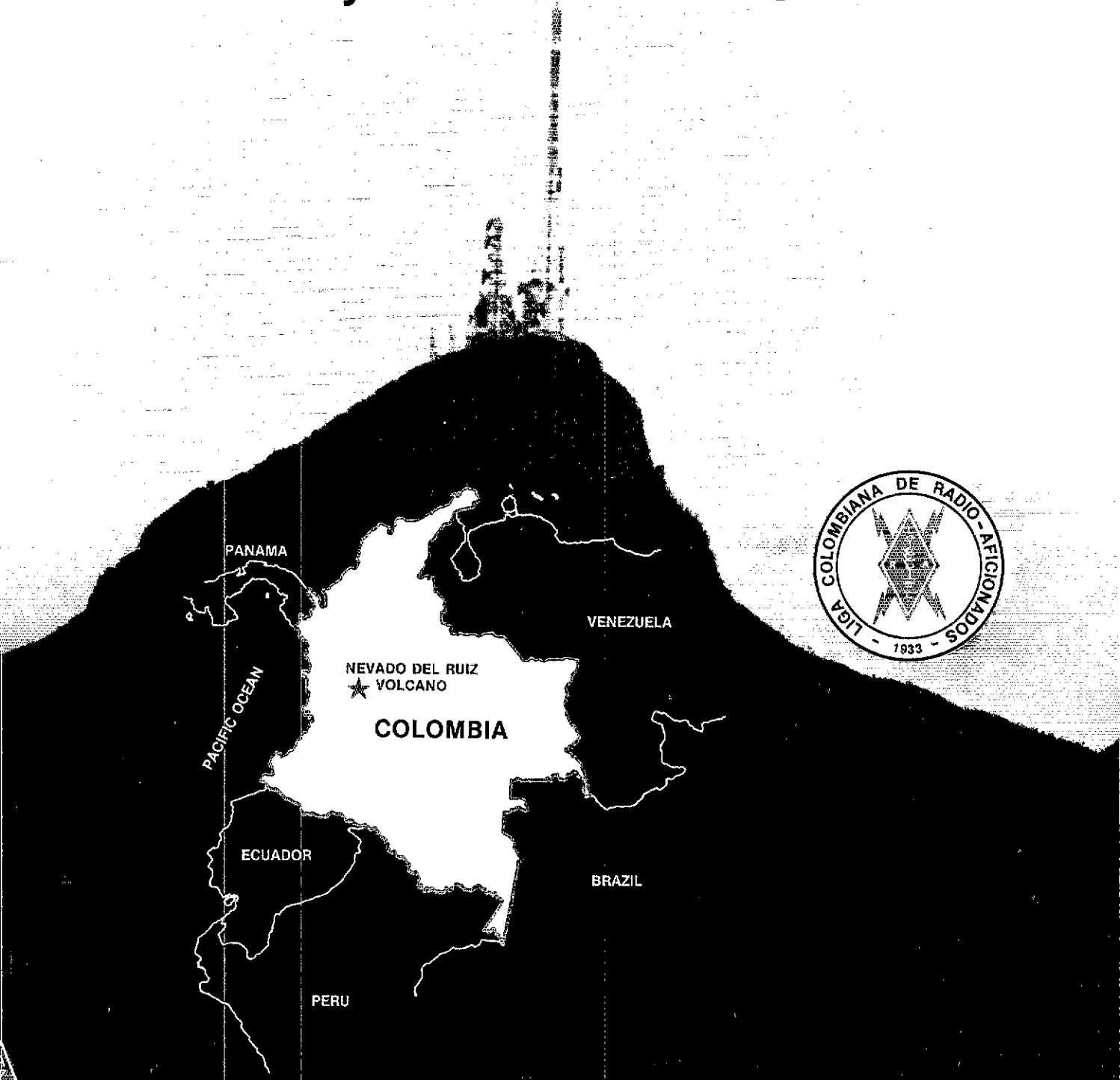
February 1986 $2.75

QST

devoted entirely to Amateur Radio



Amateurs come through —again— in wake of volcano disaster

the tempo S-15

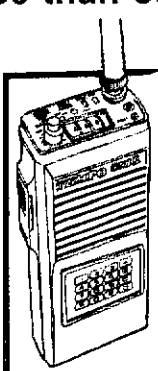
...a no nonsense radio that provides more power, broader frequency range and simplicity of operation

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

Consider these features before you decide on any hand held:

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

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



now available!

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

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

The new Tempo FMH-15S, FMH-44S & FMT-25S (mobile)
...all feature 16 channels, CPU controlled EPROM PLL, CTCSS encode/decode programmable per channel, priority scan to Channel 1, and time-out-timer.

FMH-15S... 138-174 MHz (10 MHz) frequency coverage
1 watt (low)/5 watts (high) RF power output

FMH-44S... 400-512 MHz (20 MHz) frequency coverage
1 watt (low)/4 watts (high) RF power output

FMT-25S... 138-174 MHz (10 MHz) frequency coverage
25 watts RF power output

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WAIT! 220 MHz Coming Soon!

Power-Full...70 Watts!

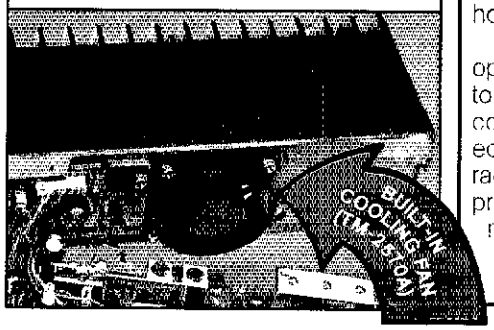
TM-2570A/2550A/2530A

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

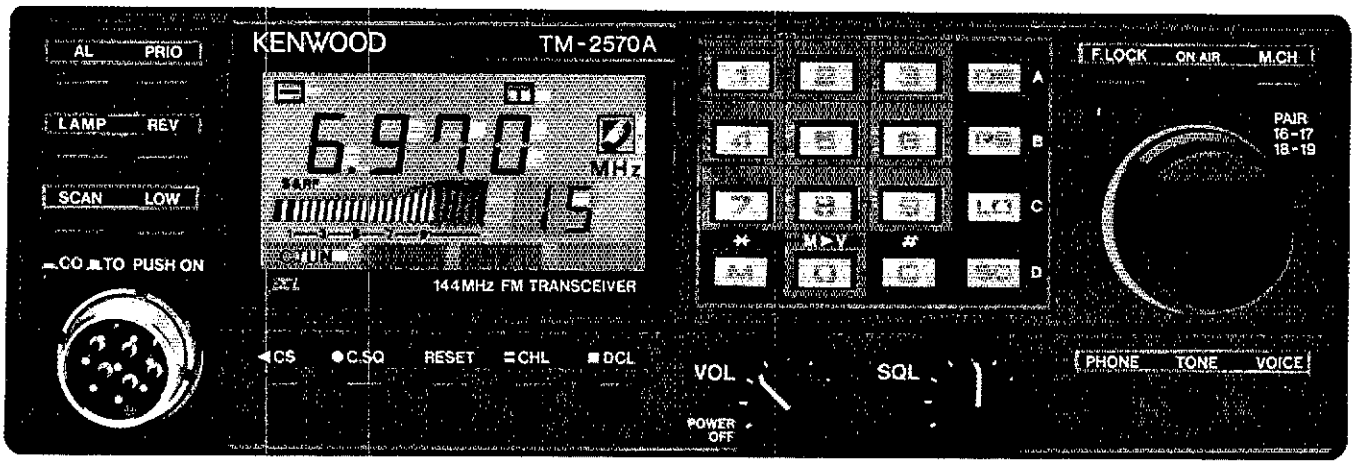
Large heatsink with built-in cooling fan (TM-2570A)



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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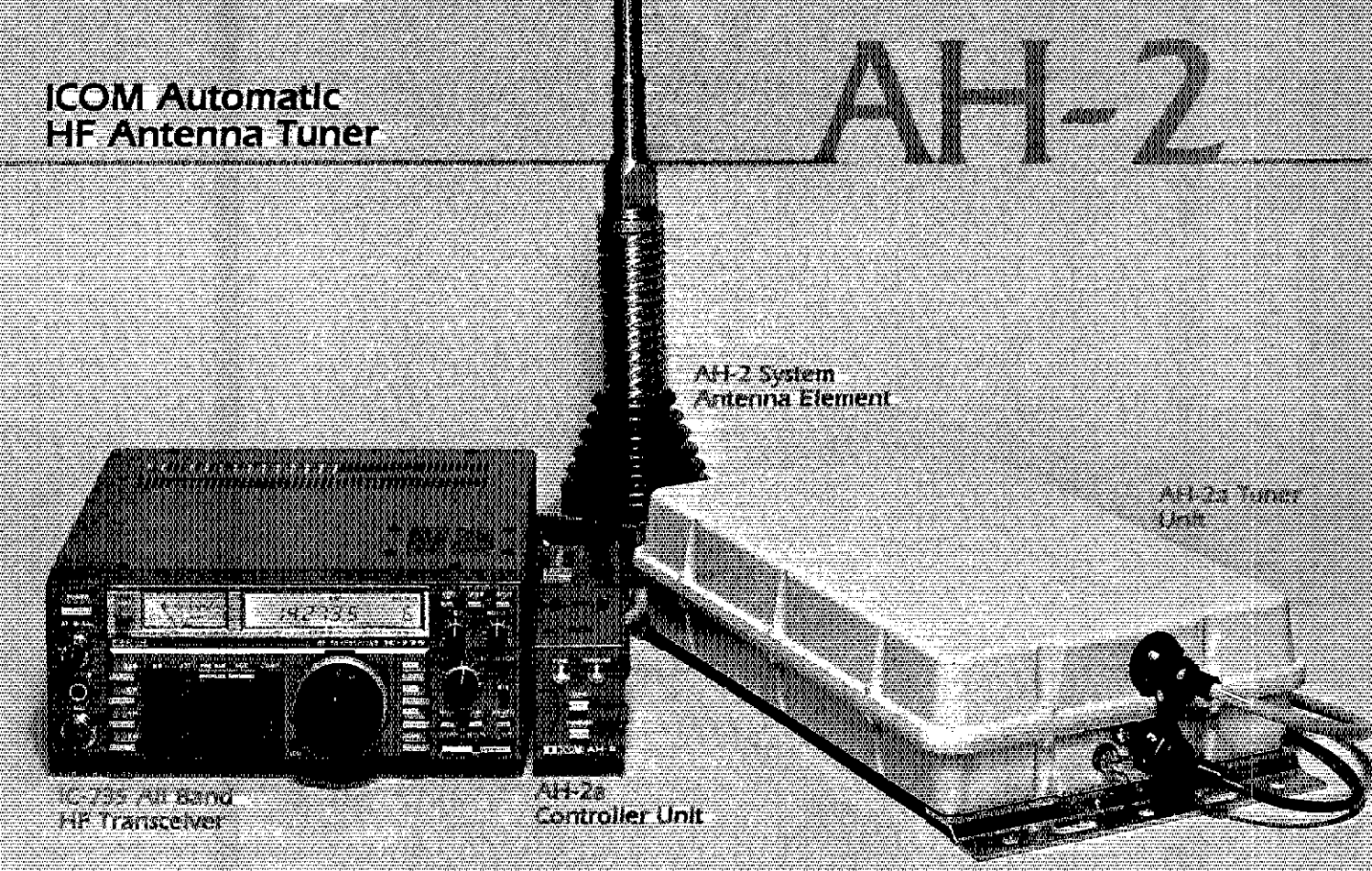
ICOM Automatic HF Antenna Tuner

AH-2



AH-2 System Antenna Element

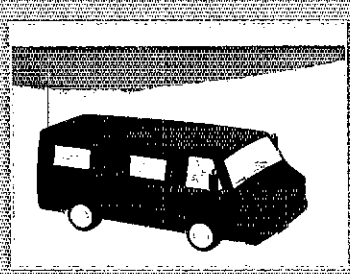
IC-735 All Band HF Transceiver

AH-2a Controller Unit

AH-2a Tuner Unit

ICOM presents the AH-2 automatic antenna tuning system for the IC-735 all band HF transceiver. The AH-2 is ideal for mobile operators since there is no manual antenna tuning needed...an advantage in inclement weather. Also, the AH-2 system enables auto tuning in areas where antennas are limited, such as apartments and condominiums.

The ICOM AH-2 System combines advanced matching techniques and rugged construction for indoor or outdoor

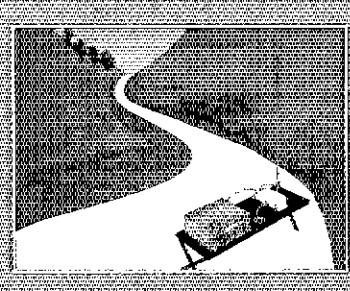


use to match frequencies from 3.5MHz to 30MHz. The system includes an antenna element, and the AH-2a tuner and controller units.

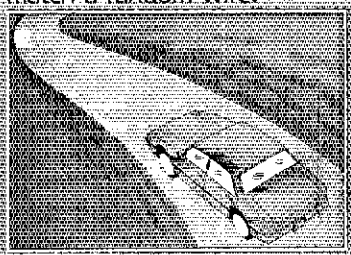
The AH-2a Tuner Unit enables optimum matching conditions via its built-in 8-bit microcomputer and LC (coil/capacitor) circuit. More than 260,000 LC combinations are possible.

The AH-2a Controller Unit easily attaches to the side of the IC-735 HF transceiver. By simply pushing the TUNE button on the front panel of the AH-2a controller unit, the controller automatically tunes from 10 to 80 meters in less than six seconds. It can also be used on the 160 meter band with an extension of the stainless steel whip.

The AH-2a tuning unit is housed in a durable weather-resistant case and is capable of storing tuning information for eight different frequencies. Retreiving tuning data from the memories is accomplished in less than one second!



The AH-2a can be purchased separately to accommodate the ham who already has a bumper mount and whip antenna, or the apartment/condo dweller who wants to match a random wire.



The antenna element includes sturdy bumper mounts which hold the 107 inch stainless steel whip in place, plus all the necessary hardware.

For the best mobile station, look at the IC-735 transceiver and the AH-2 automatic antenna system...they're quite a match.

ICOM

First In Communications

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

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OUR COVER

Towers on this Andes peak are part of a VHF repeater link that tie together all parts of Colombia. The link proved invaluable following the sudden and violent eruption of the Nevado del Ruiz volcano, located only a mile away, in November. *(photo courtesy Liga Colombiana de Radioaficionados)*

CONTENTS

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NEWS AND FEATURES

OPERATING

DEPARTMENTS

TOO GOOD TO BE TRUE?

PAKRATT™ Model PK-64

shown with enhanced
HFM-64 option installed

★ MORSE ★ BAUDOT ★ ASCII ★ AMTOR ★ PACKET ★

FIRST FIVE MODE DATA CONTROLLER

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

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

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

ENHANCED HFM-64 MODEM OPTION

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

WORKS WITH THE POPULAR C-64 COMPUTER

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

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

Prices And Specifications Subject To Change Without Notice Or Obligation

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(206) 775-7373 Telex 6972496 AEA INTL UW

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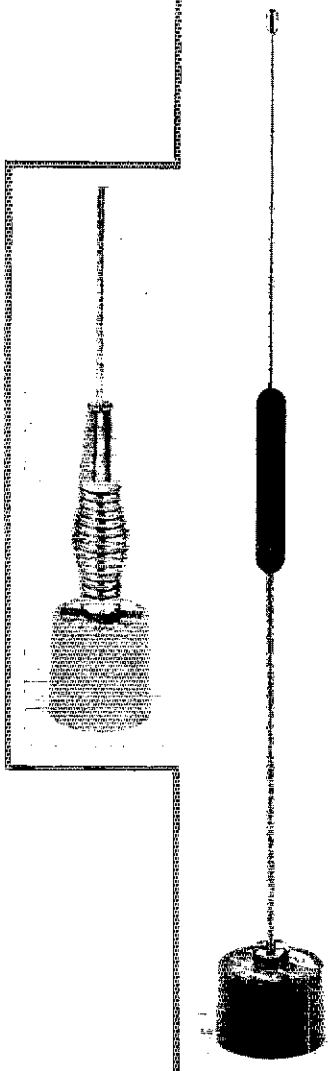

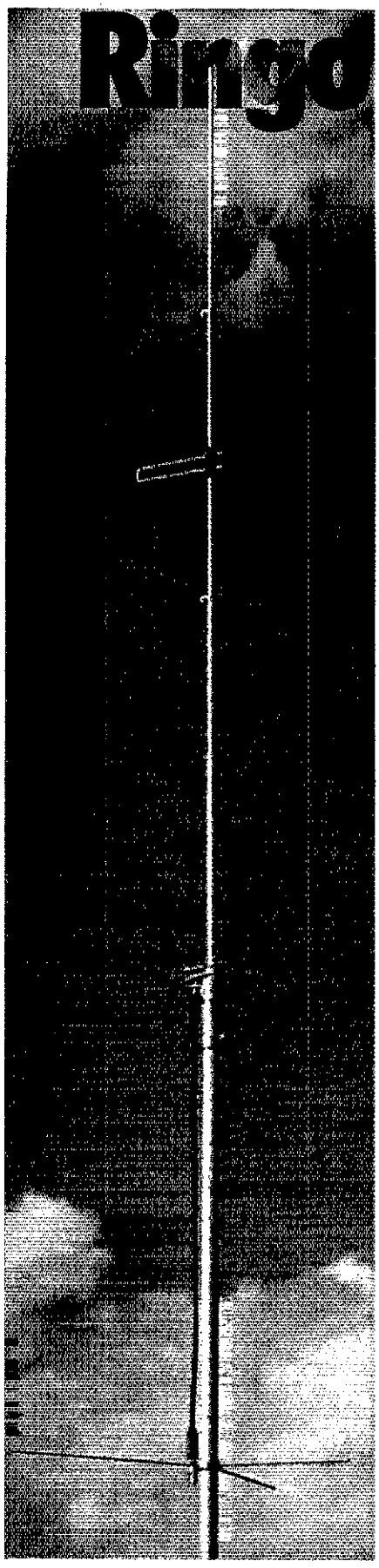

Ringo Ranger II

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

MOBILE ANTENNAS

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

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- **COAXIAL CONNECTORS**
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  2. **TRUNK LIP MOUNT**
  3. **¾ INCH HOLE MOUNT**

ONLY **CUSHCRAFT/SIGNALS MOBILE ANTENNAS** GIVE YOU ALL OF THESE IMPORTANT PERFORMANCE FEATURES.

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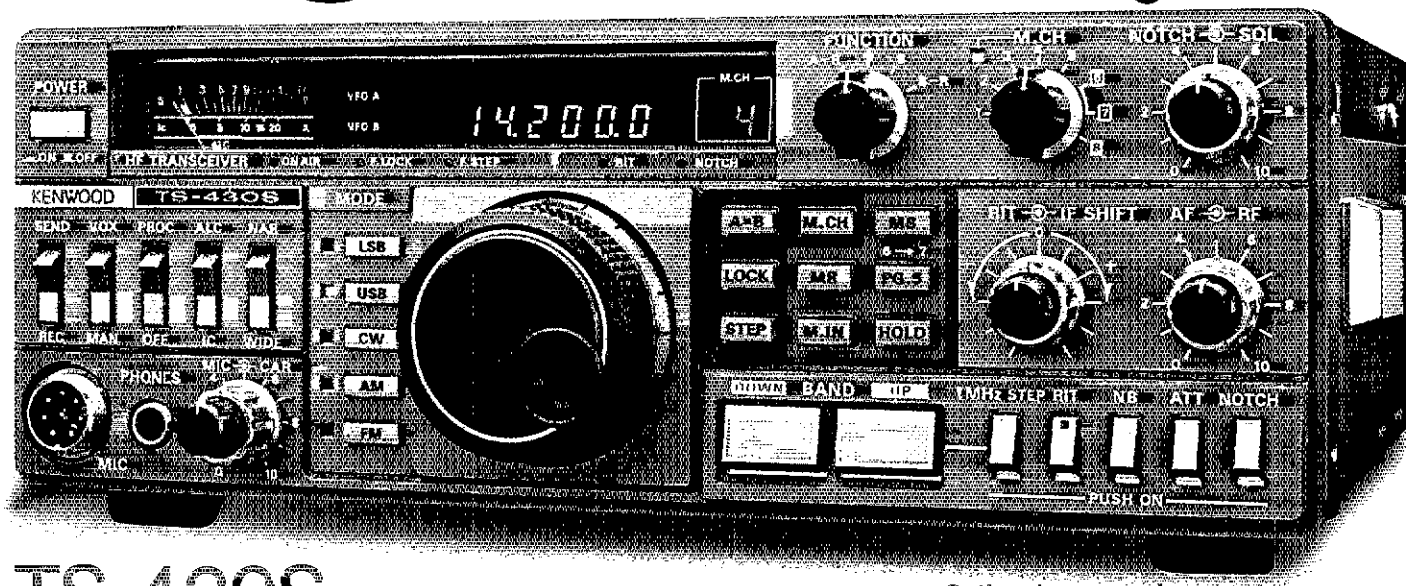
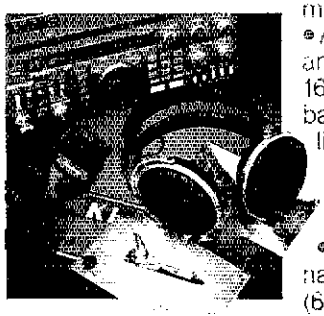
"Digital DX-terity!"



TS-430S

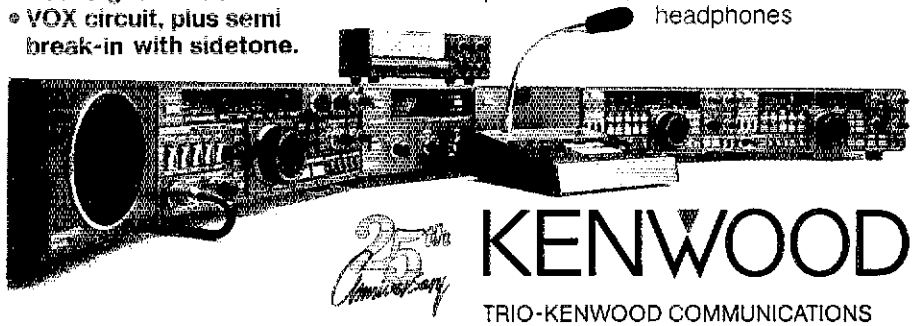
Digital DX-terity—that outstanding attribute built into every Kenwood TS-430S lets you QSY from band to band, frequency to frequency and mode to mode with the speed and ease that will help you earn that dominant DX position from the shack or from the mobile!

- **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



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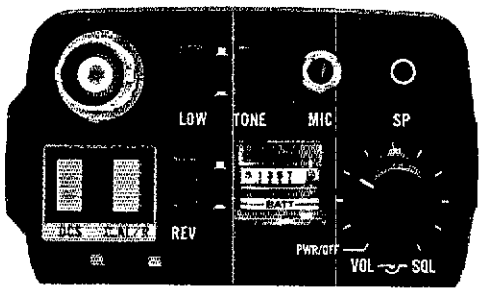
...pacesetter in Amateur radio

Handy Handful...

TR-2600A/3600A

Kenwood's TR-2600A and TR-3600A feature DCS (Digital Code Squelch), a new signalling concept developed by Kenwood. DCS allows each station to have its own "private call" code or to respond to a "group call" or "common call" code. There are 100,000 different DCS combinations possible.

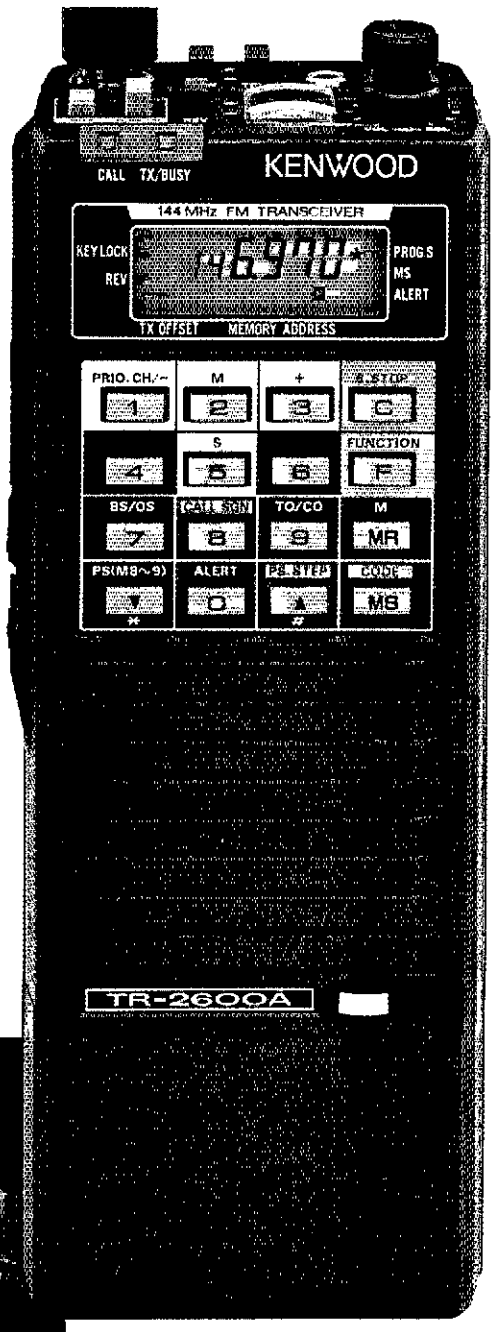


The Kenwood TR-2600A and the TR-3600A pack "big rig" features into the palm of your hand. It's really a "handy handful"!

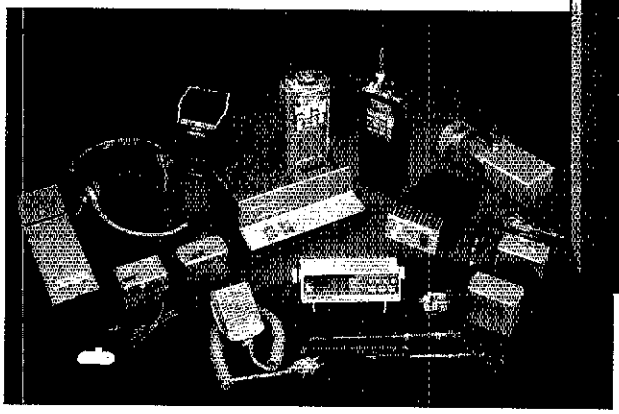
Optional accessories:

- TU-35B built in programmable sub-tone encoder
- VB-2530 2-m 25 W RF power amp.
- ST-2 base stand/charger
- MS-1 mobile stand/charger
- PB-26 Ni-Cd battery
- DC-26 DC-DC converter
- HMC-1 headset with VOX
- SMC-30 speaker microphone
- LH-3 deluxe leather case
- SC-9 soft case with belt hook
- BT-3 AA manganese/alkaline battery case
- EB-3 external C manganese/ alkaline battery case
- RA-3 2-m telescoping antenna
- RA-5 2-m/70-cm telescoping antenna
- AX-2 shoulder strap w/ant. base
- CD-10 call sign display
- BH-2A belt hook

More TR-2600A and TR-3600A information is available from authorized Kenwood dealers.



- **Simple to operate**
  Functional design is "user friendly." Built-in 16-key autopatch encoder, TX STOP switch, REVerse switch, KEYboard LOCK switch, high efficiency speaker.
- **Large LCD**
  Easy to read in direct sunlight or in the dark with convenient dial light that also illuminates the top panel S-meter.
- **Extended frequency coverage**
  Allows operation on most MARS and CAP frequencies. Receive frequency range is 140-160 MHz. (TR-3600A covers 440-450 MHz.)
- **Programmable scan**
  Channel scan or band scan, search for open or busy channels.
- **SLIDE-LOC battery case**
- **10 Channels**
  10 memories, one for non-standard repeater offsets.
- **2.5 watts high power, 350 mW low**
  TR-3600A has 1.5 watts high or 300 mW low.



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TR-2600A shown. TR-3600A is available for 70 cm operation.
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Vice Director: Richard Ridenour, KBØZL, 9 Lake Pembroke Dr, Ferguson, MO 63135 (314-521-2520)

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

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

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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)

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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)
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Montana — L. C. "Les" Belyea, N7AIK, PO Box 327, Belgrade 59714 (406-388-4253)
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Santa Clara Valley — Glenn Thomas, WB6W, 554 Simas Dr, Milpitas, CA 95035 (408-263-9450)

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

THE AMERICAN RADIO RELAY LEAGUE, INC

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

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

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

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

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 . . ."

Privacy Act—Facts and Fiction

What has Amateur Radio got that other avocations do not? Well, lots of things, but one very visible attribute is instantaneous, nationwide interchange of information. Most of the time, this is good. But our ability to spread news rapidly across the country parallels an ability to spread misinformation equally as fast.

Something like that has happened in the case of the Electronics Communications Privacy Act of 1985, S.1667 and H.R. 3378, pending before the respective Judiciary Committees of the US Congress. Copies of the legislation seem to be scarce out there in radio land (though any person should be able to obtain a copy of this or any bill pending before the Congress through the local office of his Representative or Senator, listed under US Government in the phone book).

Absent copies that can be studied, some amateurs (including some with editorial responsibilities) have assumed that the Federal bills would have a similar effect to a California bill introduced last summer. Not so!

Amateurs are saying that this bill will outlaw possession of 83-channel TV sets and scanners. Not so!

Hams feel that this bill is being whisked along with the speed of light, powerful industry groups forcing Congress to go along. Not so!

Some have said Congressional hearings have been canceled solely to muzzle amateurs, scanner operators and others who might be opposed to the bill, to prevent them from being heard. Not so!

Amateurs are saying the bill will outlaw our phone patches. Not so!

And some have said, "The League is asleep on this one. They're taking a wait-and-see attitude while the bill rushes toward completion." Emphatically not so!

Taking last things first, one of the things your dues to ARRL helps provide to the Amateur Radio Service is a registered lobbyist, the ARRL Washington Area Coordinator. His time is physically divided between Washington and Newington, to ensure active, close interchange with the rest of the headquarters staff. But he is in Washington typically two days a week, and whenever he's needed. Backing him up in the Capital City is the League's Counsel; the Associate Coordinator, formerly a government spectrum manager, on an as-needed basis; and an elected ARRL director, an electrical engineer retired from Government service. All this activity is closely monitored by ARRL President Larry E. Price, W4RA, who, under the ARRL By-laws, represents the League in its Government relations. So "neither snow nor sleet nor gloom of night can keep ARRL from its appointed Washington rounds" (if we may adapt a Post Office motto!).

