide for the regulatory material found on the exams.



Tune in the World with Ham Radio $10.00.
The ARRL License Manual Series:

Technician/General	$5.00
Advanced	$5.00
Extra	$5.00
FCC Rule Book	$3.00

$1.00 Shipping and Handling on orders under $10.00

The American Radio Relay League, Inc.
225 Main Street
Newington, CT 06111

IC-02AT

ICOM 2-Meter Handhelds

If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

Frequency Coverage. The IC-02AT covers 140.000 through 151.550MHz and the IC-2AT, 141.500 through 149.994MHz...both include frequencies for MARS operation.

IC-02AT Features. ICOM's top-of-the-line IC-02AT handheld has the following outstanding features:

- DTMF direct keyboard entry
- LCD readout
- 3 watts standard, 5 watts optional (with IC-BP7 battery pack)
- 10 memories which store duplex offset and PL tone (odd offset can be stored in last 4 memories)
- Frequency dial lock
- Three scanning systems: priority, memory and programmable band scan (selectable increments of 5, 10, 15, 20 or 25KHz)

IC-2AT Features. The IC-2AT is ICOM's most popular handheld on the market. The IC-2AT features a DTMF pad, 1.5 watts output and thumbwheel frequency selection. The IC-2A is also available and has the same features as the IC-2AT except DTMF.

Accessories. A variety of slide-on battery packs are available for the IC-02AT and IC-2AT, including the new long-life 800mAh IC-BP8 which can be used with both handhelds.

Other accessories include the HS-10 boom headset, HS-10SB PTT switchbox, HS-10SA VOX unit (for IC-02AT) and an assortment of battery pack chargers.

The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug. See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

IC-2AT

IC-02AT

Often imitated, never duplicated.

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

Catch of the day!

Have you been trawling the bounding main for a new product? We have just netted it—the TP-38 microprocessor controlled community repeater panel which provides the complete interface between the repeater receiver and transmitter. Scuttle individual tone cards, all 38 EIA standard CTCSS tones are included as well as time and hit accumulators, programmable timers, tone translation, and AC power supply at one low price of $595.00. The TP-38 is packed like a can of sardines with features, as a matter of fact the only additional option is a DTMF module for $59.95. This module allows complete offsite remote control of all TP-38 functions, including adding new customers or deleting poor paying ones, over the repeater receiver channel.

$595.00 each
$59.95 DTMF module

Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and is shipped fresh daily. Why not set passage for the abundant waters of Communications Specialists and cast your nets for a TP-38 or other fine catch.

COMMUNICATIONS SPECIALISTS, INC.
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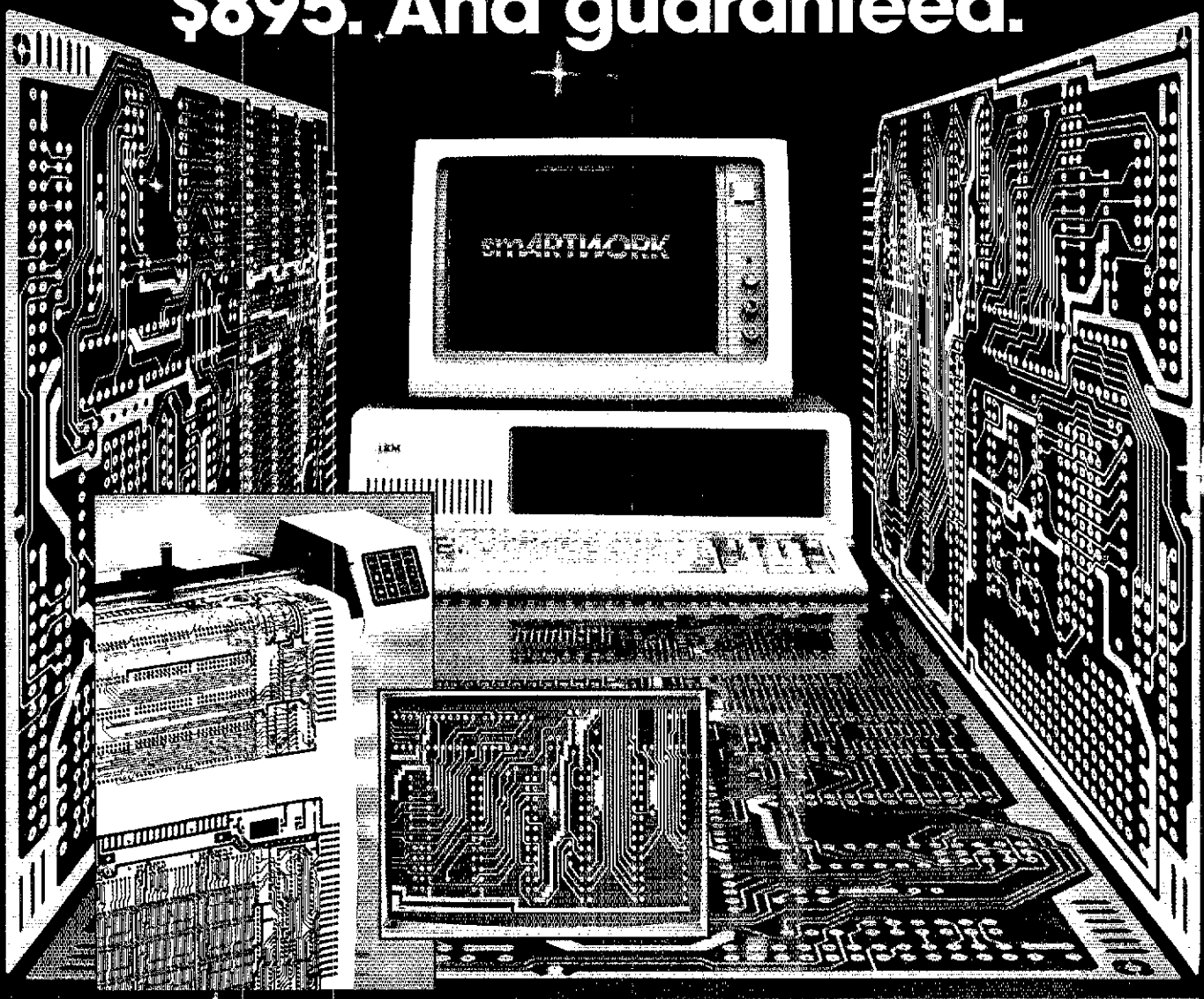
Circuit-Board-Artwork Software: $895. And guaranteed.



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smARTWORK® advantages:

- ☐ Complete interactive control over placement and routing
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- ☐ Production-quality 2X artwork from a pen-and-ink plotter
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- ☐ Easy to learn and operate, yet capable of sophisticated layouts
- ☐ Single-sided and double-sided printed circuit boards up to 10 x 16 inches
- ☐ Multicolor or black-and-white display

System Requirements:

- ☐ IBM Personal Computer, XT, or AT with 320K RAM, 2 disk drives, and DOS Version 2.0 or later
- ☐ IBM Color/Graphics Adapter with RGB color or black-and-white monitor
- ☐ IBM Graphics Printer or Epson FX/MX/RX series dot-matrix printer
- ☐ Houston Instrument DMP-41 pen-and-ink plotter
- ☐ Microsoft Mouse (optional)

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At $895, smARTWORK® is proven, convenient, fast — *and guaranteed.* Call us today. And put smARTWORK® to work for yourself next week. Try it for 30 days at absolutely no risk. That's smart work.

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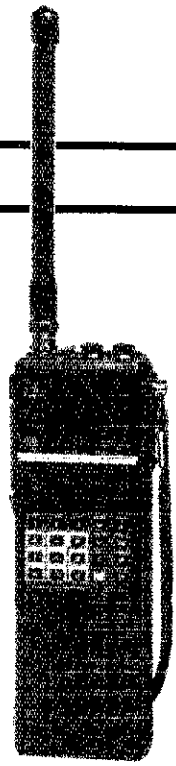


FT 203
2m HT with TTP

FT 103
220 MHz HT / TTP

FT 703
440 MHz HT / TTP

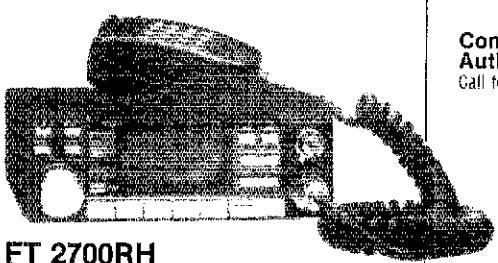
FT 209RH
2m Handheld

FT 709R
440 MHz Handheld

Accessories:
YH-2 Headset
MH-12A2B Speaker/Microphone
FTS-6 Programmable Tone Squelch
PA-3 DC/DC Car Adapter/Trickle Charger
MMB-21 Mobile Hanger Bracket
NC-15 Quick Charger/DC Adapter
FBA-5 Battery Case for 6xAA
FNB-3 10.8V, 425 mAh Ni-Cd pack
FNB-4 12V, 500 mAh Ni-Cd pack

FT 726R
Especially good for Oscar

Accessories:
6m-726 6-meter module
430-726 430-440 unit for Oscar
440-726 440-450 FM unit
HF-726 10-12-15 meter unit
SU-726 Satellite Duplex module
XF 455 MC 600 Hz CW Filter

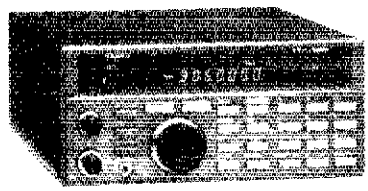


FT 2700RH
Duo-band 2m/440 Mobile Radio

FT 270RH
Compact 45 Watt 2m FM Mobile

Accessories:
FTS-8 Programmable Tone Squelch Unit
FVS-1 Voice Synthesizer Unit

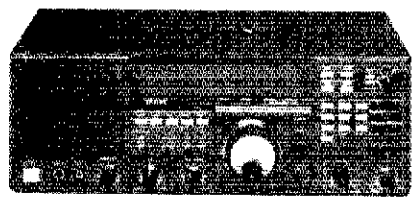
SHORTWAVE LISTENING



FRG 9600
Scanning Receiver for 60-905 MHz
FM/AM/SSB, 100 memories

Accessories:
PA-4B/PA-4C AC-DC Wall Adapter
SP-55 External Speaker
NTSC Video Unit

Coming soon: Software to extend the range of the 9600. Call for details.



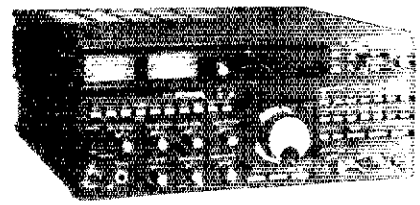
FRG 8800
General Coverage Receiver
All-band, all-mode
AM/SSB/CW/FM, 150kHz-30MHz

Accessories:
FRV-8800 Converter for 118-174 MHz
FRA-7700 Active Ant for 150kHz-30MHz
FRT-7700 Antenna Tuner
DC-8800 12-volt kit
SP-102 Speaker with filters

Commercial Land Mobile Authorized Dealer
Call for more information

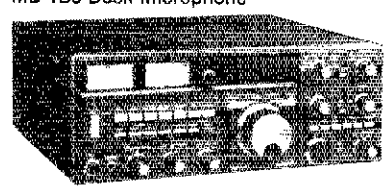
Call to check our new low prices on the FRG 8800, FT 270RH, FT 2700RH, FT 203RK, and FT 103RK.

HF TRANSCEIVERS



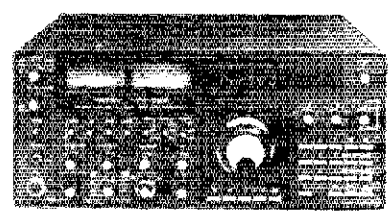
FT 757GX
Mobile Transceiver, SSB/CW/AM/FM
General Coverage Receiver
Receives 500kHz-30MHz

Accessories:
FP-757GX Flatpack Power Supply
FP-757HD Heavy Duty Power Supply
FC-757AT Automatic Antenna Tuner
FAS-1-4R Remote Antenna Selector
SP-102 Speaker
SP-102P Speaker
MMB-20 Mobile Mounting Bracket
FRB-757 Relay Box
MD-1B8 Desk Microphone



FT 980 CAT
Computer Controlled Transceiver

Accessories:
GEN-980 General Coverage Kit
XF 8.9 HC 600 HzCW Filter
XF 455.8 MCN 300 Hz CW Filter
SP-980 Speaker
SP-98P Speaker Patch
MD-1B8 Desk Microphone



FT ONE
General Coverage Transceiver
The all-mode Super Radio

FT 77
Compact Transceiver

Accessories:
FP-700 Power Supply
FC-700 Antenna Tuner
FM-77 FM Unit
MK-77 Marker Unit
FV-700DM External VFO
XF 8.9 KC 600 Hz CW Filter

ege, inc. 13646 Jefferson Davis Highway, Woodbridge, Virginia, 22191 Call for information & Service: (703) 643-1063

Orders & Quotes Call Toll Free: 800-336-4799 In VA: 800-572-4201

Yaesu has serious listeners for the serious listener.

Yaesu's serious about giving you better ways to tune in the world around you.

And whether it's for local action or worldwide DX, you'll find our VHF/UHF and HF receivers are the superior match for all your listening needs.

The FRG-9600. A premium VHF/UHF scanning communications receiver. The 9600 is no typical scanner. And it's easy to see why.

You won't miss any local action with continuous coverage from 60 to 905 MHz.

You have more operating modes to listen in on: upper or lower sideband, CW, AM wide or narrow, and FM wide or narrow.

You can even watch television programs by plugging in a video monitor into the optional video output.

Scan in steps of 5, 10, 12½, 25 and 100 KHz. Store any frequency and related operating mode into any of the 99 memories. Scan the memories. Or in between them. Or simply "dial up" any frequency with the frequency entry pad.

Plus there's more, including a 24-hour clock, multiplexed output, fluorescent readout, signal strength graph, and an AC power adapter.

The FRG-8800 HF communications receiver. A better way to listen to the world. If you want a complete communications package, the FRG-8800 is just right for you.

You get continuous worldwide coverage from 150 KHz to 30 MHz. And local coverage from 118 to 174 MHz with an optional VHF converter.

Listen in on any mode: upper and lower sideband, CW, AM wide or narrow, and FM.

Store frequencies and operating modes into any of the twelve channels for instant recall.

Scan the airwaves with a number of programmable scanning functions.

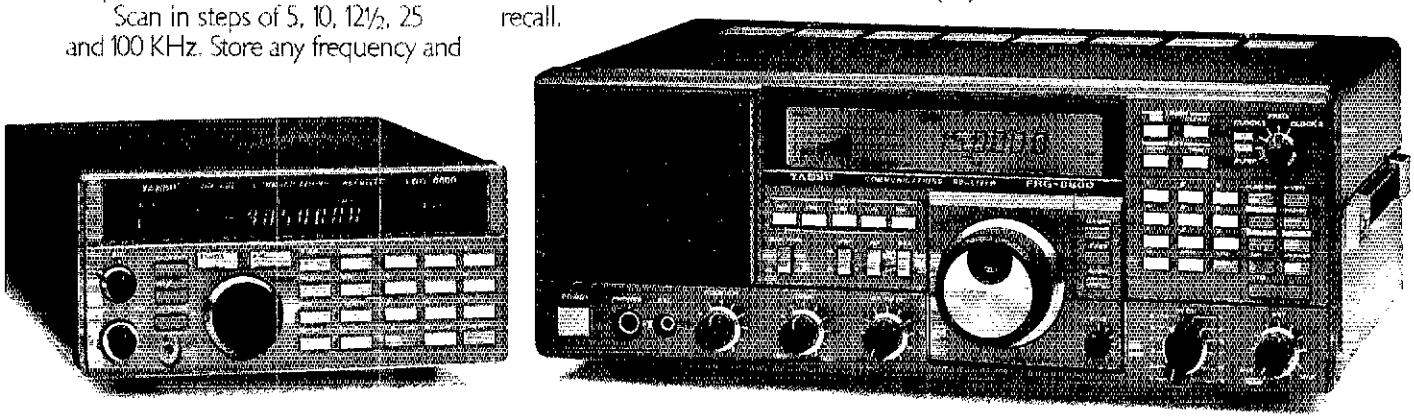
Plus you get keyboard frequency entry. An LCD display for easy readout. A SINPO signal graph. Computer interface capability for advanced listening functions. Two 24 hour clocks. Recording functions. And much more to make your listening station complete.

Listen in. When you want more from your VHF/UHF or HF receivers, just look to Yaesu. We take your listening seriously.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007

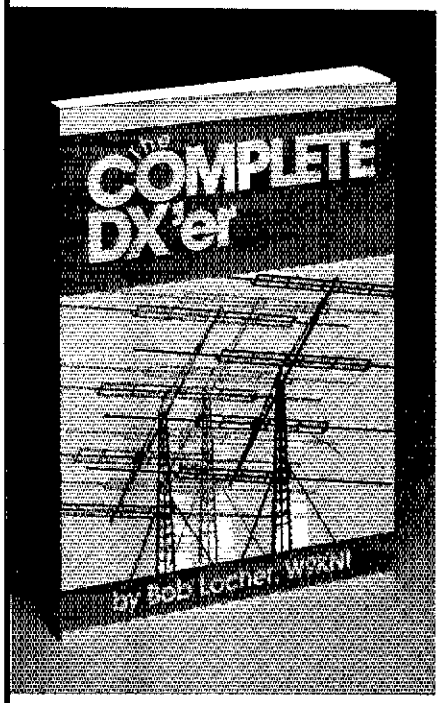
Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100



Dealer inquiries invited.

Prices and specifications subject to change without notice.
FRG-9600 SSB coverage: 60 to 460 MHz.

TWO GREAT DX BOOKS!



The Complete DX'er by Bob Locher, W9KNI is now available from ARRL. Covers all of the important aspects of the DX'ers life both in and out of the pileups: the art of listening; the chase; the capture; the quest for the elusive QSL. Gives advice on equipment and antenna selection. Humorous and educational. $10 U.S., $11 elsewhere. 187 pages. **Coming soon:** *DX POWER* by Eugene Tilton, K5RSG Co-published by ARRL and Tab Books. Watch *QST* for details.

DX POWER

DX Alpha Delta Model DX-A 160-80-40 METER QUARTER WAVE TWIN SLOPER ANTENNA

The Model DX-A combines the tremendous firepower of the quarter wave sloper with the wide bandwidth of a half wave dipole. Simple to install, quick to tune. Proven longhaul DX performance.

- **Installs like an inverted-V dipole.** One leg for 80 meters (67') and the other leg for 160/40 meters (55'). Fed with a single 50-ohm coax. SO-239 connector provided on mounting bracket.
- **Configuration provides wide bandwidth** on all three bands. Typically 70 kHz on 160 meters, 200 kHz on 80 meters and full band on 40 meters. Much wider than most other loaded slopers, dipoles or verticals. Tuner usually not required.
- **Model DX-A also operates on 30-17-12 meters.** VSWR of less than 2.5:1. Easily matched with a tuner.
- **High-power operation.** Rated at 1500 watts P.E.P. output. No traps to break down. A single "ISO-RES" isolator-resonator is used in the 160/40 meter leg.
- **Current lobe up high** for maximum radiation and excellent DX performance. Can be installed from 25 to 40' high.
- **The Model DX-A Antenna is fully assembled,** uses all stainless steel hardware, a UV-protected "ISO-RES" coil, #12 copper wire and is rated for severe environments. Specially coated wire disappears from your neighbors' view.

$49.95 Available from your local Alpha Delta Dealer or add $4.00 shipping and handling (USA only).

ALPHA DELTA COMMUNICATIONS, INC.

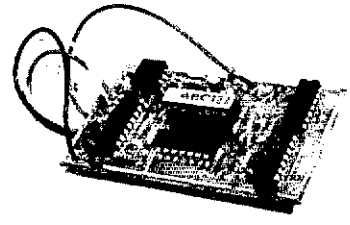
P.O. Box 571 Centerville, OH 45459
(513) 435-4772 Orders • (513) 376-4180 Antenna Tech Info

AA

current solutions to current problems

PROUD OF YOUR CALL? WORRIED ABOUT THEFT? BUILDING A REPEATER?

Identify your FM transceiver with automatic code on each transmission.



SMALL: 1 3/4" X 2 1/4" X 5/16"
Perfect means of RTTY code ID

PRICE **$49.95** Ppd.
+$3.00 for Calif. address.

Full feature repeater IDer with timer **$79.50** Ppd. +$4.77 for Calif. address.

WARRANTY
Returnable for full refund within ten day trial period. One year for repair or replacement.

Your call sign programmed at factory, please be sure to state call sign when ordering.

Inquire about commercial models.

AUTOCODE
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Westlake Village, CA 91359
(805) 497-4620

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.

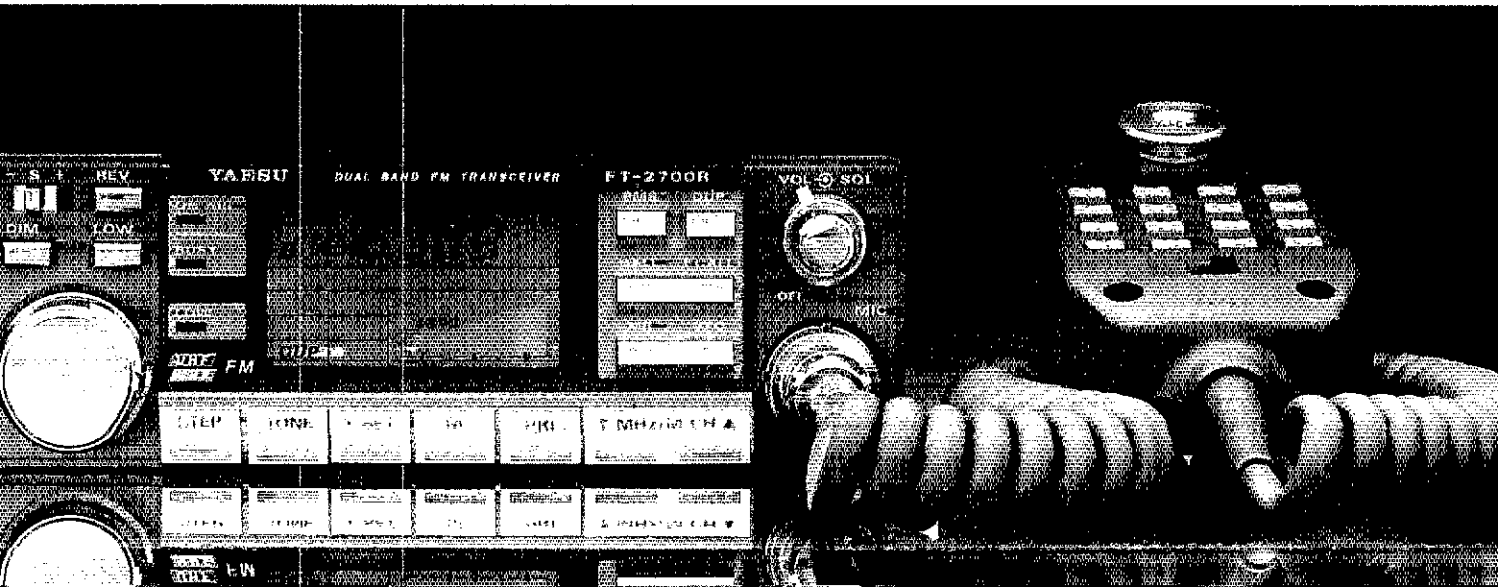
So when you need a lot of power in a compact mobile radio, discover Yaesu's FT-270RH and FT-2700RH. There's nothing else like them on the road.

YAESU

Yaesu Electronics Corporation
6851 Walthall Way, Paramount, CA 90723
(213) 633-4007

Yaesu Cincinnati Service Center
9070 Gold Park Drive, Hamilton, OH 45011
(513) 874-3100

Prices and specifications subject to change without notice.



GOOD OLD

MORSE UNIVERSITY*
MU
dahdah dididah

• A FUN WAY TO LEARN THE CODE
• A FUN WAY TO IMPROVE YOUR PROFICIENCY

Just plug the Morse University* cartridge into your Commodore 64™ or C 128 computer, choose one of the five routines from the MU* menu and the fun begins!

The LEARNING ROUTINE teaches individual characters. Each character is sent at 20 WPM, but with 3 seconds between characters so you will learn the code by sound. Let's suppose you have progressed to session 5. The new letter that you will be learning is "T". Select "groups of 1" and the program sends: "T T T T T T ....." Select "groups of 2" and random 2-letter groups are sent consisting of "T" and any 1 of 4 previously learned letters: "TK BQ QT FB TQ TF ....." Select "5 letter groups" and the program sends at random all 5 letters that you have learned in 5 letter groups: FKBQT BQFKT TBQKF BTFBK QBFTK ..... The number of times the new character appears can be selected so that it is sent all of the time, half of the time or at random.

The PROFICIENCY ROUTINE sends a random sequence of characters with options as to practice duration, start speeds and finish speed. For example, you can start at 5 WPM and the speed will gradually increase to 20 WPM over a 10-minute period.

The SENDING ANALYSIS ROUTINE analyzes character formation and spacing.

In the RECEIVING GAME, a series of thunderclouds passes over the ham antennas in a small town. After the characters have been sent, a lightning bolt is released. If you correctly type in the characters that were sent, you zap the lightning bolt. If not, or you are too slow, the bolt will knock down one of the antennas. The game is over when 19 antennas are down.

You can compose your own code practice for other students using the MORSE KEYBOARD. The characters may be stored in a buffer until sent.

The menu also allows you to select the tone and also color if you have the proper monitor.

THE ARRL MORSE UNIVERSITY* AMATEUR RADIO STARTER KIT

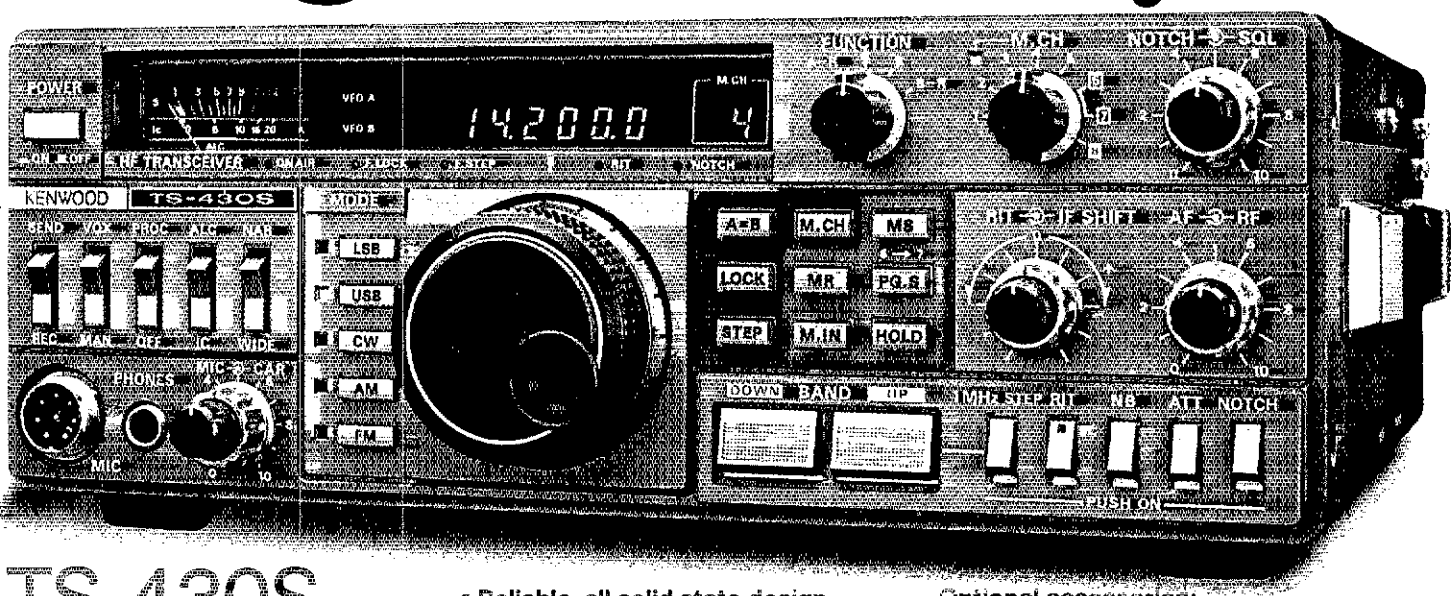
Consists of the cartridge described above, instruction manual, Tune-in the World with Ham Radio (book only) and other information for the prospective Novice. Can be used only with C64 or C 128 computers and TV monitor, not supplied. Price of the package is $40.00. Available from: ARRL, 225 Main Street, Newington, CT 06111.

*MORSE UNIVERSITY is a trademark of AEA, Inc.

KENWOOD

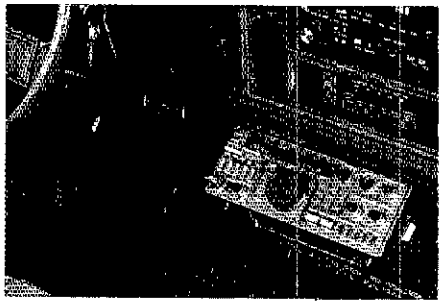
...pacesetter in Amateur radio

"Digital DX-terity!"



TS-430S

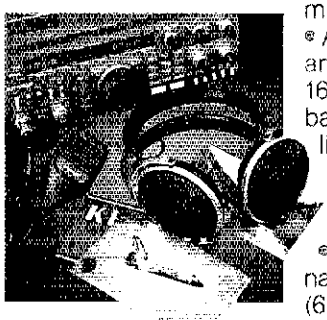
Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!



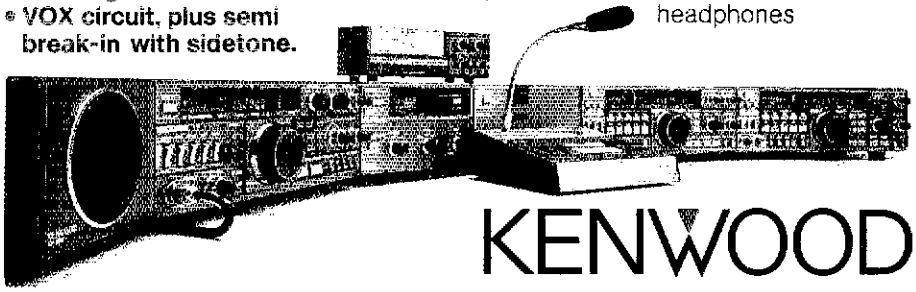
Covers all Amateur bands
160 through 10 meters, as well as the new 30, 17, and 12 meter WARC bands. High dynamic range, general coverage receiver tunes from 150 kHz to 30 MHz. Easily modified for HF MARS operation.

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.**



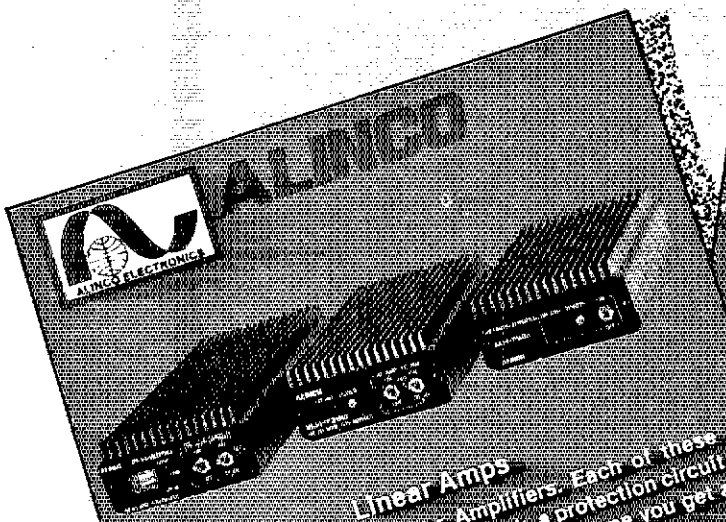
Optional accessories:
• PS-430 compact AC power supply • SP-430 external speaker • MB-430 mobile mounting bracket • AT-130 compact antenna tuner covers 80-10 meters, incl. WARC bands • AT-250 automatic antenna tuner covers 160-10 meters, incl. WARC bands • TL-922A 2 kW PEP linear amplifier • FM-430 FM 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



KENWOOD

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

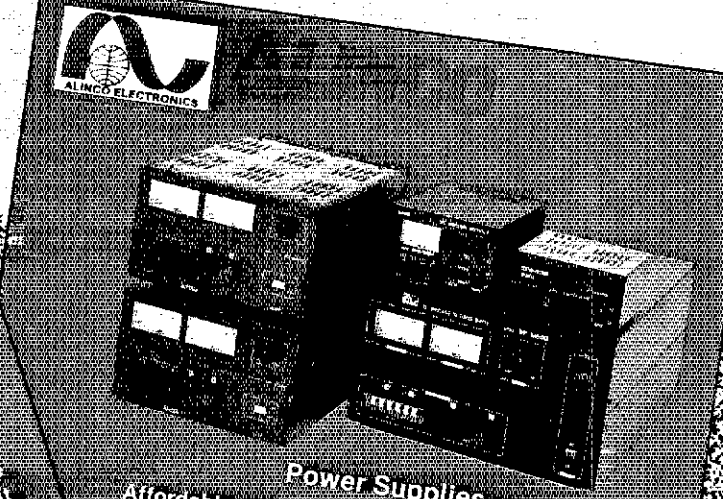
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories. Specifications and prices are subject to change without notice or obligation.



Linear Amps

2m and 70cm Micro-Linear Amplifiers. Each of these amps include a heavy duty heat sink, a protection circuit and low pass filter for a clean signal. On one you get a GaASFET RX preamp and even an RF meter on one.

List Prices From $69.95 to $156.00



Power Supplies

Affordable performance is the final output of these workhorses. These high efficiency, high output regulated supplies each comes with automatic current limit and shut down protection. Choose from 4.5 to 55 amps of output.

List Prices From $69 to $333

Holiday Special
Call Your Favorite
Dealer For Details

ALM-203T List $345.00

2m FM Handheld Transceiver

Don't decide on a handheld until you have seen Alinco's newest!

Lightweight, low spurious emission and powerful.

Transmit RF at 9.6 V - Low Power = .4 watt
at 9.6 V - High Power = 3. watt
at 13.8 V - Low Power = .5 watt
at 13.8 V - High Power = 5. watt

ALR 206T 2 Meter Mobile

- Completely programmable from microphone
- Unique frequency control knob
- 25 watt output on high power
- 5 watt output on low power

PLUS many more features too numerous to list. Stop in your local dealer or call him for your new ALR206T. You can call direct for the name of the dealer nearest to you.

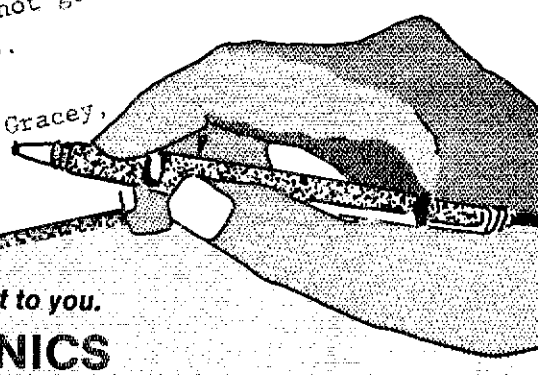
Memo:

Thank you for the terrific response! Be sure to check out the entire Alinco line at your dealer and don't forget about our 30 day/exchange, 120 day/free repair policy. You just cannot go wrong.

Best Regards,

Everett

Everett L. Gracey,
President



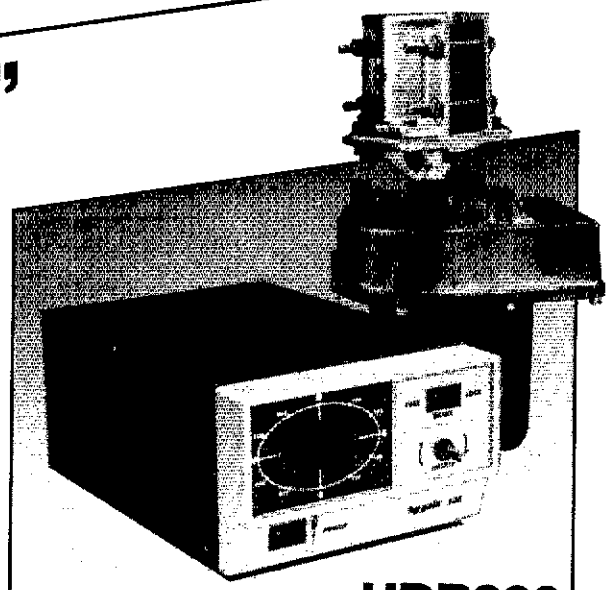
Contact your nearest dealer or Call Alinco for the location closest to you.

ALINCO ELECTRONICS

P.O. Box 20009 • Reno, Nev. 89515 Phone (702) 359-1414 • Telex 4993999 EGELECTR
44 Glen Carran Circle • Sparks, Nev. 89431 Facsimile (702) 359-1424

hy-gain®

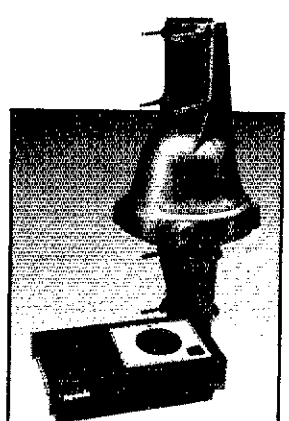
"Heavy Duty" is Relative!

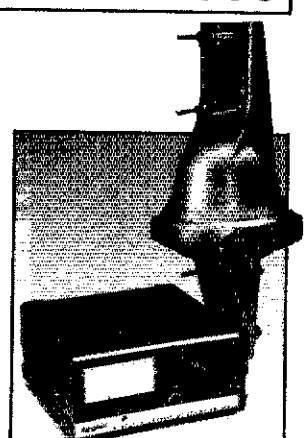


In our lineup of rotators, the CD45 II is rated as medium duty. Some of our worthy competitors offer similar rotators which they rate as "heavy duty" and, within their product line, they are. But if you compare all rotators, it's a different picture. Here is a comparison of our CD45 II, our HAM IV and the Alliance HD73 (Specifications as stated by the manufacturer).

	HD73	CD45 II	HAM IV
Output Torque	400 in. lbs.	600 in. lbs.	800 in. lbs.
Gears	Plastic and Steel	All Steel	All Steel
Control Box Weight	3.8 lbs.	6.8 lbs.	6.8 lbs.
Rotor Unit Weight	6.5 lbs.	8.5 lbs.	10.5 lbs.
Direction Indicator Potentiometer	Carbon	Precision wire wound	Precision wire wound
Rotation Limiter	Mechanical stop only	Limit switches with mechanical stop	Limit switches with mechanical stop
Braking Power	1600 in. lbs. "Windmilling"	800 in. lbs. "Holding"	5000 in. lbs. "Holding"
Antenna Size Rating	10.7 sq. ft.	8.5 sq. ft.	15 sq. ft.

Wind load rating is an important specification too. Unfortunately, there is no standard method of measurement. For example, a long boom antenna with an unbalanced wind load is a much tougher problem than the calculated square area of the antenna would suggest. So we take a conservative "worst case" approach and rate the CD45 II at 8.5 square feet. Yet, the HD73, a lighter unit, is rated at 10.7 square feet. You be the judge.





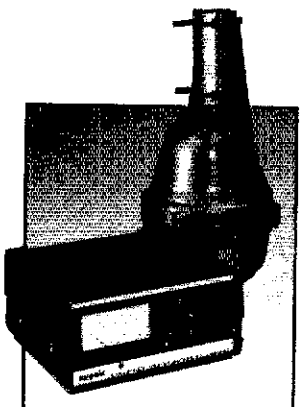
Here is a complete listing of Hy-Gain rotators and the typical antenna systems that each will comfortably and reliably manage.

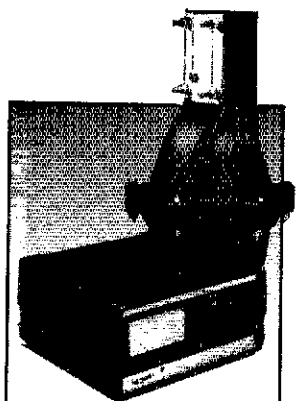
AR40—Primarily used for small to medium size VHF and UHF beams. Can also be used with a 10 or 15 meter, 3 element Yagi.

CD45 II—Recommended for a 3 element tribander such as our Explorer 14. Will also manage a medium sized VHF stack and is a good choice for the Azimuth rotator on a good sized satellite system.

HAM IV—A favorite for long boom tribanders such as our TH7DX. Would also be a good choice for an Explorer 14 stacked with a VHF DX antenna or a satellite system.

HAM SP—A modified Ham IV with a special control unit for a blind operator. Single knob directional control system includes a compass rose with braille markings. An audible beep indicates rotator start and stop.





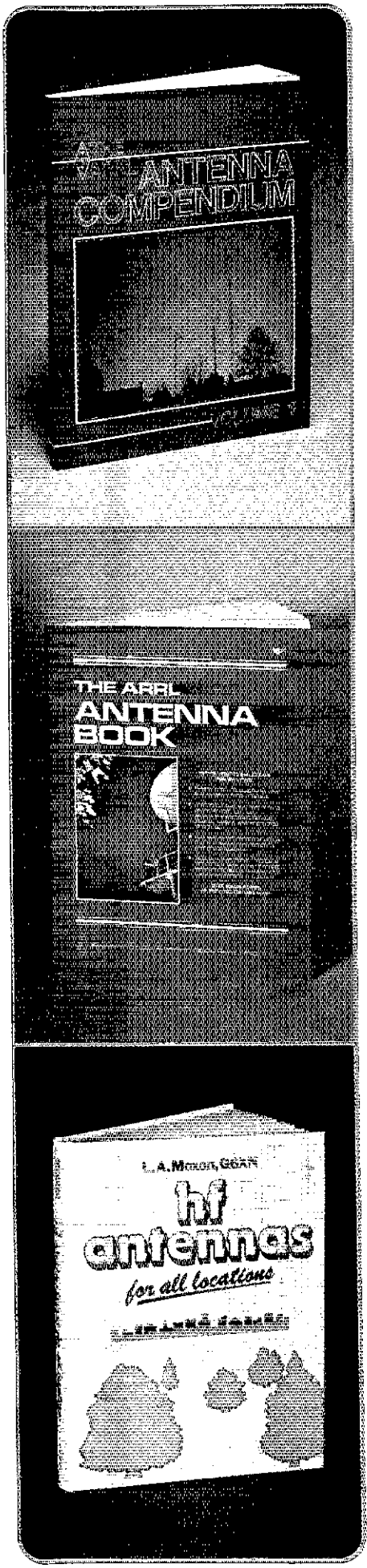
T2X—The well-known Tail Twister manages combinations such as a TH7DX stacked with a small 2 element 40 meter beam. Also a great choice for a substantial VHF "weak signal" array. Of course, the ever popular stack of 3 or 4 element 10, 15, and 20 meter monobanders is a safe match for the T2X.

HDR300—This 5000 inch pound torquer is our idea of heavy duty. This is the choice for stacked HF "Long Johns" or the full sized 3 element 40 meter monsters. A favorite too for the giant VHF "weak signal" systems where the 1° rotator control and indicator accuracy is a must.

CHOOSING THE RIGHT MODEL—The mistake most commonly made is selecting a rotator for the antenna being installed at the time and not looking forward to the antenna system that you ultimately plan. A rotator that is not over-loaded will deliver many years of reliable service. So, when you choose yours, plan ahead and buy the model that will handle the ultimate load. If in doubt, drop us a note. We will share our experience with you. Long term, you will save money.

TELEX hy-gain

TELEX COMMUNICATIONS, INC.
9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte–Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.



ANTENNA BOOKS !

Because of space limitations in ***QST,*** we don't have room to run all of the good antenna articles that are submitted. The solution to this problem? ***THE ARRL ANTENNA COMPENDIUM!*** You'll find 178 pages packed with new material on quads, loops, log periodic arrays, other beam antennas, multiband antennas, verticals, reduced size antennas, plus such interesting topics as: Mr. Smith's "Other" Chart and Broadband Rigs; Available Power, SWR and Loading; Baluns: What They Do and How They Do It; The Horizontal Dipole Over Lossy Ground; and Antenna Polarization. Copyright 1985. Paperbound: **$10.00** in the U.S., **$11.00** elsewhere.

THE ARRL ANTENNA BOOK The best and most highly regarded antenna information available. The 14th Edition contains 328 pages of propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Copyright 1982. Paperbound: **$8.00** in the US., **$8.50** elsewhere. Clothbound: **$12.50** in the U.S., **$13.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; the Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna: Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **$12.00.**

SANTEC® ST-20T

a SMART Radio... the INTELLIGENT Choice

	VHF FM TRANSCEIVER MODEL ST-20T	UHF FM TRANSCEIVER MODEL ST-40T
Suggested Retail	$349.95	Coming 1st Quarter 1986
Frequency Range	142.000 to 150.995 MHz	440 MHz to 449.975 MHz
Type of Emission	F3	F3
Memory Channels	10 Channels	10 Channels
Antenna Impedance	50 ohms	50 ohms
Power Source	9.6V NiCd battery pack 9V Dry battery pack D.C. 8.4-16V	9.6V NiCd battery pack 9V Dry battery pack D.C. 8.4-16V
Transmitter		
RF Output Power	5.0 Watts (H), nominal at 12V 3.5 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V	3.0 Watts (H), nominal at 10.5V 0.5 Watts (L), nominal at 10.5V
Modulation	Frequency modulation	Frequency modulation
Maximum Deviation	± 5 KHz	± 5 KHz
Transmit Spurious	– 60 dB	– 60 dB
Microphone	Electret Condenser Microphone	Electret Condenser Microphone
Receiver		
Receiving Methods	Double superheterodyne	Double superheterodyne
I.F.	1st 16.9MHz 2nd 455KHz	1st 21.4MHz 2nd 455KHz
Sensitivity	Less than – 0.25uV at 12dB SINAD	Less than – 0.25uV at 12 dB SINAD
Band Width	± 7.5 KHz at 6dB down	± 7.5 KHz at 6dB down
Selectivity	± 15 KHz at 60dB down	± 15 KHz at 60dB down
Audio Output Power	400mW at 8 ohm	400mW at 8 ohm

Note: See Accessory List for ST-200 for Compatible Accessories.

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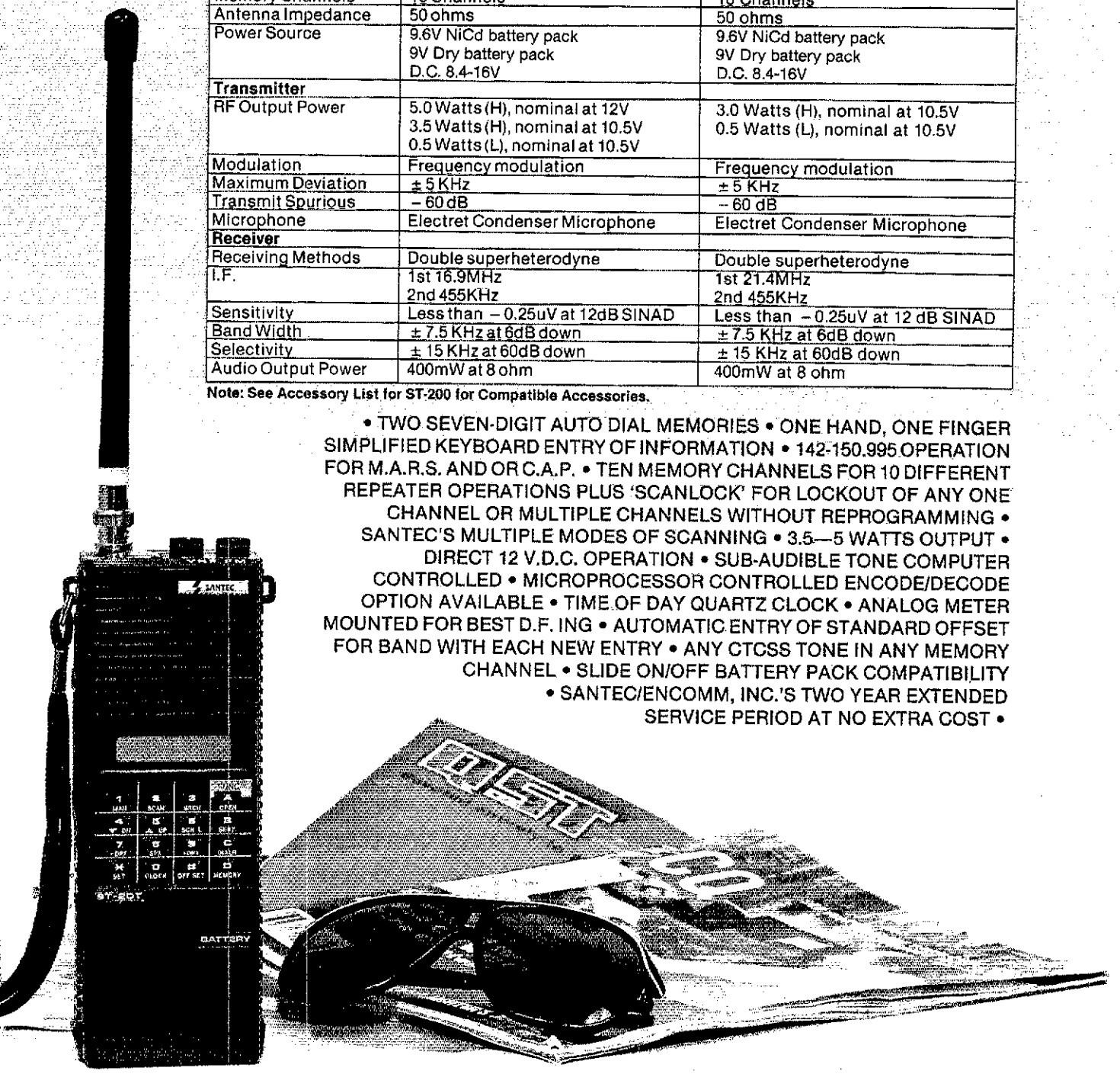

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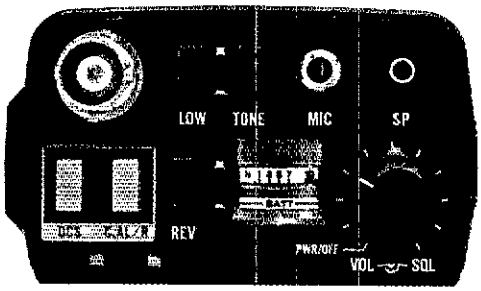

- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel 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.

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Optional accessories:

- TU-35B built in programmable sub-tone encoder
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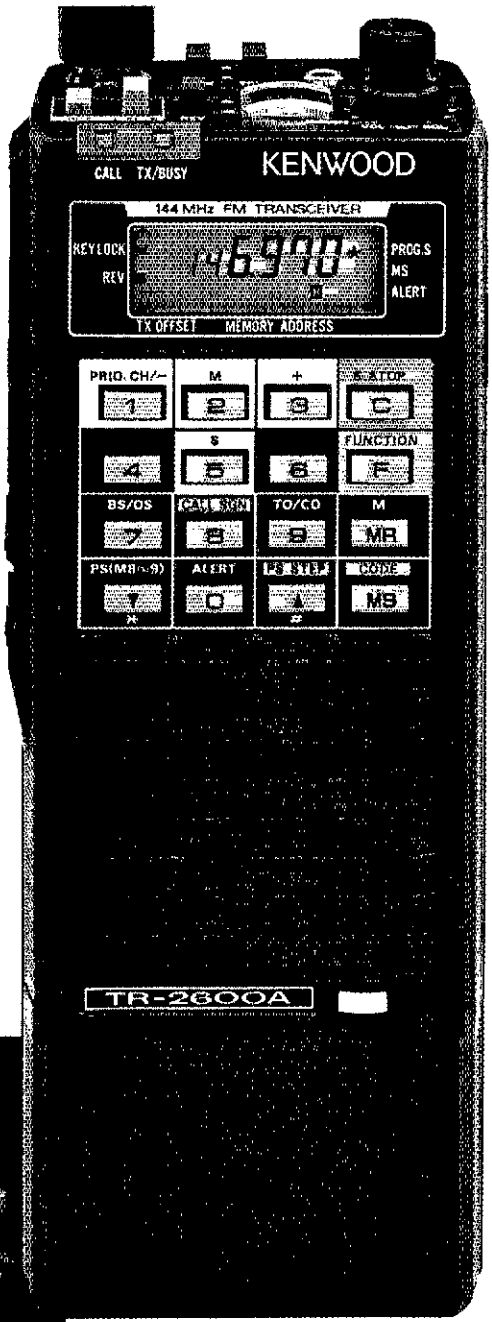
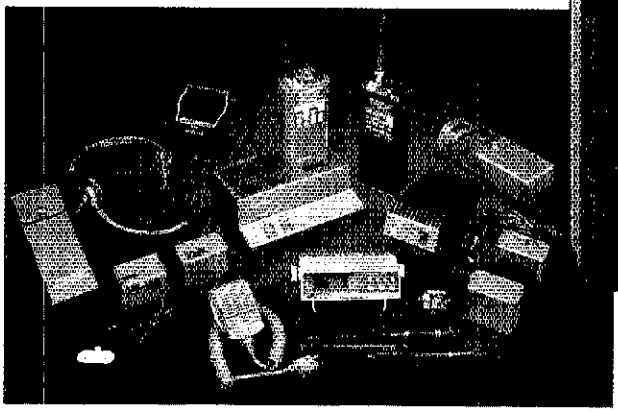
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.