Specifically, on this matter of the Privacy Act, ARRL's team has visited five key members of Judiciary subcommittee staffs; prepared seven-plus pages of written testimony; agreed to furnish a witness for a House hearing on the legislation originally in December but now probably at the end of January; talked with other Capitol Hill staffers; and continued to track the progress of the legislation.

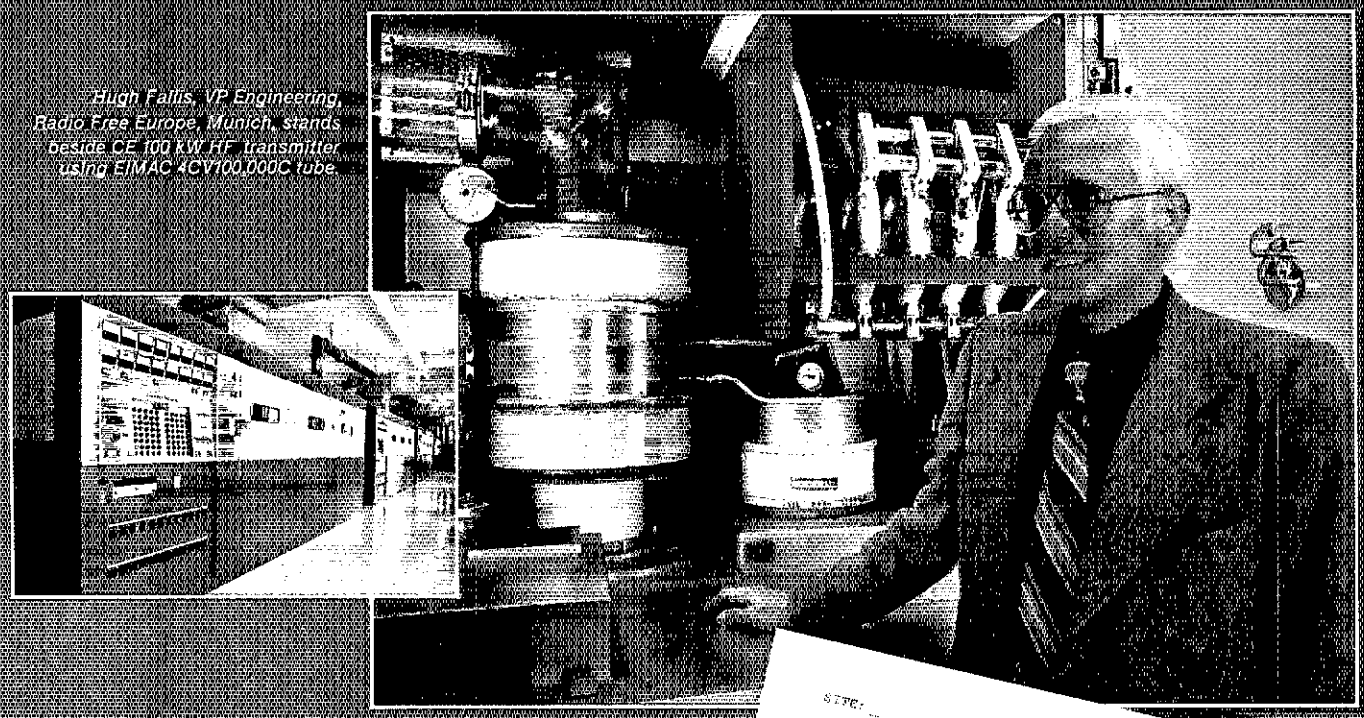
Even before all this, ARRL alerted the Goldwater and Wirth subcommittees on Communications and Telecommunications, respectively, that the Judiciary groups were looking at this bill; at that early stage neither of these bodies had been involved in the legislation because it sought amendment of the Crimes and Criminal Procedure laws, Title 18 United States Code, rather than the Communications Act, Title 47 USC, for which these subcommittees are responsible. We have a close relationship with the Wirth and Goldwater groups, having worked with them in 1982 on the present privacy language of the Act, Section 705. And we touched base with K7UGA's own staff to ensure that, if the bill got moving too fast, Senator Barry Goldwater would put a "hold" on the legislation (a point of personal privilege available in the Senate), so he could take a closer look at the matter.

H.R. 3378 and S.1667 really were originated in response to civil liberties issues arising from perceived deficiencies in the Wiretap Act of 1968 and in response to the quantum jump in technology since its enactment. Much of the bill, for instance, is to provide new rules for law-enforcement use of telephone-dial "pen registers" and electronic tracking devices. The existing law already restrains the use of wiretaps, "bugs" and long-distance listening devices; the new bill would extend the concept of "expectation of privacy" to electronic mail, computer bulletin boards, and telephone circuits using radio as well as wires (eg, cellular systems and cordless phones). Scanner users and casual listeners could be impacted to a much greater extent than amateurs per se. The operative phrase in Section 705 of the Communications Act, the only guide for these hobbyists at the moment, is "No person shall intercept and divulge. . .or use such information . . ." The penalty for violating the Act is a fine of up to $10,000 or imprisonment for a year. The proposed law under Title 18 would make interception alone a crime, even without divulgence or use; the penalties would normally be $5000 or imprisonment for six months, but could climb to $250,000 and a year in prison if the offense is committed for "purposes of commercial advantage, malicious destruction or private commercial gain"!

Other points, in reference to amateurs' uneasiness:

- The bill doesn't even mention radio receiving equipment. Thus, there is no way it could outlaw possession of an 83-channel TV set, or a scanner, or a shortwave receiver. The bill focuses on usage; that is, on deliberate interception.
- Nowhere in the bill is there mention of an amateur phone patch. The issue arose only when a magazine reporter who happens to be an amateur demonstrated the Amateur Radio autopatch to a House subcommittee staffer. After the demonstration, the aide asked the ham: "Did the woman who answered the phone know she was connected to the radio?" "Gee, I didn't

(continued on page 50)



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 Lampertheim, 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.

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UP FRONT in QST

IARU representatives arriving by air for the Region 3 Conference in Auckland, New Zealand in November found more than the usual flight information when they touched down. Their welcome was arranged by the host society, the New Zealand Association of Radio Transmitters (NZART). Watch for a complete report on the Region 3 Conference in an upcoming issue of *QST*.

Need Some Help in Financing Your Future In Electronics?

Are you a young radio amateur pursuing a higher education in electronics? The ARRL Foundation is offering three scholarships for the 1986-87 school year. Based on high academic standing, financial need and dedication to public service through Amateur Radio, these awards are provided through the generosity of individual sponsors and donors.

- The Perry F. Hadlock Memorial Scholarship of $500 will be awarded to an electrical engineering student. It is open to General- or higher-class licensees.
- The Paul and Helen L. Grauer award of $500 will be given to a student of electronics, communications engineering or a related field. The student must reside in and attend an accredited college or university in the ARRL Midwest Division.
- The You Have a Friend in Pennsylvania scholarship is available for the first time. It will be awarded to an ARRL member who maintains academic excellence.

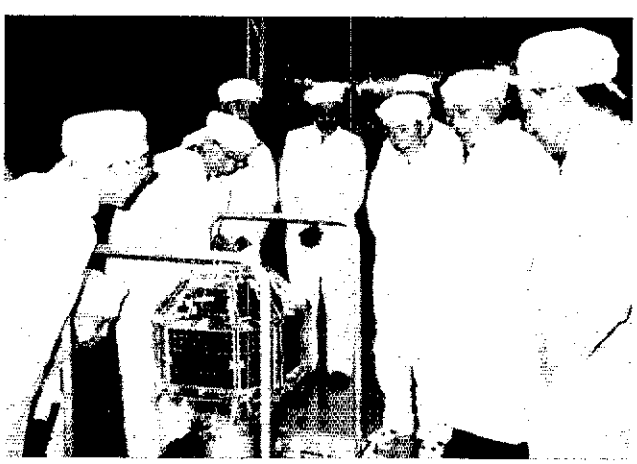
The application deadline for these scholarships is May 1, 1986. Further information and application forms can be obtained from ARRL Foundation Scholarships, 225 Main St, Newington, CT 06111.

FCC Fine-Tunes Third-Party Rules

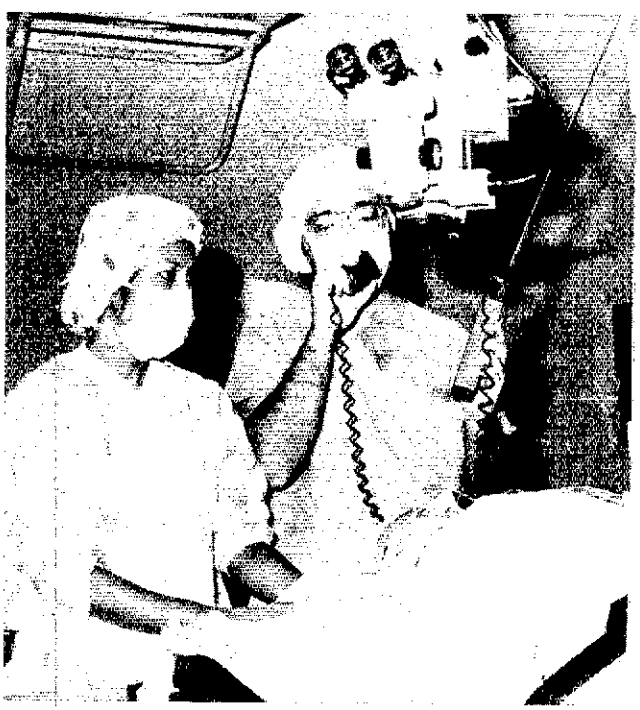
If your ham license has been suspended or revoked, you can kiss goodbye your chances of being involved in any third-party operation. The FCC has closed a loophole in the Rules that may have allowed disqualified persons to use third-party participation as a means to get on the air. See this month's Happenings for details.

Have a Story Worth Sharing?

Had an interesting experience in Amateur Radio? Lenore Jensen, W6NAZ, is writing a book, and would appreciate hearing about coincidences, rescues, thrilling and amusing incidents, and other such happenings. Proceeds from the book will go to the ARRL Foundation. Send your entries to Lenore at 14867 Round Valley Dr, Sherman Oaks, CA 91403.



The second flight model of JAS-1, Japan's first Amateur Radio satellite, undergoes close scrutiny by technicians and some members of the Japan Amateur Radio League after its completion at an NEC factory in December. JAS-1 is scheduled for launch in August 1986 aboard a National Space Development Agency of Japan (NASDA) rocket. *(photo courtesy JA1AN)*



This operation went very smoothly, thanks in part to Amateur Radio. During recent microscopic cataract surgery at St Barnabas Medical Center in Livingston, New Jersey, opthalmologist Peter Nussbaum, W2QDL (right), sought the help of Dr. Mark Olesnicky, N2DQS, of Maplewood, New Jersey, in solving an emergency communication problem. The patient, a Russian immigrant, doesn't speak English. So, during the operation, Dr. Olesnicky, who speaks Russian, translated Dr. Nussbaum's instructions to the patient from another location. Both physicians are members of the St Barnabas Medical Center ARC.

League Lines

PRB-1 wins one for Amateur Radio! The US Court of Appeals for the 6th Circuit has ruled ***in favor of radio amateur WM4T*** in the case of ***Thernes v City of Lakeside Park, Kentucky.*** This overturns the unfavorable judgment Amateur Radio received in the US District Court in the Eastern District of Kentucky. The District Court had upheld a municipal ban on amateur antennas because they were not specifically permitted as accessory uses within the city. The written decision was not available to us at press time, but we should be able to give a full report on the outcome in next month's *QST*.

The ARRL Executive Committee met in Atlanta on December 14, 1985. The EC considered ARRL's position regarding RM-5241, a petition filed by Donald Stoner, W6TNS, for the creation of a Public Digital Radio Service at 52-54 MHz. The PDRS, as proposed, would permit owners of personal computers to link their machines by radio—but ***it would also yank half of the 6-meter band away from the Amateur Radio Service!*** The League vigorously opposes the creation of the PDRS and the reallocation of 52-54 MHz; watch Happenings for details.

Also mandated were ***higher-energy efforts to recruit new radio amateurs*** through the ARRL field organization, clubs and projected publications. Full EC Meeting minutes at Moved and Seconded, page 60.

On December 14, 1985, the Spread-Spectrum Committee (see last month's League Lines) met in Sterling, Virginia, to begin the work of writing ***interoperability standards for spread-spectrum Amateur Radio.*** Committee members are working on an initial report for release this spring.

These areas are being explored by the committee: glossary of SS terms; startup protocol (includes: announcing code sequence [7, 13, 19], announcing initial register fill, announcing clock dither parameters [if used], synchronizing clocks and trigger procedure); CQ procedure; general announcement (QST) procedure; power setting procedure; recommended identification procedures; recovering synchronization; repeater coordination; interference avoidance and guidelines for good engineering practice.

You can get involved in this work. Please send your comments and suggestions to Chuck Hutchinson, K8CH, ARRL HQ, for distribution to the committee.

Beginning in March (with April *QST*), ***you'll get to see your favorite Amateur Radio publication a bit earlier.*** At the request of League members, many of whom tell us they don't get their *QST*s until well after the first of the issue month, we've negotiated ***a new mailing date*** with our printer. This also means that timely ***material you send us should arrive earlier***—eight days earlier than previous deadlines, to be precise. Ham-Ads, for example, are now due by the 13th of the second month preceding the issue date (February 13 for April *QST*, and so on). See you sooner!

Amateurs in the United Kingdom have 6-meter privileges beginning February 1. Class A licensees in the UK may operate in the band 50.0-50.5 MHz at effective radiated powers of 14 dBW carrier and 20 dBW PEP. Maximum transmitting antenna height is set at 20 meters, with no mobile, portable or temporary-premises operation allowed. Now, if Old Sol would just make with the sunspots ...

Ready to upgrade? ***The test fee in 1986 is $4.25*** if you take a Technician or higher-class exam through an ARRL-affiliated Volunteer Examiner team. Many other Volunteer Examiner Coordinators are also charging $4.25. See Volunteer Examiner Information, page 77, for details.

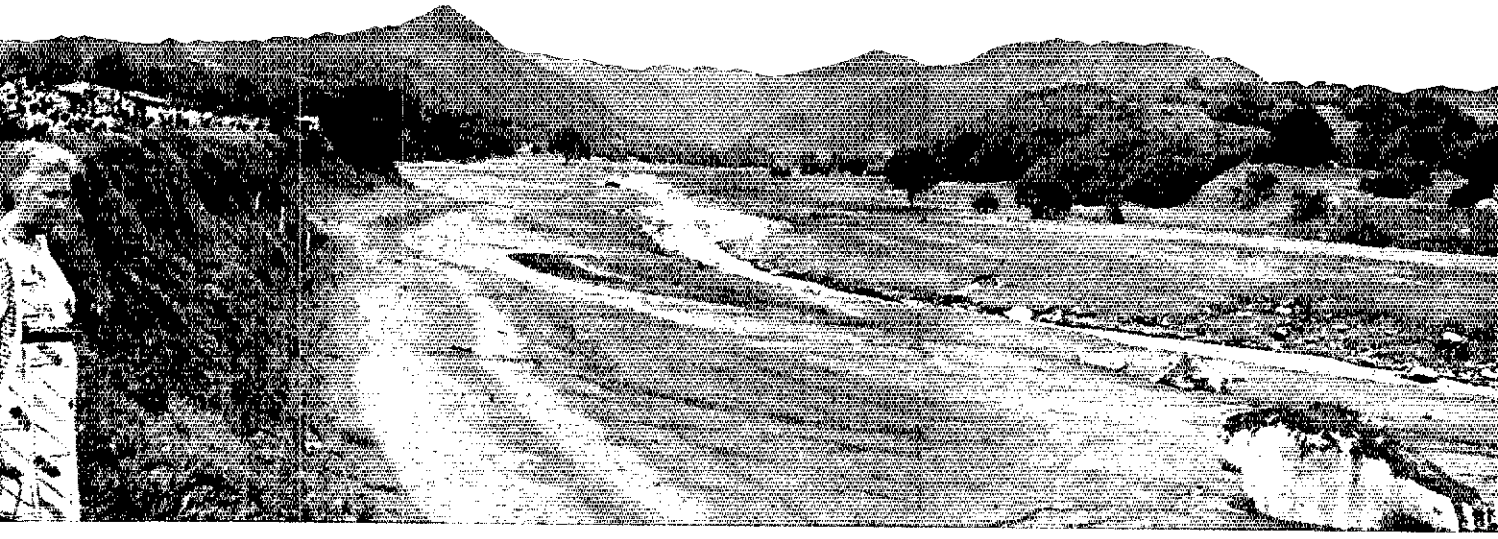
The Club Challenge for the '80s has begun anew for 1986. Your ARRL-affiliated club will receive a $5 commission for every new ARRL membership carrying your club's four-digit code. Contact Leo Kluger, WB2TRN, Club Program Manager, for more information.

There's an assistant manager position open with the Volunteer-Examiner Coordinator Department at HQ. No need to be an accredited VE, but an Extra Class ticket with solid 20+ WPM code capability is essential. Annual salary range $18,226-25,506. Contact Jim Clary, WB9IHH.

An opening exists in the Technical Department at HQ for a laboratory engineer. We are looking for a licensed amateur with a BSEE or ASEE degree, or equivalent experience. Annual salary range $21,476-30,056. Contact Chuck Hutchinson, K8CH.

ARRL HQ is looking for a Regulatory Information Branch manager. Primary responsibilities include editing *The ARRL Letter*, writing Happenings and League Lines for *QST* and updating *The FCC Rule Book*. The RIB Manager also answers phone and letter inquiries on regulatory matters, including antenna ordinances and FCC rule interpretations. Annual salary range $18,226-25,506. Contact Bob Halprin, K1XA, or John Lindholm, W1XX.

The Colombia Volcano



For the many radio amateurs in Colombia who helped in the wake of one of history's most tragic natural disasters, the concept of public service took on real meaning.

By Alberto Shaio, HK3DEU
Secretary, IARU Region 2
9 Sidney Lanier La
Greenwich, CT 06830

and

Fred Laun, K3ZO
PO Box 31097
Temple Hills, MD 20748

At 7 PM on November 13, the Nevado del Ruiz volcano began raining ash on several cities and villages in Tolima Department (state) of Colombia. The department governor immediately asked Ramiro Lozano, HK6AON, President of the Tolima Red Cross, to activate the Liga Colombiana de Radioaficionados VHF-repeater network and alert nearby localities of the disaster situation in Tolima.

Once the repeater was activated, HK6AON contacted the Mayor of Armero, Ramon Antonio Rodriguez, HK6HTC. Rodriguez maintained communications via the repeater, receiving reports from the Governor's office and keeping abreast of minute-by-minute developments. When he heard of the wall of mud and water advancing on Armero, he ordered evacuation of several blocks nearest the Lagunilla River. Lucho de la Torre, HK6FDE, represented Armero on the repeater while the mayor coordinated the evacuation efforts.

At approximately 10 PM, HK6AON asked HK6FDE to drive a few blocks in Armero and reconnoiter a building that could be used as an emergency shelter. A minute later, HK6FDE returned to the repeater and stated that he was unable to leave his house because of rising mud and water. This was the last transmission heard from Armero.

The Mayor of Armero, HK6HTC, as well as his family died that night trying to assist the townspeople. HK6FDE managed to survive the disaster, but lost all members of his immediate family. Their dedication will always be remembered.

It is difficult to be objective and dispassionate about the sudden death of more than 25,000 people as the result of an overwhelming natural disaster, especially when some of the victims were family and friends. It is equally difficult to completely describe the role that Amateur Radio played in one of the worst natural disasters ever. But, as radio amateurs, we have certain responsibilities, particularly in the field of emergency communications, which require that we know and understand our role in providing reliable communications when a disaster strikes.

Events That Shaped Amateur Radio's Response

The IARU Member Society in Colombia is the Liga Colombiana de Radioaficionados, referred to as LCRA. It is a founding member of IARU Region 2 and has led the Amateur Radio community in Colombia since 1933. The LCRA has its headquarters in Bogota and has 18 regional headquarters serving the entire country. In 1972 the LCRA established the world's first completely interlinked national VHF network. Today three such networks provide direct access to any part of the country on VHF. It is through this unique system that LCRA was able to provide the communications support required for the emergency.

The Response

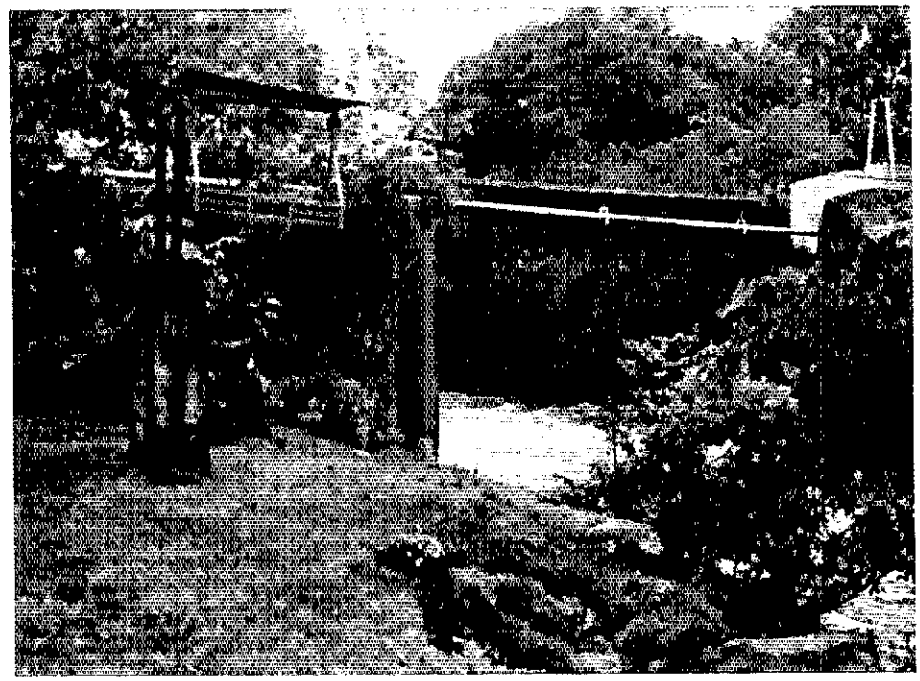
From the time HK6FDE disappeared from the air, the LCRA swung into action. HK3GJU activated the emergency net or the Cerro Negro repeater while HK3AVH, General Secretary of the LCRA, was made a member of the Colombian government's Emergency Committee. As soon as dawn gave participants an idea of the extent of the disaster, some 60 amateurs affiliated with the Bogota division of the LCRA were made available to the Emergency Commission as operators, while Red Cross and Civil Defense, who have their own 2-meter hand-helds, were advised that the LCRA

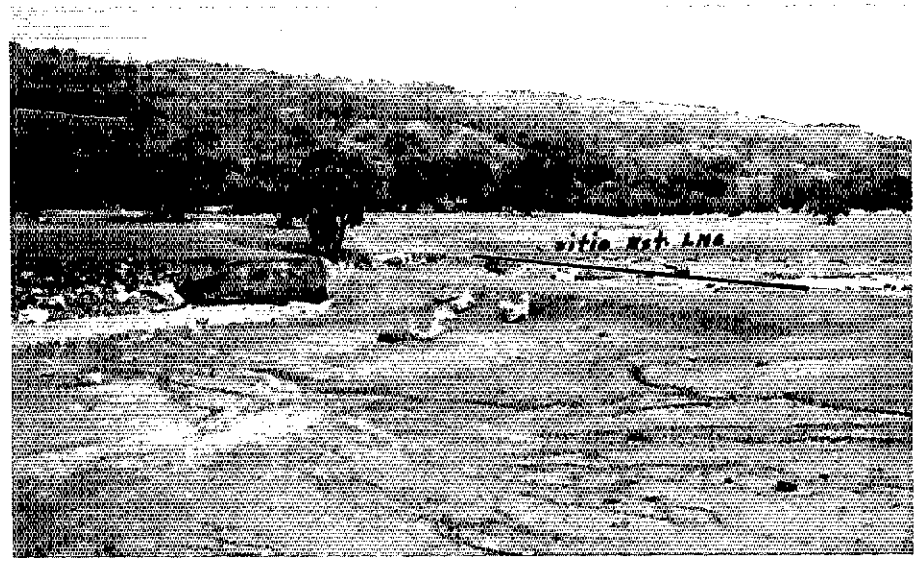
Cerro Negro repeater was usable and the necessary coverage was available through that repeater. The Bogota LCRA region declared another one of its repeaters, on Alto el Cable, reserved for local coordination within the city of Bogota, as evacuees were beginning to arrive.

Operators were sent to hospitals, airports and ambulance-dispatch points. Two stations were set up in the Presidential Palace, one on each repeater, to provide direct coordination with the President's Emergency Commission. A direct phone line was installed from the Presidential Palace to LCRA headquarters, where Colombia's W1AW, HK3LR, had been activated on 2 meters and on 40. The Minister of Communications issued a temporary decree allowing Red Cross, civil defense and military personnel to use Amateur Radio emergency frequencies even though they were unlicensed to operate Amateur Radio. Novices and other lower-class licensees were also allowed to operate on frequencies not normally available to them if it was necessary to handle emergency communications.

In Manizales, the major city adjacent to the volcano, the president of the regional LCRA division, Silvio Hoyos, HK6VH, established an impressive support center for the many scientific personnel nationwide. Within 12 hours after the eruption, the LCRA had complete communications covering all aspects related to the emergency.

As of December 1, 24-hour operations continued under the leadership of the LCRA and its dedicated members. By this time, most of the participants had worked day after day to ensure that communications were always available. Many members of the LCRA are also members of the Civil Defense League, the Civil Air Patrol and the Red Cross. This gave them the opportunity of being helpful not only through communications but also through direct rescue operations. The LCRA has always encouraged its membership to be active in organizations trained for emergencies, and this policy proved to be essential.





The site of a scientific station near Armero prior to the volcanic eruption (top photo). Note the large boulder (far right) and the bridge (background). The bottom photo shows the area surrounding the scientific station after the eruption and flooding, from a different angle. Note the boulder (beneath the tree, center) and the outline of the bridge. *(photos courtesy LCRA)*

Jorge Ivan Jimenez, HK4DKR, was responsible for supplying communications for the scientific teams following the disaster.

During the actual rescue operations, many HF stations were totally destroyed because of erratic commercial power-line voltages. At least a dozen VHF hand-held transceivers were lost by rescue personnel, and three VHF repeaters burned out after being used continuously for more than six days.

The success of the Amateur Radio involvement in this emergency was due to its organization and understanding of the nature of the emergency. The LCRA established clear objectives and traffic priorities. It invited the Ministry of Public Health, the Red Cross and state government agencies to join them in the rescue and welfare operations. Three working groups were established: a coordination group headed in Bogota, an operations group and an information group. The LCRA, its members and the entire Amateur Radio population of Colombia should be congratulated on the magnificent task performed and the service provided to people in dire need of assistance.

Our Responsibility

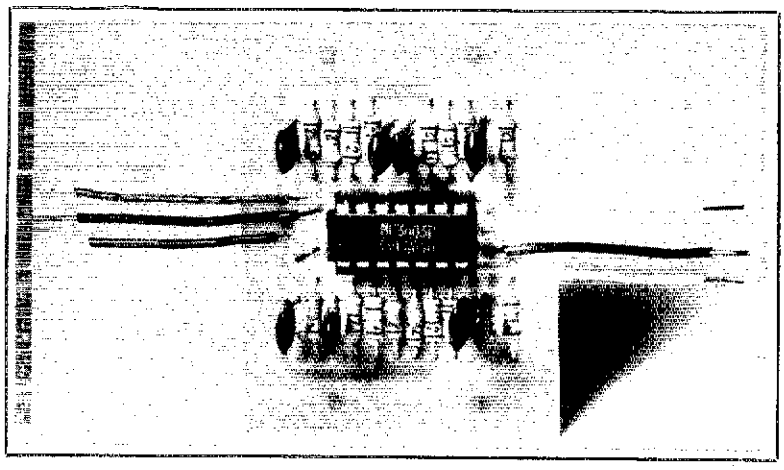
The Amateur Radio Service must at all

(continued on page 57)

A Simple, Effective Receiving Aid

Enhance the intelligibility of phone or CW with this simple addition to your shack.

By Robert C. Sommer, N4UU
American Systems Corp.
7535 Little River Tpke
Annandale, VA 22003



Noise and interference often impair the intelligibility of signals received on the Amateur Radio bands. This article describes a novel audio-processing technique to enhance the intelligibility of signals corrupted by noise and interference. The circuitry required is inexpensive, easy to build and needs no alignment or adjustment, and can be used with any receiving equipment. The technique is effective when you are using either headphones or loudspeakers and when listening to Morse code or voice signals.

The general principle of the technique is shown in Fig 1. The audio output from the receiver, or transceiver, is split into two channels by the low- and high-pass filters. When you're listening with loudspeakers or stereo headphones, high-pitched sounds seem to originate from one direction, while low-pitched sounds seem to originate from the other. Middle-pitched sounds appear to come from a position directly in front of you. Placing the speakers at 45 degrees to the left and right of you achieves good results.

If several Morse code signals are crowded into the receiver's passband, each appears to be located in a different spatial position in relation to you. Consequently, your consciousness is provided a directional parameter, which enhances the ability to focus attention upon and, hence, to better comprehend any one of the signals. A received voice signal appears to originate from a position directly in front of you, but noise and interference near the edges of the passband appear to come from the left and right of the voice. This phenomenon renders the signal more intelligible. Broadband noise, either thermal or atmospheric, is perceived in a panorama and, although audible, is less distracting because your attention is focused on a signal that appears to originate from some particular direction.

Experiments with this technique on the high-frequency Amateur Radio bands have shown that although it is not a panacea, it improves the intelligibility of signals corrupted heavily by noise and interference. In addition, you can expect less fatigue during long periods of difficult reception, such as those experienced during contests on the 160-meter band.

Filter Parameters

Butterworth filters are the best choice for this application. The relative output power from a low-pass Butterworth filter can be expressed as

$$P_L = \frac{1}{1 + (f/f_c)^{2n}} = \frac{(f_c/f)^n}{(f_c/f)^n + (f/f_c)^n} \quad \text{(Eq 1)}$$

where
f is the frequency
f_c is the cutoff frequency at half power
n is the number of poles

The relative output power from a high-pass Butterworth filter can similarly be expressed as

$$P_H = \frac{1}{1 + (f_c/f)^{2n}} = \frac{(f/f_c)^n}{(f/f_c)^n + (f_c/f)^n} \quad \text{(Eq 2)}$$

If both the low- and high-pass filters are complementary, in the sense of having the same cutoff frequency and the same number of poles, Eqs. 1 and 2 reveal that the total output power is

$$P_T = P_L + P_H = 1 \quad \text{(Eq 3)}$$

which is a constant, and independent of the frequency in question. Complementary Butterworth filters can split the audio band into a low-frequency channel and a high-frequency channel in such a way that the total spectrum of output power, from both channels, is exactly the same as the spectrum of input power. Thus, you would perceive exactly the same "tonal quality" whether the filters are switched in or out of the system. The direction from which a tone seems to originate depends on the ratio of the power at the output of one channel to

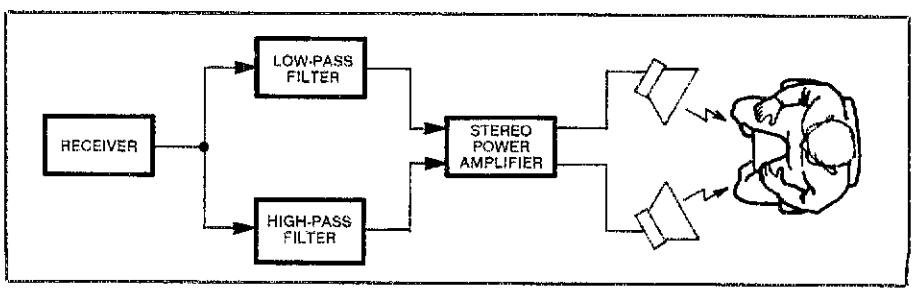


Fig 1—Illustration of the general principle.

Measure or Match Capacitance with a 555 IC

There are occasions when it is desirable to know the value of a capacitor to better than its tolerance value. In addition, the calibration of homemade capacitance meters requires several capacitors of known value. It is possible to determine the values of capacitors using a 555 IC, a few resistors and a scope or frequency counter. See the references at the end of this article.

The 555 IC is connected as an astable multivibrator. See Fig A. The frequency and period of the multivibrator may be calculated from the equation:

$$f = 1/T = \frac{1.443}{(R_1 + 2R_2)C} \quad \text{(Eq 1)}$$

where

f is the frequency in hertz
T is the period in seconds
R_1 and R_2 are in ohms
C is in farads

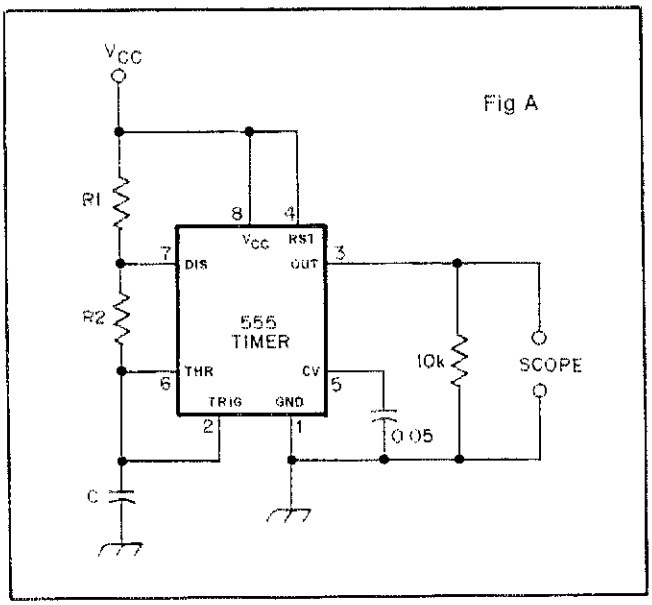
If R_1 and R_2 are known, and the period T measured with a scope, the capacitance is calculated:

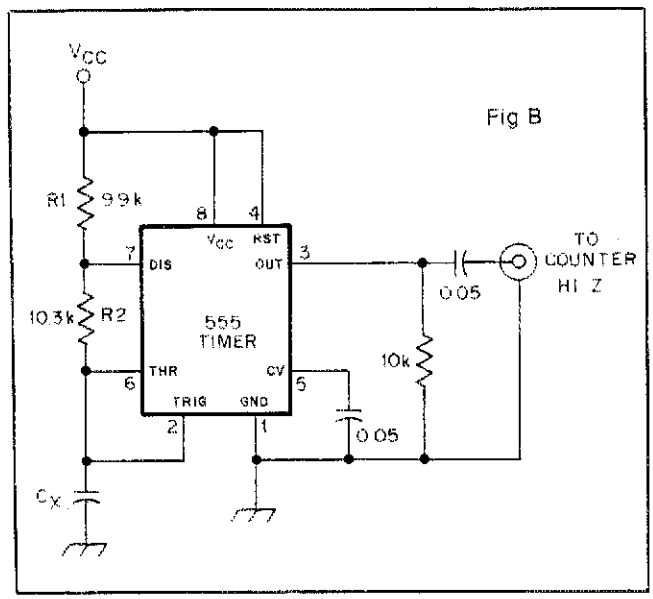
$$C = \frac{1.433T}{(R_1 + 2R_2)} \quad \text{(Eq 2)}$$

If the frequency of the multivibrator is measured with a digital counter, the capacitance may be calculated from

$$C = \frac{1.443}{(R_1 + 2R_2)f} \quad \text{(Eq 3)}$$

Note that the value of the supply voltage does not enter into the calculation. Changing the supply voltage from 5 to 9 or 12 V had no observable effect on the value of T.





I tested several capacitors to determine if using this method would be better than using a commercial capacitance meter. Table 1 lists the results of those tests.

A solderless breadboard was used to assemble the circuit. Using a perfboard would probably result in less stray capacitance. When the 0.0001- and 0.0004-μF capacitors were measured with R_1 = 9900 ohms and R_2 = 10,030 ohms, the calculated values were considerably off. Changing the resistor values to those shown in Table 1 resulted in satisfactory measurements. An early version of the 555 IC, limited to about 100 kHz, was used. Later CMOS 555s have an upper limit of 2 MHz and will provide a greater measurement range.

The circuit in Fig B was used to evaluate the possibility of using a frequency counter instead of a scope. This configuration showed promise for matching capacitors. The frequency readout provides a quick means of selecting capacitors for best matching within the tolerance range. The percentage of difference between the frequencies observed is equal to the percentage of difference between the capacitors.

While the value of capacitance measured with the 555 IC is not as accurate as a commercial capacitance meter, it is more accurate than the marked value. Capacitance values obtained by this method should be accurate enough for calibrating homemade capacitance meters. The method also offers a quick and easy method for selecting matched capacitors when used with a frequency counter.—*Harold C. Anderson, NØBX, 737 Forest Dale Rd, New Brighton, MN 55112*

Table 1
Capacitance Measurement Comparison

Marked Value on Capacitor (μF)	*Measured with a Commercial Meter (μF)*	*Calculated from the Measured Value of T (μF)*
25.0	25.2	25.67
1.0	1.338	1.4738
0.1	0.1010	0.10114
0.1	0.1042	0.1122
0.04	0.0425	0.04335
0.03	0.0282	0.0288
0.01	0.01079	0.0173
0.002	0.00182	0.00193
0.0004	0.000396	0.0004218
0.0001	0.000094	0.0000917

The 25-μF capacitor was measured with R_1 = 468 Ω and R_2 = 468 Ω. The scope was not a storage type, so the sweep rate was speeded up to read T. Capacitors between 1.0 and 0.002 μF were measured with R_1 = 9900 Ω and R_2 = 10,030 Ω. The 0.0001- and 0.0004-μF capacitors were measured with R_1 = 1.022 MΩ and R_2 = 1.017 MΩ. Resistances were measured with a digital ohmmeter. A stray capacitance of 0.000005 μF was measured by leaving the unknown capacitor out of the circuit when T was measured. T was again measured with the unknown capacitor and the stray in parallel, and the stray capacitance was subtracted to determine the value in column 3.

References

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Gilder, J. H., *110 IC Timer Projects*, Rochelle Park, NJ: Hayden Book Co.

Neben, H. M., "A Simple Capacitance Meter You Can Build," *QST*, Jan 1983, p 34.

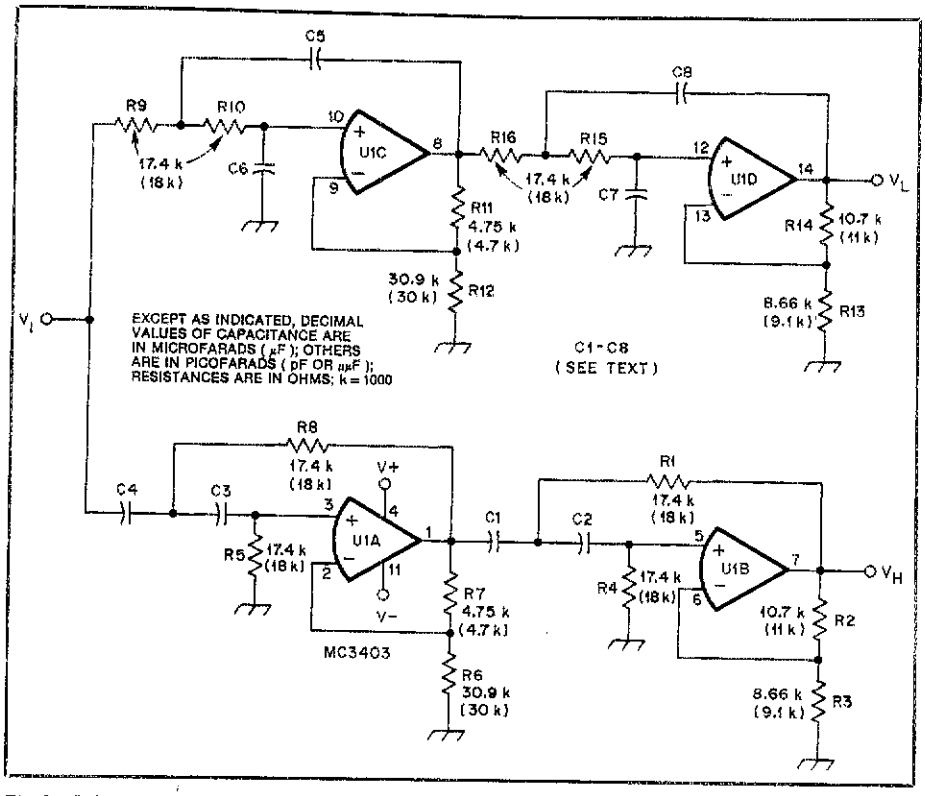


Fig 2—Schematic diagram of the four-pole complementary Butterworth filters.

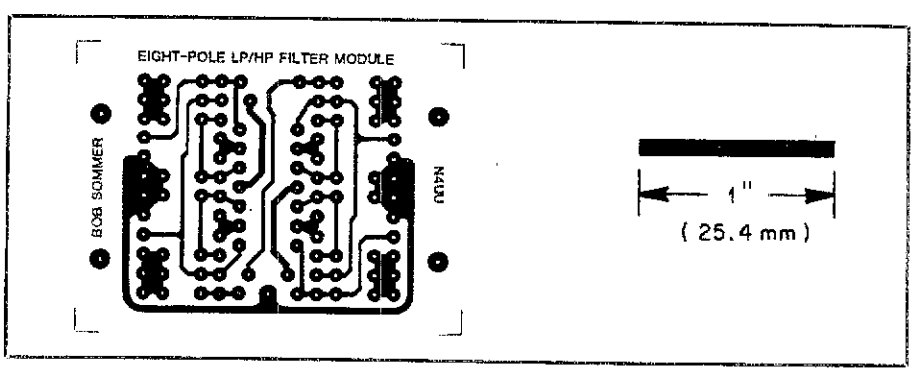


Fig 3—Full-size circuit-board etching pattern, shown from the foil side. Black areas represent unetched copper.

that of the other. Using Eqs. 1 and 2, this ratio can be expressed as

$$R = P_H/P_L = (f/f_c)^{2n} \quad \text{(Eq 4)}$$

which, when converted to decibels (dB), becomes

$$R = 20n \log_{10} (f/f_c) \text{ dB} \quad \text{(Eq 5)}$$

Consequently, complementary Butterworth filters provide a ratio of channel outputs with a constant slope of 20n dB per decade, or 6n dB per octave, across the entire audio spectrum. This characteristic causes the perceived origin of a tone to vary smoothly, at a rather uniform rate, from one direction to the other as the pitch of the tone is varied. When $f = f_c$, the two channel outputs are equal, R = 1 (0 dB), and the tone seems to originate in front of you.

Complementary Butterworth filters also provide a difference in phase at their outputs, which is fixed at 90n degrees. For you to perceive a distinct direction, it is essential that the two channel outputs be in phase, which is achieved when n is a multiple of four.

Experiments show that when the cutoff frequency is f_c = 900 Hz, voice signals appear to originate directly in front of you; and that n = 4 is the best choice for voice reception. The ratio of channel outputs varies at a rate of 24 dB per octave (Eq 5). This is low enough so that the various frequency components in the voice signal create the impression that the voice is directly in front of you and it is high enough to render the broadband noise in a panorama. In a typical SSB bandwidth of 2.4 kHz, the noise and interference at the band edges are 38 dB stronger in one channel than in the other, and seem to originate far to the left and right of the listener.

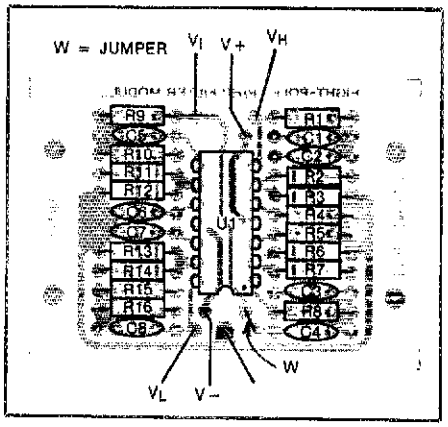


Fig 4—Parts-placement diagram for the four-pole complementary Butterworth filters.

In receiving Morse code, many operators favor a frequency near 600 Hz. A cutoff frequency of f_c = 600 Hz is a good choice. In a typical CW bandwidth of 500 Hz, and with n = 4, noise and interference at the band edges are 14 dB stronger in one channel than in the other. Under these conditions, most signals appear to originate in front of you or moderately to the left or right. The Morse code operator will benefit from the use of eight-pole filters, particularly when using bandwidths of 250 Hz or less. With n = 8, the listener perceives signals within a crowded 500-Hz passband as a wide panorama, but senses only a moderate, but useful, panorama when the bandwidth is reduced to 250 Hz.

Four-Pole Filters

Fig 2 shows a circuit diagram for a pair of four-pole complementary Butterworth filters. The voltages V_i, V_L and V_H refer to the input signal, the low-pass filtered output, and the high-pass filtered output, respectively. The supply voltages, V+ and V−, can range between ±6 and ±15 volts, and the quiescent current is nominally 3 mA. I use the MC3403 quad op amp because I've found it to be totally free of crossover distortion. The LM324 and MC4741 are readily available, inexpensive and interchangeable. Using 0.01-μF capacitors will provide f_c = 900 Hz for use with voice; 0.015-μF capacitors will provide f_c = 600 Hz for use with Morse code.

The precise value of the capacitors is not important, but it is important that all eight be matched closely. If a capacitance meter is not available, an easy alternative is to build a simple astable multivibrator, using a 555 timing circuit and note the frequency of oscillation as various capacitors are connected (see accompanying sidebar). Polyester film capacitors, with a 10% tolerance, are inexpensive when purchased in lots of 100; and one such lot will yield several sets of eight closely matched capacitors. Fig 2 shows two sets of resistor

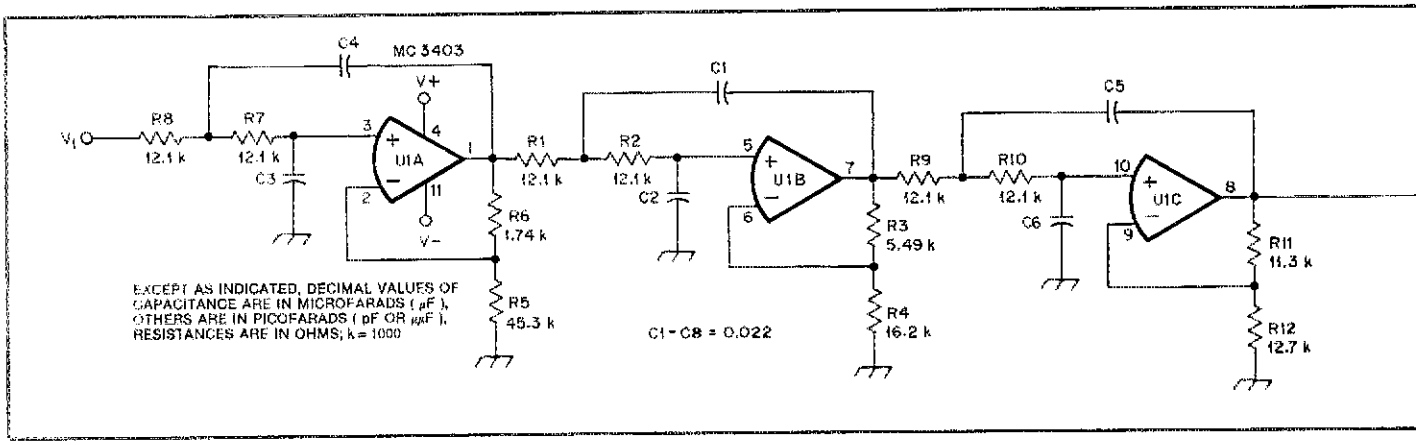


Fig 5—Schematic diagram of the eight-pole low-pass Butterworth filter.

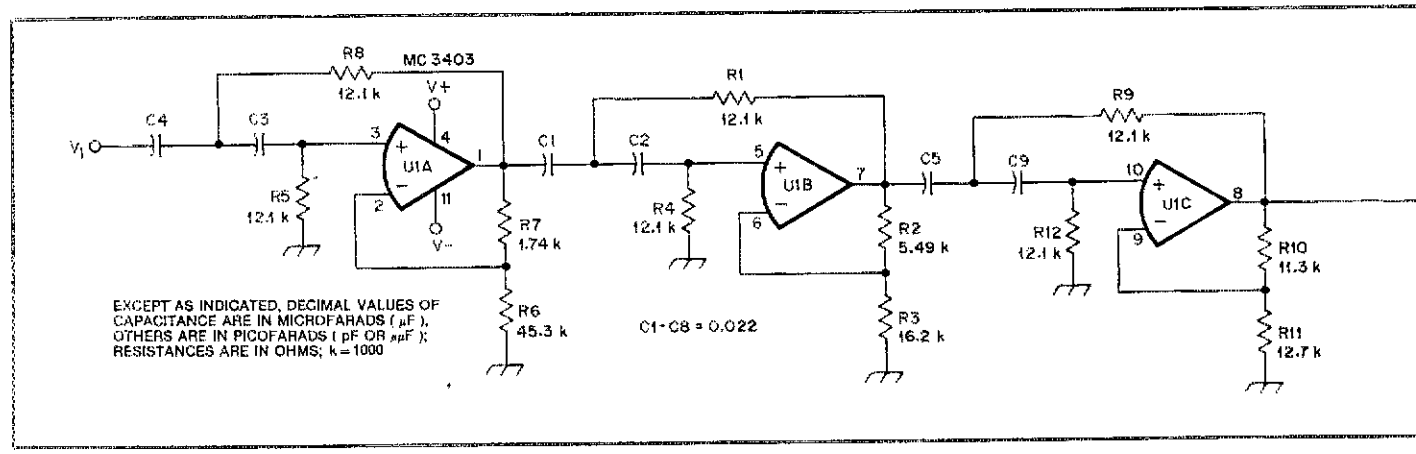


Fig 6—Schematic diagram of the eight-pole high-pass Butterworth filter.

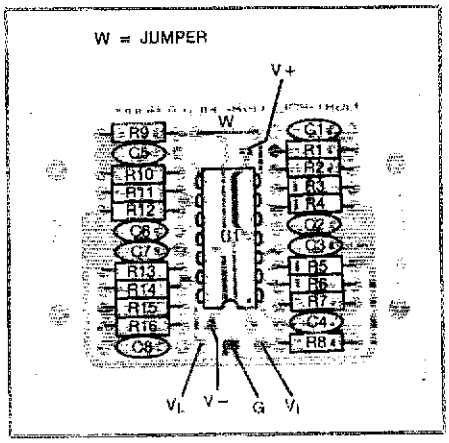


Fig 7—Parts-placement diagram for the eight-pole low-pass Butterworth filter.

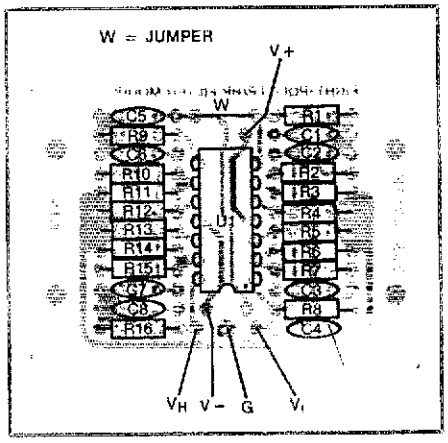


Fig 8—Parts-placement diagram for the eight-pole high-pass Butterworth filter.

values; those for resistors with a 1% tolerance, and those (in parentheses) for resistors with a 5% tolerance. These four-pole filters will work well using components with 5% tolerances, but the use of components with a closer tolerance will ensure a more accurate matching of the gain and phase of the two channel outputs.

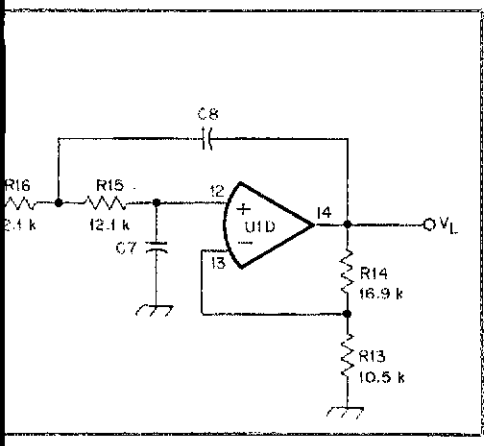
Fig 3 shows a pattern for etching a circuit board for these filters, and Fig 4 shows the parts placement. The hole spacing will accommodate the 100-V polyester film capacitors and either 1/8-W, 1% resistors, or 1/4-W, 5% resistors. The input to the filter, V_I, can be taken from the receiver audio jack for either headphones or a remote speaker. The filter outputs, V_L and V_H, should be capacitively coupled to either high-impedance stereo headphones (at least 100 ohms), or to a stereo power amplifier and loudspeakers. Use large coupling capacitors, such as 47 μF, to ensure phase matching of the two channels at lower audio frequencies.

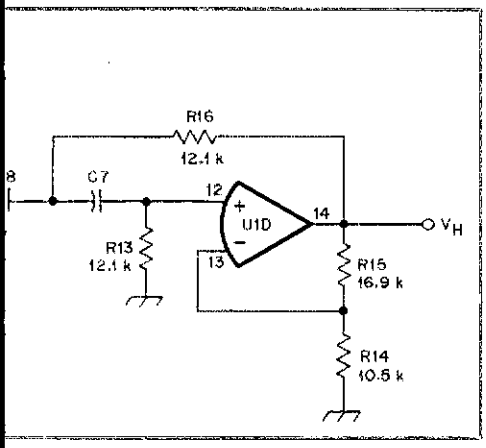
Eight-Pole Filters

Eight-pole filters provide a wider spreading of the signals, which is preferable for Morse code. Figs 5 and 6 show circuit diagrams of complementary low- and high-pass Butterworth filters. Resistors of 1% tolerance should be used in the construction of these filters, and all 16 capacitors, as a group, should be matched to within 1%. Two circuit boards, in accordance with Fig 3, are required: one for the low-pass filter, and one for the high-pass filter. The circuit boards have extra pads to accommodate either a resistor or a capacitor in certain positions, depending on which circuit is being built. Figs 7 and 8 show parts placement for the low- and high-pass filters, respectively.

Attenuators

The four-pole filters have a gain of about 8 dB, while the eight-pole filters have a gain of about 17 dB. To maintain a constant sound level as the filters are switched in and out, each channel should have a gain of 3 dB. Consequently, the four-pole filter output should be attenuated by about 5 dB, and the eight-pole filter should be attenuated by about 14 dB. Fig 9 shows a circuit for ap-





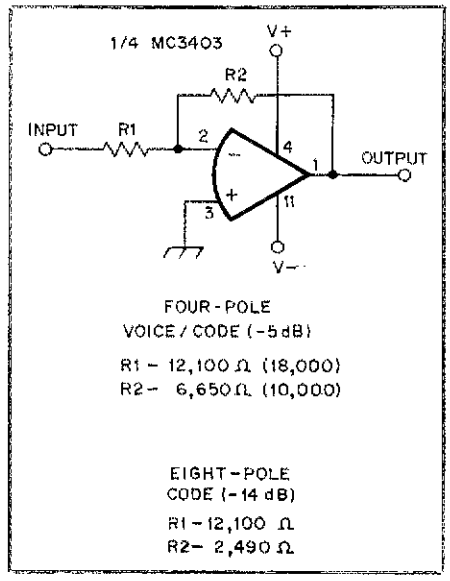


Fig 9—Schematic diagram of attenuators.

propriate attenuators, with resistance values. The parenthetical values for the four-pole filter are for 5% resistors. A single IC will accommodate up to four attenuators, and you can obtain the appropriate pin numbers from Figs 2, 5 or 6. Attenuators should be used—they are easily built and inexpensive, and permit the inherent wide dynamic range of the filters to be used to better advantage.

Refinements

Fig 10 shows an implementation of this audio-processing technique, together with some embellishments. The four-pole filters with f_c = 900 Hz, or the eight-pole filters with f_c = 600 Hz, can be selected by switch S1 for voice or code reception, while the filters can be included or bypassed with switch S2. The low- or high-frequency channels can be interchanged with switch S3 to reverse the direction of the panorama. Users with a frequency-selective hearing loss might prefer one position over the other. An 8.2-ohm resistor is included to terminate the receiver audio output stage.

When loudspeakers are used, they must be properly phased, as is the case with any high-fidelity stereo system, and identical speakers should be used to ensure the proper balance between channels.

Miscellaneous

The use of this technique is protected by U.S. Patent No. 4,434,508, with the author as inventor and American Systems Corporation as assignee. Amateur Radio operators are encouraged to build these circuits for their own use, but manufacturers are cautioned that all rights under the patent code will be enforced. [It should be noted that this article and patent describe a technique where the number of poles, (n), is a multiple of four. This approach maintains the outputs in phase. A parallel, independent development occurred in approximately the same time frame at ARRL HQ, resulting in a design using three-pole Butterworth filters. This project was reported and published in *The 1981 Radio Amateur's Handbook*, pp 8-50 to 8-52. This ARRL development is in the public domain.—Ed.]

Circuit boards and limited quantities of resistors and capacitors are available from the author and American Systems Corporation. For price and other information, contact them at: 7535 Little River Tpke, Annandale, VA 22003.

Acknowledgments

I wish to thank N. Perriello for preparing Figs 1, 4, 7 and 8, and Dr. Francis A. Burkle-Young for editing the manuscript.

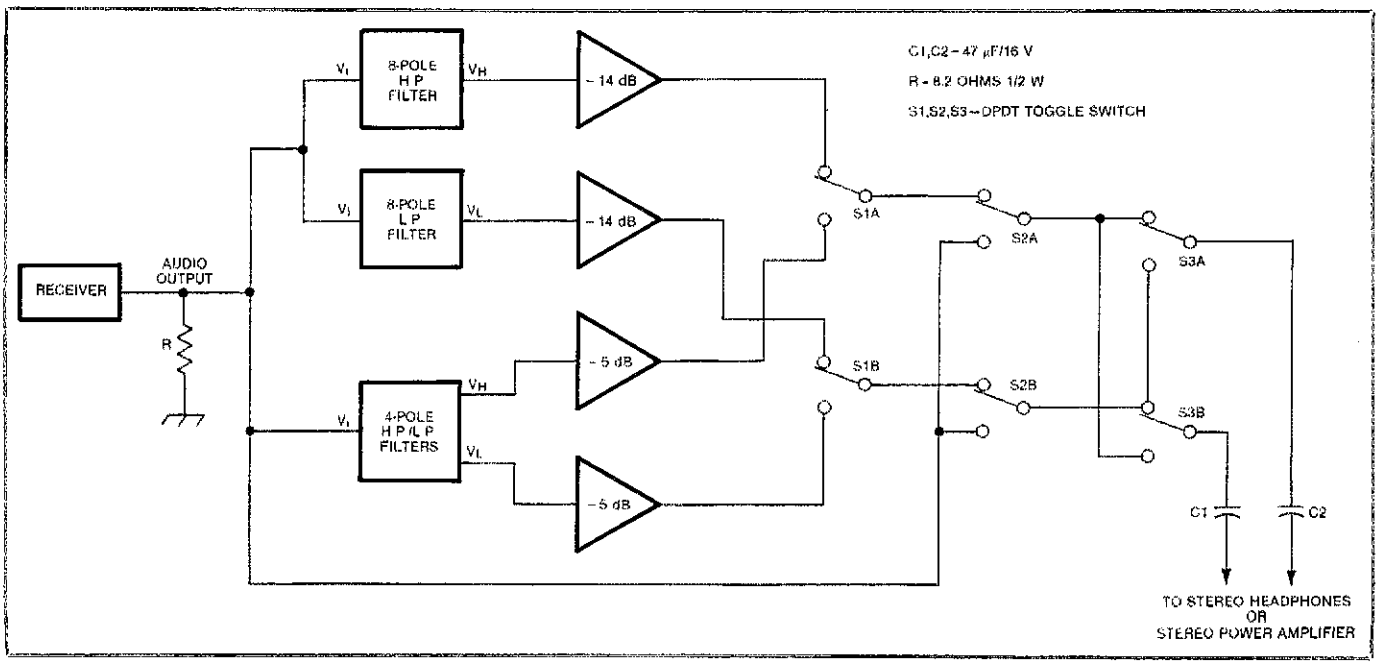


Fig 10—Block diagram of a total system with flexible switching provisions.

Gaining on the Decibel

Part 1: Would you say the bel, like the henry and the farad, is a unit of measure? If you answered yes (or if you answered no), you must read this article.