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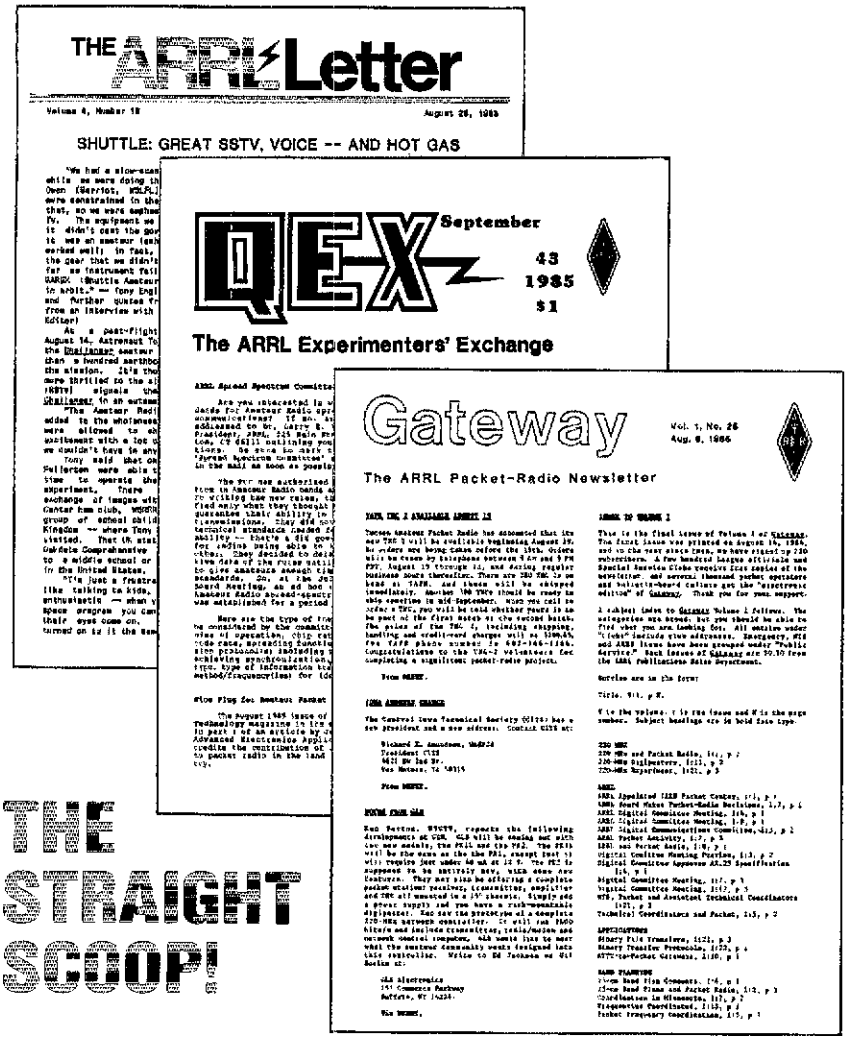

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annual "Operation Santa" in which they bring Santa via amateur radio to children who are hospitalized over Christmas. I'm sure that many of you are planning similar operations. Please let me know so that I can put it in the next column. Congrats to WARC for placing in the top 37% nationwide for their first Field Day effort. Congrats are in order once again for Mary, WB1GXZ, for 100% representation to 1RN. The FCC has announced that the maximun reimbursement for a volunteer administrated exam will be $4.29 beginning January 1, 1986. SARC completed it's 1985 Novice Class on November 4th. 11 students completed the course and passed their exams. This is excellent considering that 12 began the course. That must have been some course! Congratulations SARC. Now some news from Al Jaras, NA1I. HELP WANTED—Immediate openings for qualified hams. Must show maturity, sophistication, and competency. Must be psychologically equipped to exercise the tact and discipline that this program requires. You can become a labled "Double Zero" man. For additional information regarding the OFFICIAL OBSERVER/AMATEUR AUXILIARY and application contact: Al Jaras, NA1I, O.O.C.—122 Columbus Ave., Meriden, CT. 06450-9998. 73s. Traffic: WB1GXZ 360, K1EIR 293, KA1KPS 249, W1EFW 223, KA1GWE 109, W1WP 88, KA1KTH 80, W1YOL 71, K1AQE 70, KA1BHT 38, W1BDN 36, N1BOW 30, WA1NLD 12, W1CUH 5, W1QV 4.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: N1BBT & K9HI. 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	271	345
EMRIPN	N1BGW	3880	1730/Dy	254	240
EM2MN	KA1AMR	63/23	2000/Dy	207	417
NEEPN	K1BZD	3945	0830/Sn	8	53
HHTN	WB1CMQ	04/64	2230/Dy	210	475
EMRISS	N1CVE	3715	1600/2030/Dy	131	233
CITN	N1BYS	645/045	1930/Dy	128	260

Once again, EMASS amateurs show their true value to the public! Section Emergency Coordinator KB1PA reports that on October 11th, The Wayland Police Department made official requests for our assistance in locating a lost 9 year old girl. Over thirty amateurs responded to this plea, and provided experienced communications for numerous search teams—all at no charge. While most amateurs take this "no charge" note as par for the course, we should all continue to remind ourselves that there are constant threats to our service both from within and outside of the amateur community. Within? You bet! Your ARRL even has to fight amateurs who petition the FCC for the use of amateur frequencies for commercial ventures. And now we have commercial entities interpreting recent FCC rules to suit their own uses. The point is that the ARRL constantly has to keep on top of all petitions that might affect our ability to continue providing public service. KW1U reports that EMASS traffic handlers provided public service to the tune of 4472 pieces of formal traffic during the month! Would you know how to enter traffic into the ARRL's Nat'l Traffic System if you were asked? Congrats to recent Falmouth ARA upgrades KA1NBH, KA1MTN, N1DGO and KA1MJZ. EMASS held a combined farewell and "Thank You!" Brunch for outgoing NM KA1EXJ who has served us so capably. New net manager N1CVE looking for more participants on the slow speed net; join in—you'll learn a thing or three! KB1PA tops list of PSHR for the month. Traffic: KW1U 933, KN1K 464, WA1TBY 310, WA1FCD 236, N1BHH 218, WB1CMQ 218, KA1AE 183, K1GRP 171, KB1AF 165, N1AFF 163, N1CVE 116, W1CE 95, KA1ON 77, KY1T 68, KA1AMR 67, KA1EID 65, W1ZHC 64, K1BA 62, N1DDC 58, KA1MAM 55, K1BZD 38, WA1FNM 33, K1ABO 31, KA1LIH 30, WA1SNH 27, KY1B 20, KT1K 19, WA1TZO 19, KA1KU 18, KA1DJV 10, KA1KCU 7, K1LCQ 6.

MAINE: SM, Cliff Laverty, W1RWG—SEC: KL7IJG/1. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. PSHR: WA1YNZ 88, N1BJW 76, K1MZB 75, W1RWG 70, KL7IJG 10, WB1CBP/Novice 43. Recently elected officer of Pine State ARC include President K1AG, VP KA1BWG, Scy/Treas K1TQK, Directors K1CZ KA1CVS KW1Q W1YTQ W1QXR W1OLQ KA1GIM, Editors KA1BWG N1CFL. CMEN during Gloria provided total comms for area Red Cross involving 53 stations. Revd Cert of Apprec from Kennebec Valley Chapter. Rockland High Sch has new ham radio club thru efforts of N1DOY. Downeast Emergency Rptr Grp (new) formed for the purpose of establishing rptr on Cadillac Mtn in Acadia Nat Park. They need your support. Novices to receive free membership in Merrymeeting ARC for one yr to encourage upgrading. Traffic: KA1AVU 202, AK1W 127, K1MZB 120, KA1JOJ 94, KL7IJG 69, WB1CBP/N 64, W1ISO 61, W1RWG 53, N1BLZ 43, N1BJW 42, WA1YNZ 33, W1BMX 32, W1JTH 24, W1GCB 15, W1OTQ 14, WB1GLH 9, KA1ENL 5, KA1FTL 3.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—STM: W1TN. ACC: KI1M. The fall Hosstrader's Fleamarket in Deertield, NH, was a great success in spite of some rain. Several thousand Hams attended and the ARRL had a booth for the first time. Thanks to the HQ staff and KR1D for a lot of hard work. An increase in Emergency Comm activities after Gloria. Buck, W1GUX, reports the KARC has a Novice class that includes the state CD officer! New EC appts include KA1GOZ (Nashua), KB1KJ (Manchester), and WB1GXM (Sullivan Cty). K1ACL reports that GBARA is sending letters to the 80 Hams who checked into their CD net during Gloria-inviting them to join the club and ARES! N1CB dropped a note about the Mt Ascutney Packet Radio Assoc (MAPRA). They have a digipeater on Mt Ascutney (WA1TLN-1) that went into operation in Sept. It was used recently to demo Packet to state CD officials during the SET. WB1GXM operated the station at CD HQ. MAPRA also publishes a very informative newsletter. New GSARA officers for 86: Pres-KA1GOY, N1DHQ-VP, KA1JJN-Treas, KA1NEK-Sec. KI1M now on Packet, WB1BRE (me) on OSCAR10, K1OIQ reports successful SET from Mt Washington. Traffic: NHN 194, GSFM 152, GSPN 89, MSOVTP 36. N1CPX 410, N1NH 312, W1PEX 129, K6UXO 125, N1AKS 122, W1GUX 89, W1TN 82, KI1M 82, KA1LBW 69, W1ALE 62, WB1GXM 60, KK1E 28, K1PQV 25, K1OIQ 23, KA1HPO 21, KA1GOZ 19, K1TQY 16, WA1YZN 15, W1FYR 15, KB1KX 9, KB1MK 8, W1LQQ 8, N1ALM 7, WA1PEL 6, N1DQA 6, KA1IIP 6.

RHODE ISLAND: SM, John (Bob) Vota, WB1FDY—Received a couple of newsletters this month, The Networks news and the B.V.A.R.C. news. Tnx, this helps. The B.V.A.R.C. set up a station at the Buck Hill Scout Camp for the Boy Scouts Annual Jamboree. K1KYI made the arrangements with the Narragansett Council B.S.A. and all had a great time. Tnx for your time and interest. V.E. Exams in R.I. booming, The O.S.A.R.G., the B.V.A.R.C., and the P.R.A. all sponsored exams, another successful month for V.E.s in R.I. Our Traffic Manager, Jim, KA1KML, has some problems and we could use some help with Traffic. PSE help if you can. I wish you all a Happy New Year. Traffic: KA1JXK 204, W1EOF 121, KA1KML 198, WA1CRY 45.

VERMONT: SM, Ralph T. Stetson, KD1R—Happy 1986 everybody! STM: AE1T. SGL: W1PMH. TC: W1KRV. SEC: W1CTM. Vermont section is looking for an ACC and a PIO. Volunteers for OO/AA and ATC programs are also needed. Please contact KD1R. Congrats KT1Q for second BPL for month of October. Keep up the good work, Ed. Anyone wishing to submit station activity reports please do so to KD1R or AE1T. All efforts are truly appreciated and we would like to provide recognition in this column. My apologies to all for not having a more complete report this month. I have been very busy.

WESTERN MASSACHUSETTS: PIO/ACC: K1BE. SEC/SGL: WB1HIH. OO/RFI: N1CM. TC: KA1JJM. STM: W1UD. Final summary info on Hurricane Gloria activities shows that over 300 hams were involved in WMA. That is a great level of public service activity. Congrats to all the ARES folks and SEC WB1HIH who activated at 10 Red Cross sites, had liaison with Boston Red Cross, gave info to 4 National Weather Service offices, and activated at Mass CD. Fortunately, Gloria lost her worst punch but ham radio was there to serve. Chicopee CD is renewing RACES activities. Provin Mt. has their ACC Controller running well and is going to add a new solid state repeater to the installation. Another ACC is on KA1JJM/R, along with new duplexer and antenna. Both are looking forward to using all those goodies in the controller. W1ZPB now Advanced and enjoying his sabbatical. HCRA had W1NY transmitting DP@SL audio from the latest shuttle. Their licensing classes end mid-December with over 65 students, many of whom already upgraded by early November. The October Exam in Wilbraham had 16 tested, 16 passed including 7 Extras. Nice going! Seasons Greetings to All and Happy 1986. PSHR: WB1HIH, N1DMU. Traffic: (Sept./Oct.) WB1HIH 421/308, N1DMU 173/229, KA1T 288/92, W1UD 211/168, W1SJV 161/118, KA1EKO 0/117, W1KK 57/59, W1JP 32/56, W1ZPB 46/6, WA1OPN 19/24, WB1FSV 8/33, WA1MJE 8/0.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB—STM: KL7T. PIO: NL7CP. Congratulations goes to Mike Rice, KL7YV for being elected President of the Arctic Amateur Radio Club. Thanks goes to Tom KL7GNG, Dick KL7IS and Walt AL7CM for establishing a packet link between Fairbanks and Anchorage on 145.01 MHz. A good time was had by all at the Anchorage Amateur Radio Club Christmas Party. It was a pot luck with gifts for the kids and a magic show. John KL7GNP needs your new address. John is the faithful QSL bureau manager. New appointments are coming next month. Congratulations Jim Moody NL7C on winning the Section Manager election. Motley 992. Traffic: KL7GID 68.

IDAHO: SM, Lem Allen, Jr., W7JMH—STM: W7GHT. ASM: KA7T. SEC: KD7HZ. ASEC: N7BI. PIO: WB7PFO. SET REPORTS: Many ARES members participated in SET exercises. The Northern Panhandle simulated Earthquake, South Central Idaho simulated Winter Storm. The full count is not yet in but approx. 80 Amateurs assisted in the exercises. Many faults were uncovered and will be corrected as soon as time permits. ARRL MATTERS: Congrats to new ARES members from Kuna KA7VIN, KA7VIO, KA7VIP. K7MIY has resigned as Asst EC for Canyon County—we need a volunteer to fill that vacancy. We also need an OO in the Northern Idaho region. PEOPLE AND THINGS: W7IWU back from 7 weeks and 5300 miles in Motor Home. He kept daily skeds on 40 CW with W7GCL, visited in TX, NM, CO, UT, and NV. W7PKA, WA7RUT gone to AZ for winter.

NET REPORTS:

Net	Freq.	Time	Sess.	QNI	QTC
ID CD	3990 Lsb 810A	M-F	23	873	55
FARM	3937 Lsb 7P	Da	31	2111	58
IMN	3635 CW 8P	M-F	28	272	79
NW TFC	146.38/98 FM	730P Da	31	917	16

GENERAL: In a Bona-Fide Emergency sometimes it is necessary to leave out much of the message headings in order to save time. Also, use of ARL fixed texts saves much time. Have a copy of the ARL Numbered Texts handy at your station. Traffic: W7GHT 227, N7BHL 99, KA7KAI 82, W7JMH 55.

MONTANA: SM, Les Belyea, N7AIK—K7ABV of Great Falls has been going great DX guns on 40m CW, contacts included BV2, LH, 9Q5, SV8, TT8. KA7OUS from Butte was given recognition for tracking and sketching Halley's Comet and has been admitted into the International Halley Watch, an organized group of some 900 professionals and 600 plus amateur astronomers around the world. KA7KLH and members of the Flathead Valley ARC are currently holding radio theory classes in Columbia Falls. WB7AZJ had an experience in the Bob Marshall Wilderness area in using his 2m HT to summon help for a member of the party who suffered a broken leg, he was answered by WB7DBY in Libby who soon had a helicopter on the Way. Up-grades in Great Falls were: to Gen—N7HAE, KA7OGZ to Adv—N7GMJ, KA7TTO, KA7BDC. PSHR—WA7WZP.

NET	Sess.	QNI	QTC	MGR.
MTN	30	1472	111	KF7R
IMN	21	240	103	WA7GQO
IMNS	8	17	4	KA7QVN
NTN	5	101	0	KØPP

Traffic: (Sept.): WA7WZP 77, KF7R 32, N7AIK 17, WB7WVD 8.

OREGON: SM: William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. TC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. Upgrades: NN7U, W7YCK, WA7RQS, WB7EBG, N7OEX. KE7KA (Extra): N7GSC (Advanced): N7HMV, WB7PYQ, KA7KLK, KA7TGY, N7MME (General): KA7VKA, KA7WBA, KA7RAG (Technician): KA7VYN (Novice). Hearty Congratulations! Start saving your pennies for the Salem Ham Fair which will be held on 22 February 1986 at Rickreal. They aim to make it the biggest swapfest in the State. Thanks go out to all those who participated in handling emergency traffic during the recent Mexico City earthquake disaster. There are far too many to mention specifically but it was a chance for Amateur radio to do "it's thing" and do it, it did! Amateur Radio in Oregon is experiencing some problems particularly in the VHF/UHF spectrum. Intentional interference is increasing on simplex and on repeaters. Each area, particularly large Metro areas should form interference committees to help combat problems before they become major. Contact S.M. W7QMU for information on how to form an FCC approved Interference Committee. Let's prove we can clean up our own mess. Have a Happy and Prosperous 1986. Traffic: W7VSE 534, K7OVK 198, W7ZB 111, N7FXJ 85, N7BGW 72, W7HLF 65.

WA7VTD 45, KA7AID 36, N7DRP 28, AL7W 24, W7LNE 8. (Sept.) N7DRP 158.

WASHINGTON: SM, Gene Sprague, KD7G—ASM: KR7L. ACC: KC7PH. OOC: N7IL. PIO/SGL: W7CKZ. STM: KD7ME. TC: W7BUN. BM & SEC: Temp Vacant.

Net	Freq.	Time (Local)	QNI	QTC	Mgr.
NTN	3970	1200	1216	72	W7UU
EWTN	146.64	1700/2230	No Report		WA7CBN
PSTS	145.33	1700/2230	171	101	W7IEU
WARTS	3970	1730	3241	147	W7IGC
NWSSB	3945	1830	No Report		W7VDR
WSN	3590	1815/2145	475	153	W7GB
WEN	3987	1730 (Mon)	ARES/RACES	Net	KD7G
WARNS	3940	1900 (Mon)	Amateur News	Net	W7CKZ

A big thanks to Joe Winter, WA7RWK for the years of service to all of us as SM. He gave a lot of his time to do this job. Our Best Wishes to Joe and Addie. This is my first column. It is written for you, let me know your wishes, we will try to provide what the majority wants to read. This is YOUR Section, your input is needed, TNX. There will be some changes in the column format. It will give more space for current information. Net information will be listed every three months. KA7INX, Pierce Co EC reports a successful search & rescue mission with the use of a helicopter to pick up the people. Radio Club of Tacoma had a booth at the Puyallup Fair, during the entire pick-up it was on their two meter radio. KA7INX: "This called an awful lot of attention to an actual search and how Amateur Radio assists in communication." KA7EOV Lewis Co EC reports Oct 18 Trojan exercise was a success using 2 and 75 Meters—W7GHI Island Co EC reports successful SET Oct 8 with 28 ARES members involved, and with good newspaper coverage. Issaquah ARC, Hams had a medical emergency at the Salmon Days parade. N7CFO: "I am pleased to report that our net handled it flawlessly." The NW Amateur Packet Radio Assn. is active in promoting Packet. Western Washington Amateur Relay Assoc. is working very hard for us. Think of what it might be without repeater coordination. TNX guys! Washington Section Net working hard. W7DG, Lower Columbia ARA reports they placed 3rd in "7" land Field Day, class 4A. A job well done by all; excellent PR. NW QCWA had their fall meeting in Lynnwood chaired by W7CKZ. W7FDQ gave interesting talk on his experiences in broadcasting. Are you missing these activities? Please join in, visit a club, etc. You are most welcome! Congrats to all that are new Hams and to upgrades! Traffic: WB7WOW 394, KD7ME 318, W7LG 215, K7GXZ 191, KR7F 164, KR7L 138, W7GB 111, KS7I 105, W7IEU 48, WA7CTS 34, WA7BDD 25, KD7TJ 20, N7DDP 18, K7AJT 16, KD7G 14, KA7TCE 13, K7OXL 9, W7APS 7, W7AZU 7, N7GDW 7, N7FXM 4. (Sept.) N7DDP 32.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASM: W6ZF, N5DHN. SEC: W6LKE. STM: NI6A. Welcome aboard to our new OO/RFI coordinator NY6Z. LARK member WB6DXP up-graded to General, and EX-KG6TE is now extra class WK6X. Their coveted "Klutz of the month" Award went to KA5EQO for the sterling job he and his crew did erecting an antenna at F.D. NBARA Pres WF6C opened their dinner meeting with a request for a motion to adjourn which was moved, seconded and passed unanimously. They did manage to welcome new member WD8JPA at their breakfast meeting. (Sounds like my kind of club.) MDARC had a packet radio presentation by NI6A WA6OSA and N6IA. The club mourns the loss of member K6OWN. HARC had a packet radio presentation by KA6IVF. They welcomed new members W6SUK, N6IGB, N6JRF, Mark Rowley and Robert Rowley. EBARC has W6CUS-1 operating as a digi-eater on 145.01 and 14.103. 1986 officers for NALCO ARES are: WB6PHA, Pres; WA2UNP, VP; KA6OFR, Secty; WA1MCO, Treas; W6VTJ, EC. Oct. Traffic: K6AGD, 156, K6APW, 146; W6VOM, 127; NI6A, 103; WB6DOB, 80. (Sept.) NI6A, 162.

NEVADA: SM, Joe Lambert, W8IXD—SEC: K7HRW. Goldie, N7CXD, has recently been appointed Assistant Emergency Coordinator for Southern Nevada. Octobervention/Pacific Div Convention was a huge success. A special thanks to K7HRW and XYL, N7FFP, W7TVF and XYL, W7GJK, KA7DXU, N7FZG for their help in the ARRL Booth during the Convention. We signed up 13 new ARRL members and one life member at the convention. 80 took the volunteer exam test conducted by NK7N. About 60% passed. Packet is still growing; hoping to have a North-South Digipeater connection soon. TARA has a repeater with an autopatch on 147.24. KA7VCL is working on the SNARC 450 MHz repeater which will be on 443.075 mhz. Don't forget the NETS:

NET	DAY	TIME	FREQ.
RACES	Mon.	1900 PST	3.9965
ARES	Thurs.	1900 PST	146.01/61
WX NET	M-Sat.	0600 PST	3.993

TRAFFIC: K7HRW, 10.

PACIFIC: SM, James Wakefield, AH6CO—This report being made from W6 land so will be skimpy. Just here from Pacific Division Convention in Las Vegas where a good time was had by all. Those making the convention from Hawaii were KH6AAI, KH6IAA, KH6AN, KH6EX, KH6EM, NH6XQ and NH6CS. KH6EX was the only prize winner in the gang. Have many appointments to make if you will let me know. Hope the holidays were good to you and have a fine '86. Aloha!!! All traffic will be added next month!!!

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—ASM: Hugh Nickles, WB6YKI. STM: Al Biegler, WA6WJZ. SGL: Jim Pratt, N6IG. TC and ACC: Jettie Hill, W6RFF. Thanks to you that have volunteered to serve the Section. Thanks for past services to both Marty Brett, NY6Z, who has moved to another section and resigned as OOC and Lyle Taylor, WA6ZUD, who has resigned as SEC. More than ninety hams and spouses plus lots of nostalgia were present at the North Hills RC "Old Timers Nite." I couldn't help noticing that what was described as "a nice display of old equipment" included a lot that I had once seen as "the latest thing." Amador County ARC, the only Special Service Club in the Section was honored by Director Bill Stevens, W6ZM, at the Pacific Division Convention with the award of a plaque for Outstanding Small Club in the Division. Thanks to the Yuba-Sutter ARC for agreeing to allow the use of their WD6AXM repeater for Section nets. It covers from Amador County to at least Chico, which includes most of the section population if not all the area—I am sorry we can't get it all in yet. Yuba-Sutter ARC participation in the Boy Scout Hamboree of the air was well planned and carried out by WA6AGD, N6CCS, N6FAB, WB5FIX, WA6ISR and W6FBU including an SSTV station. Congratulations to the new officers of River City ARC, WB6YKI Pres, WA6RPB V.P., KB6JHR Sec., KG6XX Treas., and W6YFW. KB6JHS, WD6EHF, WB6ROS, K6FO Directors. Traffic: WB6CLD 287, WA6WJZ 250, N6LUY 147, WD6BZQ 86, K6SRF 31, WD6EEZ 20, WB6SRQ 6, WA6ERZ 4.

SAN FRANCISCO: SM, Bob Smith, NA6T—STM: Bob Franklin, K6TP. SEC: Pete Spruance, KE6LF. Packet interest is building in Humbolt Co. Check with KE6LF and W6BME if you're interested. MARC is in the news agn. They were selected as LARGE CLUB OF THE YEAR IN THE PACIFIC DIVISION for 1985. HARC-FWRA rptr system is being linked again on 440 MHz. XMAS party for SCRA will be at Windsor MHP as usual on Dec. 14. Check with KS6W for info. Sorry to hear that Rich, WB6VLM, is a Silent Key from MARC. SFRC X-MAS PARTY is Dec. 14 at Max's in Daly City. Contact W6VV for directions and info. DNARC's rptr was put to good use in Oct., first traffic accident on Smith River reported via Amateur Radio, get out and support this active club and rptr. Don't forget, local club elections are upon us, get out and support your officers and YOUR CLUB. Traffic: W6RNL 146, KK1A 90, K6TP 76, K6TWJ 66, N6FWG 46.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECM. Asst. SMs: W6TRP and K6YK. Appointments renewed: SEC: WA6YAB. ORS: W6DPD, N6OZ and W6SHV are SILENT KEYS. The Pacific Division Convention in Las Vegas was well attended by San Joaquin Valley Amateurs. The Fresno Amateur Radio Club is planning its annual Hamfest for the first weekend of May, 1986. N6KNA is WN6A, KB6JHW is N6MOK, KB6JHX is N6MOI. KB6IOI is N6MOG, KG6JH is WK6S. KB6IOR is N6MQK. WA6YAB and N6GPA have TH31ATs. KB6JXR has an HW-8. WB6QDM has an IC 02AT and a TR 7950. WB6HQU has an IC 271A and an IC 471A. W6DPD has an IC 04AT. KA6ORJ has a PCS 5000. Traffic: N6AWH 119, K6PMG 19, KB6HGW 19, WA6YAB 6, W6DPD 6.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—BM: W6BCY. PIO: N6BIS. TC: K6HLE. SEC: K6ITL. ACC: W6MKM. ASM: NS6N. STM: W6PHT. STM W6PHT gave a talk on traffic handling and the National Traffic System to the Gabilan ARC, W6PHT just received a commendation from the ARRL for handling a great deal of health and welfare traffic during the Gordo/Rat Creek Fire in July, 1985. West Valley ARA members provided communications for the 'Summit Marathon' recently. The marathon was run through the Santa Cruz Mtns. from Los Gatos to Soquel. WD6GYH/R and KA6YZS/R were used for the race. Those helping out with communications were: WD6GYH, KF6VM, N6JTU, WA2JDO, N6LDH, KA6AOS, KA6POQ, KA6CPR and WB6KHP. W6OAT and East Bay SM W6RGG gave another presentation on the April 1985 Clipperton DXpedition, this time to the Santa Clara County ARA. This time W6OAT gave a short history of the island and W6RGG narrated the slide presentation. There will be a 1986 Pacific Division Convention. It will take place in the San Jose area in October. SCCARA is the club that is sponsoring the convention and AE6Z is the Convention Chairman. The convention committee is already planning for the programs and have been contacting potential exhibitors. If you have and ideas on a program or forum you would like to see at the convention, please give AE6Z a call or drop him a line. New officers for Central California Radio Council include: Pres-WA6CIE, VP-N6GWL, SEC-KA6VHY & Treas-WA6CIE. W6WRV will continue as Editor of the CCRC 'Circle.' AJ6V spent the CQ WW DX CW Contest n Montserrat as VP2MEV. Remember to listen in on the Section Manager net on Tuesday evenings at 9:00 p.m. on WB6OWS/R (146.76). You will hear information about what is happening in the section, upcoming club meetings, public service events, and other matters of concern to Section amateurs. Congratulations to new ARES appointees in Santa Cruz County, WA6ICV is the new DEC for Santa Cruz County. New ECs are: N6IYA for North Santa Cruz County, N6MJV for City of Santa Cruz and KG6HS for South Santa Cruz County. Congratulations also to N6JLJ on being appointed an Official Relay Station in SCV Section. TRAFFIC: (September) W6KZJ 97 (October) W6YBV 171, W6KZJ 148, KA6CVM 72, W6PRI 67 & W6PHT 54.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W, STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. OOC: K1PLR. SGL: KE4ML. HAPPY NEW YEAR to everyone. Make your resolution NOW to enjoy Amateur Radio more in 86. A large number of amateurs in section participated in the SET. With the emphasis on Salvation Army, a lot was learned from the exercise. Many new stations became involved in ARES as a result. Congrats to our sister section, SC for beginning a HAM WATCH program. Many states are watching NC so when you QSO someone out of state, explain the HAM WATCH program to them. New officers Cary ARC: Pres. AB4S, VP, N4BYJ, SECT. N4MAR. TREAS. KA4ATK. At Brightleaf ARC: PRES. WA4MOK, VP, N4KLM, SECT. K4WKZ. TREAS. WD4JPQ. Forsyth ARC sponsoring Explorer Post 73 with EMPHASIS on AMATEUR RADIO. Nothing else will do. This would make a good resolution for clubs to sponsor an Explorer post. We could get many new amateurs. It's worth the effort. N4ERM has a cheap multiband antenna that works. Congrats to N4JVH, N4MBI, KA4LRP, N4MUM, KJ4JX, KB4MUV, KB4LPO, N4MYB, KA4UJO, and all who mastered the upgrade plateau at Concord Hamfest. Was good to see all at Concord and Greensboro Hamfests. Passing rate was at 70%. The VECs in Section have it all together. Thanks to all who make it possible. SILENT KEY: N4BTK. Need more information from all in section. Let me know what you are doing. Share your experience of helping advance Amateur Radio with others. PLEASE WRITE. From the Earthquake/Hurricane disasters I hear that clubs and individuals in section are receiving much needed publicity about our hobby. Keep the communications lines open. Keep in mind that FCC rebroadcast rules present some grey areas so when in DOUBT, DON'T DO IT. K4JHF advises several new ECs in mountain counties. With winter here and SNOW, the ECs are preparing for the worst. This month showed a marked increase in traffic. Thanks for all the SARs. More changes on staff at League HQ. Let's wait and see how this will affect you. Traffic: K4NLK 416, WB4HRR 282, NJ4L 172, KA4EYF 155, N4JRE 120, K4JHF 72, AA4MP 69, WA4MNR 68, KB4IVV 65, WB4N 61, KI4YV 50, KB4FWL 49, K4SWN 48, WD4EOK 40, WB4WII 39, N4BYV 35, K4GI 35, NE4J 34, N4LUO 31, WD4RMQ 27, KA4YMY 26, K4YJB 24, WD4HTE 21, KU4W 21, N4JEO 17, WD4MRD 17, NT4K 16, WB4CYN 15, W4PRG 14, KA4TLC 14, N4CJJ 13, W4EHF 12, WR4E 6, N4UE 6, K4WC 6, W2JDB 5, K4KYD-5, K4QXA 4.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ. ASM: WB4UDK. ACC: WA3WIP. BM: W0IKT. OOC: W4NTO. PIO: KJ4DT. SEC: K4SUG. SGL: WD4HLZ. STM: W4ANK. TC: NE4G. AIRS: W4DRF. Are SC officials aware of my public

service activities? Do SC officials recognize the capability of Amateur Radio during an emergency? Do SC officials wish to utilize Amateur Radio during emergencies? I know these questions enter your mind and I know it is difficult for you to receive an answer that will satisfy a need to be recognized for your public service effort. The only answer I can give is—1) You receive a SPECIAL SERVICE AWARD in 1984 from NOAA Weather. 2) You provide BACKUP for NOAA Weather Radio. 3) NOAA Weather calls on you to provide info via SKYWARN. 4) By an MOU with EPD, you will provide vital communications to all agencies in SC during a disaster. 5) Governor's Office and Highway Patrol organizing HAM WATCH in 1986. 6) You have an active voice in SC NVOAD. Amateur Radio has become a vital part of SC and I will be traveling to your club during 1986 to explain these programs. Contact me for a date. Traffic: K4ZN 232, K4FRX 137, W4FMZ 103, KB4BZA 78, W4ANK 72, N4LST 56, WB4UDK 39, WJ4P 35, KA4YEA 28, KA4LRM 27, K4ZB 21, WØIKT 18, KJ4KB 17, W4DRF 8, WD4FJP 2.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: WB4UHC. OOC: W4HU. ACC: NT4S. BM: AB4U. TC: WV4MAE. SGL: W4THV.