By H. Paul Shuch, N6TX
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14908 Sandy La, San Jose, CA 95124

If Alexander Graham Bell were alive today, he'd be turning over in his grave. And not only because we hams are forever taking his name in vain. After all, how would you feel if your life's work went largely ignored for over a hundred years, and instead you achieved fame for something which happened almost accidentally?

I am referring, of course, to this business of the telephone. Professor Bell, it seems, was first and foremost a teacher of the deaf. His greatest gift was training other teachers in helping the hearing impaired to function in a society of sounds. In fact, years after his now-famous invention, he told family members that it was really for his work with the deaf that he wanted to be remembered. Things seldom work out according to plan.

How exactly did the telephone come about? It's evident that Bell was trying to develop a device to amplify human speech. In a sense, he succeeded. Although Dr. Lee DeForest's audion tube (circa 1907) is most likely the first all-electronic amplifier, "the carbon microphone of telephony is an electromechanical amplifier, whose electrical power output can be a thousand times greater than its mechanical voice-power input."[1]

Dr. Bell realized that the human ear, like the "guess meter" of your favorite shortwave receiver, responds logarithmically to its input stimulus. And this logarithmic relationship, quantified by Bell and other early acoustical experimenters, has given us our standard tool for describing the behavior of nearly all electronic communications systems.

Reviewing Logarithms

The logarithm of a number is simply the power to which a specific base (or radix) must be raised to equal that number. The two most familiar bases are ten (the base of so-called *common* logarithms), and *e*, which represents the base of the *Napierian*, or *natural*, system of logarithms.[2] In this paper, with but a single exception (which I will clearly identify), we will be dealing exclusively with the radix 10. For example, since the number 1000 can be expressed as the radix 10 raised to the power three (10^3), we can say that the common logarithm of 1000 is 3. Simple, isn't it?

One advantage of logarithms is that they reduce rather cumbersome numbers to manageable proportions. Another is that their use reduces multiplication and division problems (always a challenge for me) to simple addition and subtraction (which even I can handle). But logarithmic response, be it of the ear or the calibrated meter, means that a large change in the applied stimulus results in a significantly smaller change in the output parameter, or response.

Because the ear responds logarithmically to applied acoustical power, a logarithmic unit, the bel (after Alexander Graham), can be used to express *changes* in power, or power *ratios*. Mathematically,

$$\text{bel} = \log_{10}(Ap) \qquad \text{(Eq 1)}$$

where

$\log_{10}$ represents the common (base 10) logarithm
(Ap) represents a given power ratio

I must emphasize this is the *only* meaningful definition of the bel, and any attempt to apply the term to anything other than power ratios will get you into trouble. A recent article by Gruchalla did an excellent job of clarifying the reasons for such rigid standardization.[3] I won't repeat that presentation here, but highly recommend Gruchalla's paper to anyone interested in applying what comes next, the decibel. Go read it now!

Introducing the Decibel

Done reading? Good. Now the bel, like the farad, the henry, the ampere and the watt, is a basic unit of respectable magnitude, one which we might care to subdivide. The Greek alphabet provides us with ample prefixes to indicate subdivision of a quantity, and we can apply these to the bel to increase our resolution without going too far to the right of the decimal point. The millibel (mB), microbel (μB), nanobel (nB), picobel (pB), femtobel (fB) and tacobel (tB) are all viable designations for thousandth, millionth, billionth, trillionth, quadrillionth of a bel, and lunchtime, respectively.

Of course, you might argue that millibel sings on the Grand Ole Opry, and a microbel relays many multiplexed telephone signals at extremely short wavelength. Fig 1 depicts a typical μB relay station.

The most convenient subdivision of the bel for our purposes, one that affords us ample resolution for electronic applications, is simply the 10th of a bel. The Greek prefix for 10th is deci, hence the unit decibel, or dB.

Since there are 10 decibels in each bel, we can expand Eq 1:

$$(\text{number of dB}) = 10 \times (\text{number of bels})$$

or

$$\text{dB} = 10 \times (\log_{10} Ap) \qquad \text{(Eq 2)}$$

which is the fundamental, and only valid, definition of the decibel. Easy as falling off a log!

Capitalization

Ever notice how we abbreviate everything in electronics and that there are

[1]Notes appear on page 22.

only 26 letters in the alphabet? Fortunately, the Greek alphabet affords us a few more characters, but sooner or later we're bound to run out of unique literals with which to define a quantity unambiguously. One way out of the dilemma is through the use of capitalization. For example, what's the difference between an mB and an MB? The former obviously represents millibel (lower case m), a very small unit. MB, on the other hand, starting with a capital M, most likely stands for Ma Bell, a very large unit to be sure, which is why the government had to break it up.[4]

Capitalization standards are no less important when we get to the decibel. The abbreviation for bel, being derived from a proper noun, should of course be capitalized. And remember that deci, a tenth, is a *small* prefix and thus should be written lower case. That gives us dB, but certainly *not* DB (which would mean Decabel, 10 bels, which differs from what we intend by a factor of only a hundred). And most emphatically not Db, which stands for Dumbbel!

The Voltage Decibel

This next problem will be solved using Ohm's law, so you might want to go back and review first. Ready?

Consider an electromotive force (voltage) applied across a *fixed and unchanging* resistance. If the applied potential is increased by, say, a factor of two, what change, if any, will occur to the resulting kinetic energy, or current? If you said the current will double, give yourself an A for the day.

Now the hard part. What change, if any, occurred to the total *power* dissipated in our resistor? Since potential energy (measured in volts) and kinetic energy (measured in amperes) both doubled, and since power is the product of potential and kinetic energy, power gain was the product of voltage gain and current gain, or four.

In our example, the voltage gain and current gain were the same. This occurs only in fixed-resistance (or more generally, fixed-impedance) cases. But when (and only when) the impedance across which we are measuring is *constant*, we can develop the following relationships:

$$Ap = Av \times Ai$$

where Ap, Av and Ai represent power, voltage and current ratios (or gains), respectively. Now, since in our special case

$$Av = Ai$$

we can combine the two above equations. Thus

$$Ap = Av \times Av = Av^2 \qquad \text{(Eq 3)}$$

or

$$Ap = Ai \times Ai = Ai^2 \qquad \text{(Eq 4)}$$

These relationships hold only if Av and Ai are equal. And when does that occur? *Only* in a constant-impedance system.

You may have seen in textbooks an equation that looks something like this:

$$dB = 20 \log_{10} (Av)$$

Perhaps, from the preceding discussion, you can guess where it came from. In a constant-impedance, or matched-impedance situation, since $Ap = Av^2$, you could combine Eqs 2 and 4, thus:

$$dB = 10 \log_{10} (Av)^2$$

This can be simplified by recalling that a logarithm is simply an exponent. Therefore

$$\log (A^x) = x \log (A)$$

By moving the exponent out front, we get

$$dB = 2 \times 10 \log_{10} (Av)$$

which becomes

$$dB = 20 \log_{10} (Av)$$

Please notice that the foregoing works only when impedances are constant and is a *derivation*, not a definition, of dB.

Introducing the Neper

We have established that when impedance is constant, voltage ratio and current ratio are equal. We now come to the exception I mentioned earlier, in which we will be dealing with logarithms to a base other than 10.

The Neper (a misspelling of Napier) is a convenient way of expressing voltage or current ratios logarithmically. It is defined as

$$N = \log_e (Av) \qquad \text{(Eq 5)}$$

or

$$N = \log_e (Ai) \qquad \text{(Eq 6)}$$

There are two noteworthy points in these relationships. One is that, unlike the bel, the Neper is based on natural, or Napierian, logarithms, which certainly seems appropriate. The other is that the Neper is defined in terms of either voltage ratio or current ratio. Obviously, this makes sense only if the two ratios are the same, and that happens only when impedance is constant. So a significant constraint on Nepers is that there are indeed both "voltage" Nepers and "current" Nepers, but they bear a meaningful relationship one to the other *only* in an impedance-matched system. The dB, on the other hand, is *defined* only for an impedance-matched system!

Now that we have two logarithmic units to choose from, we can establish some operating guidelines. When dealing with voltage ratios or current ratios, use the Neper when a logarithmic unit is required. If it is power ratio you're interested in, use the decibel. And in either case, apply the units across a fixed and constant impedance. These constraints will prevent the confusion which often results from trying to use power Nepers, or voltage dB.

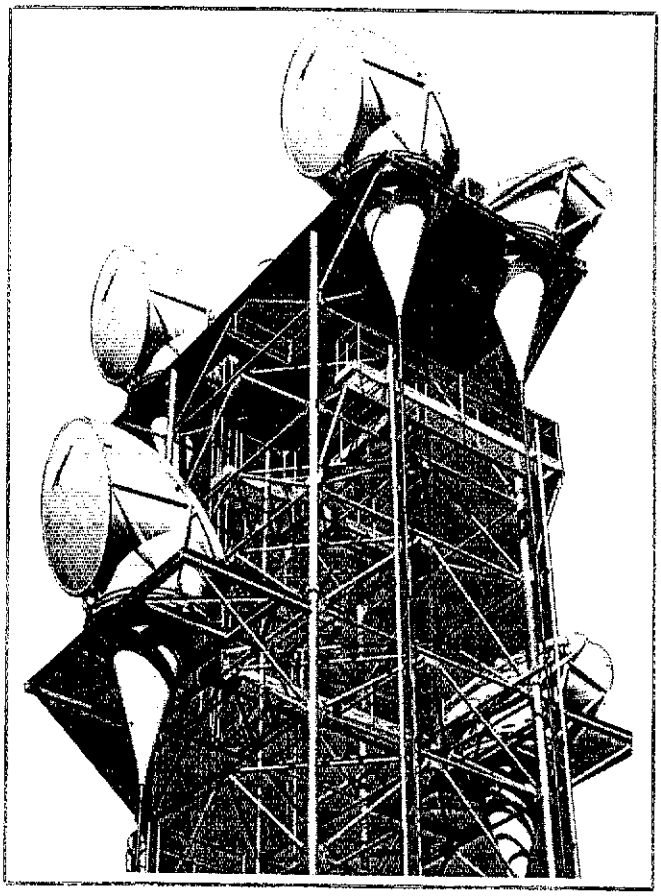


Fig 1—Antenna tower, the most visible element of a μB relay station (see text).

What's Wrong with Voltage Decibels?

Is there something wrong with using voltage dB? Plenty. It tends to imply that the dB

numbers for power and voltage are somehow different (they use different equations, don't they?). And that, in turn, leads to the most common mistakes people make with dB, the ones Gruchalla relates. See note 3.

Let's consider our previous example, in which we doubled the potential energy applied across a fixed resistance. By squaring the quantity (twice the voltage) and multiplying its common logarithm by 10, we find that doubling voltage results in a gain of 6 dB. You will recall that the current also doubled, so we can square the quantity (twice the current), take 10 times its log, and conclude that doubling current results in a gain of 6 dB.

The problem starts when we try to compute power gain. Power gain is clearly voltage gain times current gain, and didn't we say that you can multiply two numbers by adding their logarithms? Well, 6 dB plus 6 dB (related to the log of voltage gain and current gain, respectively, remember?) implies a power gain of ... 12 dB!

The fallacy in this is that there *is* no such thing as "voltage dB" or "current dB." The decibel is a logarithmic expression of power ratio *only*. The two 6-dB figures we got, by squaring voltage ratio and current ratio, are *both* actually power gains (because that, by definition, is what decibels are).

Back in the early days of my career, I lost a consulting job over that one. My client had characterized a filter I was going to incorporate into a receiver I was designing, and my task was to design in enough gain to overcome its insertion loss. Recalling the different "dB formulas" I had been taught in school, I asked my employer, "Is that 8 dB voltage or 8 dB power loss?" He didn't renew my contract, and I knew then that someday I'd have to write this article.

Absolute vs Relative Power

Since dB expresses a power ratio, or change in power, it is a relative measure. But if we use dB to compare a particular power level to a *specified* reference power, an absolute measure results. The most widely accepted standard power levels for comparison are the milliwatt or, for high-power transmitter applications, the watt. A logarithmic expression of any power level, as it compares to the reference levels 1 milliwatt and 1 watt, would be written in dBm (decibels compared to a milliwatt) and dBW (decibels compared to a watt), respectively.

Inadvertent mixing of "dB" with "dBm" can produce some interesting results. For example, you can increase your transmitter power by a certain number of dB, or dBm, and either can be correct, depending on your intentions. Increasing power 3 dB will double your output, whereas increasing power by 3 dB*m* adds an additional 2 *milliwatts* to your signal. Are the two equivalent? Only if your transmitter was putting out 2 milliwatts to begin with!

In this part of the article we have traced the history of the decibel, or dB, and introduced some standards for its proper use. In Part 2, we will explore a number of applications of the dB to electronic communications in general, and ham radio in particular. Until then, I invite you to reflect on the advice of John Donne, "... and therefore never send to know for whom the bel tolls; it tolls for Power."

Notes

[1]Dr. Robert A. Chipman, *Transmission Lines* (New York: McGraw-Hill Book Co, 1968), p 5.

[2]After John Napier, Laird of Merchinston, the Scottish mathematician who published the first system of logarithms in 1614.

[3]Michael Gruchalla, "Defining the Decibel," *Ham Radio*, Feb 1985, p 51.

[4]Small letter, small unit seems to work for everything except kilo, which for some unknown reason is properly abbreviated with a lower case k.

An Extra Class ham first licensed in 1961, Paul has the distinction of being one of the few hams in the world to be operational in all 18 ham bands from 1.8 MHz to 10 GHz. His main interest is microwaves, and his nearly three dozen articles on circuit design and construction have appeared extensively in 73, Ham Radio, Microwaves, Microwave Systems News, *the* Radio Handbook *and* IEEE Transactions on Microwave Theory and Techniques *during the past 10 years. Paul has operated moonbounce, meteor scatter, sporadic E and tropo scatter, as well as all the ham satellites since OSCAR 6. He frequently leads his division in ARRL VHF and UHF contests.*

Paul currently serves on the board of directors of Project OSCAR Inc, as an Assistant Director of the ARRL and as a member of the League's VHF/UHF Advisory Committee. He has been a featured technical speaker at numerous West Coast and Central States VHF Conferences, the IEEE International Microwave Symposium, WESCON, the first three Satellite Private Terminal Seminars and various ARRL Division and national conventions.

Professionally, Paul is an aerospace engineer and educator. He currently heads the Microwave Technology program at San Jose City College and serves as Professor of Aeronautics at San Jose State University. His consulting engineering activities have included the design of biomedical telemetry systems, satellite remote sensing equipment and the world's first commercial home satellite TV receiver.

Paul's chief nonelectronics interest is aviation. He is a commercial pilot and flight instructor, and was founding chairman of the Santa Clara County Airport Commission. He is listed in Who's Who in Aviation and Aerospace, *and* Who's Who in California.

Strays

I would like to get in touch with...

☐ anyone with information or suggestions to help me convert a Drake L4B linear amplifier for operation on the 160-m band. James Garls, W9SKO, 824 Henrietta St, Pekin, IL 61554.

☐ anyone with a manual/full-size schematic for a Hallicrafter SX-42 receiver. Will George, W4LHJ, 1731 Country Club Dr, Tullahoma, TN 37388.

☐ any hams interested in tuning into the AACS Alumni Net, which meets at 2200Z Fridays on 14,287. Jules Wenglare, W6YO, 1416 7th Ave, Delano, CA 93215, tel 805-725-8707.

☐ other Amateur Radio real-estate brokers who have had experience in dealing with antenna location restrictions. Bob Crockett, W1LF, 2 Ripley La, Weston, MA 02193.

☐ anyone with information on the Clegg FM 28. Tom Popovic, KI3R, 1008 Monroe, McKeesport, PA 15133.

☐ anyone with information on using the Macintosh computer on RTTY and AMTOR. Robert A. Winters, KD7P, 5633 123rd Ave, SE, Snohomish, WA 98290.

☐ anyone with a manual or schematics for a DuMont 304A oscilloscope or information on its filament current regulator. Arthur Katz, W2NJW, 7804 Haymarket La, Raleigh, NC 27609.

☐ anyone with a schematic or manual for a Bendix TA12 G aircraft transmitter. Dick Moore, VE3LRB, 235 Epworth Ave, London, ON N6A 2M2.

Four Watts, QSK, for 24.9 MHz

Here's your chance to try the 24.9-MHz WARC band at minimum cost. This transmitter is a fine mate for the 24.9-MHz converter described in April 1985 *QST*.

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

What might we expect from the new 24.9-MHz band? Well, it has similar propagation characteristics to the 10-meter band. It also exhibits some of the traits of the 15-meter band. Unfortunately, it is affected by sun-spot activity in a like manner to the other two bands above and below 24 MHz. Therefore, we are in a period of propagation ebb, owing to diminished sunspots.

Low power and reasonable antennas will do the job on 24.9 MHz as effectively as on 28 MHz. That is, it is not difficult to enjoy worldwide communications with less than 10 watts. With this thought in mind, plus an affinity toward being miserly when building a new rig, I designed the transmitter described here. You may build a duplicate model from scratch, or you have the option of purchasing a complete kit from a vendor.[1]

Circuit Details

The transmitter of Fig 1 features full-break-in operation (QSK). Operation requires only a key or keyer, antenna, a 12- to 14-V, 800-mA (or greater) regulated power supply (or car battery) and you, the operator. There is a terminal to which the receiver antenna line connects (terminal C of Fig 1).

Although crystal control is specified, a VFO can be substituted for Y1. Q1 is operated as a third-overtone oscillator. T1 and T2 are shielded transformers with tuned primary windings. They are arranged to provide an impedance transformation between the collectors and bases of the related transistors. This helps to ensure maximum RF-power transfer. The tuned transformers reject most of the unwanted harmonic energy before it reaches the driver and PA stages. You may substitute toroidal transformers and trimmer capacitors at T1 and T2 if you so desire.

Q3 serves as a broadband, class-A linear amplifier. It is the driver for the MRF475 power amplifier, Q4, which operates class C for maximum efficiency. A 7-section low-pass filter (FL1) is used as the output network to attenuate harmonic energy. The constants for FL1 were taken from *The ARRL Handbook* (see filter tables in the transmitting chapter). The power output from this transmitter is 4 watts into a 50-ohm load with an operating voltage of 12, and key-down current of 800 mA.

TR Switching

Q5 and Q6 of Fig 1 provide dc switching that enables the circuit to be classified as QSK. Q5 is a PNP keying switch that operates Q1 and Q2 for CW use. When the key is closed, Q5 triggers NPN transistor Q6 into the ON state, thereby shorting the receiver-antenna line (C) to ground during the transmit period. This prevents damage to the front end of the receiver or converter used with the transmitter. A similar technique was used by Wes Hayward (W7ZOI) to provide QSK operation: He used two reverse-connected 1N914 diodes as the shorting element during transmit. The measured RMS RF voltage on the receive-antenna line (key down) is approximately 0.4 with a 50-ohm termination. If diodes are used instead of Q6, the RMS voltage will be on the order of 0.7, key down.

C14 and L4 have a reactance of roughly 400 ohms. They serve as a series-tuned circuit to minimize loss of signal to the receiver during the receive period. FL1 serves as a filter ahead of the receiver, since the station antenna is attached to the output of FL1. Some insertion loss is present, but attenuation of the received signals is not significant.

S1 can be added to allow zero beating. It removes operating voltage from Q3, which helps lessen receiver overloading when you want to spot your transmitter signal. D2 is used as a dc gate to prevent the +12 V from reaching Q5, Q6 and the accessory terminal (1). The diode allows current to flow from Q5 to Q1 and Q2 (key down), but blocks the flow of current when S1 is set for the SPOT function.

S2 can be added for tune-up or Transmatch adjustments. If your key or keyer has a HOLD function, you may eliminate S2.

Key-down dc voltages have been noted at various points in the circuit of Fig 1. These have been added to aid in troubleshooting. The measurements were made with a Simpson 260 VOM. A 1-mH

[1]Notes appear on page 26.

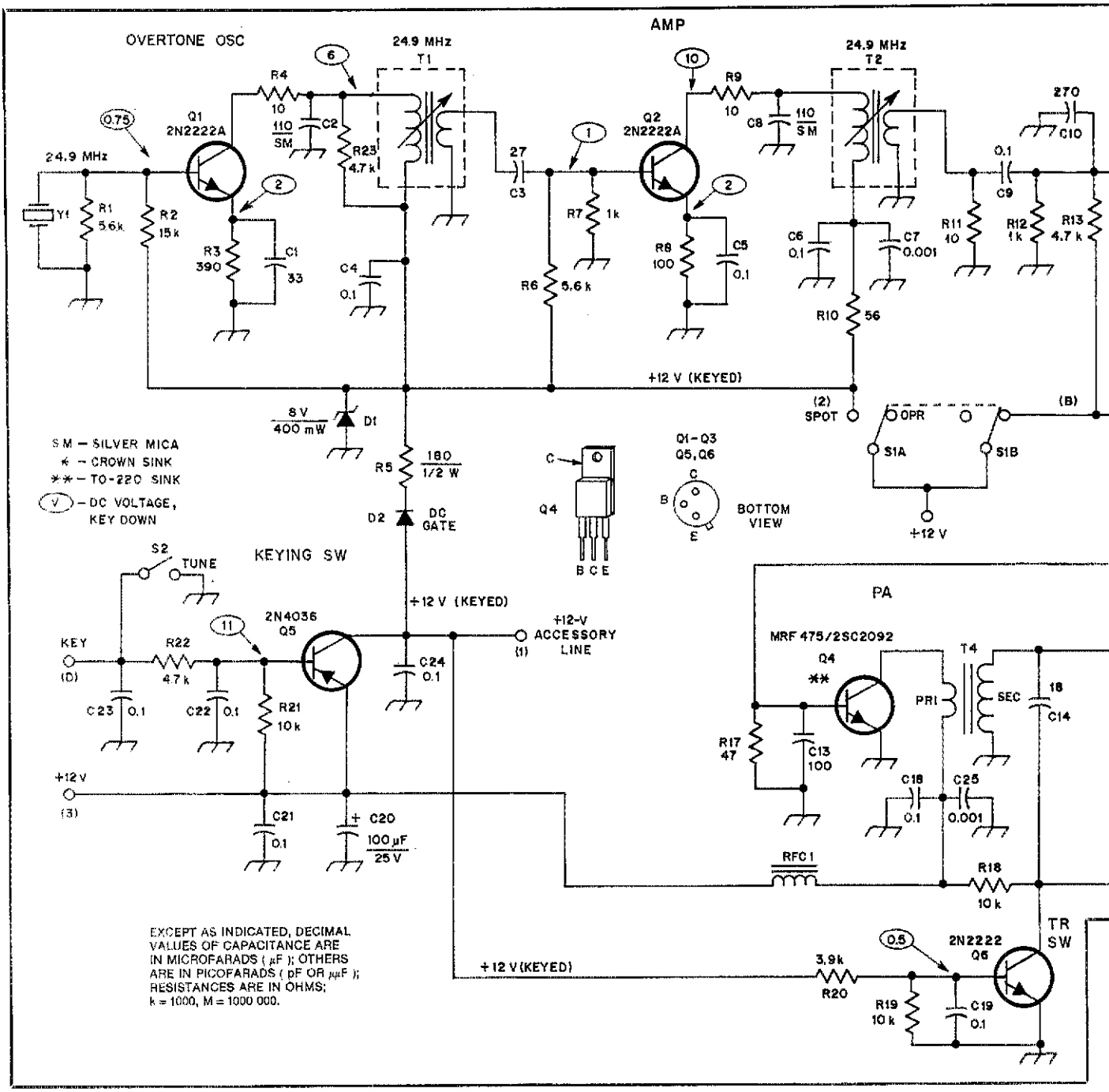
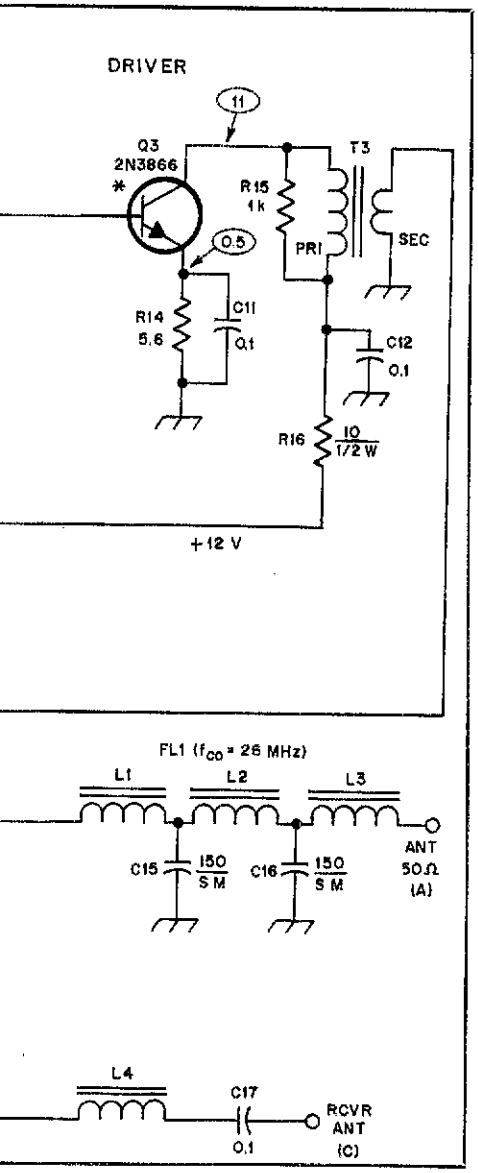


Fig 1—Schematic diagram of the 24.9-MHz transmitter. Capacitors are disc ceramic unless otherwise noted. Polarized capacitors are tantalum or electrolytic types. Resistors are ¼- or ½-W carbon composition units. Numbers inside circles indicate key-down dc voltages. Numbered components not appearing below are identified numerically for PC-board layout purposes only.

D1—8-V, 400-mW Zener diode.
D2—50 PRV, 1 A.
L1, L3—0.266-µH inductor. Use 8 turns of no 24 enam wire on an Amidon Assoc T50-6 toroid core.
L2—0.5-µH inductor. Use 13 turns of no 24 enam wire on a T50-6 toroid core.
L4—L4 and C14 have reactances of 400 ohms. L4 is a 2.27-µH inductor. Use 24 turns of 26 enam wire on T50-6 toroid core.
RFC1—Use 6 turns of no 22 enam wire on an Amidon Assoc FT-37-43 ferrite toroid (µ = 900).
T1, T2—Primary inductance is 0.38 µH. Use 6 turns of no 26 enam wire on bobbin of Amidon Assoc L57-6 shielded transformer unit. Secondary has 4 turns of same wire.
T3—Broadband transformer. Primary contains 10 turns of no 24 enam wire on an FT-50-43 ferrite toroid. Use 2 turns of same wire for secondary. Spread secondary over all of primary.
T4—Broadband transformer. Primary has 7 turns of no 24 enam wire on stacked (two) FT-50-43 ferrite toroid cores. Use 10 turns of same wire for secondary.
Y1—Overtone crystal, 30-pF load capacitance, HC-6/U holder. International Crystal Mfg Co type GP, and plastic PC-board mount holder. Choose frequency for favored portion of the band. Do not attempt 12-m operation with a 12.450-MHz fundamental crystal. Substantial fundamental energy will appear in the transmitter output if Q1 is used as an oscillator/doubler.

RF choke was used between the positive lead of the VOM and the test point measured. This prevents unwanted RF energy from reaching the instrument and causing false readings. These voltages may vary slightly in accordance with the beta of the transistors used in your circuit. The RMS output voltage measured from (A) to ground across 50 ohms was 14. This indicates about 4 W of output power: Operating voltage was 12. My RMS measurements were made with a Hewlett-



Packard VTVM and RF probe that is rated to 900 MHz. However, an ordinary VTVM and homemade RF probe (see *The ARRL Handbook*) will work equally well.

Regulated voltage is ensured for Q1 by the addition of Zener diode D1; it sets the voltage level at +8. The lower oscillator-operating voltage helps to ensure frequency stability of Y1 by limiting the crystal current.

Parasitic suppression is aided by using R4, R9, C10 and C13. These components act as low reactances at VHF, but have little effect on circuit operation at 24.9 MHz.

Checkout and Operation

Our first assignment after completing the assembly is to give the PC board (non-component side) a thorough visual inspection to make certain we have no unsoldered joints or unwanted circuit bridges between unrelated PC-board foils. A magnifying glass is ideal for this step in the checkout. Make certain that all transistors are mounted correctly on the circuit board. Fig 2 indicates the placement of the transistor case tabs when the transistors are viewed from their tops.

Connect your power supply to the rig. Attach a 50-ohm load to (A). Place S1 in the SPOT position and switch S2 to OFF. Tune your receiver to the transmitter frequency. If a signal is heard, adjust T1 and T2 for maximum S-meter deflection. The transformer tuning will be broad, so don't be alarmed if the change in meter reading is small.

Place S1 in the OPR position and close S2 (TUNE). Measure the power output by means of an RF power meter, VTVM and RF probe, or oscilloscope with a 30-MHz or greater bandwidth.

If all systems are "go," key the transmitter and listen to the note in your receiver: The keying should be chirpless. If chirp is heard, adjust T1 for minimum chirp. Should this not resolve the problem, experiment with the value of feedback capacitor C1 until a clean CW note is heard. I tried three available crystals at Y1, and in all instances a good CW note resulted.

I purposely made the CW shaping a bit "hard." I have found this useful when operating at QRP levels. The shaping may be "softened" by changing the value of C23 (Fig 1). Start with a value of 1 μF. This will round off the trailing edge of the wave form. Increasing the capacitance of C24 will also affect the shaping.

Summary Remarks

The Motorola MRF475 may be difficult to locate. Other transistors of the same general specifications may be used at Q4. A 2SC2092 works well as a direct substitute and is available by mail.[3]

A scale template for the double-sided PC board is provided in Fig 3; parts placement is indicated in Fig 2.

There is no reason why this general circuit can't be modified for other amateur bands in the HF spectrum. All that needs to be changed are C1, the collector tuned circuits of Q1 and Q2, the constants of FL1 (see *The ARRL Handbook*), C14 and L4. Of course, Y1 must be chosen for the desired operating frequency.

VFO design data are contained in *The ARRL Handbook* and the ARRL book, *Solid State Design for the Radio Amateur* (out of print). I suggest that the VFO be operated at half frequency (12.45 MHz) to reduce the potential of chirp when the transmitter is keyed. A doubler stage (preferably a push-push doubler) should be used to raise the VFO output frequency to

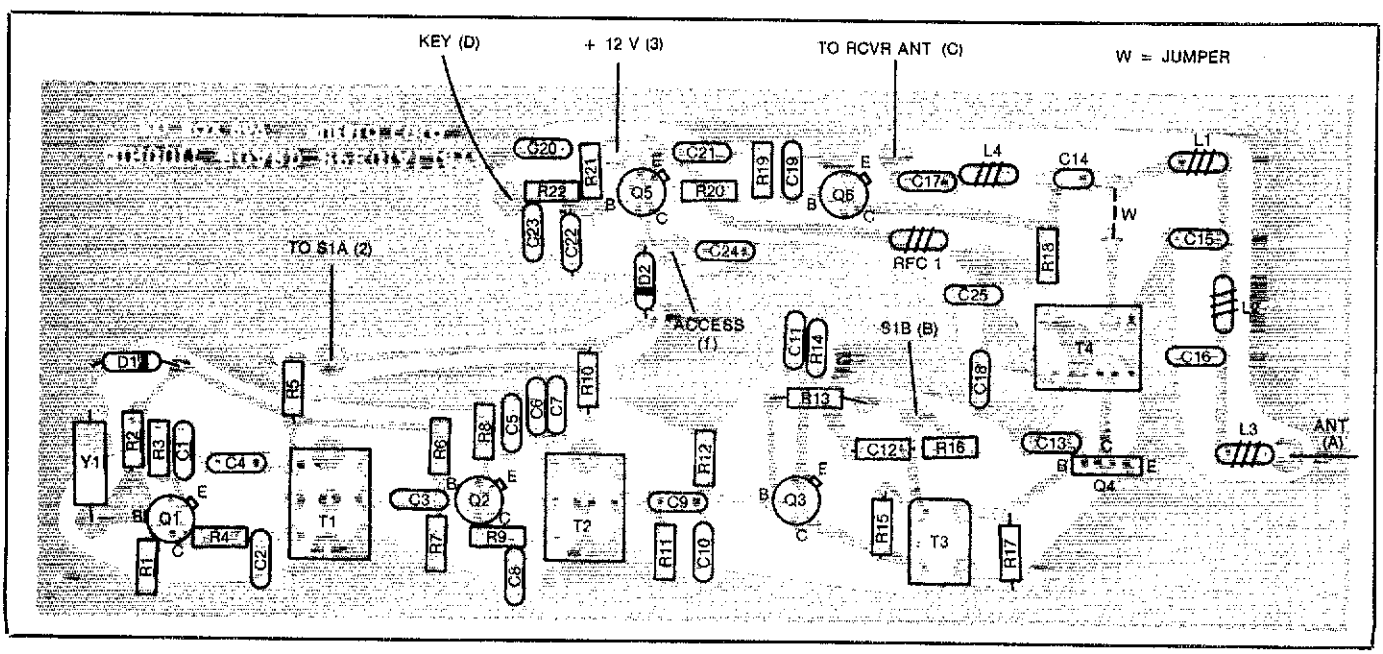


Fig 2—Parts-placement guide for the 24-MHz transmitter PC board, as viewed from the component side of the board. R23 is mounted below the board on the appropriate solder pads.

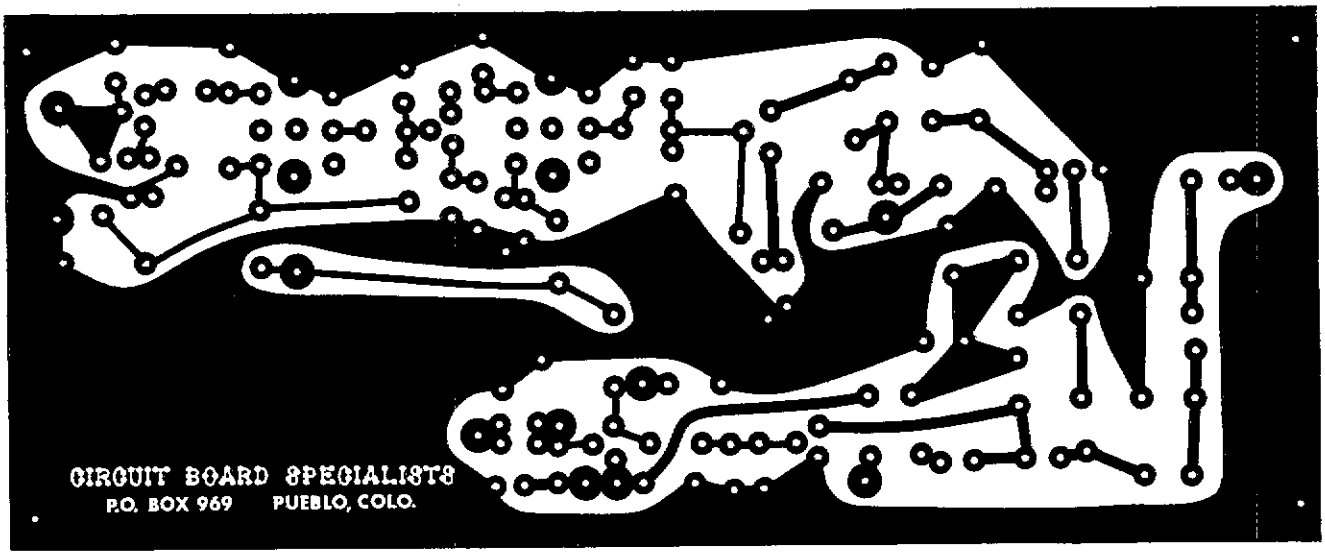
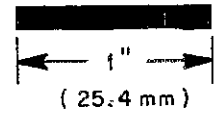


Fig 3—Scale template of the transmitter PC board as viewed from the etched side. Board is double sided, with the foil on the component serving as a ground plane. Connect etched ground foils to ground plane conductor at several points by means of component pigtails that pass through the board. Solder pigtails on both sides of the PC board.



the 24-MHz band. VFO output should be approximately 2- to 3-V RMS across a 500-ohm load.

Even during mediocre propagation conditions I have found 24 MHz to be an interesting band. During 1984, I made numerous tests on the band with others while using an experimental license (KM2XQV) granted by the FCC. Many more QSOs were made under my amateur call after the 12-m band became available to us on June 21, 1985. Certainly, under skip conditions you should have a lot of fun with this little 4-watter! I hope to meet you on the new band.

Notes

[1]Chuck Hood, Circuit Board Specialists, PO Box 969, Pueblo, CO 81002, tel 303-542-5083. PC boards or complete kits available.
[2]State Street Sales, PO Box 249, Luther, MI 49656. Transistor available for $3. Include SASE with order.

New Products

OKI INTRODUCES HIGH-SPEED VERSION OF 256K × 1 DRAM

☐ A high-speed version of its standard 256K dynamic random-access memory IC is now available from Oki Semiconductor. Rated for a maximum access time of 120 nanoseconds, the new MSM41256-12 is a fully decoded, page-mode-type DRAM organized into 262,144 one-bit words. By multiplexing the row and column address inputs, the manufacturer has been able to house the chip in a standard 16-pin DIP package.

Power consumption is only 385 mW when the device is active and less than 28 mW in the standby mode. The device operates from a single 5-V supply with ±10% tolerance. All inputs are TTL compatible and represent low-capacitance loads. There are on-chip latches for addresses and data in, and an on-chip substrate bias generator is provided for high-performance operation. Clock timing requirements are not critical. A proprietary chip coating material protects the device against soft errors caused by alpha particles.

For more information, contact Oki Semiconductor, 650 North Mary Ave, Sunnyvale, CA 94086, tel 408-720-1900. —*Bruce O. Williams, WA6IVC*

NEW ACCESSORIES FOR THE KENWOOD TH-SERIES HAND-HELD TRANSCEIVERS

☐ An extra-life battery pack and an ac-operated quick charger for the Kenwood TH-series pocket transceivers are available. The PB-21H is an extra-life 500-mAH NiCd battery pack measuring just 0.5 inch more that the standard PB-21 NiCd battery pack (180 mAH). The unit weighs just 6.5 ounces.

The BC-6 is an ac-operated, two-pack quick charger that can double as a dc power source for the TH-series radios. The BC-6 can fully charge the PB-21 or the PB-21H in just one hour. The charger comes complete with an adapter cable to allow operation of your hand-held radio while the battery packs are charging.

For more information, contact your authorized Trio-Kenwood dealer or Trio-Kenwood Communications, 1111 West Walnut St, PO Box 7065, Compton, CA 90224, tel 213-639-9000.—*Bruce O. Williams, WA6IVC*

Next Month in *QST*

If you've gotten your feet wet on 902 MHz with the receiving converter and antenna from October *QST*, you'll want to delve into the companion CW transmitter, coming your way in March. Also in the issue you'll be able to "gain" on your understanding of the decibel.

On the antenna front, you'll learn how to build: (1) a portable RF source that can help you make SWR adjustments at the antenna site quickly and easily, (2) a *truly* broadband antenna for 80/75 meters and (3) a 160-meter sloper that's just the ticket for a city-sized lot.

In addition, there'll be a report on one club's experience in giving amateur exams, with tips on how yours can do its share to help local hams upgrade. All this, and the columns and features that make *QST* unique among Amateur Radio publications, in the March 1986 issue.

The UNKEMO (UNiversal KEyer MOdule)

This change doesn't really modify your keyer. It just makes it better!

By George Murphy, VE3ERP
Box 759, 275 Victoria St, E
Allison, ON L0M 1A0

If you have a keyer or two and a rig or two, and either of your keyers (or two) sometimes won't work with either of your rigs or two, then read on. I like to use a lot of rigs—my rigs, my friend's rigs, Field Day rigs, DXpedition rigs, your rig or any other rig I can get my hands on. I work all of them with one of my favorite battery-operated keyers. In the heat of brass pounding, I sometimes hooked up my keyer to a rig the wrong way and blew a transistor in the rig. Other times, I would forget to turn the keyer off, and the battery would die a dishonorable death overnight. In addition, I didn't like the 5-90 WPM speed control on my keyer—too "tiddley"—too hard to set it to the spot I wanted.

UNKEMO Solves the Problems

The UNKEMO takes technology back a few years by stuffing a keying relay into the output circuit of the keyer so that the keyer doesn't care if the transmitter has positive,

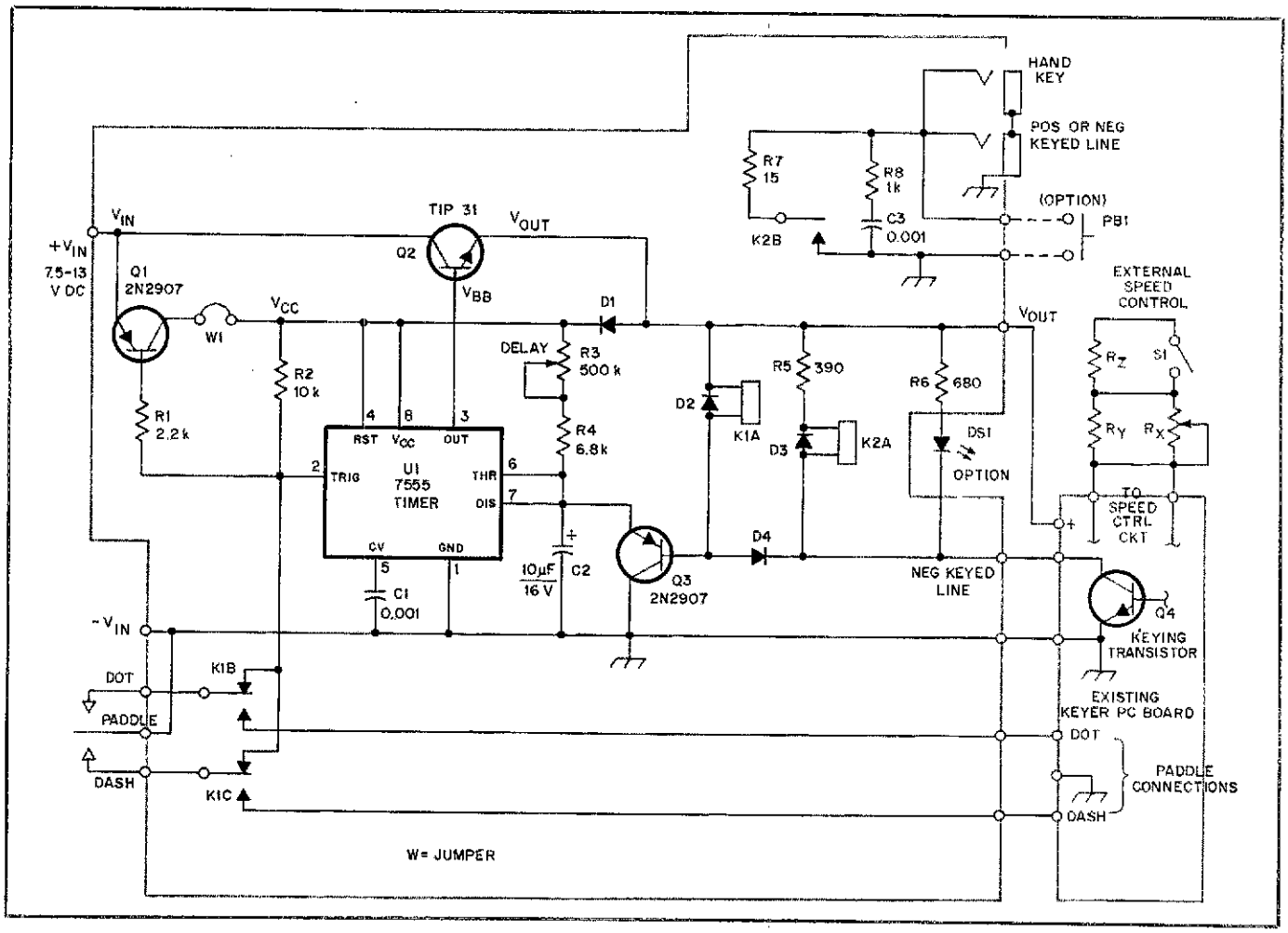


Fig 1—Schematic diagram of the UNiversal KEyer MOdification. Part numbers in parentheses are Radio Shack.
D1-D4 incl—1N914 silicon diode (276-1620).
DS1—Red LED (276-041).
K1—DPDT, 16-pin DIP, 12-V relay (275-213).
K2—SPDT 5-V reed relay (275-232).
Q1,Q3—General-purpose PNP transistor, 2N3906, 2N2907, etc.
Q2—TIP 31 NPN transistor.
U1—7555 or 555 timer.

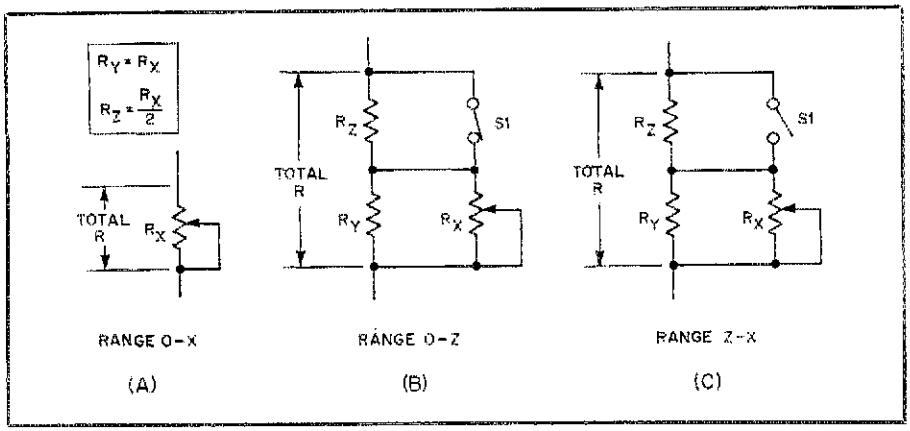


Fig 2—Dual-range speed control configurations.

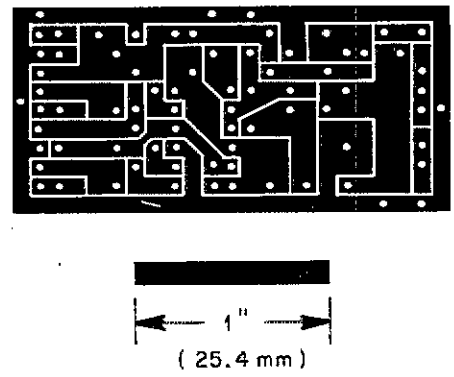


Fig 3—Full-size circuit-board template.

negative, grid-block or interrupted-spark keying. That's about as universal as you can get, and it works with *any* rig!

Some hams, without batting an eye, will spend a couple of grand on a rig, and then complain mightily about the cost of batteries at a buck or two. I am one of that group, so I built a SOX (sort of VOX) into the UNKEMO. The keyer turns on the instant you touch the paddle and stays turned on as long as you are batting out CW. When you stop keying for a bit, the SOX quits and turns off your keyer.

With all this taken care of, I ended up with an on-off switch in the keyer that wasn't doing anything because the UNKEMO now turns the keyer on and off. I can't stand to see a switch not doing anything, so I used it to make a dual-range speed control.

The Circuit

See Fig 1. The first touch of the paddle turns on Q1, starting timer U1, which turns on Q2. Q2 turns on the keyer and activates and holds relay K1 energized. At the same time, Q2 latches U1 through D1, because K1 has turned Q1 off. Q4 is the negative-keyed output transistor, or similar device, in your keyer. Q4 activates the keying relay K2 and also turns on Q3 each time a dot or a dash is sent, causing Q3 to continuously discharge timing capacitor C2 and prevent the timer from getting up steam. When you stop keying, Q3 stays off, C2 finally gets a chance to charge up, and after a delay set by R3, U1 shuts off Q2 turning everything off.

I used a 7555 timer IC. If you can't find a 7555, you can use a 555 timer, which has the same pinout configuration as the 7555 and can be directly substituted. The standby current of the UNKEMO is about 9 mA with the 555, but it is only about 0.19 mA using the 7555. At this rate, a small 9-V battery will last a long time (Table 1).

Just about any general-purpose silicon transistor can be used for Q1 and Q3, but Q2 should be a little heftier. I originally used a flea-market special for Q2, but it got quite warm, so I replaced it with a TIP 31 before the fireworks started.

If your keyer doesn't have a pilot light, you can add an LED, DS1, and mount it on the front panel of your keyer. It is on only while you are keying, so it won't put too much of a strain on your battery.

Dual-Range Speed Control

Since you don't need the on-off switch any more, you can have some fun with Mr. Kirchhoff's Second Law, using it to convert your speed control to a dual-range job. Your speed control probably looks something like R_X in Fig 2A, and functions as shown in the second column of Table 2. To make it a dual-range control all you have to do is add a couple of resistors to R_X and wire it to S1 (the unused on-off switch) as shown in Fig 2B (S1 closed) and Fig 2C (S1 open).

According to Mr. Kirchhoff, if R_Y is the same value as R_X, and R_Z is one-half the value of R_X, then R_X will now function as shown in the last two columns of Table 2. You will notice from Table 2 that in relation to the rotation of R_X, the change in resistance used to be linear, but now it is not quite linear. If this doesn't bother you, then skip the next paragraph.

Most keyers with a linear-taper speed control do not have a linear rate of speed change. If a nonlinear-taper control is used, the speed change rate can be made more linear, but a standard audio-taper control doesn't seem to have the right taper linearity to do the job. This is probably why keyer designers stick to linear-taper controls. This sounds confusing—and it is—but don't worry about it. Wiring a linear-taper control as described herein provides a two-stage nonlinear resistance change that tends to cancel out the nonlinearity of the speed rate, producing a more linear rate of speed change. Or, to put it more plainly, no longer is a whole bunch of speed change crowded into one end of the dial, with not much speed change spread out over the remainder. Now you know why I suggested that you skip this paragraph.

Construction Notes

I built the whole unit on a tiny circuit

(continued on page 50)

Table 1
Performance Comparison, 7555 Timer vs 555 Timer

U1	I_{stby}	I_{run}	I_{delay}	V_{in}	V_{out}	V_{cc}	V_{bb}	V_k
555	0.009	0.120	0.100	13.6	10.4	12.4	11.1	7.2_{ave}
7555	0.00019	0.135	0.120	13.6	11.8	12.7	12.4	5.4_{ave}

Table 2
Speed-control Characteristics (according to Mr. Kirchhoff)

% of Rotation (R_x)	*% of Total R (Fig 2A)*	*% of Total R (Fig 2B)*	*% of Total R (Fig 2C)*
0	0	0	0
25	25.0	20.0	50.0
50	50.0	33.3	70.0
75	75.0	42.9	92.9
100	100.0	50.0	100.0

Spreadsheets For The Modern Hamshack

If your computer isn't busy enough, let it do your ham-shack record keeping.

By Richard Ward, KC8OH
Wayne State University, Geology Dept,
Detroit, MI 48202

Those of us who own computers, but have very limited programming skills, are pretty much forced to use software written by others, whether or not it meets our needs. Many of the jobs we know computers can do well go undone in our shacks for lack of proper programs.

Enter the Spreadsheet

Although electronic spreadsheets were originally designed for use in accounting, they are now widely used for technical and scientific calculations and record keeping. The commands needed to make your own templates (as the programs you write with a spreadsheet are called) can be learned in a couple of hours. Of course, the more you experiment with spreadsheets, the more ideas you will get and the more skill you will acquire in using them.

When VisiCalc® (the first electronic spreadsheet) appeared, in 1978, it revolutionized procedures for accounting and economic planning, and was a major factor in the rapid acceptance of the personal computer. More than one observer has suggested that the creators should get a Nobel prize. After the success of VisiCalc, dozens of other spreadsheet programs were written and marketed. At least one program is available for each popular make of personal computer, and for some makes there are many programs. This article will discuss some of the uses for spreadsheet programs and the factors to consider when buying one.

Basics

Fundamentally, a spreadsheet consists of spaces, or cells, arranged in rows and columns. A typical layout might contain 63 columns, each with 254 cells. The columns will be identified by letters (A through Z, AA through AZ, and BA through BK) and the rows with numbers (1 through 254). Each cell can accept words, numbers or a mathematical formula. For example, you might put numbers in cells A1 and A2, and then instruct cell A3 to compute and display their product (A1*A2). If you want to, you can tell the cell to display the product only if it is positive (greater than zero). This is done by adding a built-in logic command to the formula.

@IF((A1*A2)>0,A1*A2,0) (Eq 1)

This tells the cell, if A1 times A2 is greater than zero, display A1 times A2; otherwise, display zero. The "@" tells the program to use its built-in "IF" function.

Spreadsheets are capable of extremely complicated calculations and logical operations. So far as I can tell, the logical and mathematical functions work essentially the same in all spreadsheets. Once you have a formula the way you want it, you can duplicate (replicate) it anywhere else on the spreadsheet and as many times as you want it in your template. It will then make that calculation, without error, every time you enter new numbers for it to work with. If you enter the wrong number, you merely type the correct one over it.

```
1         VSWR Records--KC8OH
2         QTH: E. Detroit. MI
3---A--------B--------C--------D--------E-------
4  Antenna:  75-meter dipole
5  Configuration: Inv. V  Apex @ 40'
6  Feed line:  RG-58
7  Wattmeter:   Bird
8  Transceiver:  ICOM-730
9  Date: June 2, 1985
10-------------------------------------------------
11            Freq.      Fwd.      Refl.      VSWR
12            (MHz)     power     power
13-------------------------------------------------
14              3.60        50         8      2.33:1
15              3.65        50         5      1.92:1
16              3.70        50         3      1.65:1
17              3.72        50         2      1.50:1
18              3.73        50         2      1.50:1
19              3.75        50       2.5      1.58:1
20              3.76        50       2.5      1.58:1
21              3.78        50         3      1.65:1
22              3.80        50         3      1.65:1
23              3.90        50         5      1.92:1
24              3.95        46        11      2.91:1
25              4.00        45        15      3.73:1
26-------------------------------------------------
27  Enter present resonant freq.            3.72
28  Enter desired resonant freq.            3.90
29  Approx. change req'd each leg:      -34.84 in
30-------------------------------------------------
```

Fig 1—VSWR and antenna-analysis template.

File: QSL.Mgr.

		Station	Band	QSO	QSL	VIA	Mgr.call	Country		Rec'd
1		For notes go to cell T100		Sent/Received				40/32		
2										
3										
4	-									
5	1	VP2EC	20	31.Mar.85	30.Apr.85	M	N5AU	Anguilla		
6	1	KD7P/NH4	20	30.Mar.85	30.Apr.85	D		Midway		
7	1	DX1A	15	30.Mar.85	3.May.85	D	DU1AC	Philippin		
8	1	ZF2FL	20	2.Mar.85	8.May.85	M	N6RJ	Cayman I.		
9	1	WB4MIV/V4	20	2.Mar.85	8.May.85	D				
10	1	HB0BHA	20	27.Oct.84	13.May.85	D	HB9BHA	Liecht.		
11	1	ZD7XY	20	27.Jun.85	05.Jul.85	D		St.Helena		
12	1	KK9A/PJ7	20	3.Mar.85	8.May.85	D		St.Maartn	1	09.Sep.85
13	1	GI4SGP	20	20.Mar.85	22.Mar.85	D		N.Ireland	1	19 Apr.85
14	1	AH8A	15	30.Mar.85	30.Apr.85	M	K6EDV	Am.Samoa	1	17.May.85
15	1	VP2VCW	80	27.Oct.84	30.Apr.85	M	N6CW	Brit.V.I.	1	10.May.85
16	1	"	40	"	"			"	1	10.May.85
17	1	"	15	"	"			"	1	10.May.85
18	1	CX5CC	15	30.Mar.85	30.Apr.85	D		Uruguay	1	28.May.85

Fig 2—QSL-tracking template.

File: KC8OH.DXCC

		PREFIX	ZONE	CON.	C O U N T R Y	80	40	20	15	10
1										
2										
3										
94	1	J8	8	NA	St. Vincent & Dep.				1	
95	1	JA-J?	25	AS	Japan			1	1	1
96	1	JD;KA1	27	AS	Minami Toroshima					1
97	0	JD;KA1	27	AS	Ogasawara					
98	0	JT	23	AS	Mongolia					
99	1	JW	40	EU	Svalbard			1	1	
100	0	JX	40	EU	Jan Mayen					
101	0	JY	21	AS	Jordan					
102	1	K,W,N		NA	United States	1	1	1	1	1
103	0	KC6	27	OC	Fed.States of Micronesia					
104	0				(E.Caroline Is.)					
105	0	KH6	27	OC	Rep.of Belau					
106	0				(W.Caroline Is.)					
107	1	KG4	8	NA	Guantanamo Bay				1	1
108	0	KH1	31	OC	Baker,Howland,Phoenix					

Fig 3—Five-band DXCC record template.

Many Amateur Radio calculations are long and complicated. To do them by hand is pretty much out of the question. In the past, we worked with a slide rule. Later, we could use those great little pocket calculators, but it was still necessary to write out the formula and jot down intermediate results. Even then we had no record that every value was entered correctly. Now, there's a better way. If you wish to do several sets of calculations (all at once or over a period of time) and keep a good record or print out the results, then you might as well organize the problem carefully, program in the formulas and have a permanent place to get the calculations done quickly and without error.

Ham-shack Applications

Here are some examples to show some of the things that can be done in the shack with spreadsheets. Fig 1 shows a template for determining VSWR from forward and reflected-power readings. If you enter the measurements as you make them, the results appear almost immediately, and you are able to obtain values close to, and then at, the resonant frequency without doing the lengthy calculations. I replicated the formula 12 times, but rows can be added or deleted easily. Format the template to suit yourself. Only the formula, Eq 3, is critical. I added a logical operator to the formula to avoid having an error message appear when there are no data. (When there are no data, the computer considers the input to be zeros. When the denominator of a fraction is zero, an error message appears because division by zero is undefined.) Eq 2 is from the *Handbook*, and Eq 3 is derived directly from it.[1]

[1]M. Wilson, ed, *The 1986 ARRL Handbook for the Radio Amateur* (Newington: ARRL, 1985, pp 16-1, 16-2, 23-11.

```
322|
323|
324|     Country Totals:                    5BDXCC Count:
325|           10 Meters---   136          10 Meters---   100
326|           15 Meters---   104          15 Meters---   100
327|           20 Meters---    52          20 Meters---    52
328|           40 meters---    18          40 Meters---    18
329|           80 meters---     9          80 Meters---     9
330|     DXCC Total---------   168          5 Band total   279
331|
332|
333|
334|
335|
336|
-------------------------------------------------------------------------------
G330: (Value) @SUM(B4...B320)                  K330: (Value) @SUM(K325...K329)
```

Fig 4—DXCC-summary template.

```
 A     B         C                          D                                  E          F
 2 Calculation of signal-to-noise ratio in Earth-Moon-Earth system.
 3                 (from 1986 ARRL Handbook pp. 23-11)
 4
 5 Enter the following values:
 6        Po=        30  transmitter output power (dBW)
 7        Lt=        .5  transmitter feed-line loss (dB)
 8        Gt=        23  transmitter antenna gain (dBi)
 9        Pl=       262  total path loss (dB)
10        Gr=      23.5  receiving antenna gain (dBi)
11         B=       100  bandwidth (Hz)
12        Ta=       100  antenna temperature (K)
13        Lr=         1  receiving feed-line loss (ratio)
14        Ti=       290  temperature of feed line (K)
15        Tr=     50.72  receiver noise temperature (K)
16         K= 1.38E-23  Boltzmann's constant
17
18 The next two values are calculated by intermediate formulas.
19        Ts=    150.72   (Eq.5)   +C12+((C13-1)*C14)+(C13*C15)
20        Pn=   -186.82   (Eq.6)   +10*(@LOG10(C16*C11*C19)
21
22 Answer:
23       S/N=      0.82   (Eq.7)   +C6+C8+C10-(C7+C9+C20)
24
```

Fig 5—EME signal-to-noise calculation template. The calculations performed in cells C19, C20 and C23 are shown.

$$\text{VSWR} = \frac{1+\Gamma}{1-\Gamma};\ \Gamma = \sqrt{\frac{PR}{PF}} \quad \text{(Eq 2)}$$

```
@IF(B17>0,(1+@SQRT(C17/B17))/
  (1-@SQRT(C17/B17)),0)        (Eq 3)
```

It may seem that the number of parentheses in Eq 3 is excessive, but spreadsheets contain no hierarchy of calculations, so you use parentheses to tell the spreadsheet how to do it your way.

If you are using these measurements to help you trim a dipole, you may want to write a few more lines to calculate how much wire to remove (or add) to bring the resonant frequency to where you want it. Eq 4 uses the standard half-dipole formula multiplied by 12 to give a measurement in inches.

```
((234/E28)-(234/E27))*12        (Eq 4)
```

Don't take the number too literally; length isn't the only factor in determining the resonant frequency. Be safe, trim a little less or add a little more. When the job is finished, print out the results and keep them close to your operating position.