VTN	1 PM	3907	AA4AT
VSBN	6 PM	3947	K4VWK
VSN	6:30 PM	3660	NN4I
VN (EARLY)	7 PM	3680	K4AXF
VN (LATE)	10 PM	3680	N4GHI
VLN	10:15 PM	3947	N4KSO

Another busy month for ARES net members with the emergency flood condx in the western part of the state and the Richmond areas. All reports have not yet been received but KB4PW, EC Roanoke, says his group had 34 hrs continuous operation with 25 operators supporting the Red Cross and other agencies. I know WA4RTS, Lynchburg DEC, and his gang were active in the area emergency. Amateurs from Winchester went to West Virginia to give them support. N4EXQ, State RACES Coordinator, constantly monitored all activity in case RACES needed to be implemented and he coordinated the communications for the emergency in Richmond. Again the training received from participating in local 2 meter ARES nets was very evident in this emergency. A job well done. There has been an upsurge of interest in club affiliation with ARRL from WD4OQW in Mclean, KI4EZ in Chesapeake, KB4DRN in Churchville and WA8MWI in Bedford. If your club is interested in affiliation or application as a Special Service Club contact "ACC" NT4S or the SM. I regret to announce that K4IY is a Silent Key. Jim was a musician, educator, churchman and a community leader. He will be missed. AA4GL reports that the Tappahannock ARES gang supplied communications for the areas annual Oyster Feast. Those people know the right spots to pick. OOs KE4EQ, W4HU, W8IRT and KB4WT were busy monitoring the bands. The Lynchburg club will furnish communications for the State Winter Special Olympics, Jan. 6, 7, and 8 if you would like to help suggest you contact WA4RTS. VE exams Feb. 1, Virginia Beach contact KA4UNC, Mar. 1 Chesapeake, Va. contact AA4MB. AA4GL, K3RZR, WB4PNY, WA4EQW, WA4COK, N4GHI and K4JST attended the recent EAN staff meeting in Boston. The size of this group is an indication of the Virginia section's leadership in traffic handling circles. I want to thank those clubs who send me copies of their newsletters they are very helpful to me in evaluating the Section's activities and is a source of material for this column. Also, I welcome your comments and opinions so do not hesitate to express them to me. Upcoming Hamfests are Frostfest, Jan. 12 and Wintertest, at Vienna Feb. 23. Both N4GHI and N4EXQ make BPL and 18 stns make PSHR with over 60 points. 49 stns reported traffic. Traffic: N4GHI 650, N4EXQ 544, AA4AT 380, AA4GL 269, WB4PNY 260, W3ATQ 239, WD4FTK 186, KB4WT 132, WD4OCW 131, WD4ALY 120, K4JST 112, WA4CCK 109, WA4LJI 95, K4AXF 93, WB4FLT 92, W4JLS 79, K4JUM 73, N4KSO 72, W4WVP 70, KA4ERP 69, NN4I 54, WB4VMX 54, K4JM 54, K4BGZ 45, NT4S 43, K4VWK 41, KB4NGO 37, K4MLC 36, WB4KIT 34, KA4IUM 34, NW4O 32, K3RZR 32, WB4DQZ 31, W4TZC 30, N6ANQ 28, N4DWO 27, WB4UHC 27, WB4FDT 24, K4MTX 24, K4GR 22, N4FNT 12, WB4ZNB 11, WA4TVS 9, WB4EDB 9, KI4LO 8, N3RC 8, W4YE 5, W4KX 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. SGL: K8BS. ACC: WA8CTO. TC: K8CG. Regret to report that W8SKD, Kelly, is a Silent Key. KZ8Q is new WVN MGR. Many Tnx to W8LYV for his years of service and tnx to Ben for accepting apt. As is usual in WV, Hams responded in an exemplary fashion, often at great personal sacrifice during Nov. flooding.

Net	Time	QNI	QTC	Sess.	NM	Freq.
WVFN	6:00	1139	124	31	W8YP	3885
WVMD	11:45	797	59	31	W8FZP	7235
WVN	7:00	308	91	31	KZ8Q	3567
Hillbilly	Noon Su	130	8	4	W8YP	14290
WVRN	6:30	214	48	31	KD8RD	3640
WVNN	5:30	63	15	25	WD8LDI	3730

Traffic: WA3NUI 149, N8GJO 145, WD8LDY 141, KZ8Q 121, W8YP 70, N8EMQ 53, K8KT 47, KD8RD 39, K8QEW 39, N8FXH 25, WA8YCA 24, NC8G 22, KA8OGF 20, KD8G 20, WD8EBH 16, WB8TJO 11, NJ8J 3.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J—SEC: WB0FQB. STM: WD0AIT. ASM: W0RSG-KA0MQA. ACC: WB0DUV. OOC: NM0X. PIO: N0FOE. SGL: WD0GQL. TC: NC0F. BM: KD0RX. It has been one year now that the VE testing program has been in effect in our section. I am very proud that every single area of the state has had at least one VE test. For 1985, my records show 31 ARRL VE Tests that were scheduled. Thanks to the dedication and effort of the sections many volunteer examiners. VE Test schedule for Jan. as follows: Jan. 11th, Mile Hi VE Team (WØIJR) Jan. 27th, Boulder VE Team (NØBWS) Packet Radio is going great in the section, and I am sure we will see linking around the state in 1986. With many mfg's coming out with 1296 gear, several Colorado hams are now on this mode. look for lots of activity on this band. KØKE recently mountain topped on this band giving out some rare grid squares. Our condolences to WBØEIV and family whose XYL WBØWXQ passed away after a lenghty illness. 73, and a very Happy New Year is wished to all from the Section Team. NETS: Col; QNI 924, QTC 26-inf 114, time 945, sess. 27. CWN; QNI 181, QTC 79, time 598, sess. 30. CWXN; QNI 2739, QTC 3469, time 2790, 31 sess. NCTN; QNI 223, QTC 80, time 292, 27 sess. SCTN; QNI 95, QTC 79, Time 271 19 sess. Traffic: NØBQP 2570, WAØHJZ 1439, KØRXK 540, WØACH 532, KAØCZW 472, KØJAN 461, WAØOYI 394, KBØZ 236, WØLAE 114, WDØAIT 104, NØDZA 94, WBØFFV 44, AIØW 26, WØNFW 12.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ.

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- **EB-2** external C manganese/alkaline battery case
- **SC-8/8T** soft cases
- **TU-6** programmable sub-tone unit
- **AJ-3** thread-loc to BNC female adapter
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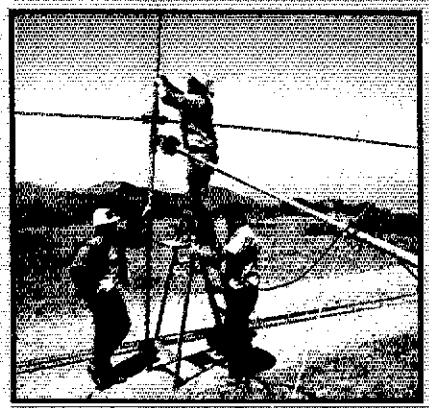
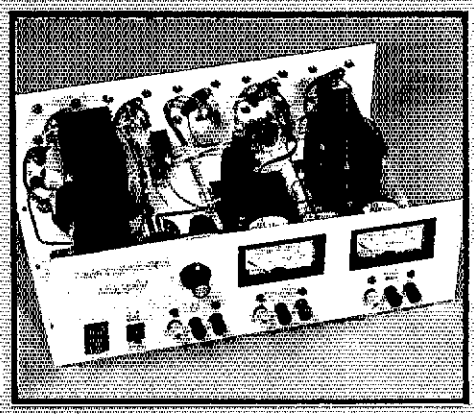
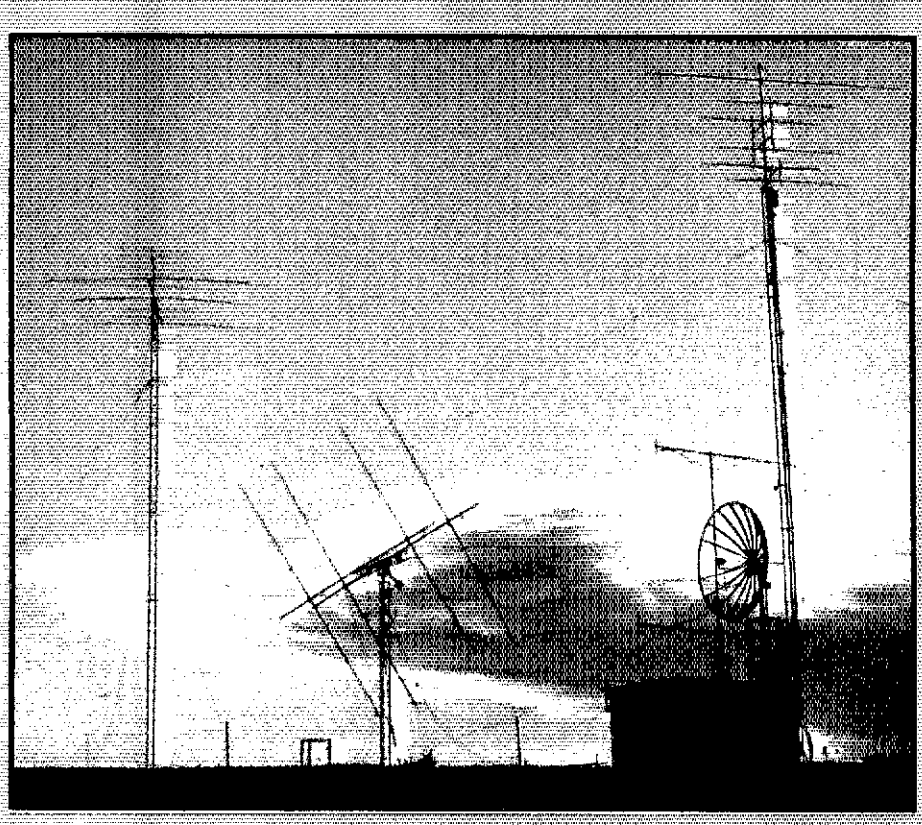
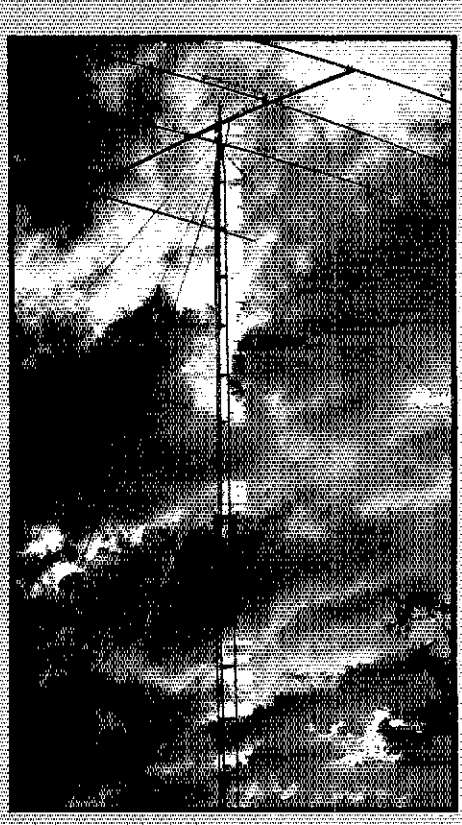
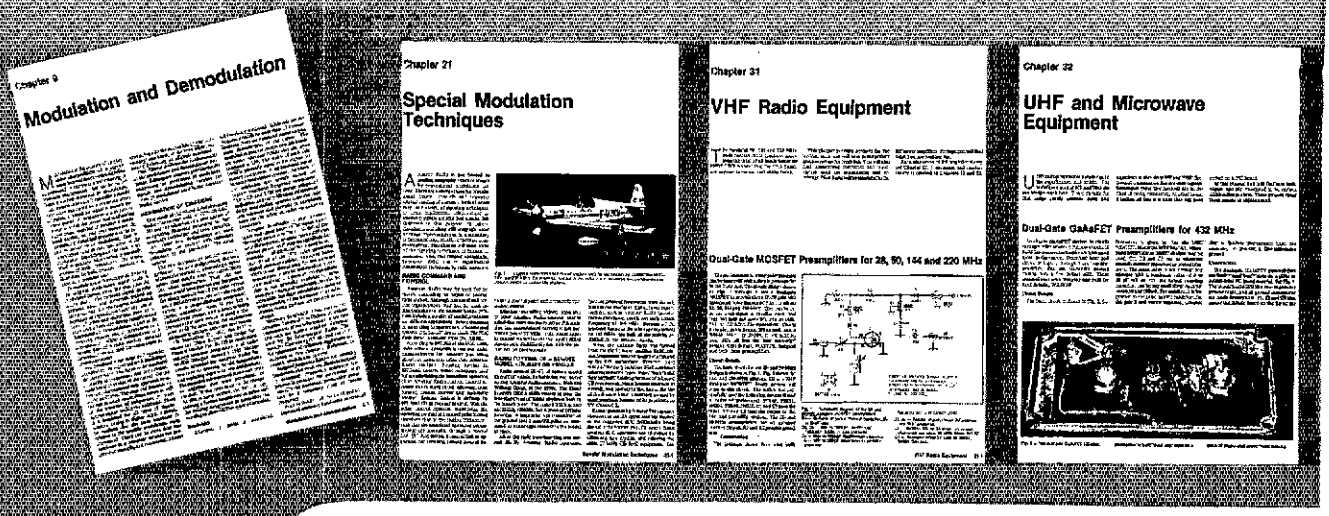


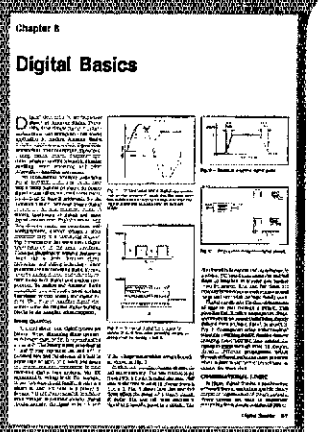


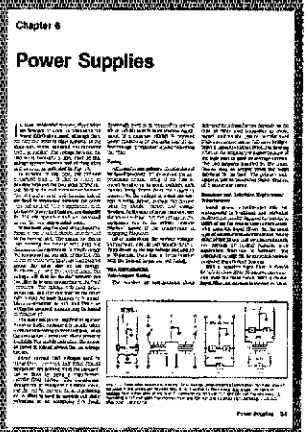
THE ARRL 1986 HANDBOOK

FOR THE RADIO AMATEUR







THE PLOT THICKENS!

The ARRL 1986 Handbook for the Radio Amateur takes over where the 1985 Edition left off. Each of the 40 chapters has had some revision, and there are more than 500 new or revised figures. The new edition will contain 1184 pages — way up from last year's count of 1024. Many key chapters with "hot" topics among today's radio amateurs have been completely revised and rewritten. In fact the new material represents 532 text pages.

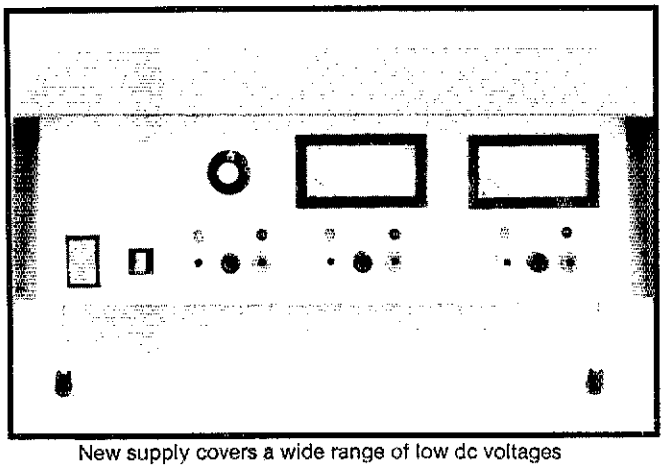
An understanding of digital electronics is a must these days since such circuitry has so many practical applications in station control, frequency synthesis, telemetry, word processing and other information-handling systems. The Digital Basics chapter will help you to understand what is going on in everything from simple keyers to sophisticated microcomputers. Packet-radio enthusiasts will find the most up-to-date information available in the Digital Communications chapter. There are new sections on data interfacing and modems, 50 new and revised figures, plus an expanded bibliography and glossary.

The Special Modulation Techniques chapter has the latest on spread-spectrum. On the fun side, we've added a new section on remote control of model aircraft and vehicles.

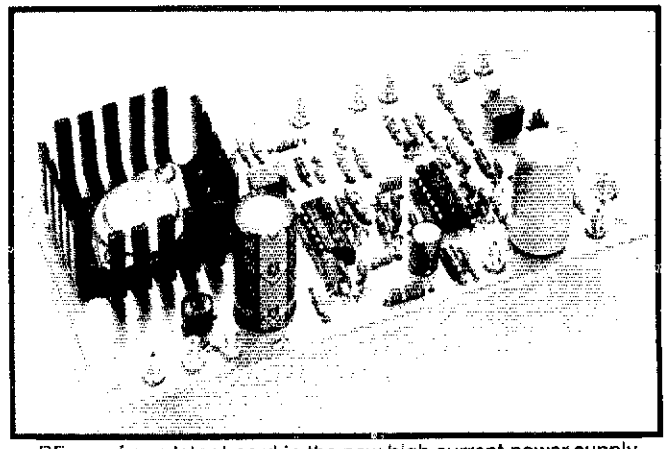
On the practical side, you will find many of the 27 new projects described on the next page. There are new power amplifiers for 1.8, 50, 144 and 1296 MHz, plus preamplifiers and transverters for the VHF/UHF enthusiast. The new digital PEP Wattmeter - SWR Calculator will be one of the most popular projects.

We've only scratched the surface in describing what is in the standard manual of RF communication. Over 5.7 million copies of *The Handbook* have been published in 63 editions since 1926. The new edition will be available in early November. It is must reading for today's radio amateur!

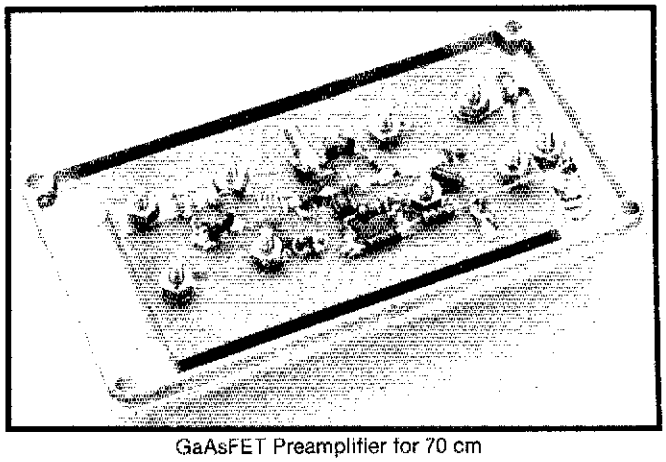
The *1986 Handbook* will be available in November. Paperbound prices are $18.00 in the U.S., $19.00 in Canada and elsewhere. Cloth prices are $27.00 in the U.S. and $29.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.



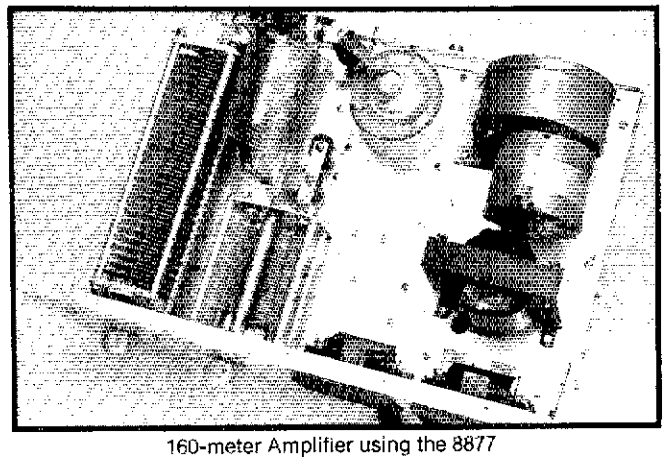
New supply covers a wide range of low dc voltages



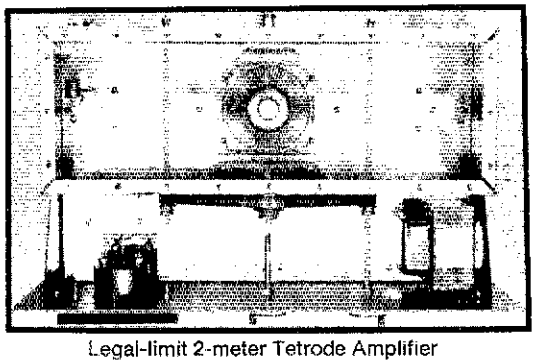
RF-proof regulator board in the new high current power supply



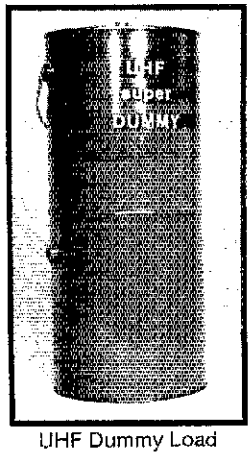
GaAsFET Preamplifier for 70 cm



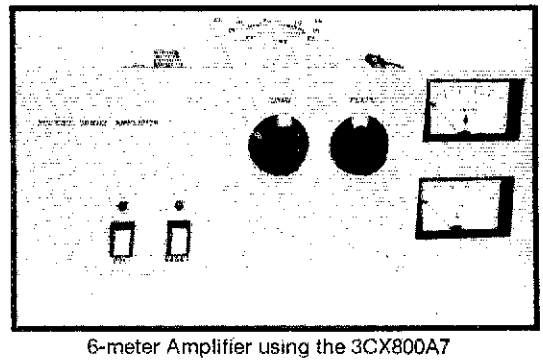
160-meter Amplifier using the 8877



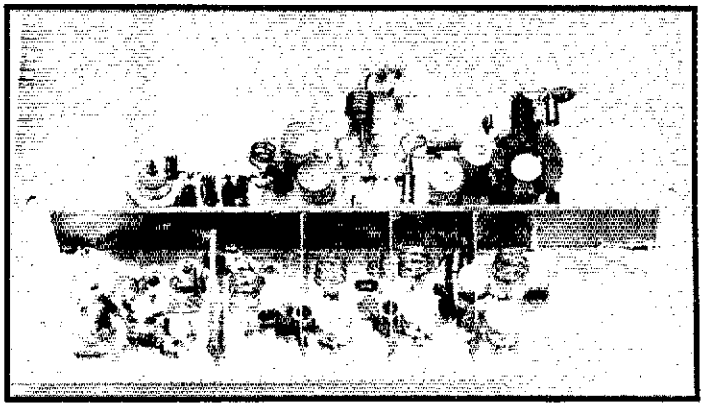
Legal-limit 2-meter Tetrode Amplifier



UHF Dummy Load

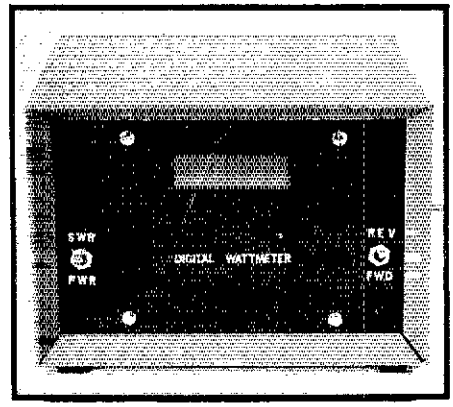


6-meter Amplifier using the 3CX800A7



Transmit converter board: 220 MHz Transverter

New for '86



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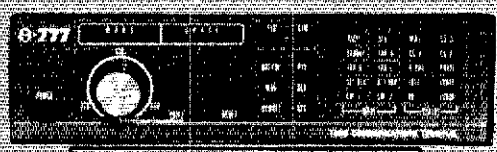

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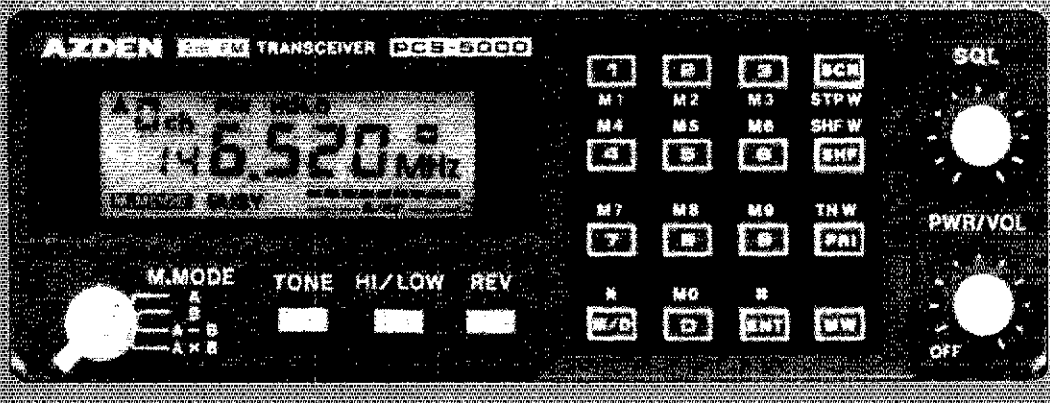

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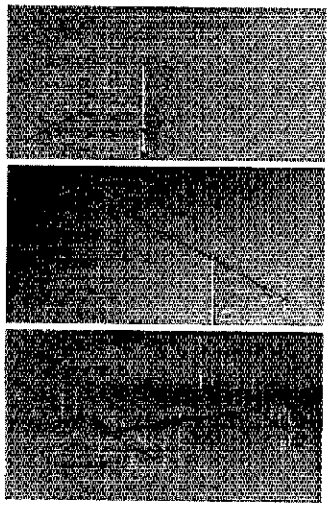

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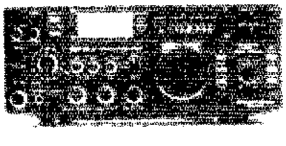

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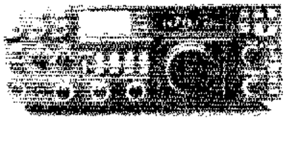

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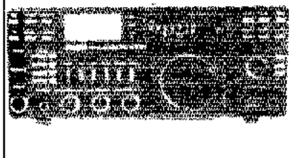

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Uses 2AT accessories

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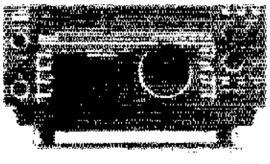

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includes CW keyer, AM/FM, CW filter

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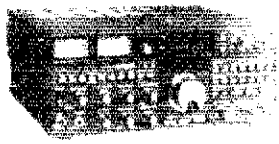

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Free FTS-6 Tone Encoder with 209RH

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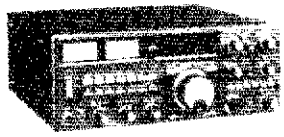

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Great for Satellite Work

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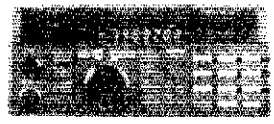

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Continuous Coverage
60 MHz-905 MHz, All mode

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Other sizes at similar savings
Foldovers shipped freight paid
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Complete Tower Packages:

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Each package includes top section, mid section, base, color sheet, guy brackets, guy wire turnbuckles, equalizer plates, guy anchors, cable clamps, thimbles. Ask about substitutions and custom designs. Tower packages are shipped freight collect FOR our warehouse.

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HG37SS 37-feet tall ... CALL
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Order Hy-Gain tower, Hy-Gain antenna, and Hy-Gain rotor and receive free shipping on all

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Shipping not included. Shipped direct from factory to save you money.

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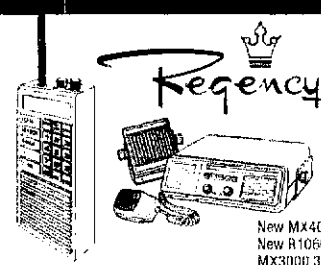

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AT-1200A 1200 PEP Tuner ... 173.95
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LA-2065R 2m Amp, 2 in, 60 out ... 125.95
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Procom 400 desk mike ... 57.75
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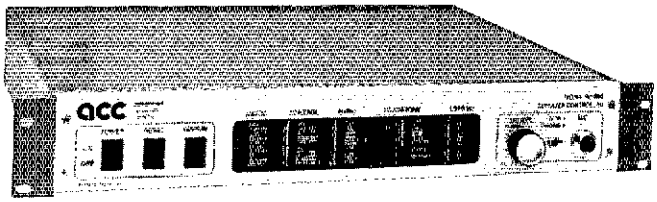

... yours

... and ours.

So we designed the **RC-850 Repeater Controller**, the industry's top of the line repeater control system. Now in it's "third wave" of innovation, thanks to its designed for the future architecture and new software releases. The '850 defines the industry standard in repeater control systems.

- Fully remotely programmable with Touch-Tone commands
- Front panel LED display
- Over 300 word customized male and female speech synthesis vocabulary
- Time/day of week Scheduler with 10 set-up states, 30 changeovers and events, over 100 scheduled items for hands off operation and automatic reminders
- Full or half duplex autopatch, autodial (250 numbers), emergency autodial, reverse autopatch, antidialer, toll restrict including telephone exchange tables, supports remote and multiple phone lines
- Informative remotely programmable ID's (17), tail messages (13), bulletin boards (5)
- 16 channel voice response analog metering, automatic storage of min/max values on each channel, values may be read back on command or may be included in any programmable messages
- Supports synthesized remote base transceivers and full duplex links
- Individual user access codes to selectable features
- Mailbox for user-to-user, and system-to-user messages
- Paging – two-tone, 5/6 tone, DTMF, CTCSS, HSC display, user commandable and may be included in programmable messages (i.e. alarms)
- Easy hookup to any repeater

If your repeater budget can't afford the '850, we offer the **RC-85 Repeater Controller**, which we like to call the "second best repeater controller in the world". It's a scaled down, simplified version of our '850, but overall, it offers more capability and higher quality than anyone elses control equipment at any price.

- Remotely programmable with Touch-Tone commands
- Over 175 word customized male speech synthesis vocabulary
- Selectable "Macro sets" for easy control operator selection
- Autopatch, autodial (200) numbers, emergency autodial, reverse patch
- Remotely programmable informative ID's (7), tail messages (3), bulletin board (2)
- Supports synthesized remote base transceiver, control receiver, alarm
- Selectable, informative courtesy tones
- Talking S-meter, Two-tone paging
- Easy hookup to any repeater

For those who like to "roll their own", we can get you off to a rolling start with our **ITC-32 Intelligent Touch-Tone Control Board.** Much more than just a decoder, it's a mini-control system of its own, with the basic repeater and remote base functions built-in. And it can be tailored by you with its Personality Prom.

- 28 remotely controllable latched or pulsed logic outputs
- 4 alarm or remote sensed logic inputs
- Response messages to confirm command entry
- Repeater functions including COR, IDer, timers, courtesy tone, etc.
- Remote base functions including control of synthesized transceiver

Our new **Digital Voice Recorder** lets you remotely record ID's, tail messages, and various other response messages for automatic playback through your repeater. Audio is stored digitally with no-compromise reproduction quality in up to eight megabits of memory. The DVR can support up to three independent repeaters for a low per-channel cost. Its Touch-Tone activated voice mailbox lets your users easily record messages for other users when they aren't around.

- Remotely recordable, variable length audio tracks, accessed from controller messages
- Top quality, no compromise audio reproduction
- Supports up to three repeaters for cost effective installation
- Expandable to roughly 6 minutes of speech in 8 megabits of memory
- Easy interface to RC-850, RC-85 controllers, or to any stand-alone repeater

QST: Attention All Hams

If you own a shack, you should know about ShackMaster™

ShackMaster lets you carry your home station with you in the palm of your hand. It acts as your gateway to the world, linking your handheld transceiver to your high performance HF station. Now, instead of your valuable home equipment being available to you 1% of the time, it's available 99% of the time! Whether around the house, in the yard, or across town, ShackMaster let's you take it with you.

But that's just part of ShackMaster's story. It lets you communicate with the family by handling third party traffic – its electronic mailbox and intercom let you keep in touch. And a simplex patch lets you place important calls directly through your home phone.

- Crossband linking – VHF/UHF to HF
- Telephone access to your home station
- BSR Home Control interface
- Electronic Mailbox
- ShackPatch™ intercom into the shack
- PersonalPatch™ simplex autopatch

Because of the remote control capabilities of ShackMaster, the ARRL would like us to remind you that "Use of this device with a transceiver operating in the two meter band, or on any frequency below 220.5 MHz is not permitted unless a separate control link is provided".

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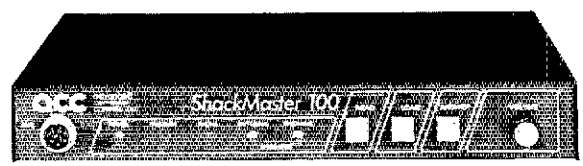

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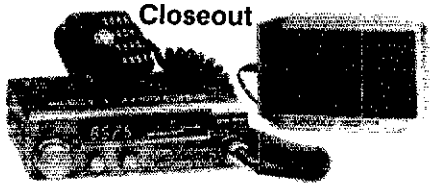

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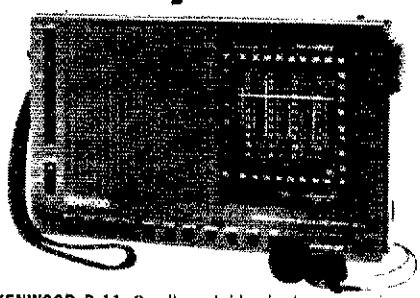

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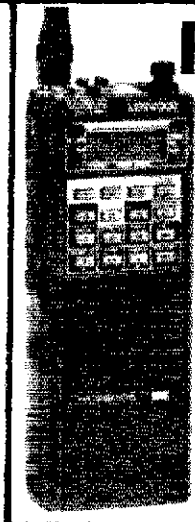

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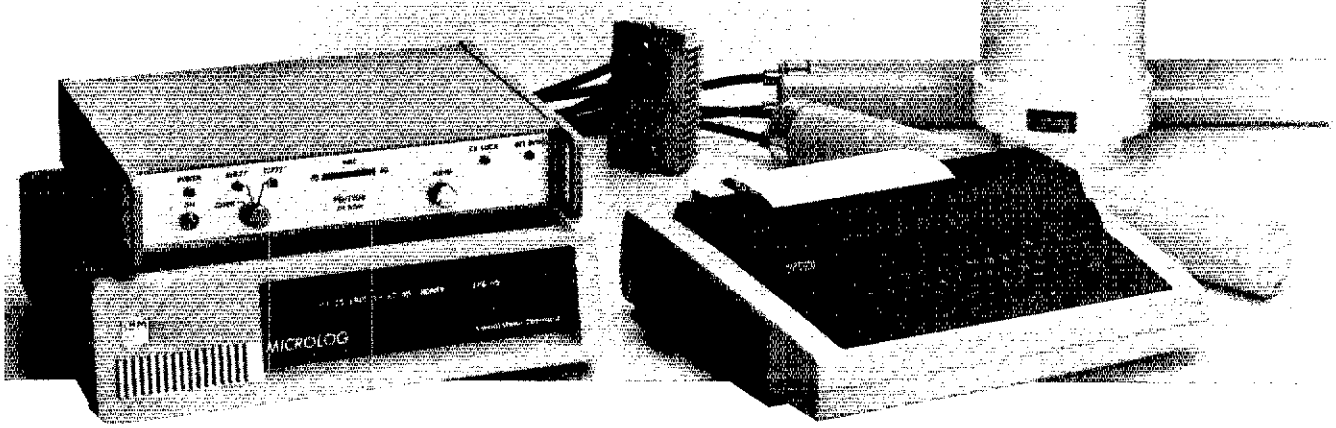

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TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 178 msgs with 236 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 96 msgs with 1074 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 81 msgs with 822 stations in. Yucca 2-mtr Net 78/18 handled 44 msgs with 318 checkins. Caravan Club 2-mtr Net 66/06 handled 18 msgs with 135 checkins. SCAT 2-mtr Net 66/06 handled 17 msgs with 707 checkins. Early Birds had 1 msg with 610 checkins. W5DER, a founder of 2 mtr in NM, became a Silent Key while fishing. N5EIB became a Silent Key while on final approach to ABQ Airport. K5VXJ & W5WVF also passed on. We'll miss them. W8GY doing FB job on Freq. Coord. & 15 vs 20 kHz vote. He deserves a BIG vote of thanks! Traffic: W5ENI 121, W6SX 14.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, WA7JJL. STM: John Sampson, W7OCX. NM, Utah Code Net: WA7WIB. WA7JJL is father of new 7 lb boy. Rumor has it that he has been pounding code out on his crib. We now have 43 packeteers; more each week. UT Packet Radio Assn has a weekly net on Tues. evenings at 8:45 on the 146.62 machine. K7FY is back from his trip to Mexico City. 73 de NA7G. Traffic: K7HLR 340, WA7KHE 70, N7ASY 70, WA7MEL 58, KD7NU 52, WA7JJL 19.

WYOMING: SM, Dick Wunder, WA7WFC—ASM: KA7AWS. SEC: W7TVK. STM: KA0X. I would like to introduce KA0X, Mary Ann Lenth, our new Section Traffic Manager. Mary Ann comes to us from Iowa and was STM there. Anyone interested in reviving a statewide traffic net and etc. can contact Mary Ann on the Nets or at 4306 Navaho Dr., Laramie, WY 82070. W7SDA hosted 20 Scouts for the "Jamboree On The Air," congrats Chet. Cheyenne has 6 new Novices and is conducting a General class license course to help them upgrade. Cheyenne has a new local repeater with autopatch and a new frequency, 146.175/.775 and welcomes those traveling thru to try it. KC7AR reports the Wyo. Cowboy Net held 23 sessions with 1037 QNI & 8 QTC. Traffic: NN7H 178, W7HLA 33.

SOUTHEASTERN DIVISION

GEORGIA: SM, Eddy Kosobucki. K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: W4PIM. ACC: WA4ABY. OOC: NA4I. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. As we commence a New Year I want to thank all who have rededicated themselves in the true spirit of Amateur Radio. Last year was a banner year in the Georgia section in many ways. You proved that the hobby is strong & continuously growing & that in times of emergency you are willing to share the load. The section now has more ARRL members, more clubs, the repeater issue has been resolved, the SET was a great success, many, many helped with the Mexican earthquake & the devastating hurricanes that plagued our neighbors & the nets are getting great participation. We also have more League appts, my staff is functioning smoothly & at this time I want to thank all of them for the fantastic job they are doing. We have numerous VE groups in the section so finding a place to take an FCC exam is no problem. I could ramble & ramble about the things that are happening in the Ga section because as your section mgr these are the things that make me proud to be in the position. As you know that as an ARRL member there are many appointments that are available. We still need EC's, OO's, ATC's & PIA's. There are also ORS & OES appts. Please contact me if you are interested. The Georgia SSB Association met at the Warner Robins Hamfest & elected as follows: Pres: WB4DVZ, VP: W4BKK, Sec-Treas: W4HON & Directors: W4WKP & N4LGF. The Georgia Cracker Net re-elected W4HON as Net Mgr & WA4IOU as Sec-Treas. Douglas County elected Pres: N4HOH, VP: K4PHA, Treas: W4JFL & Rpt Mgr: KB4EO. MALARC elected N4DTC Pres; VP: K4UKB, Sec: N4HJE, Treas: K4JGK, News: WO4U, Pub: WI4K, Net Mgr: WA4YWK, Memb: N4MAQ, Hist: KB4KHS. Happy New Year to all of you FB Georgia Hams. Traffic: W4PIM 232, W4WXA 132, WB4WQL 65, W4BKK 64, WB4DVZ 49, K4MOG 49, K4VHC 46, W9NXC 46, W9NXC 41, W4HON 33, K4EV 26, W4JWO 19, N4UZ 18, K4BAI 16, KF4FG 16, WB4SPB 14, KI4RG 12, KC4WL 10, WA4CBT 9, K4PIK 8, KA4ATM 6, K4NM 4.

NORTHERN FLORIDA: SM, Phil, WR4X; ASM/ACC: Roy, N4ADI. SEC: WA4PUP. PIO: WA4PUO. OO: K4JJE. SGL: KC4U. BM: KB4LB. STM: WB4GHU. TC: N3KF. Northern Florida is proud to have 33 clubs as ARRL Affiliated Clubs, and of these, 6 are SSC's. By the time this is in print, it will be election time for many clubs. Please make certain that your new club officers are shown on the 1986 annual report forms which will be mailed after the first of the year. If your club is not affiliated with ARRL we invite you to write ARRL Hq. Newington, CT 06111 for information and forms. The Central Florida VE Team will have the use of the Language Lab at Seminole Community College for administering CW tests 11/19/85. We are hopeful that the use of "cans" with separate volume controls will help eliminate some of the problems which are sometimes experienced. A new group of Amateur Radio Operators has been formed as part of the Retired Employees of Martin-Marietta and they've picked the logo "HAMM RAMM." They meet at 7PM, Second Thursday, at Crossland Bank in the Colonial Mall, Orlando, FL. We have heard that TARS has been the recipient of commendations from NOAA and the American Red Cross. Many other clubs have also received thanks for their efforts during all the fires, tornadoes, and hurricanes we experienced this year. As usual the amount of printed word covering these events did not often give any recognition to the Amateur Operators who spent many hours away from home manning shelters and providing much needed communication skills to those who were sheltered. Our efforts to get the word to local printers has improved and we ask that each of you pass on info to Petey, WA4PUO so she may help get the public recognition we need to help keep Amateur Radio growing. WF4X, Phil, our SM is on the road to recovery and he soon may resume his duties. I've (N4ADI) tried to fill his shoes these past few months and it has been enjoyable! We wish Phil a quick return to his radio work! Traffic: WX4H 736, N4PL 592, WA4QXT 583, WD4IIO 510, WB4ADL 400, KB9LT 284, KC4VK 191, WD4IUI 162, AA4HT 162, WB4GHU 145, WC4D 138, KB4MHH/T 134, WA4EYU 130, KD4KK 127, KF4U 127, KB4LB 110, W4GUJ 89, KB4FIY 79, KF4TM 76, N4JAQ 71, N4ADI 67, W4KIX 62, W4MGO 60, WA4PUP 50, W4LDY 37, WA4FXW 36, WD4MLQ 35, N4GMU 33, WB4TZR 31, WB4FJY 29, NS4C 28, N2AOX 26, KI4CQ 25, WD4EQB 23, WD4HBP 18, NQ4P 17, WD4HUZ 14, N4ENL 13, WA4PUO 11, N4JHI 11, WB4AWG 9, KF4GY 6, NA4F 5. (Sept.) NF4O 143, AA4HT 29.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK—SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WD4KBW. PIO: W4WYR. SGL: KC4N. OO: W4SS. ACC: WA4NBE. WD4KBW reports a total of 183 bulletins received and transmitted this month. OBS stations reporting were: AA4BN 9, W4DL 18, W4ESH 7, WT4F 6, KA4GUS 18, K4IEK 20, WD4KBW 38, WA4EIC 51 and AA4MI 16. NW4R is in the hospital for tests—hope you are back on QFN/QFNS soon! NW4R is a newly appointed Assistant Technical Coordinator for Polk County. WA4PIL is the new Emergency Coordinator for Lee County, replacing WB2OUK who is moving out of the county. Good luck on your move, Jeff. The Ft. Myers ARC is sponsoring a special event station—W4LX is operating from Ochopee, the smallest Post Office in the US. WA4PFK made contact with W4LX/Leroy on 40 meters November 3. WB4WDK, EC for Highlands County, reported the following were active in providing shelter communications during Hurricane Elena: KI4XM, K4ZNB, W8OKW, K4UGC, N4APC, W1PI, KB4BEV, N4FJH, N4EIE, N4GXX, K4IFH, WB4KWJ, KB4DGF, KE4PM and WB4WDK. KR4X, EC for Hillsborough County sent an After-Action Report for Hurricane Elena to W4SS. A few of his suggestions are—hams should be aware that if they go to a shelter it might very well be for an extended stay, so take the personal items needed to be as comfortable as possible. Also suggested is a firming up of the HF nets link with the National Hurricane Center and the State Bureau in Tallahassee. He also recommends that the agreed upon 72 hour moratorium on Health and Welfare inquiries be followed. At the recent hamfest in St. Petersburg there was considerable discussion of emergency communications—especially as related to formal message handling during international emergencies. A Simulated Emergency Test held by South Palm Beach County amateurs resulted in letters of praise from both the Shelter Chairman of South County Service Center, Palm Beach County Chapter ARC and also from the Palm Beach County Director of Emergency Management. K4KE reported a total message count of 102 during the Florida Sheriff's Boys Ranch Open House in Live Oak. AA4WJ now has a new IC 735. N2WX reports much increased packet activity thanks to W4LLA and KB9LT. 73 de WA4PFK. Traffic: W3CUL 3016, W3VR 891, WA4PFK 364, K4ZK 284, KF4AJA 245, K4SCL 245, W4NFK 239, KA4FZI 223, K4EUK 213, N4KFU 203, WA4EIC 170, WB4WYG 151, KA4GUS 132, KY8Y 126, K4IA 111, KA4NXF 108, WA4RUE 100, WD4KBW 82, KB4MON 67, KY8T 66, KF4RL 64, W4DL 61, KA4SIH 59, KB4KB 54, KA4YHS 53, N4ET 50, N4HAS 43, W4ESH 42, KB4MON 41, WA4HXU 40, K5IHH 38, WT4F 38, N4MML 32, W4SS 30, K4JJ 29, N2WX 27, W3TLV 26, KA4AMC 25, WD9AEP 22, K4FQU 20, WA4HDH 19, KA4EWO 19, N4IOA 19, AA4MI 18, W4WYR 17, W3IJR 16, K4OVC 16, W4ROA 14, KB4ABT 13, WA9VND 12, KA9AKY 12, KB4KAW 11, W4PKP 11, WB4BKC 11, KA4KDD 10, K4IRT 10, KB4LTL 10, W4YCL 9, W4MPV 8, WD4CHO 8, WD4MCC 7, WK4F 7, N4ILN 7, N4IXQ 6, W4MFD 5, WB4AID 5, KA4GDU 5, KD4GR 4, AA4IF 3, N4LLZ 3, W4DWN 2, KB4LKT 2, KI4ZW 1. (Sept.) K4IWT 552, N2WX 18, KA4KDD 7, N4LLZ 3.

WEST INDIES: SM, Carlos Flores, WP4J—WINS Net Daily at 2300Z on 3710 kHz. WINE Net Daily at 0001Z on 1984 kHz. Hello friends, KP4BZ station was on the air competing in the CQ World Wide contest during the weekend of 25, 26, 27 Oct. Around 5,675 QSOs were made during the 48-hour operation, operators at Tim's and Hector's station using the call sign KP4BZ were KP4BZ Tim, NP4CC Hector, NP4Z Felipe, NP4A Pedro, WP4C Ernie, WP4K Carmelo, WP4CBB Wayne and our SM WP4J Carlos hunting for multipliers. The final score is expected to be in the 6.8 millions, which is not bad for multi/single. Still the ARES program is working, giving support to the Red Cross in passing traffic around Puerto Rico. SM WP4J and SEC NP4HF are working hard in the field by coordinating communications. NP4CF, KP4FI and SGL WB4CSG are helping. WP4J is looking forward in the near future to affiliate another organization that's interested in ARRL. At this moment, all members of this group are taking a Novice course. The trip to St. Croix from Puerto Rico with WP4J and WP4ATF was not possible due to aircraft problems. WP4J will go later. WP2VI NM for WINE reports sessions 22, QTC 51, QTC 2. Hasta Luego Amigos. Traffic: KP4DJ 49.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, KA7HEV, WB7CAG. Am pleased to announce the appointment of Ed Hughes, KX7P, as our new SEC. Ed's credentials are outstanding and we are proud to have him on the team. Also, new EC appointment is KQ7T in Cottonwood. Congrats to KD7XO, Frank who became certified L.L. in Williams. Congrats also to John, W7CAQ for making BPL in October. N7CEE reports he and N7FU setting up a packet link for winter Special Olympics. The Cactus Net on two meters is off to a flying start with 427 checkins during first full month. K6LL reports taking part in Boy Scout Jamboree on the air, W7FH, 75 years young took part in 200 kilometer bicycle race in Mexico. Understand Palo Verde Nuclear Generating Plant Emergency Drill was a success with many Phoenix area hams participating. Communications were provided for Red Cross during drill. ND7B reports Scottsdale ARC had to scrap plans for the Hamfest there in April '86. Problem related to conflicting dates with other hamfests would have limited vendor support. They still plan to host the SW Division hamfest in 1987. Dora, KE7DR reports new Superstition Club sponsored traffic net on 147.12 daily at 1900 hours local. W7KAX reports the Mohave County SET will be run in November with ARES/RACES working with Sheriff's office. K7KYW reported a very successful Pima County SET drill in October. W7FF and K7KI made technical presentations to Tucson IBM Club, and to the Green Valley Radio Club. W7YS helped NN6F put up a Bob-tail curtain antenna on 80 M., and it worked 47 countries during WWDX test. KY7M, Lee reported good results for the WWDX phone test due to sudden upswing in solar flux. 73 de Jim. NET REPORTS

NET	QNI	QTC
CACTUS (75M)	617	133
CACTUS (2M-FM)	427	72
ARIZONA TRAFFIC (75SSB)	890	164
EMERGENCY NET (ATTEN)		
SWN (80M CW)	208	139

Traffic: KB7FE 418, W7AMM 279, W7GAQ 266, K6LL 262, W7EP 147, W7KCM 144, KA7HEV 60, WB7CAG 41, WA7KQE 32, K7JKM 29, W7OIF 27, K7POF 22, K7RDH 12, NN7A 126, W7KXE 4, K7NMQ 3.

LOS ANGELES: SM, Bob Poole, AJ6F—Packet Radio is the hottest thing in the section these days. There is a phenomenal popularity among those interested in all aspects of the service. Look for more ARRL and Section activity to be conducted on Packet. Congrats to the LAACARC and the Hughes, Northrop, Downey and SCRAN clubs for their N6BSA exhibit at the Los Angeles BSA Camporee. It was a big hit with the scouts. Special thanks to KN6H as the primary organizer and motivating force. There will (usually) be a booth at the TRW swap meet sponsored by the SM and Director for the purpose

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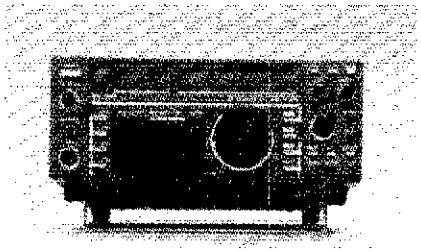

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8669 7/16" tinned copper braid	1.10/ft.
International Wire RG214, non-mil, good cable	.70/ft.