I use another template in my shack to keep track of QSLing. A few lines are shown in Fig 2. The numeral "1" is entered in columns A and Q to keep track of how many cards have been sent out and received. The results are displayed at the top in cells O1 and Q1. If this template is written with a spreadsheet that has a sorting feature (I used Appleworks®, which does), you can group the cards received separately from those still outstanding. The sorting feature will rearrange rows by the letters or numbers in the column you designate so it is easy, for instance, to separate the cards still outstanding for 15-meter contacts from all the others.

A rather elaborate template is used to keep a record of my progress toward 5-band DXCC. Fig 3 shows a few lines of

this program. The biggest job was entering the list of countries. (I used the ARRL DXCC countries list modified to include the new Soviet calls.) The template has a space for each country confirmed on each band. If I recorded CW and SSB separately, more columns would be required. When a new country is confirmed, a "1" is put in the appropriate cell. The template then determines whether it is a brand new country or whether it is only new for one band. This is automatically recorded in the summary table, Fig 4, which is placed at the bottom of the list in cells G330 and K330. This is a simple summing procedure, and I print it out from time to time and tack it to the shelf above my rig. During a contest or a band opening, the sorting feature can, for instance, be used to gather all of the European countries still needed on 40 meters, and print out the list to help plan the evening's strategy. An interesting aspect of this template is that it uses so much memory that to expand it will require additional memory (RAM) in my Apple® //e. If you are considering a template for this program, remember that there are over 300 countries. Any spreadsheet with fewer rows than that will introduce formatting problems.

The above examples are more matters of record keeping than calculating. To see the spreadsheet's real power, let's look at a problem where the arithmetic is cumbersome and it is necessary to consider several variables to end up with the design that gives the best performance for what you can afford to buy or build. On page 23-11 of *The ARRL Handbook* there is a discussion of how to calculate the signal/noise ratio in an earth-moon-earth (EME) receiver. Thirteen terms (values) are used in three equations to arrive at the answer. Fig 5 shows a suggested approach to the calculations using the spreadsheet. The values are from the *Handbook* and are entered in cells C6 through C16. Eqs 5, 6 and 7, which reside in cells C19, C20 and C23, are spelled out for the purposes of this article. Once the template has been created, it is a simple matter to experiment with other values, or combinations of values, to see how they affect the results. This is a kind of computer modeling. You can see how performance will be affected by changing components and design merely by plugging the new values into the formula. Now you can see why spreadsheets have been called "What if ..." programs.

Getting Started

If these examples suggest to you that the possibilities for the use of spreadsheets by hams are nearly unlimited, you're right. Start off by writing a couple of simple templates. That will give you the chance to learn the basic commands. Then progress to bigger jobs that require you to use more features. My own progress was held back by my tendency to avoid reading owner's manuals until, of course, all else fails. Read the manual and use the HELP screens if your spreadsheet has them. It won't be long before your computer is helping you enjoy Amateur Radio more than ever. And, as is often the case with Amateur Radio, the new skills you acquire are likely to prove very useful professionally or at school.

Which Spreadsheet?

Which spreadsheet to buy depends on what kind of a computer you have or intend to buy, what kinds of things you intend to use the spreadsheet for and, naturally, cost. Almost any commercial spreadsheet will do a lot of chores in the ham shack. Mail-order software houses have good programs in the $50 to $100 range, and Lotus 1-2-3®, the top of the line, is less than $350. New spreadsheets appear every month, and prices have dropped sharply in the last year or two.

For amateur work, the features I have found to be most valuable are the presence of trig and log functions, and the ability to sort rows by letter or number. Having a large number of rows is also useful, but few programs have more than about 260.

I think that Multiplan® has a very good selection of features for the Commodore 64®. The combination of Advanced VisiCalc and Appleworks serves all my needs for the Apple //e. VisiCalc is slow and not easy to learn, but its mathemetical and formatting features are very complete. VisiCalc was made for a number of different computers, but is no longer being produced. Appleworks has 1000 rows and a sorting command, and comes with a fine word processor and data base (which I don't yet know how to use). Appleworks is very convenient to use, but it lacks trig and log functions. While it is fine for record keeping and data handling, it is not adequate for many calculations. There are, of course, many other good spreadsheets I haven't mentioned because of my lack of experience with them.

If you can find a friend who'll let you experiment with his spreadsheet, you'll be able to shop for your own more effectively. Once you get your spreadsheet up and operating, you'll find lots of additional time-saving chores for it to do in your shack. QST

Strays

QEX: THE EXPERIMENTERS' EXCHANGE

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

- W. C. Smith, K6DYX, tells how to "Write Pictures into the Apple's HIRES Screen from a Deskfax Machine."
- VHF+ Technology by Geoff Krauss, WA2GFP, focuses on UHF power triode bias circuits.
- Want to learn more about EMP? Nickolaus Leggett, N3NL, lists resources.

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.

I would like to get in touch with...

☐ anyone who has developed RTTY programs and interfaces for the Atari. John Pardun, NB2K, NSGA Box 659, Winter Harbor, ME 04693.

☐ anyone with a service manual for an ICOM IC-211 2-m transceiver, and information on installing RIT and other modifications on a Heathkit HW-8. Rick Newton, KA3AUX, 9 Emma Dr, Pittsburgh, PA 15223.

☐ anyone participating in a special-interest net and would like it publicized Down Under. Ash Nallawalla, ZL4LM/VK3CIT, PO Box 539, Werribee VIC 3030, Australia.

☐ anyone having and/or using a Macrotronics M-83 Ham Interface for the Model III TRS-80, complete with manual and cassette. Russ Smith, W6ONK/7, Box 141, Brownsville, OR 97327.

☐ anyone with schematics/manuals for EICO 324 generator, 460 scope, 625 and 667 tube checker; also for Drake 2B receiver and Sylvania 216 generator. Frank Lev, WA2LPX, 327 Adirondack Dr, Farmingville, NY 11738.

• *Under Construction*

Construct a VHF/UHF Signal Generator

Part 4: Most builders need an inexpensive VHF/UHF signal source for project testing. Beat the high cost of commercial gear with this simple circuit.

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

Super stability, calibrated power output and digital readout are features to enjoy when working with a signal generator. But, we experimenters need not have that level of sophistication for much of the experimenting we do: A compromise signal source will often do the job as well as a high-cost, laboratory-grade signal generator can. It is this philosophy we have enjoyed as amateurs for many years, and I see no reason to abandon the principle of ingenuity as we move toward equipping our workshops with the essentials we require for circuit development.

This month we will consider a signal generator we can build and get operating with a minimum of fuss and bother. Also, the price of the parts is modest—especially if you have a well-stocked junk box. The cabinet can be homemade in the interest of lowering the cost of our project.

Last month, we learned how to construct a signal generator for the high-frequency (HF) part of the spectrum. No workshop is complete without a VHF/UHF signal source, so let's build a unit that can serve our needs from 50 to 1296 MHz. It matters not if the end product is an ugly duckling or a masterful example of workshop skill. Our basic concern is that the circuit works properly and that the assembled equipment is reliable.

Circuit Options

Frequency stability for a signal generator can be enhanced if we use a synthesizer as the control element. Unfortunately, frequency synthesizers are somewhat complicated for the beginner, and they increase the cost of a project considerably. A simple alternative to the synthesizer, with respect to stability, is the crystal-controlled oscillator. The limitation is that we end up with spot frequencies rather than being able to vary the frequency in 100-Hz or 1-kHz steps, as would be the case with a synthesizer. Fig 1 shows an overtone oscillator that uses three crystals that provide markers from 50 MHz to 1296 MHz. This circuit can be used to replace the VFO of the tunable generator in Fig 2. Additional crystals and a switch (S1) with more positions can be used to provide additional spot frequencies. You may wish to adopt the circuit of Fig 1 if you have a large number of surplus crystals on hand. Many fundamental-cut crystals will oscillate on their third or fifth overtones, so check to see what is available as surplus. Plated crystals in HC-6/U holders are recommended for best performance in overtone circuits.

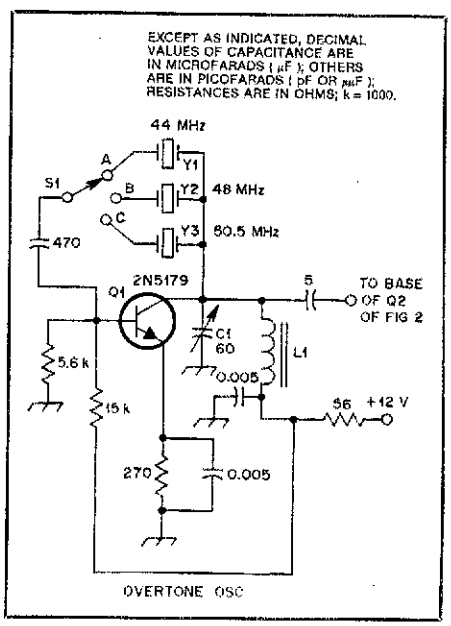


Fig 1—Schematic diagram of a suggested crystal oscillator for providing spot frequencies. Capacitors are disc ceramic, except C1, which is a miniature trimmer. Resistors are ¼- or ½-W carbon composition. L1 is a toroidal inductor that has 10 turns of no. 22 enam wire on an Amidon T37-6 core. This circuit can be used with that of Fig 2 (see text).

A Tunable VHF/UHF Signal Generator

Let's consider a homemade signal source that uses a tunable oscillator (VFO) as the frequency-controlling element. If we make the oscillator cover a range from 44 to 51 MHz, we can generate signals that fall in the 50, 144, 220, 432, 900 and 1296-MHz amateur bands. At frequencies above 6 meters we will rely on harmonics of the oscillator; for example, the generator output at 220 MHz would be the 5th harmonic of the VFO, and at 1296 MHz we would use the 26th harmonic of the oscillator. This technique results in lower and lower signal output from the generator at the higher frequencies. Useful signal levels are still available, even at 1296 MHz. The change in output power also rules out the need for a calibrated output attenuator.

A Practical Circuit

Our workshop project for this month is shown in Fig 2. This two-stage signal generator has a small parts count and contains low-cost components. A parts kit or a PC board can be obtained from A & A Engineering.[1]

Q1 of Fig 2 is an LC oscillator that tunes from approximately 44 to 51 MHz. C1 is the main-tuning control, which should be driven by a vernier drive with a numbered scale. C1 should have a bearing at each end of the rotor shaft. This will aid mechanical

[1]A & A Engineering, 7970 Orchid Dr, Buena Park, CA 90620, tel 714-521-4160. Circuit boards and parts kits are available.

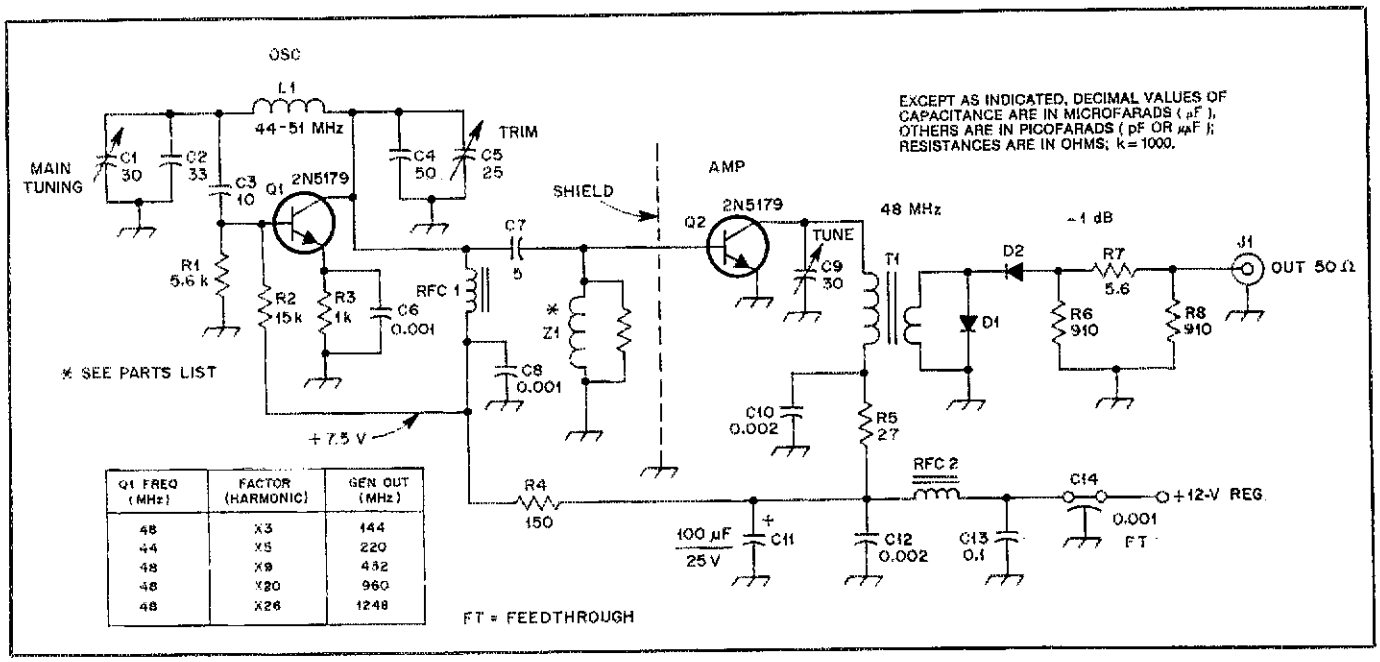


Fig 2—Schematic diagram of a practical signal generator. Unless otherwise noted, fixed-value capacitors are disc ceramic. C11 is an electrolytic or tantalum unit. Resistors are 1/4- or 1/2-W carbon composition. The tabular inset indicates the frequency range of this circuit versus the harmonics of 44-48 MHz.

C1—Miniature air variable, double-bearing type preferred, 30 pF (see text).
C2, C3, C4, C7—NP0 disc ceramic or dogbone.
C5—Miniature ceramic trimmer (NP0 preferred), 25 pF.
C9—Same as C5.
D1, D2 —Small-signal switching diode (1N914 or equiv.).
J1—Coaxial connector, type BNC or UHF.
L1—Air-wound coil (see text), 7 turns of no. 20 enam wire, close wound, 3/8-inch ID × 3/8 inch long.
Q1, Q2—UHF, NPN transistor (see text).
RFC1, RFC2—Miniature 10-µH choke.
T1—Toroidal transformer, 0.75-µH primary. Use 16 turns of no. 24 enam wire on an Amidon T37-6 toroid. Secondary has 6 turns of no. 24 wire.
Z1—33-ohm, ½-W carbon resistor wound full (close wound, single layer) of no. 30 enam wire.

stability. C5, a trimmer capacitor, is used to calibrate the oscillator while observing the operating frequency with a frequency meter.

Q2 functions as a class-C amplifier. I chose a class-C stage in the interest of enhanced harmonic output. Although the circuit calls for 2N5179 transistors for Q1 and Q2, any UHF small-signal NPN transistor should work fine. The transistor F_T should be at least 400 MHz, and the maximum V_{ce} needs to be 24 V or greater. Total oscillator current for this circuit is approximately 30 mA, with the parts values given in Fig 2.

A shield divider is placed between Q1 and Q2 on the component side of the circuit board. This will minimize unwanted coupling between L1 (and other components) and the circuit of Q2. Ideally, all of the Q1 circuit would be built in a separate shield box to aid isolation. You may want to follow this procedure by using PC-board sections for the compartment walls and cover. Such a technique makes it possible to place the oscillator assembly on rubber shock mounts, which helps to reduce frequency changes caused by vibration.

T1 of Fig 2 is a tuned transformer. The secondary winding of T1 connects to a pair of 1N914 small-signal diodes. 1N34A germanium diodes may be substituted at D1 and D2. The diodes enhance the harmonic currents at the output of T1. This boosts the level of the generator output energy at the harmonic frequencies.

A 1-dB pi attenuator is included in the circuit after the diodes. This sets the output impedance of the generator at 50 ohms and ensures that Q2 has a proper load to look into.

The Matter of Leakage

A well-designed generator has very little signal leakage from the cabinet and the external power leads. RF energy should exit only via the output cable or spigot. This is especially important if the generator has a built-in attenuator, or if we use an external step attenuator to lower the effective output power. Leakage problems are the most crucial when very low output power is desired from the generator. In a worst case, the leakage from an inferior generator can exceed the signal power from the intended output port. This makes accurate measurements impossible.

How may we minimize unwanted leakage? First, we must filter the power leads that supply the generator circuit. Fig 2 shows C11, C12, C13, C14 and RFC2 as filtering elements in the 12-V supply line. C14 is a feedthrough capacitor. It can be mounted on the rear wall of the signal-generator cabinet, thereby serving also as a connector for the power supply.

Our cabinet should be RF tight. This means that no holes or cracks are available for RF energy to sneak through. It is

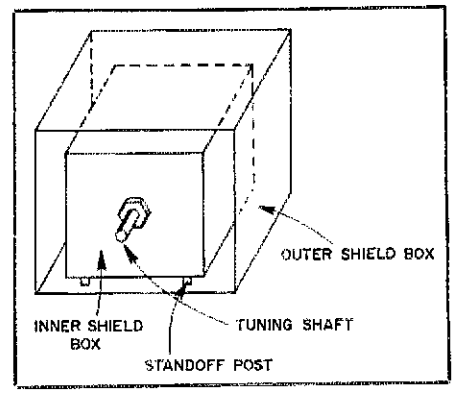


Fig. 3—Example of two boxes for providing double shielding (see text).

common practice in the commercial world to employ two shielded cabinets—one inside the other, for double shielding. Fig 3 illustrates this idea. The front panel of the outer box is not shown in order to make the inner layout visible. A shaft bearing may be used on the front outer panel to help seal the tuning-capacitor shaft hole. I have found double-sided PC board inexpensive and easy to work with when making cabinets for homemade gear. Consider using this material when designing the boxes for your signal generator.

Construction Notes

Perhaps you would rather start from scratch when building the circuit of Fig 2.

There is no need to use a PC board. You may elect to adopt the W7ZOI "Ugly Construction" method, using point-to-point construction. An example of this method is shown in Fig 4. The photograph shows my breadboard version of the Q1 circuit of Fig 2. A shield partition can be added, then the Q2 part of the circuit can be located on the remaining side of the partition. A multilug terminal strip is used as the foundation for the circuit module of Fig 4. A second terminal strip would serve nicely for the Q2 circuit.

It is important that L1 of Fig 2 be made rigid. After it is wound and the turns are spread or compressed to set the oscillator tuning range, lay a bead of quick-dry epoxy cement along two sides of the coil. This will reduce the effects of vibration and aid frequency stability. If you have a small ceramic coil form available, wind L1 on it, then cement the turns with polystyrene Q-Dope.® This adhesive is manufactured by General Cement Co.

L1, C1 and C5 should have short, rigid connecting leads in order to ensure frequency stability. Both ends of the C1 rotor shaft (common to the capacitor frame) should be grounded to the PC board or main chassis. Keep the Q1 and Q2 leads as short as possible. The remainder of the components in Fig 2 need to be installed with short, direct leads.

If you desire a commercial look for your signal generator, it may be worthwhile to consider using a store-bought cabinet. However, it is possible to develop the commercial look by adding a coat of paint or contact paper to your homemade PC-board cabinet.

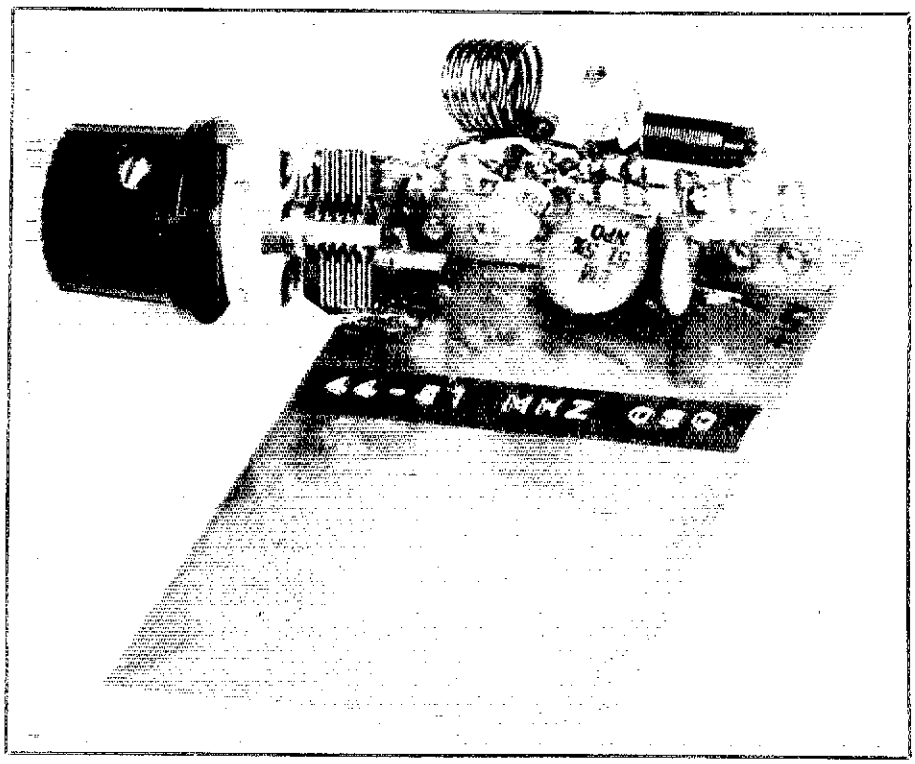


Fig 4—The oscillator section of Fig 2. Ugly Construction was used.

Adjustment and Calibration

A frequency counter is needed for the calibration of our circuit. It can be coupled to the collector of Q2 through a 10-pF blocking capacitor. The harmonic currents caused by D1 and D2 make it impractical to connect the counter at J1.

Apply operating power to the circuit and set C1 at maximum capacitance (plates meshed). Set trimmer C5 at mid range. Spread or compress the turns of L1 for a reading of 44 MHz on the counter. If this is not possible, change the setting of C5, and again experiment with the turns of L1. Repeat this procedure until a reading of 44 MHz is obtained with C1 at maximum capacitance. Now, set C1 for minimum capacitance and check the frequency reading on the counter. The operating frequency should be approximately 51 MHz.

C9 should be adjusted for maximum Q2 output at 48 MHz. A VTVM and an RF probe may be used for this adjustment. Alternatively, tune in a signal at 50 or 144 MHz and adjust C9 for maximum S-meter response on your 6- or 2-meter receiver.

Greater frequency coverage may be obtained from the circuit of Fig 2 by using a 50-pF tuning capacitor at C1. This will require the removal of one or two turns from L1 in order to reach the high-frequency range of the generator.

A calibration chart can be drawn for the dial face of your vernier drive. This should not be done until the signal generator has warmed up for at least one hour. I prefer to leave my homemade generators turned on around the clock, so to speak. This assures stability when I need to use the instrument. A small incandescent lamp can be installed inside the inner generator cabinet (Fig 3) to help maintain a nearly constant operating temperature: A 7-W, 117-V lamp may be a good choice.

Summary

There is considerable latitude for experimentation when building your VHF/UHF signal generator. I have attempted to lay the foundation for this type of project, but you may be innovative enough to exceed the design of Figs 2 and 4. For example, you may want to construct a more rugged coil (L1) than is described here. Also, an output attenuator that will function into the UHF region can be added as an integral part of the overall generator assembly. If you develop improvements or if you are especially proud of your completed unit, please consider sharing your achievements with *QST* readers. The Hints and Kinks column is a suitable vehicle for circuit changes, for example. Good luck! QST

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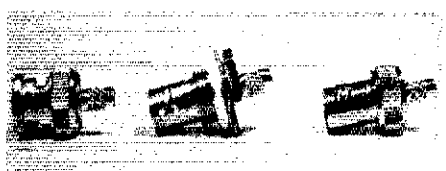
Call or write for free full-line catalog to Mouser Electronics, 11433 Woodside Ave., Santee, CA 92071, tel 619-449-2222.—*Bruce O. Williams, WA6IVC*



Spiderweb—The Range Circle Calculation

You may be familiar with spiderweb acquisition circles as map overlays for amateur satellite communications. Use the information in this article to build your own overlays—for any location and on any kind of map.

By Dimitrios Zachariadis, NJØW
61-02 171 St, Fresh Meadows, NY 11365

It had been about two months since I first heard the Soviet Amateur Radio Satellite RS-7 on the 29.5-MHz downlink. The space bug had bit me hard enough to get me seriously involved in all kinds of related things. One of the things I really wanted was a good mathematical model for the ground operations so I could use a computer for all the calculations I might need.

After I made a scholastic review of hundreds of issues of Amateur Radio magazines and AMSAT newsletters, I had most of the desired information for the mathematical model: formulas for subsatellite point, azimuth and elevation angle, and slant range. As a quick graphic aid, I prepared a corrected version of an early OSCARLOCATOR for the RS satellites (which are the only ones operating in mode A at this writing). *The Satellite Experimenter's Handbook* helped me a lot in putting things together and obtaining valuable new material.[1]

One thing was absent from the model, however, and that was the spiderweb calculation formulas. These formulas were not really necessary for the operation from my QTH, since most of the spiderwebs I needed were given in the *Satellite Handbook*. But I wanted greater accuracy and the ability to have spiderwebs with other kinds of maps (Mercator type, and so forth). I also wanted to be able to help people in places with coordinates that are difficult to match for spiderwebs given in the *Satellite Handbook*. So I decided to derive the necessary equations.

In the beginning, I followed the suggestion at the end of Chapter 9 of the *Satellite Handbook* and worked with right spherical triangles. The results I got by following this approach were rather long and messy, so I looked for an easier way to attack the problem.

[1]M. R. Davidoff, *The Satellite Experimenter's Handbook* (Newington: ARRL, 1985). Also see *AMSAT Newsletter*, Dec 1973, Mar, Sep and Dec 1976; *The ARRL Antenna Book*, Hall, Gerald, ed (Newington: ARRL, 1982).

Table 1
Definitions of Terms Used in This Article

A	=	azimuth angle measured clockwise from geographic north
B	=	the angle of arc for the great-circle path from Q to C (Fig 1)
C	=	the subsatellite point
E	=	the elevation angle
H	=	the height of the satellite (km from surface)
O	=	Earth's geocenter
Q	=	the ground station
R	=	the radius of Earth (6371 km)
S	=	the satellite
FQ	=	the latitude of the ground station
FS	=	the latitude of the distant point
LQ	=	the longitude of the ground station
LS	=	the longitude of the distant point

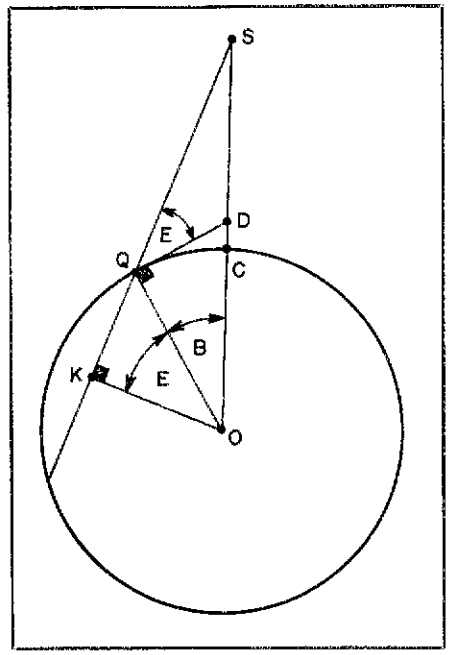


Fig 1—Geometry for computing the center angle, B.

The Problem and the Solution

Knowing the position of the ground station and the satellite's height, we need to find the range of communications at various elevation angles while we vary the azimuth. The formulas should give the subsatellite coordinates of a point at the specified range for the given elevation angle and azimuth. By connecting all azimuth points for each elevation angle, we get the range circles. If we now connect the points that have the same azimuth, we get the "spiderweb" of the range circles.

I found the problem already solved, but in a reverse fashion. If we know the coordinates of the ground station and another desired point (which in our case is the maximum distance point), we can calculate the azimuth and surface distance from Eqs 1 and 2:

$$\cos B = \sin FQ \sin FS + \cos FQ \cos FS \cos (LQ - LS) \quad \text{(Eq 1)}$$

(Terms for this and subsequent equations are defined in Table 1.)

$$\cos A = \frac{\sin FS - \sin FQ \cos B}{\cos FQ \sin B} \quad \text{(Eq 2)}$$

To solve the spiderweb problem, we just need to solve for the unknowns in our problem, FS and LS. Using Eq 2, we obtain

$$\sin FS = \sin FQ \cos B + \cos FQ \cos A \sin B \quad \text{(Eq 3)}$$

or

$$FS = \arcsin (\sin FQ \cos B + \cos FQ \cos A \sin B) \quad \text{(Eq 4)}$$

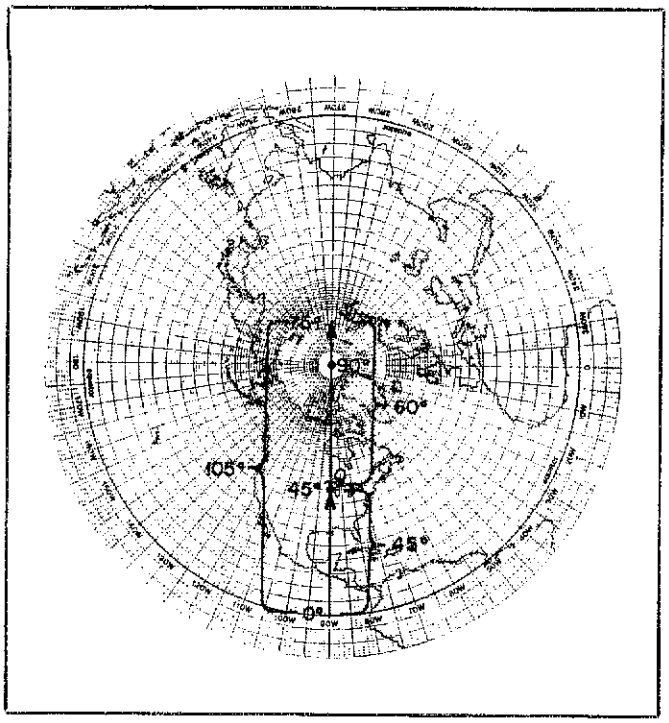


Fig 2—The "beyond the pole" case.