AMPHENOL

831SP-PL259 Silverplate	1.25
UG176 reducer RG8X	.30
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
New 82-202-1006 N-Male fits 9913	5.00
1/4" E.H.S. Guy cable, Rohn US, 1000 ft	250.00
3/16" E.H.S. cable	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
Porcelain 500D Guy Insulator (3/16)	1.69
Porcelain 502 Guy Insulators (1/4)	2.99

COMPUTER STUFF

Kantronics UTU-XT	319.00
Fits any computer (even yours!) Software Available	19.00
Morse University (Great CW program for C-64)	39.00
AEA New VHF 1200	Coming

USED EQUIPMMENT

All equipment, used, clean, with 90 day warranty and 30 day trial. Six months full trade against new equipment. Sales price refunded if not satisfied.

POLICIES

Minimum order $10.00. Mastercharge, VISA, or C.O.D. All prices FOB Houston, except as noted. Prices subject to change without notice. Items subject to prior sale. Call anytime to check the status of your order. Texas residents add sales tax. Dats all, folks

DON'S CORNER

Packet mania is upon us. It's been quite a while since everyone in amateur radio got so excited about a new mode, but packet seems to be doing the job. Prepped for a boom by the computer-RTTY explosion, Packet radio starts the year as the hottest item on most hams "I want" list. We keep seeing reports that packet is "FM of the eighties" or the "biggest thing since direct current". We also see the buying of packet gear escalating because of price reductions and ease of operation (packet's so easy even a ham can do it). Best bets for packet: the AEA PKT-80, or the Kantronics Communicator, (they retail at $229.00 but call for current pricing). Another bombshell: MFJ has announced their model at $129.00 retail (call for availability—this may be the best buy in Amateur radio.) In closing, the Madison gang hopes that 1986 is your best year yet—in and out of Amateur Radio—and that you work the rare ones, do well in the contests, explore the boundaries of the hobby, and chew the rag regularly with all your radio friends.
73 & Good DX
DON

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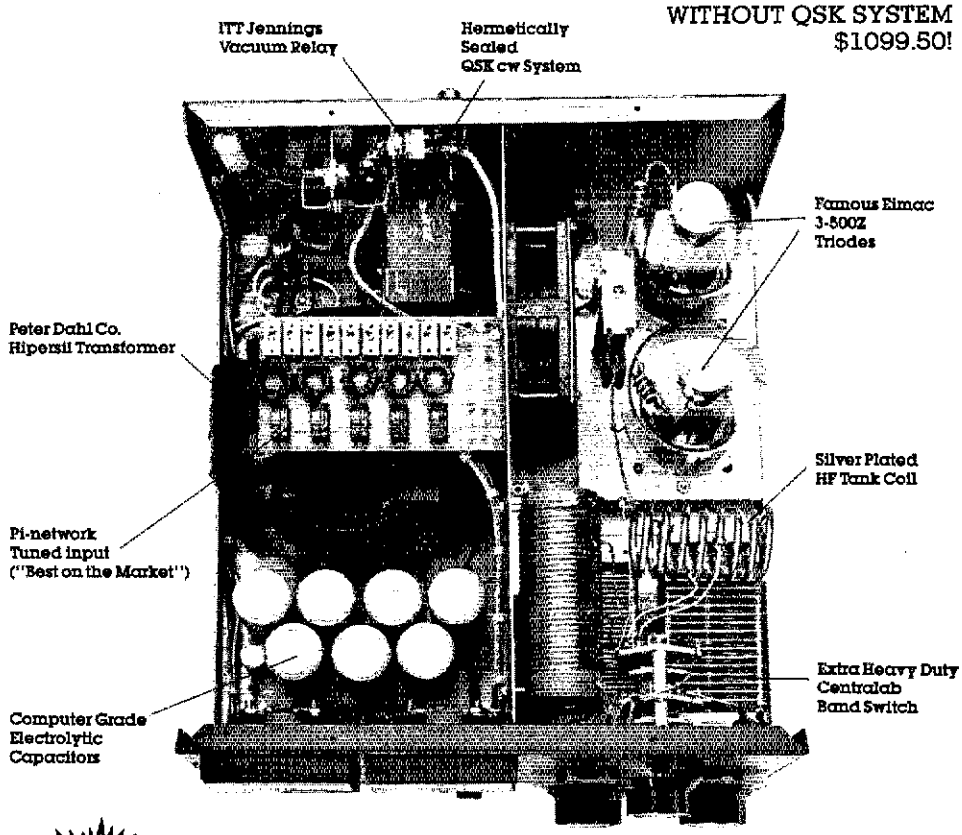

Thinking of buying a linear amplifier? You owe it to yourself to check out the new LK-500ZB.

The LK-500Z series of amplifiers were created to offer the best value you can buy in HF linears covering 160-15 meters. Last year, it was demonstratively the best value. It was the lowest priced, full feature pair of 3-500Z's on the market. It had the longest warranty and the only amplifier with a money-back guarantee. It's not surprising that the LK-500ZA, both the standard and "hipersil" version, became one of the most popular amplifiers on the ham bands.

Now, for 1985, Amp Supply engineers have taken this durable, dependable "rock crusher," fantastically improved it, and called it the LK-500Z "B" version.

Improvements include an ITT Jennings vacuum antenna changeover relay with a companion sealed relay QSK system which eliminates any signal attenuation between CW characters. The silver-plated HF tank coil and the extra heavy duty silver-plated Centralab bandswitch are the finest available.

The LK-500Z "B" version has all the outstanding standard features of the LK-500ZA; such as the Peter Dahl Hipersil power transformer, and a full-wave bridge rectifier system (we will not produce amplifiers using weak voltage doublers). Computer grade electrolytic capacitors are standard and the low-pass pi-network tuned input is the absolute best on the market. Oh yes, we only use Eimac 3-500Z triode tubes in the LK-500Z amplifiers.

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of dispensing League materials and just good old fashioned eyeball QSOs. Stop by and say hello the last Saturday of each month in Redondo Beach (corner of Aviation and Marine). May the holiday season bring joy, happiness and new gear for all! New Section Appointees are as follows: ASM K6IYK, SEC AK6Y, STM W6INH, ACC KX7Q, OOC K6BMG and others pending their acceptance. W6NAZ still seeking your stories of Ham Radio experiences of interest to non-hams. Please send them to Lenore at 14867 Round Valley Drive, Sherman Oaks, CA 91403. Barry, NØKV, has a SHOWCASE ham radio trailer that may be available for public events. Contact the SM for details. The following nets may be worth monitoring: SW Director and SM net, Sundays at 0815 local on 3815 kHz and the LAACARC Club-to-Club net on 147.705 MHz (-) Weds at 1930 local. We have a new SM for the Los Angeles Section, Gene Pool, AJ6F, we wish him the best of luck. Gene is an engineer with a local aircraft company. Sorry to say we lost another old timer Ernie Lasky W6TKN in Lone Pine, he will be missed by many. QCWA Chapter #130 had their fall luncheon Nov. 3 in Cucamonga, a very good turnout and a fine meal. Ted, K6UYK, still doing yeoman duty as myself on the traffic nets. Notice if you old timers would like to do some cw work we can use some help to fill some spots a night or two a week! Traffic: K6UYK 866, W6INH 547, N6LHE 57, W6NKE 29, W6ORF 24, K6CL 17.

ORANGE: SM, Jim H.Brown, W6UBQ—ASM:Karl, N6BVU. SEC: Jim, AE6N. STM: Ernie, WA6QCA. OCC: Alex, W6RE. SGL: Loren, N6HIQ. TC: John, KD7XG. PIO: Joe, WB6DXT. The Section Affiliated Club Coordinator slot goes to Phil E. Bettencourt, KB6FRW. He will share the responsibilities with his assistant, Gordon West, WB6NOA. In the Norco/Corona of Riverside County Mark Costa has been appointed Emergency Coordinator. Good luck KB6GNZ. The Riverside County Amateur Association Novice class under the direction of Pancho Johnson, W6KIJ is just winding up. It appears we will have new Hams in our midst. New Class will start Jan. 7th. Attention all Amateurs, clubs need instructors. You do not need a degree, just a willingness to give one evening a week to help the cause and growth of Amateur Radio. The N6ENV 220 MHZ Repeater Group New Officers, Pres Linda Rohs KA6UPI, VP Dan Purdy KB6BXK, SEC Rowdy Malcom KG6GK, Tres Bob Wasson N6JDH, Editor Mike Gunderman KB6GVT. Goals of this club? Growth and Utilization of the 220 MHZ band. With the spectrum bandits around, we need groups like this. During October the Barstow ARC participated in six public service events and had a garage sale for the repeater fund. EC Blynn WD6BNG SEZ, this gave the ARES/RACES Unit the chance to test operating procedures under field conditions. From The Lee De Forest Club comes the word that the Simulated Emergency Test was a good exercise, it offered practice and training using the new equipment in the Hemet EOC. Section wise the DECs from each county report the new high-tec gear (packet and rtty) systems worked well. Mr. Murphy was evident in helping us find discrepancies in the planning and implementing of emergency plans. The Anaheim Amateur Radio Association rpts 73% of those examined during the Sept testing were successful. GOOD SHOW. Larry, W6LO, has a good idea, if all clubs had Ham Classes and Testing, the work load of any one club would be very light. The Citrus Belt Amateur Radio Club dedication, Hugh T. Jones of Highland, a ham operator for more than 20 yrs, received the Radio Amateur of the Year Award for San Bernardino County. The Fullerton Radio Club October 4 marks the eighth anniversary of Rehab Radio operations. Happy Birthday! During October the 1600th Radio Time patient QSO was celebrated. The hunt winner this month, N6JSX. The Mystery Guest was the old adversary, "Murphy". The Mexican Earthquake proved again that the Amateur Radio Service is a valuable resource. I believe the news media has awakened the Private and Public Sector to the value of Amateur Radio. Attend your club meetings and make your comments and ideas known. Service and good will, the answer to most of our problems. PSHR WF6O, WB6QBZ, WA6QCA, KA6HJK/T.

SECTION NET ACTIVITY

NET	FREQ	TIME	SES	QNI	TFC	NM
SCN/1	3598	1830	30	281	224	WF6O
SCN/*	3598	2015	30	165	28	WF6O
SCN/V	146.645	2100	31	455	391	WA6QCA
RTTY/V	145.12	0900	62	473	148	KA6HJK

Traffic: WF6O 340, KA6HJK 181, WB6QBZ 172, WA6QCA 164, ADØA 126, K6ZCE 82, N6GOT 80, K6DD 54, W6CPB 66, W6TKV 40, N6FRW 18, W6RE15, N6LNI 4, N6ADV 5.

SAN DIEGO: SM, Arthur R. Smith, W6INI—KB6IUX has been apptd EC for the Eastern Dist of S.D. County. Richard also edits the Counterpoise, the ARC of El Cajon newsletter. ARES members are urged to get "official" jackets & caps to improve visibility and aid identification. Contact WD6CSS, 424-5785, for info. In reporting a packet workshop last month I erred on the call sign of one of the key participants. It should be N6CQW. Sorry, Roger! WANTED: operators with 220 equip to improve ARES disaster preparedness. For info check into 220 net. Sat at 1900, 224.9(-) N6ECL, W6PDA, WA6QQQ made contact on 902 MHz band at 1701 PDT, Sept. 27. N6ARU, W6BIG, WD6CSS, WA6EDG, WA6FUB, WD6FUN, N6GW, KD6QJ, W6QLJ, K6QM, K6UV, W6UZL, W6VMN, WB6YHC, W6YVY, KE6YY turned out for CDF Red Flag alert in Oct. EMS drill participated in by WA6BEJ, N6HQT, N6IMN, KR6K, N6MAE, W6NFG, K6PD, WB6TQF, W6TZV, KE6XF. S.D. County Board of Supervisors presented a proclamation to SW Div Dir WA6WZO recognizing Amateur Radio activity in the Mexico City earthquake. New ARES: KB6IUX, N6MLH. Attn ORS: Don't forget monthly traffic report by 5th of month to STM N6GW. NCTN met 30 times, handled 131 msgs. Traffic: KU6D 182, N6GW 26.

SANTA BARBARA: SM, Byron Looney, K6FI—Due to the extensive OJT in emergency work this summer, our SET consisted of a section meeting in Santa Barbara. N6KFD gave a presentation on the Incident Command System used throughout CA for emergency work. Much discussion on ARES/NTS operations in handling emergency traffic. Action items include a revised traffic plan to make better use of packet and a simplified message form for local traffic. The traffic we handled in July is nothing compared with what we will face when the 8.3 earthquake occurs. If you have topics for the next section meeting, drop a card to the SM. WB6RVA is now DEC for Ventura County. KF6DY is new EC for Santa Ynez Valley area. SBARC has already used the PRB-1 ruling with some success. More fire operations near Santa Paula. Merry Christmas and thanks for a successful year. Traffic: K6YD 81, N6HYM 74.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—Asst. SM/ACC: NI5V. STM: AE5I. TC: W5LNL. PIO: K5HGL. RFI: WB5JBP. BM: W5QXK. SGL: W5UXP. W5GPO is considering resuming his duties as SEC early in 1986. We sure miss Charlie's leadership, and are awaiting his return to the helm of ARES. If you are interested in public information work, and have good contacts with your local media and press, you are needed as a Public Information assistant here in our Section. K5HGL is our Public Information Officer, presiding over the program. Our goal is for each club in our section to come forth with a candidate so that we may fully publicize our many public service activities while at the same time, educate the media and public about our capabilities and services in times of disaster and at the many local events we cover each year. Public service work pays our dues for our operating privileges, and public awareness is vital to our efforts in maintaining these benefits. Write me for details on this program. My address is at the bottom of page 9 of this issue. The ATV radar transmitter is in its final testing stages and will go on the air in downtown Dallas in time for the spring storm season. It will operate on 426.250 MHz and retransmit the Doppler radar video from KDFW-TV at Cedar Hill, permitting fixed and mobile storm spotters with a live picture with Mapsco overlay. Congrats to WD5FYD, WB5PWV, AJ5L, WO4W, WA5WXA, K5HTK, K5HW, N5CSU, N5GUZ, W5BJ, K5HGL and N5EDI for making this project possible. Traffic: KA5SPT 188, KD5RC 170, N5BT 140, AE5I 125, WB5VIH 107, W9OYL 73, KA5AZK 60, KB5UL 51, W5VMP 30, KB5UQ 6, N5EZM 2, K5PC 2.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG. SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. The 1985 S.E.T. enjoyed an increase in activity over last year, with many organizations in the Section participating, including a Packet operation by Okla. Central ARC. Kudos to W5UUX, K5KW, NF5M, KE5UL, K5ENA, NW5H, WB5OSM, WB5CDW, and NB5N for fine JOTA operation at Sequoyah State Park. Over 300 scouts at the Camporee participated. Congratulations to KU5B, creator of Q.R. Zedd, on being named to the Okla. Journalism Hall of Fame. Packet activity continues to rise in OK Section with OIDAR now joining in the fun. Kudos to GPARC and friends for staging the 9th annual Beaver Okla. Amateur Radio QSO, a little known but worthwhile event, complete with dealers, exams, fleas and more. Planning is well underway for the 1986 ARRL State Convention at Green Country Hamfest. It promises to be a super event this year. OLZ activity is building, but we still need many CW ops to fill the roll. Check in any night on 3682.5 at 0100z. NEW ATC: K5SW, Muskogee. Everyone have a safe and joyous NEW YEAR. TRAFFIC: K5CXP 256, W5AS 206, KB5EK 191, W5VXU 142, WA5OUV 94, W5RB 86, NX5I 72, W5REC 66, N5IKN 60, WD5IFB 55, KC5OU 54, KV5X 48, NB5N 41, WA5IMO 41, WA5QGC 33, W5SUG 32, NG5O 28, W5VOR 26, WA5ZOO 26, K5GBN 26, W5VLW 25, WB5OHK 25, NR5L 25, K5CAY 21, KX5W 20, KE5MT 17, WB5VXK 12, K5ENA 12, N5HLJ 11, KA5TTH 9, ND5S 5, N5GVK 4, NQ5Y 4, W5DKC 4, N5DWN 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR—SEC: KA5KRI. ASM: N5TC. STM: K5QEW. PIO: WA5UZB. ACC: K85V. Hill Country ARC reports KA5SHK and N5FGR upgraded to Advanced, KA5VPP to Technician and N5FLC is now KF5EZ. Brazos Valley ARC reports N5FNA is now Advanced Class and KA5UPB has changed to NZ5I. Congratulations to all!! OBS W5KLV reports 9 ARRL bulletins, 31 satellite bulletins, 5 propagation forecasts, 4 DX bulletins and 4 CRRL bulletins given 134 readings on 9 nets. DRN5 Mgr WB5YDD reports STX represented 100% by W5KLV, WB5EPA, WB5FQU, W5CTZ, KD5CB, NX5V, KD5KQ, N5DFO, NZ5U, WA5ZJY and WB5YDD. CAND Mgr W5KLV REPORTS DRN5 represented 100% by STX stations NZ5U, W5KLV, KD5KQ, NX5V, WA5ZJY, WB5YDD, N5DFO and W5CTZ. The Mexico City earthquake and Hurricane Juan again proved that there is really no time for training during an emergency. Join a traffic net NOW and begin training for the next real emergency. Traffic: W5TFB 398, W5CTZ 313, W5KLV 304, WB5YDD 270, KS5V 248, W5AC 183, WB5EPA 111, WB5FQU 102, WD5GKH 54, K5HZR 46, AC5Z 28, AJ5K 16, N5GKM 15, NZ5J 9. (Sept.) W5TFB 833, ND5C 393.

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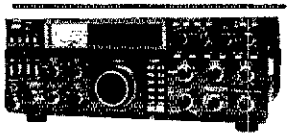

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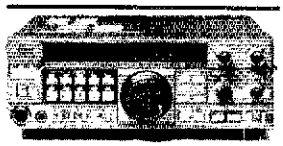

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B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
C22	220	No	2W	20W	$ 79
C106	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
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D1010N	440	No	10W	100W	$289

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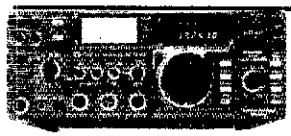

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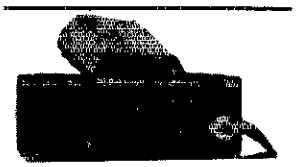

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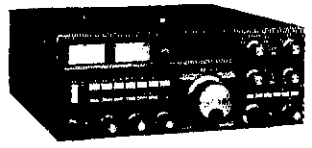

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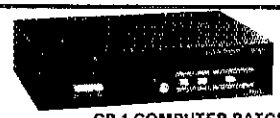

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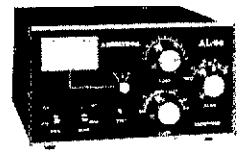

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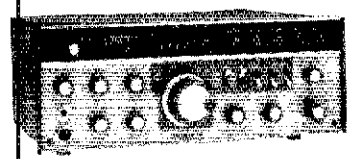

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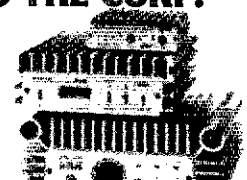

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$99.95 (+$4) **MFJ's fastest selling tuner packs in plenty of new features.** **New styling!** Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

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 watts RF power output.

Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4) 5x2x6 in. **Use any transceiver**, solid state or tube. Operate all bands with one antenna.

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MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4) **MFJs best 300 watt Versa Tuner II. Matches everything** from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load, SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10) 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 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10) **Meet "Versa Tuner V", it has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-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.

Built-in 2% 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-981, $239.95, 3 KW, 18 position switched dual inductor. SWR/Wattmeter, 4:1 balun.

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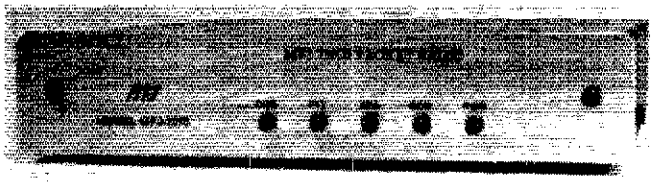

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MFJ brings together efficient manufacturing and TAPR's (Tucson Amateur Packet Radio) leading edge technology to bring you affordable packet radio. You get a nearly identical clone of the widely acclaimed TAPR TNC 2 with identical software and hardware. It's in a new cabinet and includes a TTL serial port for extra versatility.

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Unlike machine specific TNCs, you never have to worry about your MFJ-1270 being obsolete because you change computers or because packet radio standards change. You can use any computer with an RS-232 serial port and an appropriate terminal program. If packet radio standards change, software updates will be made available as TAPR releases them. Also speeds in excess of 56K bauds are possible with a suitable external modem! Try that with a machine specific TNC or one without hardware HDLC as higher speeds come into widespread use. You can also use the MFJ-1270 as an inexpensive digipeater.

It features the latest AX.25 Version 2.0 software, hardware HDLC for full duplex, true Data Carrier Detect for HF, 16K RAM, simple operation plus more.

Join the packet radio revolution now and help make history. Order the MFJ-1270 today.

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SUPER KEYBOARD

MFJ-496 **$169.95**

Price slashed 50% to $169.95! Get a full feature Super Keyboard that sends CW/RTTY/ASCII for the price of a good memory keyer.

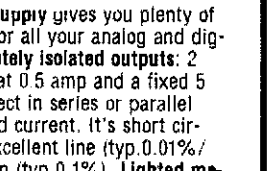
You get the convenience of a dedicated keyboard —no program to load—no interface to connect—just turn it on and it's ready to use.

This 5 mode Super Keyboard lets you send CW, Baudot, ASCII, use it as a memory keyer and for Morse Code practice. You get text buffer, programmable and automatic message memories, error deletion, buffer preload, buffer hold.

TRIPLE OUTPUT LAB POWER SUPPLY MFJ-4002 $149.95

Lab quality power supply gives you plenty of voltage and current for all your analog and digital circuits. **3 completely isolated outputs**: 2 variable 1.5-20 VDC at 0.5 amp and a fixed 5 VDC at 1 amp. Connect in series or parallel for higher voltage and current. It's short circuit protected, has excellent line (typ.0.01%/V) and load regulation (typ.0.1%). **Lighted meters** monitor volt./cur. 12x3x6 in. 110 VAC.

CROSS-NEEDLE SWR/WATT METER MFJ-815 $59.95



MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected and 1:1 to 1:5 SWR on easy-to-read two color scale. Lighted meter. Needs 12 V. ±10% full scale accuracy. 6½ x 3¼ x 4½ inches.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

$29.95 MFJ-1701

Instantly select any antenna or rig by turning a knob. Organizes coax cables and eliminates plugging and unplugging. Unused terminals are grounded to protect your equipment for stray RF, static and lightning. 2 KW PEP, 1 KW CW. For 50 to 75 ohm. Negligible loss, SWR, and crosstalk gives high performance. SO-239s. Convenient desk or wall mounting.

MFJ-1702, $19.95. 2 positions. Cast aluminum cavity construction gives excellent performance up to 500 MHz with better than 60 dB isolation at 450 MHz. Heavy duty, low loss switch has less than 20 milliohm contact resistance, less than 0.2 dB loss and SWR below 1:1.2. 2 x 2½ x 1 inches.

MFJ-1701, $29.95. 6 positions. White markable surface for recording ant. positions. 8½ x 1½ x 3 in.

ANTENNA CURRENT PROBE MFJ-206 $79.95

This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **Indicate transmission line radiation** due to high SWR, poor shielding or antenna unbalance.
- **Detect re-radiation** from rain gutters and guy wires that can distort antenna field patterns.
- **Detect RF radiation** from ground leads, power cords or building wiring that can cause RFI.
- **Determine if ground** system is effective.
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- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

MFJ's best 300 watt tuner is now even better!

The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

DIGITAL SWR/WATTMETER

MFJ-818 **$89.95**

Fully automatic Digital SWR/Wattmeter reads SWR 1:1 to 1:9.9 directly and instantaneously—no SWR knob to set. Huge 0.6 inch bright orange digits make across-the-room reading easy. 12 segment LED bar graph wattmeter gives instantaneous PEP readings up to 200 watt RF output.

Good, bad. mismatch tri-color LEDs indicate SWR conditions. Small size (5½ x 4¼ x 1 in.) and easy-to-read digital display makes it ideal for mobile use. For 50 ohm systems. 1.8-30 MHz. 12 VDC or 110 VAC with MFJ-1312, $9.95.

MOBILE ANTENNA MATCHER

MFJ-910 **$19.95**

Lower your SWR and Get more power into your mobile whip for solid signals and more QSOs. Your solid state rig puts out more power and generates less heat. For 10-80 meter whips. Easy plug-in installation. Complete instructions. Fits anywhere, 2½x2½in.

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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 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 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 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).

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

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.

THE GOOD SAM HAMS CLUB Invite RV operators to check in the Good Sam Ham Net 14.240 or Sundays 1900Z also 3.880 or Tuesdays at 2359Z Net control, N5BDN, Clarksville, TN.

"12-12" WORLDWIDE is promoting activity and good operating practices on the new 12-Meter Band. During Charter Membership months you may get your Number, Certificate, and quarterly newsletter, by joining. $4 per year. "12-12" Worldwide, Box 222, Cherokee, OK 73728.

INDIANA: SOUTH BEND Swap & Shop, Jan. 5 at the Century Center downtown, on U.S. 33, Oneway north between St. Joseph Bank Building and river. Half acre on carpeted floor. Industrial history museum in same building. Four lane highways to door from all directions. Talk-in 52-52 & area Repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, Telephone 219-233-5307.

FCC EXAMS, Novice-Extra. Sunnyvale VEC ARC. 408-255-9000, 24 hour. 73, Gordon, W6NLG, VEC.

LIMARC HAMFEST Sunday, February 16th. Indoors at the Electricians Hall, 41 Pinelawn Road, Melville, Long Island. Doors open at 9 AM to 3 PM. Admission is $3 to all regardless of age, $2 after 12 PM. Sellers tables 4' × 6' are $10 or bring yours at $1 per foot. Each table admits 1 person, additional helpers are $3 each. Your check to LIMARC must be with your letter. Directions: LIE 495 to Exit 49 North, ¼ mile to Pinelawn Road on right. Info call Hank Wener days 201-569-8888 at night 516-484-4322. Talkin on 146.25/85.

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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.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

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.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M. Marietta, GA 30065.

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FINEST custom QSLs, large cut catalog and samples $1 refundable on first order. Ritz Print Shop P.O. Box 45018, Westlake, OH 44145.

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.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

PICTURE QSL cards of your shack, etc. from your photograph or black ink art work. 500 $24.00; 1000 $36.50. Also unusual non-picture designs. Send stamp for illustrated literature. Generous sample pack $1.00; half pound of samples $2.00. Custom printed cards, send specifications for estimate. Raum's, 4154 Fifth Street, Philadelphia, PA 19140. Phone: 1-215-228-5460.

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QUALITY QSLs, Samples 50c. Olde Press, WB9MPP, Box 1252, Kankakee, IL 60901.

QSL MANAGERS . . . As a DXer (as time allows), I know how often you dig into your own pocket to keep things going. Our new Program for QSL Managers can ease the pain. Write for details. QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

CUSTOMIZED CERAMIC Items for your Club: Send S.A.S.E. for free information on how your club can have attractive custom collectible items. Hill Decal (W5HOW) 5746 Schutz St., Houston, TX 77032.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-6, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin, TX 78745.

WANTED; old microphones for my mic. museum. Also mic-related items. Write Bob Paquette, 107 E. National Ave., Milw. WI 53204.

HALLICRAFTERS Service Manuals. Amateur and SWL. Write for prices. Specify Model Numbers desired. Ardco Electronics, P.O. Box 95, Dept. Q, Berwyn, IL 60402.

WANTED: PRE-1923 radios, pre 1940 T.V. Entire collections bought. Top cash paid immediately. Phil Weingarten, 67-61 Alderton St., Flushing, NY 11374, 718-896-3545.

WANTED: radios, magazines, horn speakers, pre 1930. W6THU, 1545 Raymond, Glendale, CA 91201. 818-242-8961.

MICROPHONES and related memorabilia used in radio/TV broadcasting prior to 1960 wanted. Cash paid; trade items available. Write: James Steele, 80 Central Park West, New York, NY 10023-5206.

RECAPTURE EARLY DAYS of Ham radio, professional radio and broadcasting! Our book Vintage Radio (263 pages) takes you from the earliest days up through spark to early 'phone days. A Flick Of The Switch (312 pages) covers Ham, commercial, wartime and broadcast radio from 1930 to 1950. Rekindle that excitement of early ham days! Discover the pleasures of collecting old radio gear! Just send $10.95 for each book to N6VY, Box 2045, Palos Verdes Pnsla., CA 90274.

WANTED: MCINTOSH and Marantz tube-type audio equipment, parts, accessories and literature, for personal collection. 100% reply. Marcus Frisch, WA9IXP, Box 385, Elm Grove, WI 53122-0385, 414-475-5356.

COLLINS WANTED: Pre-WWII transmitters - 45 series, 20R, 202A, 30FXR, 30FXC for personal collection. Also want to find a nice HRO Sr. with all coils and manual, in good condition. Please contact AC1Y c/o ARRL Hq. or call 203-667-2494 days 8-4.

WANTED: QST VOLUME 1. W6ISQ, 82 Belbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brandname, Model No., SASE. Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

MANUALS for most Ham Gear made 1937/1972 plus Kenwood. Our 1986 catalog is $1 and required for ordering. Over 2,000 models listed. HI-MANUALS, P.O. Box F802, Council Bluffs, IA 51502-0802.

COLLINS KWS-1 and 75 S-3. Mint condition. Pick up only So. Calif. K6TGE 619-728-7777.

WANTED: SSB Converter CU-591A/URR for a R-390A/URR. R. J. Mackee, 4310 Selish Drive, Vancouver, BC V6N-3M7 CANADA.

WANTED: OLD Crosley 1-3 tube radio. K4NBN, "No Bad News".

OCEAN HOPPER by Knightkit wanted - N4ZO. Call collect 803-237-9212 daytime.

AMATEUR NEEDS assistance assembling a small collection of Vintage Telegraph Bugs. Your input is invited. QSO Hensley, 5054 Holloway Avenue, Baton Rouge, LA 70808.

FOR SALE: HALLICRAFTERS SX-100 Communication Receiver. Collectors item. Good condition. $75. F.O.B. G.E. Nemetz, 8202 Beechwood Drive, Lynchburg, VA 24502, 804-239-7789.

BACK ISSUES QST. Stamp for list. Koepke, 6 Katherine Road, Albany, NY 12205.

SELL - RECEIVER: Hammarlund HQ-150 and matching speaker looks real nice and works. Also CQ Magazines back to 1950's sell all $250. John Warren, 2908 Jamison, Mt Vernon, IL 62864. Phone 618-242-7189.

HAMMARLUND USER wants information on parts/service/operating tips for HX-50A and HQ-180A. Seeking correspondence with other Hammarlund collectors. Mike Ryder, KA9N, 503 S. 5th St., Oregon, IL 61061.

CLEANING OUT ham shack, four page list of receivers, transmitters, tubes, parts and accessories. SASE, please. W9VZR, 4627 North Bartlett, Milwaukee, WI 53211.

WANTED - COUPLE 'old' Bugs—use, not display. Dick Downey, 253 Guy Park Ave., Amsterdam, NY 12010. 518-842-8847.

WANTED WW2 Japanese Military Radios, unmodified condition. Also USA BC611, BC1000 etc. Stop Handbook on Japanese Military Forces published in September 1945, Serial TME30480. Please Write "Tajima" JA1DNQ/KD2HB, care Toshiba Co. 111 Business Park Drive, Armonk, NY 10504.

WANTED: RCA 44BX microphone w/wo stand. Sam Thompson, W6HDU, 1133 Polk St., San Francisco, CA 94109. 415-521-1429 evenings.

QST's, 1958 through 1984, sold as set only, make offer, you ship. SX-117, mint, make offer, WB5FXI.

HALLICRAFTERS WANTED: HT-33B amplifier, R-47, R-48 speakers. Contact: G. Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

HALLICRAFTERS SX101A like-new condition, with Manual. $200, W2ACC, 201-369-4200.

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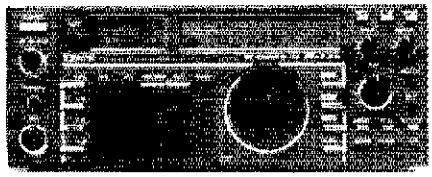
VACUUM TUBES 807, 808, 811, 866-A/866 Radiotron HQ-29X, EX Meissner Signal Shifter, Misc. Equipment Wlmta-1984, 401-737-5911. Mrs. D. R. Johnson.



HF Equipment	Regular	SALE
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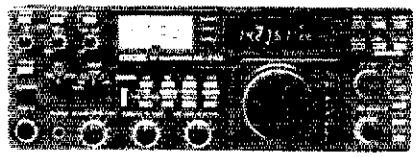
PS-55 External power supply	160.00	144.95
AT-150 Automatic antenna tuner	349.00	314.95
FL-32 500 Hz CW filter	59.50	
EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/ 1-30 MHz rcvr	999.00	769.95
PS-35 Internal power supply	160.00	144.95
EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic 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
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	1089
PS-35 Internal power supply	160.00	144.95
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	39.00	
RC-10 External frequency controller	35.00	
MB-18 Mobile mount	19.50	

IC-720A 9-band xcvr • (CLOSEOUT) •	1349.00	699.95
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	39.00	
MB-5 Mobile mount	19.50	

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	5.50	
SP-3 External base station speaker	49.50	
SP-5 Remote speaker for mobiles	25.00	
CR-64 High stab. ref. xtal (/45/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
AT-100 100W 8-band auto. antenna tuner	349.00	314.95
AT-500 500W 9-band auto. antenna tuner	449.00	399.95
AH-1 5-band mobile antenna w/tuner	289.00	259.95
GC-4 World clock • (CLOSEOUT) •	99.95	79.95

ICOM

HF linear amplifier	Regular	SALE
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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
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EX-106 FM option	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271A 25W 2m FM/SSB/CW	699.00	569.95
AG-20 Internal preamplifier*	56.95	
IC-271H 100W 2m FM/SSB/CW	899.00	759.95
AG-25 Mast mounted preamplifier*	84.95	
IC-471A 25W 430-450 SSB/CW/FM xcvr	799.00	699.95
AG-1 Mast mounted preamplifier*	89.00	
IC-471H 75W 430-450 SSB/CW/FM	1099.00	969.95
AG-35 Mast mounted preamplifier*	84.95	

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PS-35 Internal power supply for (H)	160.00	144.95
PS-15 External power supply	149.00	134.95
SM-6 Desk microphone	39.00	
EX-310 Voice synthesizer	39.95	
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	579.95

VHF/UHF/1.2 GHz FM	Regular	SALE
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IC-27H Compact 45W 2m FM w/TTP mic	409.00	359.95
IC-37A Compact 25W 220 FM, TTP mic	449.00	329.95
IC-47A Compact 25W 440 FM, TTP mic	469.00	399.95
PS-45 Compact 8A power supply	112.95	99.95
UT-16/EX-388 Voice synthesizer	29.95	
SP-10 Slim-line external speaker	29.95	
IC-3200A 25W 2m/440 FM w/TTP	549.00	489.95
UT-23 Voice synthesizer	29.95	
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	999.00	889.95
ATV-1200 ATV interface unit	TBA	
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
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.	999.00	899.95
RP-1210 1.2 GHz, 10W FM, 99 ch. synth	1199.00	1089
Duplexer 1210 1.2 GHz duplexer	1199.00	1089
Cabinet for RP-1210	249.00	

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Deluxe models	**Regular**	**SALE**
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Standard models	**Regular**	**SALE**
IC-2A for 2m	239.50	189.95
IC-2AT with TTP	269.50	199.95
IC-3AT 220 MHz, TTP	299.95	239.95
IC-4AT 440 MHz, TTP	299.95	239.95

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	69.00
BC-60 6-position gang charger, all batts SALE	359.95
BC-16U Wall charger for BP7/BP8	10.00
LC-11 Vinyl case	17.95
LC-14 Vinyl case for Dlx using BP-7/8	17.95
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	39.50
BP-3 Extra Std. 250 mah/8.4V Nicad Pak	29.50
BP-4 Alkaline battery case	12.50
BP-5 425mah/10.8V Nicad Pak - use BC35	49.50
CA-2 Telescoping 2m antenna	10.00
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	9.50
DC-1 DC operation pak for standard models	17.50
LC-2AT Leather case for standard models	34.95
RB-1 Vinyl waterproof radio bag	30.00
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HM-9 Speaker microphone	34.50
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	79.95
SS-32M Commspec 32-tone encoder	29.95

Receivers	Regular	SALE
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RC-12 Infrared remote controller	TBA	
R-71A 100 kHz-30 MHz, 117V AC	$799.00	649.95
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	39.95	
CR-64 High stability oscillator xtal	56.00	
SP-3 External speaker	49.50	
CK-70 (EX-299) 12V DC option	9.95	
MB-12 Mobile mount	19.50	

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WANTED: CENTRAL Electronics 20A, any condition. Also Hallicrafters SX-101 (not 101A), condition unimportant. Will pick up if local. John, WB2EQG, Box 1872, Wayne, NJ 07470, 201-694-2392.

COLLINS GEAR, like new, just out of the box, extremely low or zero hours: 75A-4 w/Blanker, KWS-1, 270G-3, 75S-3C, 32S-3, 32S-3A, 30L-1, 30S-1, 516F-2, 312B-3, 312B-4, CP-1, TD-1, 637T-2, DL-1. 75A-4/KWS-1 ratio knobs, over 40 75A/75S filters, matching mikes (sold to RX/TX buyers first). For details, write or call John Werner, 183 Tacoma Boulevard, Troy, MI 48084. 313-362-2706, 2230-0400 CUT.

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NEW! Bearcat® 50XL-CA

List price $199.95/**CE price $114.95/SPECIAL**
10-Band, 10 Channel • Handheld scanner
Bands: 29.7-54, 136-174, 406-512 MHz.
The Uniden Bearcat 50XL is an economical, hand-held scanner with 10 channels covering ten frequency bands. It features a keyboard lock switch to prevent accidental entry and more. Also order part # **BP50** which is a rechargeable battery pack for $14.95, a plug-in wall charger, part # **AD100** for $14.95 and also order optional cigarette lighter cable part # **PS001** for $14.95.

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List price $499.95/**CE price $157.95/SPECIAL**
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Frequency range 26-88, 108-180, 380-514 MHz.
The JIL SX-200 has selectable AM/FM receiver circuits, tri-switch squelch settings -signal, audio and signal & audio, outboard AC power supply - DC at 12 volts built-in, quartz clock - bright vacuum fluorescent blue readouts and dimmer, dual level search speeds, tri-level scan delay switches, 16 memory channels in two channels banks, receive fine tune (RIT) ± 2KHz., dual level RF gain settings – 20 db pad, AGC test points for optional signal strength meters all for this special price.

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List price $329.95/**CE price $189.95/SPECIAL**
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Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

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New direct channel access feature
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Bands: 30-50, 118-136, 144-174, 406-420, 440-512 MHz.
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List price $649.95/**CE price $339.95/SPECIAL**
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NEW! Bearcat® 800XLT-CA

List price $499.95/**CE price $299.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½."

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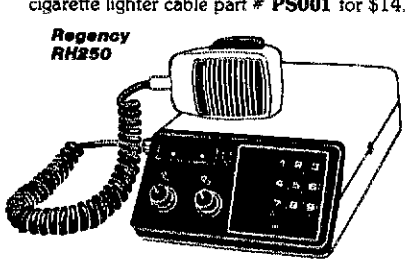

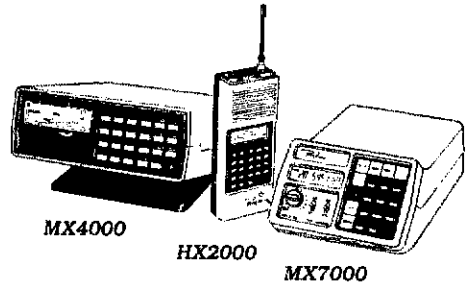

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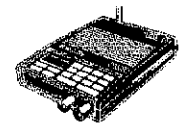

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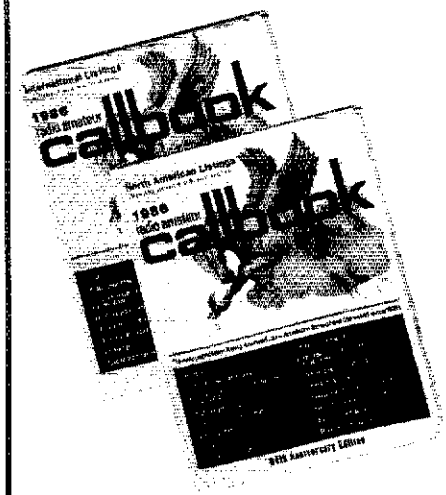

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R-390A RECEIVER, .5-30 MHz all modes, 4 mechanical filters, meters sealed (Government removed, operation unaffected): complete/checked $195, complete/reparable $115, spare parts unit (80% complete) $65. CPRC-26 Manpack Radio (described in March 1985 Ham Radio), transceivers 46-54 MHz FM, with battery box, antenna, crystal, handset: $22.50 apiece, $42.50/pair. Info SASE. CPRC-26 add $4/unit shipping. R-390A shipping charges collect. Baytronics, Dept. QST, Box 591, Sandusky, OH 44870. 419-627-0460 evenings.

WANTED: SWAN 160X Transceiver w/117XC Power Supply. 313-779-5178, Ziggy, WA8CPL, 22513 Norcrest, SCS, MI 48080.

FOR SALE: Wilson ST-77B crank up, tiltover tower with rotating base. Fully extends to 77 feet. Excellent value at $2000 with Tailtwister rotator. Pick up only. WB1EAZ, 203-742-9320.

WANTED: PLUG-IN VOX accessory Type VX-2 for Swan 500C. Call collect W5FGO, 504-393-7457.

HEATH SA-2060A Antenna Tuner Perfect condx. $220 shipped UPS. KA1FYG, eves only 215-632-6022.

TS-430S/PS-430S, YK-88C, YK-88A, YK-88SN, FM-430, MC-80, operating and service manuals, original cartons, $800. Robot 400, $185; HM-9, $20; HO-10, $25; HM-102, $25; Millen 90651 GDO, $30; SB-620, $25; Tail-Twister (T 2 X) rotator, $275; Bird 43 with 100H, 10C and 1000H slugs, $200; RCA TC-1000 CCTV camera (parts value) $15. Kantronics Minireader, $25. AN/URM 144 signal generator, $20. Inquiries SASE; purchaser pays shipping. Paul K. Pagel, N1FB, 4 Roberts Rd., Enfield, CT 06082; days 8-4, 203-666-1541; evenings before 9 P.M. Eastern, 203-745-1029.

WANTED: 15 kV Vacuum Variable Capacitor (approx. 10-250 pF). Also need 15 kV-20 kV Ceramic Blocking Capacitor (500 or 100 pF). N6VE, Bryan, 213-648-9102 or 714-636-9894.

COLLINS STATION, KWM-2, N.B., 312-B4, 516-F2, Crystal Pack, DC Supply, manuals, $875 will separate. WB0EYT, Bernie, 402-731-0128, 2811 Bonnie St., Omaha, NE 68147.

WANTED: DRAKE 7077 Mike 216-856-2441 collect. N8GEC.

HEATH SB-101, HP-23B, EV638 good-$325. 319-390-3733 evenings WB0VDR.

FOR SALE: Drake R-4C rcvr and MS-4 speaker $250. Drake T-4XO xmtr, AC-4 power supply $250. Drake MN-2000 matching network $100. Drake TR-4 xcvr, AC-4 power supply and MS-4 speaker $300. Drake TR-6 xcvr $250. Swan Mark 6B six meter kW Linear Amplifier and Power Supply $400. Ham-M rotor and control box $100. Specify item and send check or money order to Thomas E. Bryant, 328 Holiday Road, Lexington, KY 40502.

COLLINS R390A Receiver 0.5-32 MHz, cabinet, speaker & manual $150. Alpha 374 Automatic Amplifier $995. HAL ST-6TTY Converter, Mod-28 KSR, Monitor Scope, Manuals $195. WA4UTP, 8214 Ll Fair Dr., Pensacola, FL 32506, 904-453-1135.

STATION CLOSE-OUT: Drake B-Line w/p.s. and D-104 mike, Drake L-7 linear brand new, Triex W-51 Self Supporting Crank-Up Tower, TH6DXX tribander, CDR rotator, cables, dipoles, baluns. All must go make offer. W0RA, 303-773-6260.

TEMPO-ONE with AC One, p/s $200, WB4YKP, R. Claudy, RT 6, Box 254, Lawrenceburg, TN 38464.

ESTATE SALE: TenTec 40-20 mtr $30. HAL MKB-1 Morse Keyboard $125. MEJ-496 CW, RTTY, ASCII Keyboard $200. Autronic Keyer w/paddle $20 Palomar Keyer w/paddle $25. 2 Santec HT1200 2 mtr HT ea. $125. Kenwood TR2500 2 mtr HT w/leather case $150. Radio Textbooks, Coax Cables, Simpson Meters 260 series, Micrometers, earphones Heathkit Monitor Scope, and misc. items. Call Grace Wymbs, 914-693-3861.

COLLINS 32S-3 with 516F-2 AC Supply, 32S3 with 200 Hz CW filter, all cables. $665. W8OBI, 419-882-2142.

WANTED YAESU FT-480, 680 or 780. Must be excellent appearance and operation. Sell Yaesu FTV-901R with 6, 2, ¾ modules $500. Tempo VHF One 2M FM $150. Original cartons and manuals. George, KX1C, 617-562-3137.

DRAKE 2NT XMTR, 2B rcvr, $100 each, delivered 48 states. Hallicrafter HT-37 xmtr, $90 plus 80 lb shipping. All excellent condx with manuals. Walt Slack, K7EC, 3921 Montebello Ave., Las Vegas, NV 89110.

WANTED: MOTOROLA HT-220's and HT-100's, VHF or UHF. WB8OQC/6, P.O. Box 4344, Chatsworth, CA 91313.

NOVICE RADIO OUTLET New and used equipment dealer! Special attention beginners! *January special!* SPI-RO Five Band Trap Dipole $62.95, (NEW) AZDEN PCS-5000 2M mobile $305.00, free shipping U.S.A. 919-286-7927. 1604 Delaware Ave., Durham, NC 27705.

HEATHKIT SB221 Amplifier for sale $425. Don Kadish, 135 Barbara Rd., Waltham, MA 02154.

KENWOOD MC-50 Mike $35, also Drake Headphones $15. (Both seldom used), will ship. KR2V, 518-584-1578, 37 Orenda Dr., Saratoga, NY 12866.

SALE: TH7DXS (damaged, repairable); two 14el 2 mtr beams; 2 BDQ 80/40 Dipole $100. You pick up. W. P. Cave, Genoa, NE 68640, 402-993-2250.

WANTED: TEN-TEC Delta, Dead or alive. If dead, state condition & asking price. KZ5B.

WANTED: ANTENNA 10 meters 3 or 4 elements. 501-925-1432. Paul Wise, Rogers, Ark 72756.

LINEAR - 1 kW new 872's Heath HA-14 exc. cond. panel 3" × 12" separate P.S. complete $299. W2IXU, 305-485-5913.

ROHN 64 ft Foldover, Ham II rotor, winch, guys, cables, anchors, hardware. Buyer must remove. $1200 KA1ES, 617-369-5744.

FOR SALE: HAL CT2200/KB2100 RTTY Setup. Exc. cond. $750. Call Joe, KC2TN, 609-768-0822.

LINEAR - 2 kW - H.B. custom lab job 4CX1000 - complete w/H.V. Supply, schematics, specs, etc. Needs finishing touches. $399. W2IXU, 305-485-5913.

SELL: RK4D32 only $35 each, inquire on others: Wanted Gonset Aircraft Monitor Receiver. Levy, 101 East Driftwood #26, Fredericksburg, TX 78624. Tel. 512-997-2534.

SWAN 350, $200, good condition, with manual, WB7OKS, 4805 S. 3100 W., Roy, UT 84067.

WANTED: Western Electrid C.B. carbon microphone model 600A, 600B or 387W complete with ring and spring desk stand with or without covers. Universal D.B. carbon microphone "Stretched Diaphragm Type" Cr. 1930-38 Model "X" or Model "BB" or Model "KK" or Broadcast model with ring and spring desk stand, and a D.B. microphone transformer to match above. W. H. Martin, W8MHO, Rt. 1 - Box 1030, Harpers Ferry, WV 25425.

HEATHKIT HW-100 10-80 meter SSB Transceiver with AC Power Supply and microphone. Needs two 6146B finals to make for perfect condition. $225 or best offer. Contact Mark Aarons, WA2HZB, 212-734-2408 or write 225 East 70th Street, New York, NY 10021.

TH6DX Assembled $200 Disassembled $250. You ship. KA1ES, 617-369-5744.

WANTED - FINCO 7 ft Parabolic Dish Antenna for UHF Television in good condition with all mounting hardware. K2RG, 201-366-8225, 10 Rose Court, Dover, NJ 07801.

KENWOOD TS-530S Transceiver with WK88C and YK88CN filters and SP230 external speaker. $450. Jim Bailey, 206-362-2933.

CUSHCRAFT ATB-34 Tribander; clean and very good condition. $150. KG5C, 505-835-1088.

MECHANICAL FILTERS, new Kokusai MF 455 2.1 kH Upper or Lower SB, $10 each with spec sheets. Bill Judge, K6TVN, 2818 Joaquin. Burbank, CA 91504.

ATLAS 350XL w/DD6, 350 PS, mint, make offer, MLA-2500 160-15, make offer, WB5FXI.

OLD TIMERS, I am interested in parts, literature and equipment from the early days of ham radio. Help a serious historian preserve those exciting times. W3HWT, 329 Evergreen, North Wales, PA 19454.

WANTED: DEFECTIVE Vapor Tubes, 3CV1500A7, with good filaments for experiments. Cash. Don Payne, Box 100, Springfield, TN 37172, 615-384-2224.

MUST SELL Drake TR-7. All extras. RV-75 VFO. Factory reconditioned guaranteed. K6DUE, 818-346-0137.

WANTED In Good Condx: EZ Way RBS50 with Ground Post. WA3FII, 412-264-3575.

CONNECTORS MADE in USA, PL259. 10/$6. PL259 Silver Plated 10/$15. UG175/UG176 10/$2.50. NiCads, Panasonic 2/3 AA (for BP3) 7/$13.65. Shipping cont. USA $2.50, COD add $2. NY Residents add local tax. E. Cheslow. 895 E. 54 St., Bklyn, NY 11234, 718-444-4735.

PETER GORDON, ex-VQ5DM, now GD3GCE looking to contact, or be contacted by the Rev. Edward G. Schuit, ex-9Q5HF of the Africa Inland Mission of the Congo Belge (as it then was). Last contact a QSL card dated July 1960, which states "Brought together during crisis-We'll look for you again when peace returns." Please contact Buddy Robins, W2KN/GDØAVF at 4665 Iselin Ave., Bronx, NY 10471.

FOR SALE: COLLINS 62S-1 VHF Converter Ser #11710. With hard-to-get spare tubes. $500. Isaac Roach, P.O. Box 3088, Vero Beach, FL 32964. 305-231-2717 after 5:30 PM.

SELL TEMPO 2020. $300 one owner. Kenwood TS530S $400. Autek Filter QF-1A $50. Heath Phone Patch HD-15 $25. Call 201-759-7512, Dick, WA2JHP.

SALE: ALLIED model 2517 5-band SSB/CW transceiver, Remote VFO, power supply, and all manuals. $150. U-pick-up. Chicago, IL 312-251-0641. WA9IVH.

WANTED: SERVICE MANUAL for EICO Scope, number 425. Sell ARRL Handbooks 1942, $8 and up; Ham Radio, Volume 1 Number 1. W6BIH.

MICROWAVE DISH For Sale: Four-foot diameter, aluminum web construction, commercial-grade dish in good condition. Excellent for 1296/2304 Tropo or upcoming OSCAR microwave downlink. $40-you pick up. Contact Microwave Book Editor, ARRL, (phone ext. 296).

HAMTRONICS UHF Transmitting Converter. Input 28-30 MHz output 435-437 MHz. $100. Hamtronics Power Amplifier 420-450 MHz $150. Hamtronics Receiving Converter 145-147 MHz. $40. All in good condition. Don Kadish, 135 Barbara Rd., Waltham, MA 02154.

DIGITAL AUTOMATIC DISPLAYS for FT-101's, TS-520's, Collins, Swan and all others. Six ½" digits. 5" wide by 1¼" metal cabinet. Send $1 for information. Receive a $25 discount. Be specific. Grand Systems, POB 3377, Blaine, WA 98230.

WANT: EICO (or similar) V.F.O., Dentron "Trim-Tenna," reasonable, N4ZB, 1420 Mount Vernon Drive, Holiday, FL 33590.

YAESU FT-101E $420. Good condition. Taylor, 19921 Angus Ct., Saratoga, CA 95070, 408-867-1329.

HEATH SB-101, $275, SB-200, $250. B. Nelson, 105 Oak Ridge Ct., Decatur, IL 62521.

WANTED: JOHNSON Matchbox. Kilowatt or 275-watt. Ron Aaberg, AL7DX, Box 5, Pedro Bay, AK 99647.

DRAKE T4XC, R4C, AC4, MS4, 4ND, FL500 $475. TS-660 $425. Swan Astro 150 $325. All excellent. Bob, KØFHG, 314-272-8718.

SWAN 350D (Digital) Transceiver. Built-in PS, extra final, original carton, manual, mint. $295 plus UPS. WB2GRB, 14 Duryea Place, Lynbrook, NY 11563, 516-599-3440.

CENTURY 21. LIKE NEW. $200. No shipping. W4OQ, Box 613, Roswell, GA 30077.

IBM-PC RTTY/CW. CompRtty II is the complete RTTY/CW program for the IBM-PC and compatibles. Virtually any speed ASCII, BAUDOT, CW. Text entry via built-in screen editor! 10,000 character transmit/receive buffers! Adjustable split screen display. Instant mode/speed change. Hardcopy, diskcopy, break-in buffer, select calling, text file transfer, customizable full screen logging, 24 programmable 1000 character messages. Now with WRU (simple mailbox). Ideal for MARS and traffic handling. Requires 128k PC, XT, AT, PCjr, PC-DOS, serial port, RS-232C TU. $65. Send call letters (including MARS) with order. David A. Rice, KC2HO, 7373 Jessica Drive, North Syracuse, NY 13212.