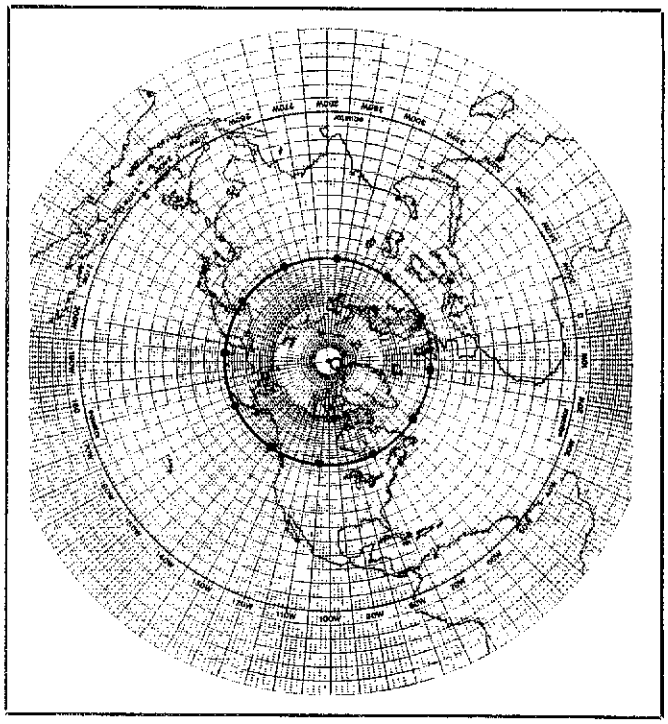


Fig 3—The limit case. Input data: H = 1654 km, FQ = 90°, LQ = 74°.

And from Eq 1,

$$\cos (LQ - LS) = \frac{\cos B - \sin FQ \sin FS}{\cos FQ \cos FS} \quad \text{(Eq 5)}$$

or

$$LS = LQ - \arccos\left[\frac{\cos B - \sin FQ \sin FS}{\cos FQ \cos FS}\right] \quad \text{(Eq 6)}$$

Eqs 4 and 6 are the solution to the problem, but to use them we must first determine the center angle, B. To do this we need to know the height of the satellite, H, and the desired elevation angle, E. From Fig 1 we have

$$OC = OQ = R \quad \text{(Eq 7)}$$

$$CS = H \quad \text{(Eq 8)}$$

Angle SQD = E. Note that OQ is perpendicular to QD, and OK is perpendicular to KQ. Therefore, angle KOQ = E. From triangle QKO we have

$$\cos E = \frac{KO}{QO} = \frac{KO}{R}$$

and therefore

$$KO = R \cos E \quad \text{(Eq 9)}$$

From triangle SKO we have

$$\cos (E + B) = \frac{OK}{OC + CS} \quad \text{(Eq 10)}$$

From Eqs 7, 8 and 9,

$$E + B = \arccos\left[\frac{R \cos E}{R + H}\right]$$

And finally

$$B = \arccos\left[\frac{R \cos E}{R + H}\right] - E \quad \text{(Eq 11)}$$

Now we have the complete solution to the problem, in Eqs 4, 6 and 11.

Other Considerations

For computer programming, there are a few more things to be considered: the "beyond the pole" case and the limit cases. "Beyond the pole" is a case that occurs when we add two latitudes and the result is more than 90°. For a station at 45° latitude and 90° west longitude, an addition of 60° north latitude would yield a latitude of 105° north, which is not valid. This situation is shown in Fig 2. In this case the correct latitude would be 180 − 105 = 75° north, and the longitude would be 180 + 90 = 270° west.

None of these extra calculations need to be done with the equations given here. These equations give correct coordinates for all but the limit cases.

The limit cases are FQ = 90° and FS = 90°. For 90° values of FQ and FS, their cosines equal zero. This creates a division by zero error, since these cosines both appear in the denominator of Eq 6. To cure that problem, we can substitute 89.9° for FQ or FS, as appropriate, or else solve each case separately. I found the substitution to be much faster than any other solution.

Note that an FQ of 90° north latitude means that the ground station is located exactly at the geographic north pole. In this case, the azimuth, as defined, has no meaning at all, because all directions are south! However, the equations are valid and yield, in this case, the coordinates of a latitude circle. Fig 3 shows an example.

A simple BASIC program is given in Table 2. The program is written for the IBM® PC, but it can be adapted easily to any other computer.

The accuracy of the solution drops as FQ or FS approaches 90°. When they are close to 89.9°, the error is practically negligible. However, if one uses 89.999, the error is much greater. The value 89.9° yields good results. Lines 190 and 200 take care of errors that arise from the floating point number representation in the computer.

As an example, a spiderweb construction in two steps is given in Fig 4. The circles were drawn by using the output of the program of Table 2. The map on which the spiderweb is drawn can be of any kind; the maps of Fig 4 came from the back-cover foldout of *The Satellite Experimenter's Handbook*.

If you've been bitten by the space bug

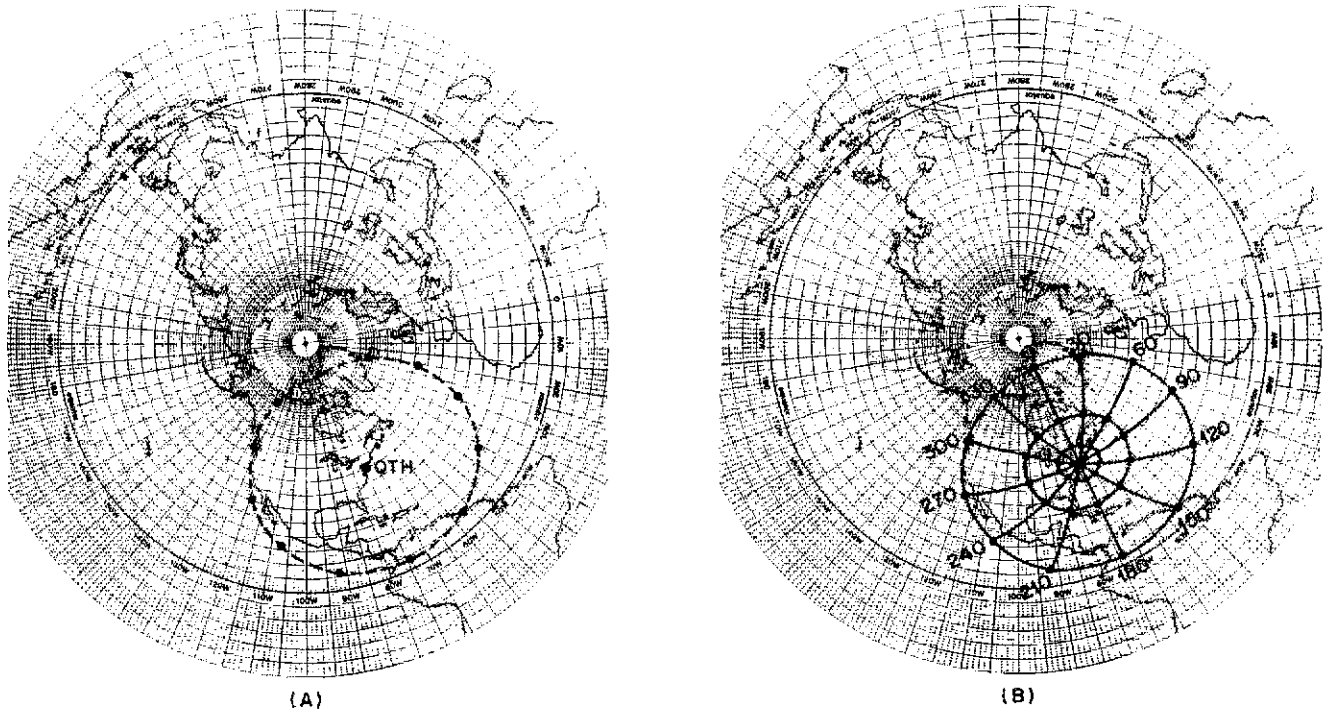


Fig 4—At A, the beginning of a range circle plotted for New York City (H = 1654 km, FQ = 40.8°, LQ = 74°). In this plot, only the coordinates and range circle for a zero-degree elevation angle are drawn. At B, the completed spiderweb is shown.

Table 2
BASIC Program for Calculating Spiderweb Data

```
1Ø CLS
2Ø DEF FNARCSIN(Y)=ATN(Y/SQR(1-Y*Y))
3Ø DEF FNARCCOS(Y)=1.57Ø796-ATN(Y/SQR(1-Y*Y))
4Ø PI=3.141593:R=6371
5Ø INPUT "Height of satellite (km) ->";H
6Ø INPUT "Latitude of your QTH     ->";FQ
7Ø INPUT "Longitude of your QTH    ->";LQ
8Ø IF ABS(FQ)>89.9 THEN FQ=SGN(FQ)*89.9
9Ø FQ=FQ*PI/18Ø:LQ=LQ*PI/18Ø
1ØØ FOR E=Ø TO PI/2 STEP PI/6
1Ø5 CLS
11Ø PRINT:PRINT
12Ø PRINT:PRINT "Data for ";:PRINT USING "##";E*18Ø/PI;:PRINT " deg. elevation"
13Ø PRINT:PRINT "Latitude (N)","Longitude (W)"
14Ø B=FNARCCOS (COS(E)*R/(R+H))-E
141 REM
142 REM For more points, change the STEP from PI/6 to PI/12 or less.
143 REM
15Ø FOR A=Ø TO 2*PI STEP PI/6
16Ø FS=FNARCSIN(SIN(FQ)*COS(B)+COS(FQ)*SIN(B)*COS(A))
17Ø IF ABS(FS)>89.9*PI/18Ø THEN FS=SGN(FS)*89.9*PI/18Ø
18Ø X=(COS(B)-SIN(FQ)*SIN(FS))/(COS(FQ)*COS(FS))
19Ø IF ABS(X)>.99999 THEN LS=LQ:ELSE LS=LQ-SGN(PI-A)*FNARCCOS(X)
2ØØ IF LS<Ø THEN LS=LS+2*PI ELSE IF LS>2*PI THEN LS=LS-2*PI
21Ø PRINT USING "###.#            ";18Ø*FS/PI,:PRINT USING "###.#";18Ø*LS/PI
22Ø NEXT A
224 LOCATE 24,1:PRINT"Press any key to continue"
225 IF INKEY$="" GOTO 225
23Ø NEXT E
```

and have a computer, the spiderweb calculation program can be very helpful. Use it when you are looking for DX windows in the low-orbit satellites.

Born in Greece in 1958, Dimitrios Zachariadis built his first QRP transmitter at age 12 and his first superheterodyne receiver when he was 15. He received an Electronics Engineering Diploma from the Advanced School of Engineering Technology in Piraeus, Greece, and earned a BS degree in Electrical Engineering at the University of Missouri (Rolla). He is currently working toward a Master's degree in Computer Science at Queens College of the City University of New York. Dimitrios was licensed as a Novice in March 1984, and upgraded to Amateur Extra Class in March 1985. His interests lie mainly in the fields of digital and satellite communications. He has designed and built various microprocessor-based projects, and has written several programs in areas related to Amateur Radio.

Strays

I would like to get in touch with...

☐ anyone with operation/service manuals for a Cushman CE-2B service monitor. Dave Land, KD5FX, 2515 Bonnie, Ponca City, OK 74601.

☐ any hams who belong to the International Wings of Shasta Camping Club and are interested in joining a net. John Weber, N2DTL, 51 Stanton Ave, Piscataway, NJ 08854.

☐ hams who served aboard the *USS Mohawk* during the Battle of the Atlantic in WW II and are interested in joining a net. R. Kouba, K9ZRB, 21462 W Barbara Ct, Kildeer, IL 60047.

Untangling Upgrade Math

Stumped by trig functions and logarithms? This article will help.

By Maria L. Evans, KT5Y
1112 N Rubey St
Macon, MO 63552

Almost everyone is familiar with the movie scenario of a man who braves snowstorms, perilous mountains, high winds and, of course, the Abominable Snowman to reach the High Lama of Tibet. As the Lama sits placidly meditating, this poor soul scales over the last precipice, chest heaving, hands cut to shreds by rocks, and gasps, "Tell me, O Master, what is the secret of life?"

If we move this scenario to the local repeater, we might hear the following. Gilbert General plans to take his Advanced test in two weeks. Late one night he sweats over his study guide, attempting to work one of the math problems. Frustration sinks in. He chews his pencil, purses his lips and tenaciously tries again, but to no avail. Not one of his computations comes close to the choices on his multiple-choice practice test.

As Gilbert's hands sweat his calculations into a smudge of glistening graphite, his head pounds with the memories of all those hours he spent gazing out the window of that algebra class so many years ago. Finally, in desperation, he picks up the mic for his 2-meter rig and calls for his buddy Eleanor Extra. With trembling lips, he can barely mouth the words that give away his mathematical ineptitude. "Hey, Eleanor! How do you work these resonant-frequency problems, anyway?"

After hearing this a number of times on my local repeater, I discovered that many potential upgradees have similar fears about the mathematical aspect of licensing exams. After being away from math for some years, upgradees seem most apprehensive about hamdom's Big Four—metrics, exponents, logarithms and trigonometric functions.

Anyone who has ever tried to explain these concepts over the air can appreciate the monumental difficulty of such a task. One wrong move can send your hard-working student back into the deepest depths of confusion. So for those of you wishing to better grasp these key concepts, and for those of you who ache to find a way to overcome the puzzlement of your students, I'd like to share my gut-level explanations of these four topics. Get your pencils, and let's get started!

Mastering Metrics

Many of us are used to doing things the hard way. That is what we are doing with our English system of measurement—times 3 here, divide by 12 there, divide that by 5280. It's a real zoo of "magic numbers." The rest of the world got the jump on us with the invention of the metric system, which made it possible to go from one unit to another just by dribbling the decimal point around.

When I taught seventh-grade science, I cooked up the "Magic Metric Ruler" to keep those floating decimals straight. Eleven metric prefixes are shown in Fig 1, but you might want to memorize only the seven metric prefixes most commonly used in the electronics industry—giga, mega, kilo, (unit), milli, micro, nano and pico—in that order. Remember each is three decimal places away from the other. These prefixes are good for all units in electronics—ohms, farads, henrys, Wouff Hongs, whatever. Now, draw a number line, just like you used in grade school, placing the prefixes underneath so that it resembles mine shown in Fig 1A.

Let us use our little gizmo to change 23 microhenrys to henrys. Count the lines from "micro" to "units" as I have done in Fig 1B. We moved six places to the left on our number line. Therefore, we move our decimal six places to the left to receive an answer of 0.000023 henry. Easy, huh? Let's try another example using the same number. We will change 23 kilohms to milliohms. Because we moved six places to the right (Fig 1C) on the number line, our answer is 23,000,000. I admit, it is a "counting your fingers" approach to the problem of metric unit conversion, but until you get used to metric units, don't be ashamed to take this route.

Taking the Scare out of Exponential Notation

Scientific notation, sometimes called exponential notation, is merely a step-saver to avoid writing all those zeros in gigantic or itsy-teeny numbers. For example, $3 \times 10^6 = 3 \times 1{,}000{,}000 = 3{,}000{,}000$. Or, in the reverse, $3 \times 10^{-6} = 3 \times$

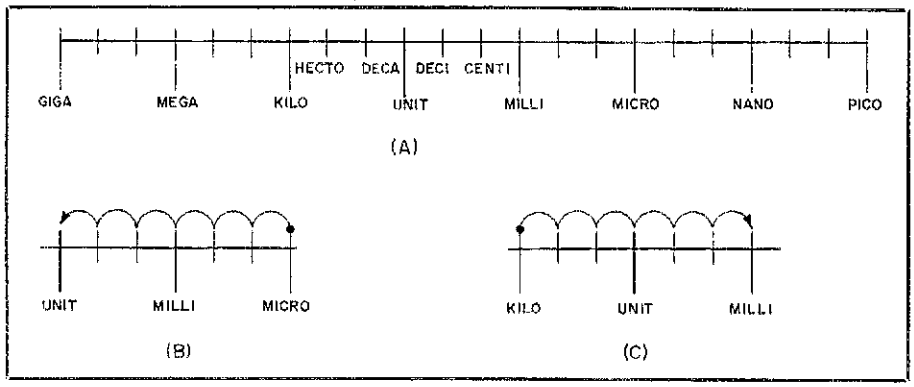


Fig 1—At A, the prefix number line helps students convert numbers from one unit to another. In B, we convert 23 microhenrys (μH) to henrys. The decimal point is moved from right to left six places. In C, 23 kilohms (kΩ) is converted to 23 milliohms (mΩ). Here the decimal point is moved to the right by six places.

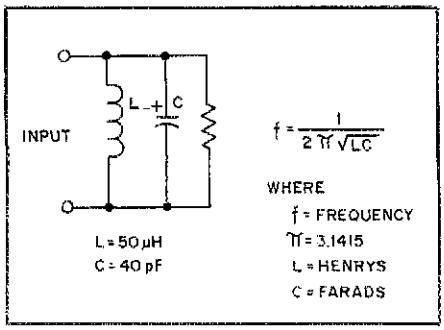


Fig 2—The resonant-frequency problem.

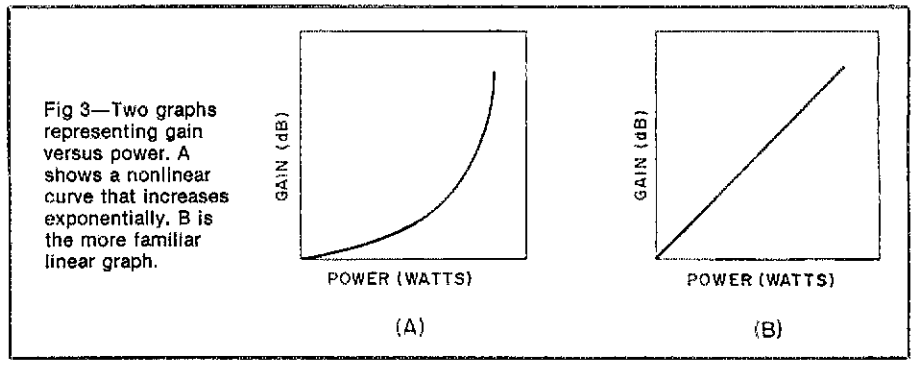


Fig 3—Two graphs representing gain versus power. A shows a nonlinear curve that increases exponentially. B is the more familiar linear graph.

0.000001 = 0.000003. The decimal simply moves the number of places the exponent indicates, while the sign of the exponent tells us in what direction the decimal will move. If the sign is positive, then the decimal moves to the right. If the sign is negative, the decimal moves left.

By using scientific notation in some of your computations, you have also solved the problem of plugging large numbers into your calculator. Let's practice calculating with this method. Fig 2 shows the schematic for a common test question, the resonant-frequency problem. The equation that solves for frequency is also displayed.

I chose this problem because it allows an opportunity to deal with scientific notation in a variety of math operations. To begin, let's change microhenrys to henrys and picofarads to farads. We move the decimal to a point just right of the first significant digit, and count the places.

$50\ \mu H = 0.000050$ henry

We can ignore the zero to the right of the 5 and write an exponent of

$0.00005 = 5 \times 10^{-5}$ henry

(The exponent sign is negative because the original decimal point was left of the 5.)

Likewise,

$40\ pF = 0.000000000040$ farad $= 4.0 \times 10^{-11}$ farad

Plugging into our formula, we get

$$f = \frac{1}{2\pi\sqrt{(5 \times 10^{-5}H)(4 \times 10^{-11}F)}} \qquad \text{(Eq 1)}$$

When we multiply numbers in scientific notation, we multiply the decimal number and add the exponents. The "times" sign is like a barrier, allowing us to work each half of the number separately.

$(5 \times 10^{-5})(4 \times 10^{-11})$

$= (5 \times 4) \times 10^{(-5+[-11])}$

$= 20 \times 10^{-16} = 2 \times 10^{-15}$

Going back to our formula, we now have

$$f = \frac{1}{2\pi\sqrt{2 \times 10^{-15}}}$$

When taking square roots of a number in scientific notation, we "juggle" it so the exponent is even (i.e., $2 \times 10^{-15} = 20 \times 10^{-16}$). We can then take the square root of the decimal number and split the exponent in half:

$2 \times 10^{-15} = 20 \times 10^{-16}$

so

$\sqrt{20} \times \sqrt{10^{-16}} = 4.47 \times 10^{-8}$

The rest, friends, is cake and cookies.

$$f = \frac{1}{2(3.14)(4.47 \times 10^{-8})}$$

$$= \frac{1}{28.1 \times 10^{-8}} \qquad \text{(Eq 2)}$$

$$= \frac{1}{28.1} \times \frac{1}{10^{-8}} = 0.0356 \times 10^{-8}$$

$= 3.56 \times 10^{6}$ Hz $= 3.56$ MHz

Licking Logarithms

Now that we have covered exponents, logarithms are a snap because, "A logarithm is nothing but an exponent." No kidding—it's just a power of 10 written in decimal form. For instance, the logarithm (shortened to "log") of 327 is 2.52. (I know this because I punched it up on my calculator.) This means that $327 = 1 \times 10^{2.52}$, which is the same thing as $10^{2.52}$, which is the same as the 2.52nd power of 10.

We use logs to treat exponential properties of radio theory (such as power gain, measured in decibels) as if they are ordinary linear numbers. We do it all the time with S-meter readings. Remember when your buddy Joe B. Hamm put up his new antenna, and he went up three decibels at your house? That is about the same effect as if he had doubled his output power. That's because the graph of power vs gain looks like that in Fig 3.

Notice the upward curve on the graph in 3A. This is typical of factors that increase exponentially.

Still confused? When we count 1, 2, 3, 4, and so on, we increase the number by one unit. This is called a linear increase. When we count 1, 10, 100, 1000, we increase by a power of 10 each time—an exponential increase.

Unless you want to learn more about the workings of mathematical functions, don't worry about calculating logs. Most $15 calculators will do it for you with very little pain and frustration, and quite a bit of speed and accuracy. (Heck, even in the "dark ages" we had slide rules!) However, it pays off to be able to estimate a log on a test *before* you calculate it. For example:

$\log 100 = \log 10^2 = 2$

$\log 1000 = \log 10^3 = 3$

So, if you are taking the log of 275, you know it will be between two and three, and closer to two than to three. Then, when you work the problem, you can eliminate a certain amount of "oops, wrong button." Now that we're experts on logs, let's work with our old pal, the gain problem.

Harvey Homebrew built the linear amplifier he always dreamed about. The output of his rig without his linear amplifier is 112 watts key down. With trembling fingers, he eagerly patch-cords the amplifier in line. Beads of sweat dance on his forehead; Harvey pants with anticipation. Finally, unable to hold back his mounting passion, he flips the switch to TUN—918 W! How many decibels did Harvey gain with the addition of the linear?

$$\text{dB gain} = 10 \log \left(\frac{P2}{P1}\right) \qquad \text{(Eq 3)}$$

where

P1 = 112-W power input
P2 = 918-W power output

$$\text{dB} = 10 \log \left(\frac{918}{112}\right) = 10 \log 8.2$$

$= 10(0.91) = 9.1$ dB gain

Epilogue: Harvey reads the next issue of *QST* and wishes he had bought a seven-

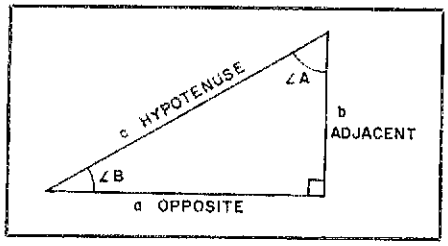


Fig 4—A right triangle. The symbol for an angle is ∠ . Capital letters inside the triangle represent angles, while small letters a, b and c label the sides.

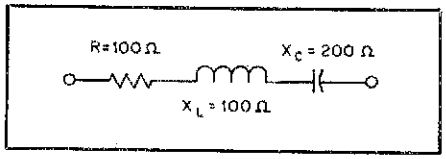


Fig 5—The schematic for a phase-angle problem (see text).

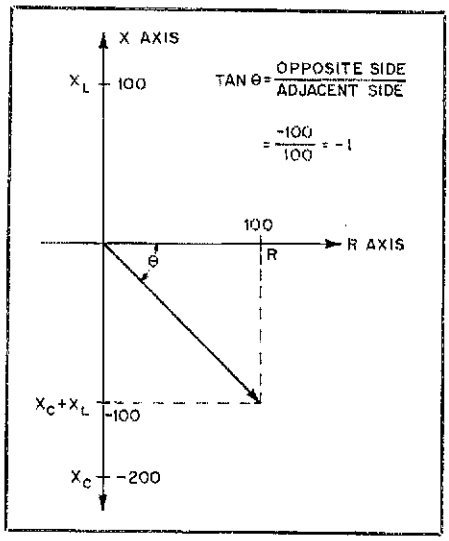


Fig 6—The phase-angle problem shown in vector form.

element beam. He would have received comparable gain for less money, but that's another story.

Tackling Trig

Trigonometry is the study of the functions of right triangles. Right triangles are a key to solving vector problems, such as the phase-angle problem found on the Extra Class test. Before we go to that, however, let's take a look at a generic right triangle in Fig 4.

Notice that each side is directly across from its corresponding angle, and the hypotenuse, c, corresponds to the right angle. Thanks to Pythagoras and a host of other talented ancients, we have three important trig functions: sine, cosine and tangent (abbreviated sin, cos and tan). Using angle A as an example, we get:

$$\sin \angle A = \frac{\text{opposite side}}{\text{hypotenuse}} = \frac{a}{c}$$

$$\text{cosine} \angle A = \frac{\text{adjacent side}}{\text{hypotenuse}} = \frac{b}{c}$$

$$\text{tangent} \angle A = \frac{\text{opposite side}}{\text{adjacent side}} = \frac{a}{b}$$

The arcsine, arccosine and arctangent are the inverse, not reciprocal, of these functions. A good example is shown below.

$\sin(45°) = 0.707$ $\quad \arcsin(0.707) = 45°$

The value for sine, cosine and tangent can be found easily with a calculator. Usually an inverse button, labeled differently on different models, is available. By pressing this button first and then one of the three trigonometric functions, you can solve for the arcsine, arccosine, and arctangent. This is an easy test for you to learn those function keys.

We can use what we have learned in a typical phase-angle problem. The symbols and their values are shown in Fig 5. The equations can be determined from looking at the diagram. (In the equation, θ, the Greek letter theta, represents an unknown angle.)

$$\tan \theta = \frac{X_{total}}{R}$$

where

$$X_{total} = X_L - X_C$$

$$X_{total} = 100 - 200 = -100$$

$$\tan \theta = \frac{-100}{100} = -1$$

If we wrote this problem as a vector, it would look like Fig 6. Inductive reactance, X_L, and inductive capacitance, X_C, act in opposite directions. This is shown in Fig 6.

To get θ by itself, you take the inverse of the tangent (arctan). Once again, your best bet is letting your calculator do the work.

$$\theta = \arctan(-1)$$

$$\theta = -45°$$

The phase angle in this problem is −45 degrees. If you got this one, "ya done good!"

Now That You Got This Far ...

If you still feel a little shaky on these concepts, remember what I've covered in a few paragraphs takes some folks years of learning. Don't feel ashamed or inadequate. You should be able to get a handle on it, and that is the key to meaningful learning. Always realize that higher math involves learning and understanding the concepts of mathematical functions, rather than actual computation. Once you feel comfortable with the concepts, you can use them as a foundation for new knowledge. You may even look forward to the math problems on your exam (no kidding) because of your new skills.

At any rate, don't let math become a stumbling block to the class of license you want! "I didn't have much math in school," or, "I haven't had that yet," is no excuse. Sure, math is tough, but once mastered, you will have a new weapon in the arsenal of knowledge you need to aim for the license you desire.

Maria became a licensed amateur in 1976 and earned her Extra Class license in 1981. She holds a BS in biology from Northeast Missouri State University and is certified to teach biology, chemistry and general science. Presently employed by A & A Amusement in Macon, Missouri, Maria works as an electronic coin-operated amusement-machine technician. She spends her spare time working closely with upgrading hams in the area and participates in teaching Novice classes.

Strays

I would like to get in touch with...

☐ anyone who has purchased surplus ACSSB boards from ARRL or who works with ACSSB technology and would like to assist others in getting their boards working. Maureen Thompson, c/o ARRL.

☐ anyone interested in starting a net on 3945 kHz (9 PM EST Mon through Fri) for Western Electric ops (Radicians) who worked on the DEW Line for WECO. Andy Sallet, W1TG, 10 Wellesley Rd, Nashua, NH 03062.

☐ anyone with instructions or information on the Hy-Gain HM-6 6-m halo antenna. Howard Kraus, K2UD, 372 Callodine Ave, Amherst, NY 14226.

***QST* congratulates...**

☐ Henry Bartsch, N1AK, of Rutland, Vermont, on receiving the 70th Anniversary Award from QCWA 2VP-1915 via Yankee Chapter 112.

☐ Curtis B. Thompson, WA6RLE, of San Jose, California, on being named Vice President and Group Executive—Components for Honeywell.

☐ Travis Marshall, W3HPS, of Bethesda, Maryland, on being named Senior Vice President, Director of Government Relations, for Motorola, Washington.

CATVI Field-Strength Measurements Made Easy

Turn your 2-meter transceiver into a field-strength meter—no modifications required!

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

Last month in *QST*, I reported on the current state of cable television interference (CATVI).[1] In this article, I will explain how to locate cable leaks and how to measure the severity of those leaks.

Locating the Leak

Cable leaks are not difficult for amateurs to track down. Any amateur who owns a 2-meter transceiver has the equipment needed to locate a cable that radiates. The faulty line segment or cable-system component can be pinpointed by watching for the highest S-meter reading in a suspected cable-leak area.

In many cases, a complete and accurate report to the cable company may be all that is needed to get a leak fixed. The report should include leakage locations (street addresses or utility pole numbers), areas affected, dates and circumstances surrounding the discovery of the leak(s), and field-strength measurements. A well-documented technical report increases the chance of resolving the problem. Any amateur suffering from CATVI who receives no cooperation from his local cable franchise should submit such a report to the joint National Cable Television Association (NCTA)/ARRL CATVI Committee.[2]

While amateurs can detect and identify cable leaks by using various fox-hunting techniques, most hams do not have access to the specialized equipment needed for making quantitative field-strength measurements. Professional field-strength measuring systems are designed to give accurate readings over wide frequency and signal-level ranges, making them prohibitively expensive. Amateurs, on the other hand, are primarily interested in one frequency, 145.25 MHz, and one field-strength measurement, 20 μV/m. This represents the maximum permissible electromagnetic field strength a cable may legally radiate, when measured 10 feet from it, provided the cable does not cause harmful interference to another radio service.