ROSS $$$$ NEW Specials (January only): If you don't see what you want, send Call letters, name & phone #for personal price quote. Over 6500 ham-related items in stock. Robot 1200C $1195, Bird 4304 Watt Meter $239.90, ICOM IC-735 $729.90, IC-04AT $279.90, IC-745 $768.90, IC-490A $509.90, IC-751 $1099.90, Kenwood TS-940S/wAT $1689.90, TH-21AT $194.90, TR-2600A + free PB-26 $287.90, TR-2550 $379.90, TS-430S $689.90, TM-211A $309.90, TR-8400 $349.90, TW-4000A $494.90, TS-660 $529.90, Yaesu FT-209RH $294.90, FT-757GX $698.50, FRG-7700 $369.90, FV-901DM $309.90, FC-102 $259.90, FT-203R $169.90. All major lines stocked, L.T.O. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830.

FOR SALE: TS130SE w/CW Fltr, PS-30, Mobile and Desk Mikes, Service Manual, Original Cartons, $500. HW-100 w/Manual, spare tubes, PS-23, HW-12A, $125. KK9Y, 233 North Church St., Virden, IL 62690.

TEN-TEC CENTURY 22 with Calibrator and 979 Power Supply $350. Without power supply $270. All mint condition. Jack, KJ2P, 44 Farrell Terr., Rochester, NY 14617. Tel. 716-342-3476.

WANTED: THREE 8874 tubes. Must be brand new. W1DBS, John Savonis, 410 Blake Road, New Britain, CT 06053. 203-223-3072.

ROSS $$$$ USED January Specials: (over 200 used items in stock) Kenwood TS-520 $359.90. TS-520S $379.90, TS-180SDFC $389.90, TS-930SwAT $979.90, TS-820S/DG1 $439.90, TS-711A $609.90. Yaesu FT-101ZD $459.90, YO-901 $379.90, FT-625RD $425.90, ICOM IC-490A $399.90, IC-251A $369.90, IC-701 $295.90. If this month's special is not what you are looking for send SASE, Call letters, name & phone # for used list. also 7,500 NEW ham-related items in stock. Mention ad. Prices cash, FOB Preston. We close at 2:00 on Saturdays & Mondays. Ross Distributing Company, 78 South State, Preston, ID 83263, 208-852-0830.

BELDEN 9913 COAX special $38/100 feet or .39/foot. No spool saves on shipping. Amphenol N-type fitted for 9913 $4.50. Other connectors and adaptors in stock. 8 gauge hook-up wire .28/foot. Same day shipping. Call Bill, KA2QEP at 201-884-1133 or write QEP's 110-4 Route 10, East Hanover, NJ 07936.

ICOM IC-4AT for sale or prefer trade for IC-3AT. Tom Berne, W6TAG, 2057 Redcliff St., Los Angeles, CA 90039.

WANTED: HEATH SBA-301-2 CW Filter. Also need Linear and VFO for SB-102. Tim Hoy, P.O. Box 3734, La Mesa, CA 92041.

SALE: SB401 with Xtal Pack new filters $150. HB7 mint $35. 20A $35. W3DFX Rt 3 Box 283, Easton, MD 21601, 822-0987.

SINGER FM-10 CS Communications Service Monitor $1850. Motorola 1327 B Service Monitor $1950. Both with Dev. Scopes & Broadband mixers. Gary, WA4IJM, 615-483-0301.

WANTED 5886 Electrometer Tubes, new or used. N7NI, 2640 S. 133, Seattle, WA 98168.

CRYSTALS: BUILD SOMETHING! QRP, quick, easy with inexpensive FT-243 crystals. All bands FT-243's 160M to 2M made to order. FT-243 General, Novice - 4001 to 8700 kilocycles $2.50, minimum five $1.95 each. 30M fundamentals 10,100-10,150 .01% $2.95, five $2.70. 3500-4000 $2.95, five $2.50. 160M $3.95, five $2.95. Overtones including 12M, 10,000-25,000 $3.95. Sockets 60¢. Postage-Airmail 30¢ per crystal. "Crystals Since 1933." Stamp or long SASE for 1700-60,000 kilocycles, listings-circuits. Special - Unused 203'A's $9.95 + $2.40 postage. C-W Crystals, Marshfield, MO 65706.

HOME and excellent ARS QTH for sale. 3 bedroom, 1½ bath: 1200 sq ft, plus 700 sq ft shop & shack in separate, insulated, heated & A/C bldg. On 2 acres of land in rural Georgia on paved road 25 minutes to Macon. $44,900 (firm). Write to W4TG, PO Drawer F, Gray, GA 31032.

WACOM DUPLEXERS - 2 Meters. Like new, used less than 5 hours. $400 plus shipping. Donald Bixler, P.O. Box 535, Marion, AL 36756, 205-683-6564.

FOR SALE: KENWOOD TS-820S, Heath SB221. Low mileage, best offer. W2LEI, 71 Boulevard, Mountain Lakes, NJ 07046, 201-335-6483.

SWAN CYGNET 260 SSB/CW Xcvr. 80-15 mtrs. Built in AC & DC Pwr Sup. Manual, Mic, Pwr Plugs. Some mods. Best offer over $150. Will ship - Your expense. N6SI, 6540 Birch, Santa Rosa, CA 95404.

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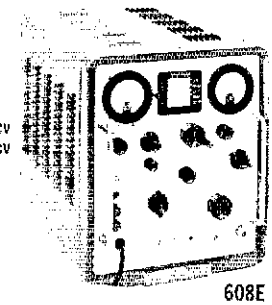
13-510A 2m FM/CES scan $169 e
MIRAGE
MP-1 PEP wattmeter $ 79 w
MURCH
UT-2000A Tuner $119 w
PANASONIC
RF-4900 SW receiver $269 m
RF-6300 SW receiver 299 w
RF-B600 SW receiver 369 m
REGENCY
EC-175 Freq counter $ 89 f
SBE
SB-450 440 FM Xcvr $ 79 m
SONY
ICF-2001 SW receiver $159 f
ICF-2002 SW receiver 169 mwf
ICF-2010 SW receiver 229 m
SPECTRONICS
DFD-K Dig disp; Kenwood $ 69 c
DD-1T Dig disp; Tempo 69 m
SWAN/CUBIC
PSU-6 Power supply $ 99 f
TV-2C 2m Xvtr (6m IF) 149 m
FP-4 Phone patch 39 f
TEMPO
Tempo One Xcvr $189 mwcv
AC One* AC ps 69 mwcv
*Not sold separately
RBF-1A SWR bridge 19 w
TEN-TEC
505 Argonaut Xcvr $199 c
509 Argonaut Xcvr 239 m
206A Calibrator 19 m
251 9A supply 49 m
525/1.8 filt Argosy Xcvr 369 e
225 9A power supply 89 m
570 Century/21 Xcvr 189 mwfv
574 Century/21 digital 249 m
276 Calibrator 19 mwv
Triton II Xcvr 229 mf
546C/500/1.8 Omni Xcvr 599 v
252M/O Power supply 79 m
262G Power supply 89 mc
560 Corsair Xcvr 699 m
560/2 cw filts Corsair 769 m
263 Remote VFO 139 m
255 Power supply 119 m
227 Ant tuner 59 m
277 Ant tuner/SWR 59 w
444 Hercules Linear 1069 m
214 Desk mic 29 wv
700A Hand mic 19 w
USI
1400C 14" color monitor $199 m
YAESU
FL-101 Transmitter $229 wc
FT-101 Xcvr 379 fc
FT-101B Xcvr 389 mf
FT-101E Xcvr 449 mwc
FT-101E/CW filter 479 w
FT-101E/CW/AM filts 499 m
FT-101EE Xcvr 399 fc
FT-101EX Xcvr 389 mf
FT-101F Xcvr 449 mfc
FT-101ZD Dig Xcvr 469 f
FT-101ZD Mk III Xcvr 549 w
FV-101 Remote VFO 89 f
FV-101Z Remote VFO 79 m
SP-101 Speaker 19 m
SP-101PB Spkr/patch 49 w
SP-120 Speaker 19 m
ERB Relay box 19 f
FP-700 Power supply 99 m
FT-901DM Xcvr 549 mfc
FT-902DM Xcvr 749 m
SP-901 Speaker 19 m
FV-901DM Remote VFO 169 m
SP-102 Speaker 49 m
FC-102 Ant tuner 189 m
FT-107M/DMS Xcvr 469 m
FT-107M/DMS/int ps 569 w
FP-107E External ps 99 m
FV-107 Remote VFO 89 m
FT-707 Xcvr 369 mf
FT-707/CW filter 399 m
FP-707 Power supply 99 m
FT-980 Xcvr 998 mc
FT-980/cw/am filts 1049 m
SP-980 Speaker 39 m
FT-ONE/fm/ram/4 filters 1469 v
FT-ONE/fm/ram/4 filts/kyr 1499 w
FL-2100B Linear 249 f
HF/726 HF module 159 e
FTV-707 Xvtr w/2m 189 w
FRG-7000 SW Rcvr 289 m
FRG-7700/mem SW Rcvr 369 w
FT-620B 6m Xcvr 289 m
FT-625RD 6m Xcvr 449 w
FT-225RD 2m Xcvr 449 w
FT-72DRVH 2m FM Xcvr 169 w
FT-72DRU 440 FM Xcvr 199 e
FP-80 4.5A ps 49 w
FT-207R 2m FM HT 129 e
YM-34 Desk mic 19 m
YM-50 TTP mic 39 m
SATELLITE TV EQUIPMENT
WILSON
YM-400 Receiver $149 m

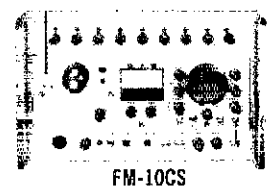
11-5-85

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced **after** we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on **used** gear. (5) Used gear policies do not apply to New Equipment specials, Closeouts, etc.

USED AES SHOP TEST EQUIPMENT



608E



FM-10CS

8640B

HEWLETT-PACKARD
608E 10-480MHz sig gen 1295
8640B .5-1024MHz sig gen
w/options 002/003 4995

SINGER-GERTSCH
FM-10CS w/RFM-10A, FIM-3
& ODM-1 3995
OAM-1 AM module/FM-10 195

HELP WANTED

We are looking for an experienced Electronic Technician to repair Amateur Radio equipment at our Milwaukee Headquarters. On-the-job training, good benefits, will consider helping with moving expenses, prefer non-smoker. Send resume and picture to:

AES® P.O. Box 16729, Milwaukee, WI 53216

Location	Local Phone	Nationwide	In-State
m = **Milwaukee, WI** 53216; 4828 W. Fond du Lac Ave ...	(414) 442-4200	1-800-558-0411	1-800-242-5195
w = **Wickliffe, OH** 44092; 28940 Euclid Ave.....	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = **Orlando, FL** 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = **Clearwater, FL** 33515; 1898 Drew Street.....	(813) 461-4267		
v = **Las Vegas, NV** 89106; 1072 N. Rancho Drive.....	(702) 647-3114	1-800-634-6227	
e = **Chicago, IL** Erickson Communications (Associate)...	(312) 631-5181		

MasterCard VISA

TS-430S w/All Filters, FM, SP-430, PS430 $750. TR-7950 $325. Bob, WD9EKA, 812-299-9784 after 22:30 UTC.

FOR SALE: Dentron MLA-2500 with 10 meters and 2 spare new 8875 tubes as package for $700. Shipping paid in continental US. W6GMC, 328 Harsin Lane, Santa Maria, CA 93455.

HW-101, CW Filter, Mic, PS. $250. WA2HAW, 203-379-9005.

BUY, SELL, SWAP your equipment in the Amateur Radio Mailbag. A neat, easily readable publication. Published twice monthly. Subscribe—only $10/year. SASE for sample. Subscribers: Commercial 50¢/word, other 20¢/word. Non-subscribers: Commercial 65¢/word, other 40¢/word. P.O. Box 3718, Edinburg, TX 78540.

CLEANING OUT SHACK. Heathkit SB-200 80-10 meter 1000 watt Amp. Excellent, $295. 80-10 meter Vertical Ant. $30. Hustler Colinear Ant 2 meter, $25. 2/6 meter mobile ant. $30. Drake TR-22 2-meter Transceiver, $80. Prices including shipping. KD4AJ, 404-396-6760 evenings.

WEBSTER BANDSPANNER Mobile Ant. w/mount. Interchangeable Coils for 75, 40, 20, 15 mtrs. Best offer over $55, will ship - your expense. N6SI, 6540 Birch Dr., Santa Rosa, CA 95404.

ICOM FL44A SSB IF filter. Brand new - never installed, for IC740, IC745. $95. Rick, KT2Q, 201-876-4586.

KENWOOD TS-520S VFO-520 MC-50 $450. Kenwood R-1000 $325. Heath SB-200 Linear Amp $300. MFJ Computer Interface MFJ-1224 $50. Kantronics Atari RTTY Rompac $25. Will sell separate or all for $1100. N0ATS, 907-248-6294.

DIRECTION FINDER: DDF 4002 Doppler scan. L.E.D. Readout, factory assembled, complete antenna package $600. Microlog ATR-6800 RTTY, Monitor, Expansion Module, mint, b/o. WB2CHW, Larry, 516-822-3040, 516-483-9695.

WANTED, MILITARY/COMMERCIAL Collins equipment. We need 618T, RT-743/ARC-51, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-857/ARC-134 or Wilcox 807A, ARC-159 or Collins 719A, ARC-164, ARC-186. RT-859A/APX-72, RT-868A/APX-76, ARN-89, ARN-118, RT-1159/A, MRC-95, 718F½, HF105, KWM-2A, 516F-2, PM-2, 312B-5, 30L-1, 302C-3, Antenna Couplers 490T-1, 490T-2, 490T-9, 490S-1, CU-1658A/ARC, CU-1669/GRC-180S-1, 70K-9 PTO. Anything Collins old or new. We also service. Our 30th year. Top dollar paid or trade for new Amateur gear. Write or phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

EXCELLENT COLLINS 30L-1, KWM-2, 516F-2, 136B-2 blanker, all $675. K4RV, Tom, 803-359-3418, SASE list.

KENWOOD TS-520SE, SP230 speaker, MC50 mike. All mint condition. Used very little. $550. I ship. KCØMW, 319-362-3357.

DRAKE R4A, T4X, AO4, $250 FOB. W3EVW, 313 Pontiac, Lester, PA 19113, 215-521-9055.

HAL DS-3000 KSR vers 2, like new $200. Robot 400 black and white board for SSTV complete with schematic $100. Charles Borg, N4JQH, 458 Borraclough Ave., NW, Palm Bay, FL 32907, 305-725-0011.

ICOM IC-260A 2-meter multi-mode, excellent condx, $210. N1BAX/NA1G, 617-369-7896.

HOMEBREW 2X813 Amplifier $110. Eico 720 $40. New Cushcraft ATV5 $75. AR22 rotor $15. Arcade quarter acceptors $12. N4HW, 704-545-9914.

TS-830S, two 500 CW Filters. $625. Includes shipping. K1BW, 203-848-3796.

DRAKE C-LINE. In mont cond. From last run - R4C, Ser. 29218 - T4XC Ser. 30139 - AC-4 in MN-4, with NB-4, 250, 500, 1500 filters. Additional crystals for 160M, complete 10M and WWV. Price $650. Firm. M. Gabriel, WA2EOU, 66 Grandview Dr., West Paterson, NJ 07424. Call after 7 PM 201-278-0015.

SELL COLLINS HF-380 Serial #1, with Keypad $4000 OBO. McKay Dymek Rcvr DR-44 with cabinet, DP-40 Preselector & DA-100 Active Antenna. Also DA-9 VLF Preamp/Antenna included $3000 OBO. Warranty available. All above mint condx. Must sell. George, W6NRE, 818-901-7440. Want KWM-1 in mint condx.

KENWOOD 820S $550. Remote VFO $100. Matching Speaker $60. MC50 Mike desk $35. All perfect. K4UTZ, Route 11, Murfreesboro, TN 37130. 615-893-5344.

FREE SHIPPING, continental USA, Mini-Quads $139.95, Mosley TA-33's $239.95, Butternut, Nye, Larsen, Dipole kits, etc. Stamp for flyer, Hart Eastern Communications, 1444 Darlington Drive, Derby, NY 14047 716-947-4840.

Jobs for Hams

COUNSELOR: OPERATOR with General license to teach Ham Radio at Pennsylvania co-ed Camp. Have completely equipped Ham Station. Write Trail's End Camp, 215 Adams Street, Brooklyn, NY 11201.

MARINE COAST Station WKM West Haven, CT seeking working partner to share operator duties. Telegraph license preferred. Call 203-937-5074 or WKM, 45 Victory Drive, New Haven, CT 06515.

WANTED for summer of 1986: Instructors in Electronics, Ham Radio, and Computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, Pennsylvania 18451.

AMATEUR RADIO Operator needed for summer co-ed residential camp in Metro Detroit area—own equipment needed. Contact Tamarack Camps, 6600 W. Maple Road, West Bloomfield, MI 48033.

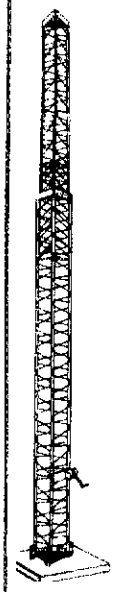
ADVERTISING DEPARTMENT STAFF

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

Index of Advertisers

ANTENNA/TOWER SALE!



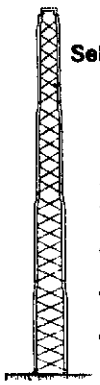
hy-gain CRANKUP SALE!

All Models Shipped Factory Direct—Freight Paid*!

Check these features:
- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft	9 sq ft	$CALL
HG52SS	52 ft	9 sq ft	$CALL
HG54HD	54 ft	16 sq ft	$CALL
HG70HD	70 ft	16 sq ft	$CALL

Masts—Thrust Bearings—Other Accessories Available—Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!



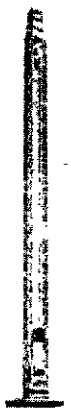
ROHN Self Supporting Towers On SALE!

FREIGHT PREPAID

- All Steel Construction—Rugged
- Galvanized Finish—Long Life
- Totally Free Standing—No Guy Wires
- America's Best Tower Buy—Compare Save $
- Complete With Base and Rotor Plate
- In Stock Now—Fast Delivery

Model	Height	Ant Load*	Weight	Delivered Price*
HBX40	40 ft	10 sq ft	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	363	$489

*Your Total Delivered Price Anywhere in Continental 48 States. Antenna Load Based on 70 MPH Wind.



Tri-Ex®

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

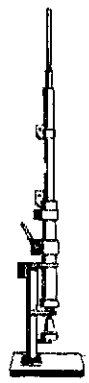
To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

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 Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$899
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM4700 (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$3199
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$7200	Call

US TOWER CORPORATION

Formerly Tristao Tower Co.



MA-40
40' tubular
Regular $745
SALE! $549

MA-550
55' tubular
Will handle 10 sq. ft. antennas at 50 MPH winds.
Regular $1245
SALE! $899

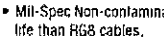
IN STOCK FOR IMMEDIATE DELIVERY
CALL FOR INFORMATION ON ALL OTHER MODELS

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.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
¼" 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
Stranded 14 ga	$ 10/ft	16 ga	$ 09/ft
¾ mile 18 ga copper-clad steel wire			$30
6 inch heavy-duty end insulator			$2.00/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 $49.00

ALPHA DELTA
DX-A 160-80-40 Sloper $49

CUSHCRAFT

A3 3-el Tribander Beam	$209
A743 30/40mtr 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 40mtr Beam	$279
A50-5 5-el 6mtr Beam	$79
215 WB NEW 15-el 2mtr Beam	$75
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
Discoverer 3-el Conversion Kit
EXPLORER-14 SUPER SPECIAL
0K710 30/40 mtr. Add-On-Kit
V2S 2-mtr Base Vertical
V4S 440MHz Base Vertical
TH5MK2S Broad Band 5-el Triband Beam
TH7DXS 7-el Triband Beam
TH3JRS 3-el Triband Beam
205BAS 5-el 20-mtr Beam
155BAS 5-el 15-mtr Beam
105BAS 5-el 10-mtr Beam
204BAS 4-el 20-mtr Beam
64BS 4-el 6-mtr Beam
18 AVT/WB 80-10mtr Vertical
18HTS 80-10 mtr Hy-Tower Vertical
23BS 3-el 2mtr Beam
25BS 5-el 2mtr Beam
28BS 8-el 2mtr Beam
214BS 14-el 2-mtr Beam
28DQ 80/40 mtr Trap Dipole
58DQ 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

NEW HF4B "Butterfly" Compact Beam $189 delivered (cont. USA)

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

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

MOSLEY

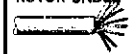
TA-33 3-el Tribander	$239
TA-33JR 3-el Tribander	$189
PRO 37 7-el Tribander Beam	$469
S-403 3-el 40-mtr Beam	$699

MINI-PRODUCTS HQ-1 $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 HDR300 Heavy Duty (25 sq ft rating)	$Call
KLM EL-3000 Moon Tracker Elevation Rotator	$369
Kenpro KR400 Azimuth Rotator	$129
Kenpro KR500 Heavy Duty Elevator Rotator	$159
Kenpro KR600 Azimuth Rotator	$199
Kenpro KR2000 Heavy Duty Azimuth Rotator	$379
Kenpro KR5400 AZ/EL Rotor Package	$259
Kenpro KR5600 Heavy Duty AZ/EL Rotor Pkg	$329

ROTOR CABLE



Standard 8 cond cable $ 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 $134.50

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 × 7 Aircraft Cable (2700 lb rating)	$.15/ft
3/16 CCM Cable Clamp (3/16" or 5/32")	$.45
1/4 CCM Cable Clamp (1/4" Cable)	$.55
1/4 TH Thimble (fits all sizes)	$.45
3/8EE (3/8" Eye & Eye Turnbuckle)	$6.95
3/8 EJ (3/8" Eye & Jaw Turnbuckle)	$7.95
1/2 × 9EE (1/2" × 9" Eye to Eye Turnbuckle)	$9.95
1/2 × 9EJ (1/2" × 9" Eye & Jaw Turnbuckle)	$10.95
1/2 × 12EE (1/2" × 12" Eye & Eye Turnbuckle)	$12.95
1/2 × 12EJ (1/2" × 12" Eye & Jaw Turnbuckle)	$13.95
5/8 × 12EJ (5/8" × 12" Eye & Jaw Turnbuckle)	$16.95
3/16" Preformed Guy Grip	$2.49
1/4" Preformed Guy Grip	$2.99
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45 Affordable Watts!

TM-201B/401B

Super-compact mobile transceivers

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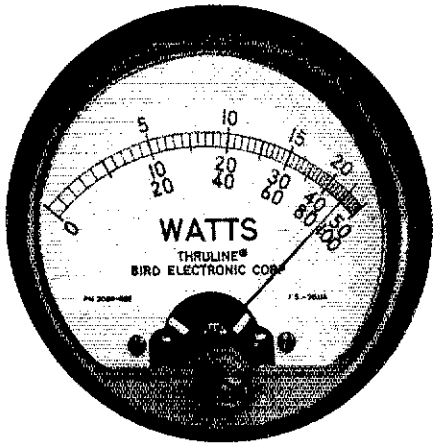
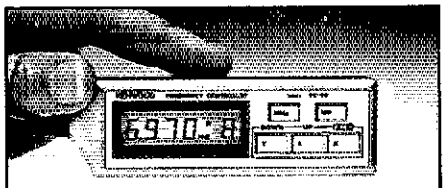
- 45 watt output, with HI/LO power switch (TM-401B has 25 watts output.)5 W low.
- Dual digital VFOs
  TM-201B covers 142-149 MHz, includes certain MARS and CAP frequencies
  TM-401B covers 440-450 MHz
- 5 memories plus "COM" channel, with lithium battery back-up



- Programmable, multi-function scanning
- High quality external speaker supplied
- Audible beeper confirms operation

Optional accessories:

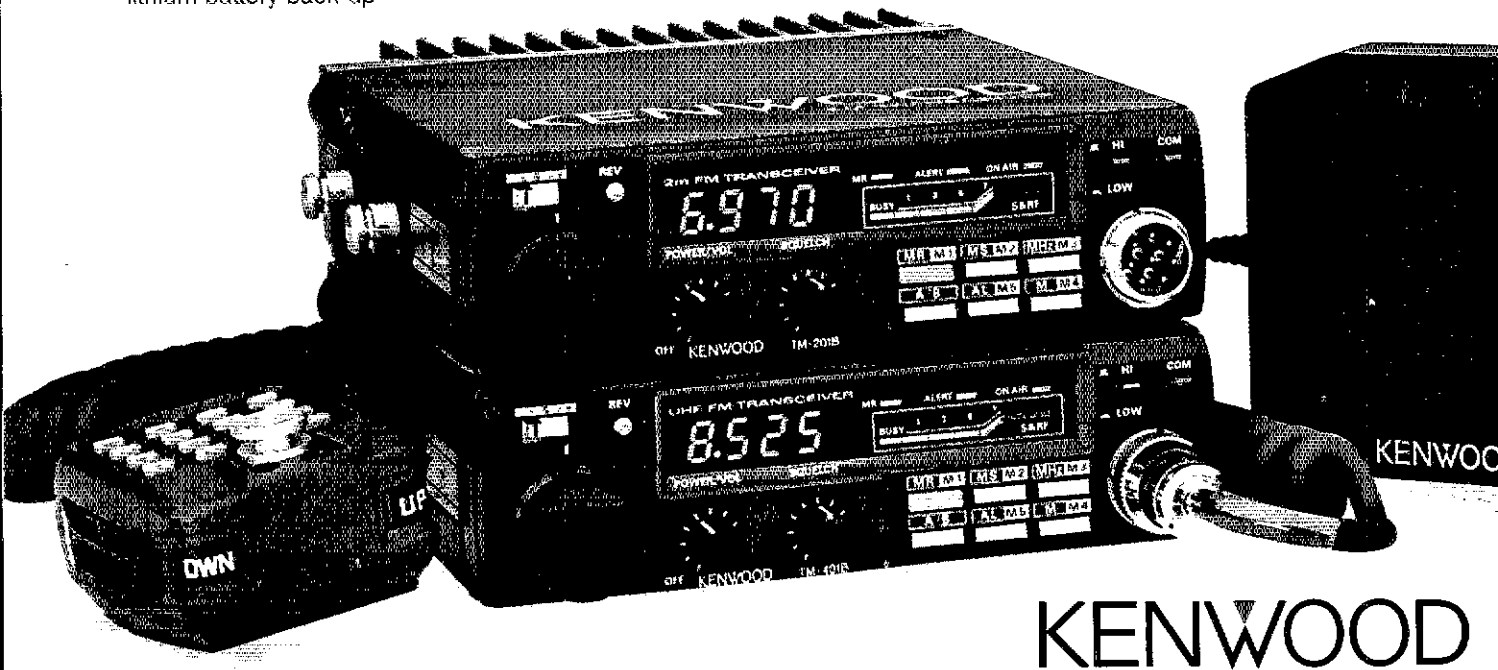
- PS-430 power supply
- TU-3 or TU-3A two frequency tone encoder
- FC-10 frequency controller
- MC-55 (8-pin) mobile microphone
- SP-40 compact mobile speaker
- SP-50 deluxe mobile speaker
- SW-100A/B SWR/power meters
- SW-200A/B SWR/power meters
- SWT-1 2 m antenna tuner
- SWT-2 70 cm antenna tuner
- PG-2K extra DC cable
- PG-3A DC line noise filter
- MB-201 extra mobile bracket



Optional FC-10 frequency controller

Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel).

More information on the TM-201B/401B is available from authorized dealers.



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TM-401B is similar to the TM-201B, but covers 440-450 MHz and is 25 watts.
Specifications and prices subject to change without notice or obligation.
Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.