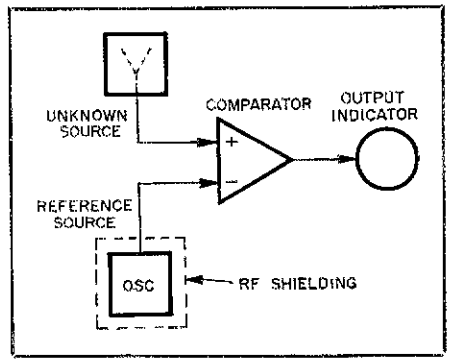


Fig 1—A basic FSM scheme. Output is binary (Hi/Lo, or on/off).

Developing a suitable field-strength meter is not a trivial task. Two approaches are presented here. The first gives insight into the nature of amateur field-strength measurements, while the second describes a tested and working prototype system.

Conventional Field-Strength Measurement Methods Approach

Fig 1 is the block diagram of a basic field-strength measuring (FSM) system. At its heart is a comparator that compares the signal strength of an incoming unknown source to that of a reference source. Whenever the unknown's level is different than the reference, it causes the comparator output to change. The output indicator may be as simple as an LED that glows whenever an unknown signal-source level exceeds the reference level.

In this network, it is assumed that the comparator is operating at RF—that is, the known and unknown sources both deliver RF signals to their respective comparator inputs. An alternative FSM system might first convert the unknown signal (from an antenna) to a dc voltage, and compare this to some reference dc voltage level. This reduces oscillator/RF circuitry, and eliminates the need for RF shielding between the reference and unknown source.

System Transfer Function

Regardless of the particular configuration used, the network's input-output transfer function must be known. Given this function, the voltage that will be delivered to the comparator when the antenna is immersed in an electromagnetic field of known intensity can then be determined. This is the most crucial and difficult part of designing an accurate FSM system because each component affects this mathematical input-output relationship to some degree. System modeling must be accurate. From the standpoint of FSM, the most important system parameters are those involving the antenna. These are also generally the hardest to obtain. Type of antenna used, directivity, gain and even polarization will affect the voltage a given electromagnetic field produces at the antenna terminals. Because of these variables, measurements are normally taken in the orientation that produces the maximum indication.

Aside from these theoretical concerns, an amateur FSM network must meet several practical requirements. It should be as simple as possible, easy to reproduce and inexpensive. An ideal way of satisfying these design criteria is to incorporate an

[1]Notes appear on page 46.

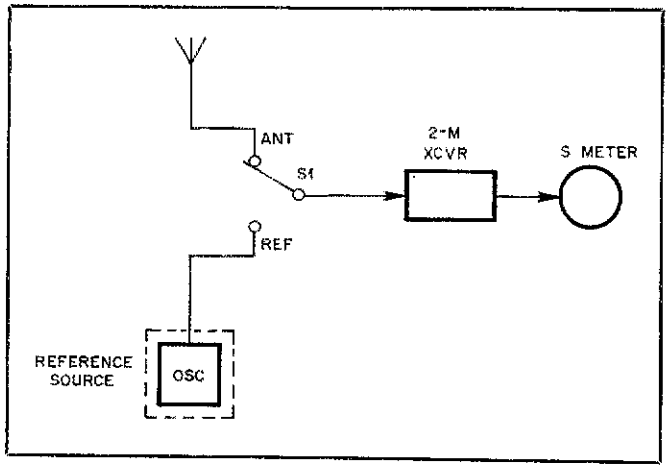


Fig 2—FSM circuitry can be reduced by integrating an existing 2-meter transceiver into the system. See text for discussion.

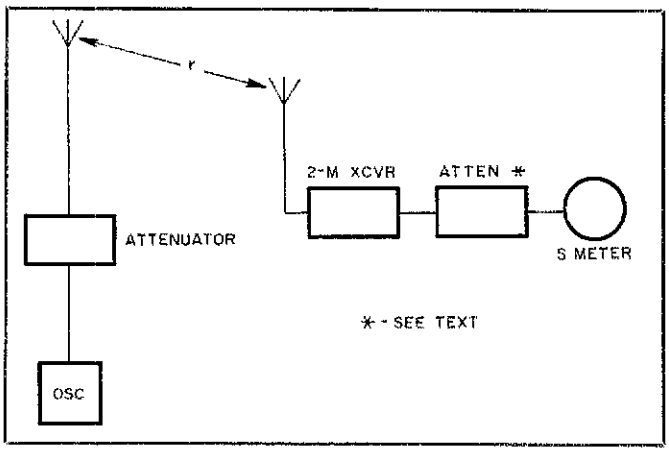


Fig 3—The "calibrated leak" approach. Any receiving antenna located a distance, r, away will be immersed in a calculable electromagnetic field.

existing 2-meter transceiver into the FSM system, rather than develop separate RF, IF and signal-detection circuits.

Adapting a transceiver to the system of Fig 1 results in the simple system of Fig 2. The only additional equipment required is S1, which switches between the antenna and the reference signal source. The "leakage threshold level" may be obtained by switching S1 to the REFerence position and observing the signal level on the S meter. Then, for detecting leakage, S1 is switched to the ANTenna position. In use, the antenna is placed 10 feet from a suspected illegal leak. Any S-meter reading that exceeds the reference level indicates a radiating cable.

The Hand-Held Transceiver Dilemma

Many of the new hand-held units are encased in a nonmetallic enclosure. This may protect its circuitry from mechanical shock, but offers little attenuation to RF energy. (This is the reason local repeaters can be heard quite well on a hand-held transceiver with no antenna attached.) From an FSM standpoint, such a "feature" invalidates the calibration process. RF may enter the receiver through either the antenna feed line or by way of conductive circuit-board traces and components that act as small antennas. The amount of RF contributed by each path is never a constant ratio, since the "stray" RF changes (in amplitude and phase) with instantaneous changes in hand-held transceiver orientation. Nothing short of installing the unit in a "suit of armor" will alleviate this problem. (Incidentally, this solution was tested, but made access to the speaker, volume- and squelch-control knobs inconvenient!)

An Alternative Approach

Instead of trying to make a calibrated FSM network that works with any cable leak, why not design a calibrated cable leak that will work with any transceiver? This approach (Fig 3) has many benefits. Here, the system transfer function has to be developed only for the transmitting antenna. An S-meter reading corresponding to this known electromagnetic field strength can then be read from a transceiver with its antenna located a measured distance away and its orientation varied for maximum S-meter reading.

System Details

This system requires three basic components—an RF signal source

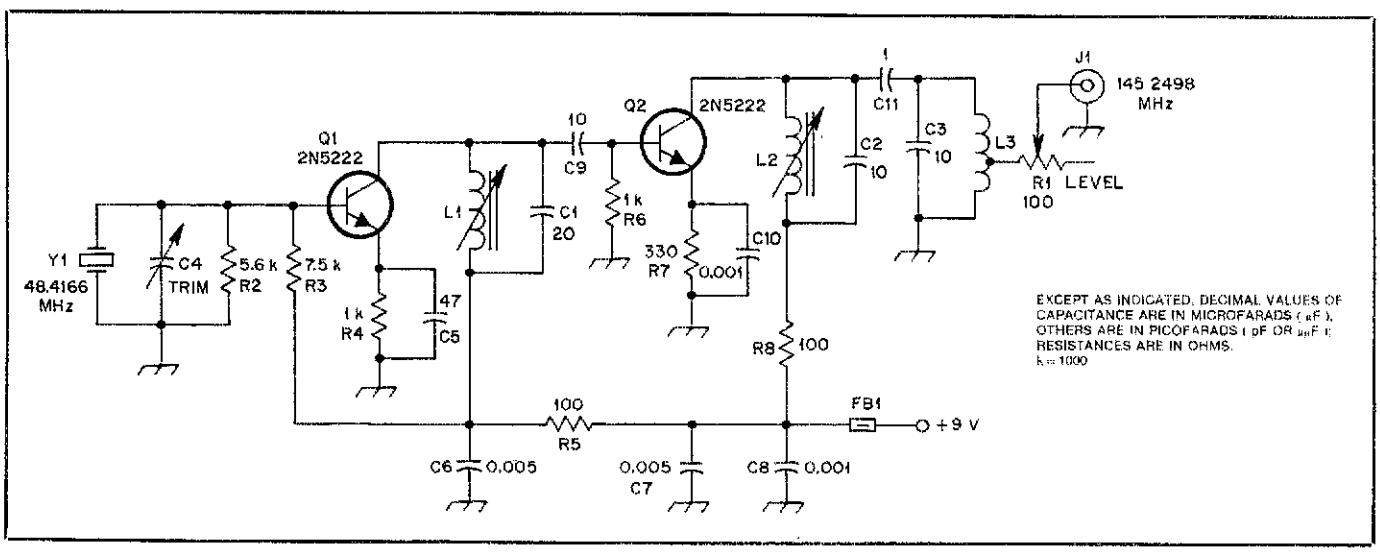


Fig 4—Schematic diagram of the oscillator.

C1—20 pF.
C2, C3—10 pF.
C4—3-20 pF ceramic trimmer.
J1—BNC connector.
L1—1.08 µH, slug-tuned.
L2—0.12 µH, slug-tuned.
L3—5t number 20 wire on ¼-in-diam coil form, tapped 2t from ground.
Q1, Q2—2N5222 (SK3246).
R1—100-ohm trimmer potentiometer.
Y1—48.4166-MHz crystal, 3rd-overtone type.

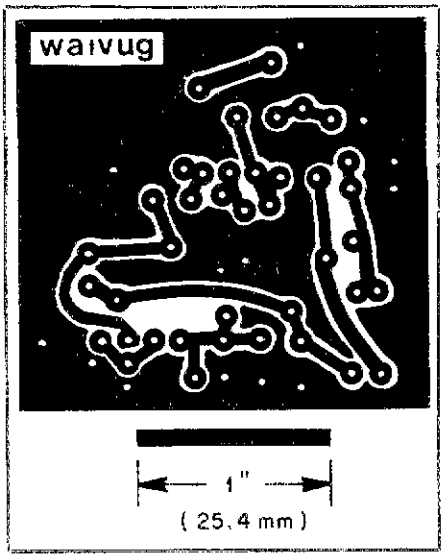


Fig 5—Full-size etching pattern for the oscillator.

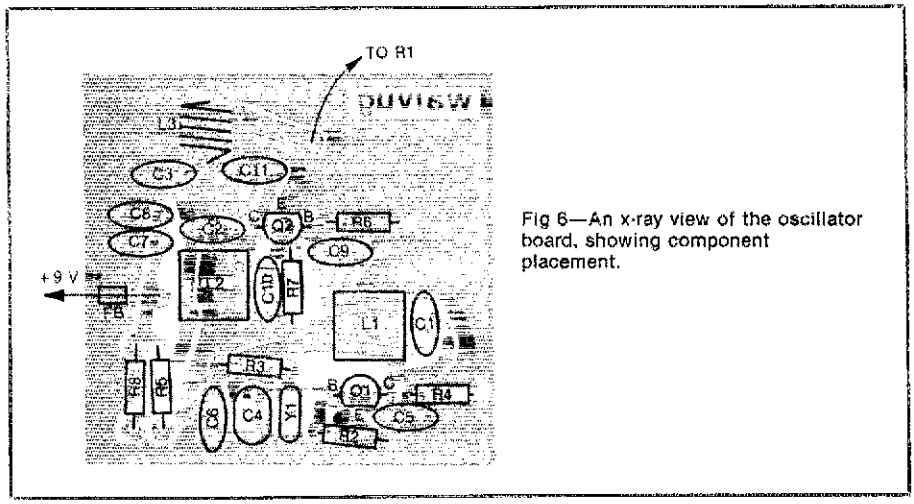


Fig 6—An x-ray view of the oscillator board, showing component placement.

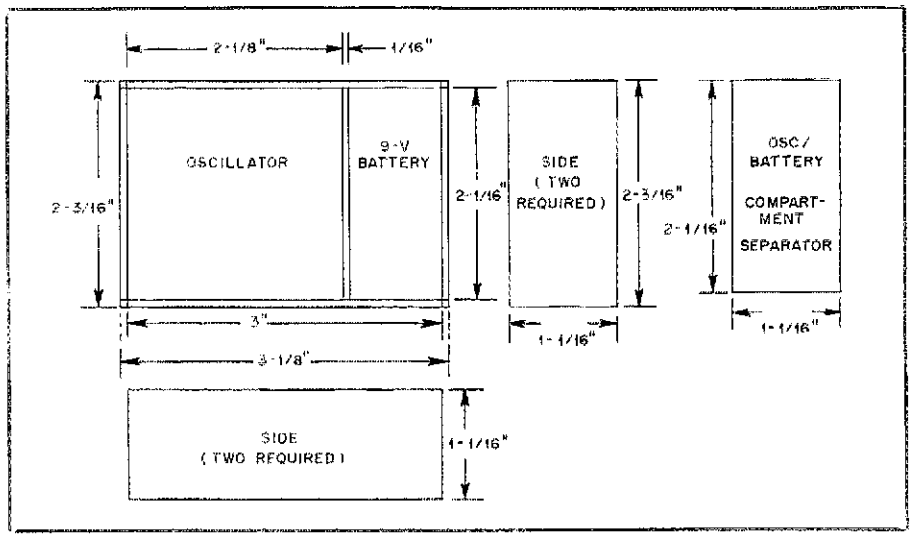


Fig 7—Oscillator enclosure dimensions. The top and bottom are copper mesh. See text for details.

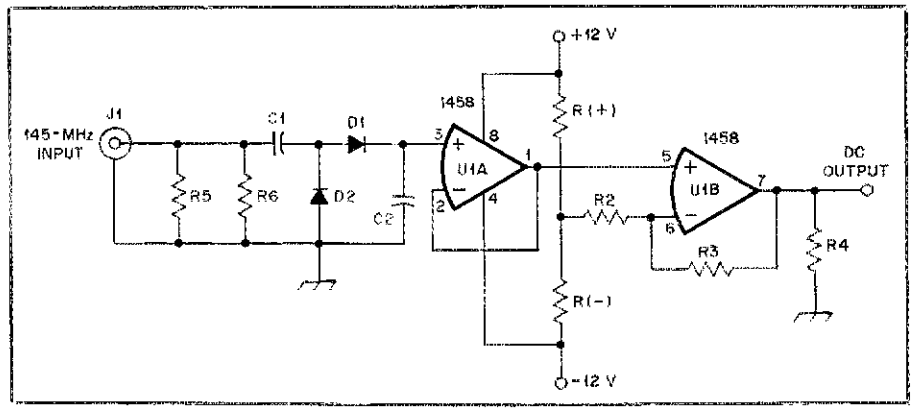


Fig 8—RF calibrator schematic diagram.
C1, C2—0.1 μF, 50 V.
D1, D2—Schottky barrier diodes.
J1—BNC connector.
R(+), R(−)—See text.
R2—2.2 kΩ, ¼ W.
R3—220 kΩ, ¼ W.
R4—5.1 kΩ, ¼ W.
R5, R6—100 ohm, ¼ W.
U1—Dual op-amp, 1458 (RS 276-038).

(oscillator), attenuators (to reduce the RF from the oscillator's practical level to some extremely small level), and the antenna (including the feed line). To obtain a transfer function, I chose the simplest antenna available—a λ/2 dipole. (A horizontal λ/2 dipole mounted at a 15-foot elevation best depicts a cable.) Aside from its straightforward geometry and basic electrical characteristics, it is simple to build and to feed.

The Field Strength Function

Since dipole field strength is a function of both power into the antenna and distance, r, from the antenna, I chose r = 10 feet. (This is the same distance used for actual field-strength measurements.) The equations leading to the system transfer function are presented at the end of the article. The results show that, in order to produce a field strength of 20 μV/m 10 feet from the antenna, a feedpoint signal level of −71 dBm is necessary. Since this power level is so low (−71 dBm = 75 pW = 75 μμW!), I decided to use a signal source that produces −11 dBm and attenuate the output by 60 dB. Oscillator, attenuators and antenna construction are considered separately.

Oscillator

Fig 4 shows the schematic diagram of the oscillator. Y1 is a 48.4166-MHz third-overtone crystal. C4 is the frequency-trimmer capacitor. Output from the oscillator stage (Q1) is applied to L1-C1, which resonates at 48.4166 MHz. Q2 provides amplification. L2-C2 tunes to the third overtone of the fundamental frequency, 145.25 MHz. L3 is used primarily for impedance matching. The tap point should be positioned to obtain maximum power output. R1 is a 100-ohm trimmer potentiometer used to fine-tune the output level to −11 dBm. It has a 10-dB attenuation range. A full-size etching pattern is presented in Fig 5. Double-sided copper-clad G10 epoxy circuit board should be used. Fig 6 shows component placement.

The oscillator is built in a box constructed from scrap double-sided circuit

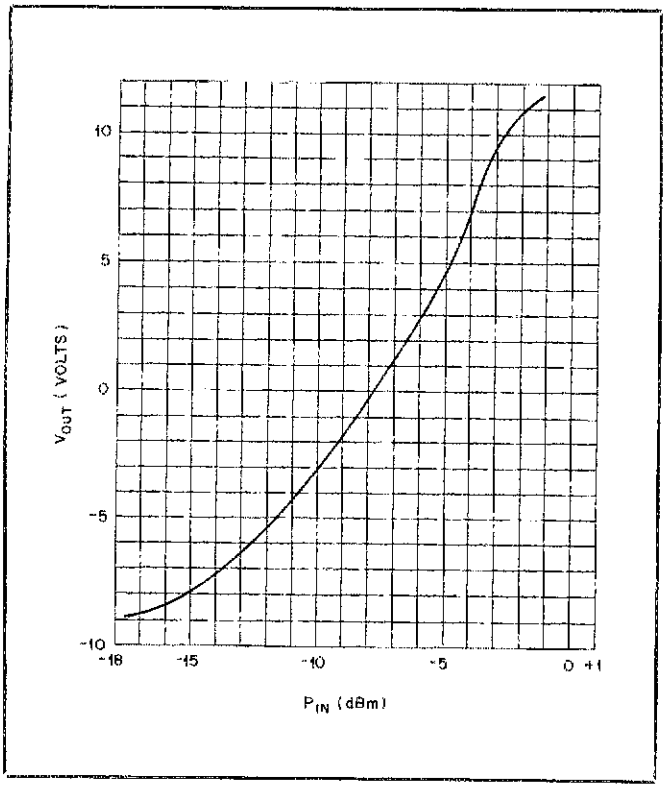


Fig 9—Input-output relationship for the RF calibrator of Fig 8.

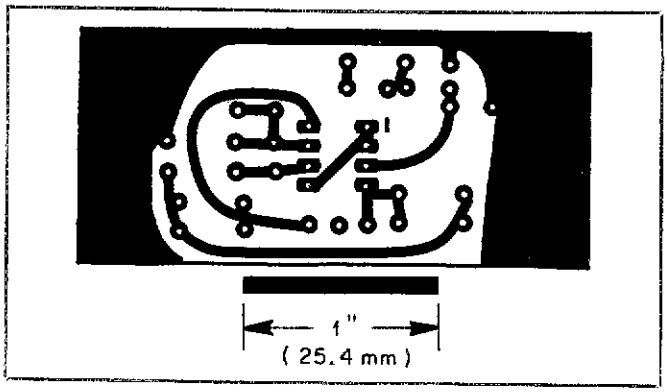


Fig 10—Full-size etching pattern for the RF calibrator.

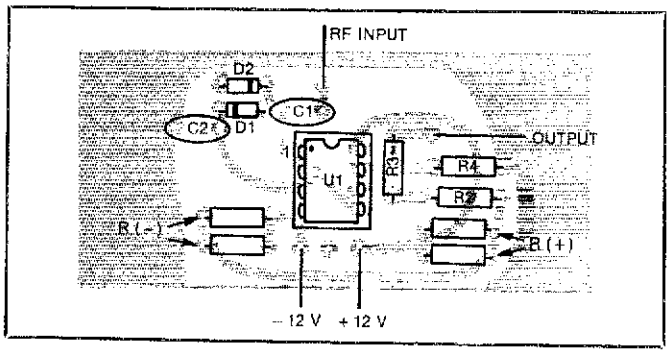


Fig 11—Parts-placement guide for the RF calibrator.

board (see Fig 7). Be sure to seal the four inner seams and the seams formed by the battery compartment with solder. The oscillator board is positioned about ¼ inch from the bottom of the box and soldered in place from above and below. The bottom of the box is copper mesh, which folds around the outer edges of the box for easy soldering access. Similarly, mesh is used for the top cover, but does not extend over to the battery compartment. Double-sided PC board serves as the battery compartment cover. To ensure that RF can only get out through the BNC antenna jack, place a ferrite bead on the +9-V battery lead where it enters the battery compartment. A standard alkaline battery provides 9 V for powering this circuit.

Calibration

Several methods may be used to set the oscillator output. The easiest way is to hook the oscillator to a spectrum analyzer and adjust for an output of −11 dBm at 145.25 MHz. Alternatively, an RF probe may be used; −11 dBm produces 61.4 mV RMS (86.8 mV peak) across 50 ohms.

If, however, your only troubleshooting or test equipment consists of a high-impedance voltmeter, the following RF calibrator may be used. (See Fig 8.) Two Schottky-barrier diodes and two capacitors form a voltage doubler/rectifier. These convert any incoming RF signal to a dc level and apply it to a high-input-impedance voltage follower (U1A). U1B is a noninverting voltage amplifier. When properly aligned, this circuit produces a −9 to +11 V output for input levels between −18 and −2 dBm.

Construction

Use only the Schottky-barrier diodes specified or another diode with similar transfer characteristics. Any others will cause a significant variation from the input-output relationship shown in Fig 9. Fig 10 is a full-size etching pattern for the calibrator. Use double-sided, copper-clad G10 epoxy circuit board. Fig 11 shows parts placement.

Use a socket for U1. It keeps heat from damaging the IC and will make replacement easy, if necessary. Install R2, R3 and R4 as shown. Similarly, install C1 and C2. Mount the BNC connector on an upright piece of double-sided PC board and solder this board to the main board as shown in Fig 12. Side plates add structural support. R5 and R6 are soldered between the center pin of the BNC connector and the upper ground plane of the main board. D1 and D2 are soldered last. Use the minimum heat necessary.

For alignment, connect the wiper of a 10-kΩ potentiometer to pin 3 of U1 and the ends across to ±12 V. Turn the potentiometer to the center of its range. This is the *dc input level simulator*. Next, solder 1.5-kΩ resistors to each end of a 1-kΩ potentiometer. This is the *output level adjust* potentiometer. Attach the free ends to ±12 V and the wiper to the unterminated end of R2 (see Fig 13). Now, apply ±12 V, being sure to observe correct polarity. Watch the voltage on U1 pin 3. Adjust the dc input-level simulator for 0 V. Similarly, connect the voltmeter to U1 pin 7 and turn the output level adjust potentiometer for 0 V or ground.

The next procedure ensures that the voltage gain, A_v, is 60. First, connect the voltmeter to U1 pin 3 and adjust the dc input-level simulator for a voltage between +80 and +250 mV. Record this value and the corresponding output voltage (U1 pin 7). Repeat for a negative voltage. Voltage gain, A_v, is computed from A_v = voltage$_{out}$/voltage$_{in}$. For example, if the output is +7 V with +80 mV applied, the gain is 7/0.08 = 87.5. Compute the average of the two measurements [$\bar{A}_v = A_v(+) + A_v(-)/2$]. If $\bar{A}_v$ is greater than 60, reduce the R3/R2 ratio. Likewise, if the gain is less than 60, increase R3/R2. Next, remove the dc input-level simulator and temporarily ground U1 pin 3. Adjust the output level adjust potentiometer for −9.0 V at U1 pin 7. Carefully remove the 1-kΩ potentiometer with the two resistors attached, noting which resistor was connected to +12 V. Measure the resistance between this resistor's free end and the wiper. This represents R(+). Record this value, and repeat for the other resistor to obtain R(−). Choose a single- or parallel-combination of ¼-W resistors that yield R(+) and R(−) and solder as shown in the parts-placement guide. Let the resistors cool and verify that the output (U1 pin 7) is −9.0 V with the input (U1 pin 3)

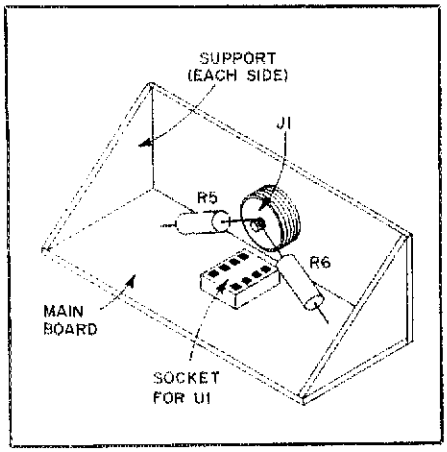


Fig 12—RF calibrator construction detail. See text.

grounded. This completes alignment.

Power Measurements

As shown in Fig 9, the RF calibrator's output will be −4.5 V when the oscillator delivers −11 dBm. Connect the output of the oscillator to the RF calibrator, apply ±12 V, and observe the output voltage (U1 pin 7). Adjust the oscillator's output attenuator (R1) to obtain −4.5 V. This completes calibration.

The Antenna

The antenna chosen for the FSM system is a λ/2 dipole. This type was chosen for its reproducibility and the relative ease by which its performance may be mathematically modeled and later verified in the field.

The prototype, constructed from 1/8-inch-diameter aluminum rod, has an overall length of 3 feet 2½ inches; 50-ohm coaxial feed (RG-158) is used. The balun consists of seven tightly coiled turns of feed line 3 inches from the antenna feedpoint. Experimental results indicated that the pattern produced by this antenna is truly bidirectional. Measured SWR is 1.7:1. The antenna elements mount in a Plexiglas® block, which in turn mounts vertically to a section of PVC pipe. This provides a convenient, nonmetallic mounting system for field use.

Attenuators

A 60-dB attenuator is needed to bring the −11 dBm oscillator output level down to the −71 dBm required at the antenna terminals. Such a large amount of attenuation also ensures that no reflected RF (because of antenna or feed-line mismatch) gets back to the oscillator. The attenuators are constructed from information given in *The 1986 ARRL Handbook*.[3] Two identical 30-dB pi-network attenuators were constructed in individual double-sided copper-clad PC-board enclosures. BNC connectors were installed at each end. Measured attenuation at 145.25 MHz was 30 ±1 dB.

RG-158 is used to interconnect the oscillator, attenuators and antenna. Since the system requires less than 8 feet of coaxial cable, feed-line attenuation is assumed to be negligible.

Using the System

The accuracy of my prototype network was checked using a professional FSM system with calibration traceable to the National Bureau of Standards (NBS). Field strength, measured 10 feet from the antenna, *was* 20 μV/m!

If you duplicate this system carefully, I'm confident you'll get the same results. It's important, however, to remember that *any* objects near the antenna will influence the field pattern.

Best results are obtained in large, open areas—a sports field or empty parking lot are fine locations. Accurately measure and mark a 10-foot-radius circle near the middle of the field. Position the calibrated "leaky cable" in the center. Turn on the oscillator and position the antenna of the transceiver requiring calibration at the 10-foot-radius marking. (Anyone not directly involved with the calibration process should stand at least 100 feet away.) When this S-meter reading has been recorded, any remaining transceivers may be calibrated in the same way. With some transceivers, an attenuator may be needed between the antenna and the unit to obtain midscale deflection. Happy hunting!

Special thanks to ARRL Lab Supervisor Phil Accardi, AJ1N. His technical assistance made this project possible.

Calculations[4]

The electric field produced by a dipole antenna is given by:

$$E_o = \frac{\sqrt{49.2\ P_t}}{R} \qquad \text{(Eq 1)}$$

where

E_o = field strength (volts/meter)
P_t = power transmitter (watts)
R = distance to measurement points (meters)

Rearranging the equation, we get:

$$P_t = \frac{E_o^2 R^2}{49.2}$$

For E_o = 20 μV/m
R = 3.048 m (10 feet)

$$P_t = \frac{(20 \times 10^{-6})^2 \times (3.048)^2}{49.2}$$

$$= 7.54 \times 10^{-11} \text{ watts}$$

This value is equal to −71 dBm and represents the power that must be applied to the transmitting dipole to produce a 20-μV/m field 10 feet away.

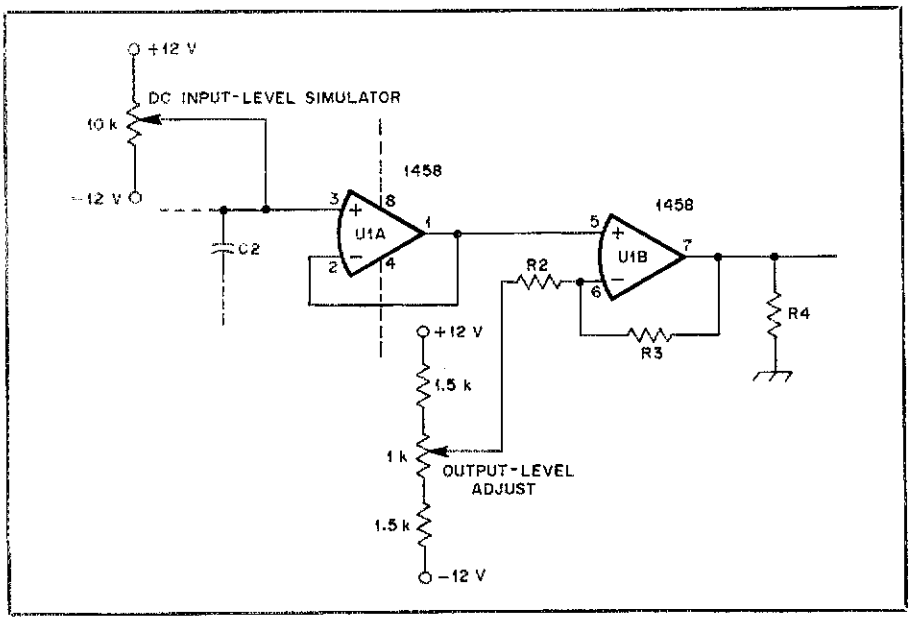


Fig 13—RF calibrator alignment detail.

Notes

[1]G. Bonaguide, "Cable Television Interference: 1986," *QST*, Jan 1986, p 33.
[2]CATVI reporting forms are available from the ARRL. Write to CATVI Desk, c/o ARRL, 225 Main St, Newington, CT 06111.
[3]See p 25-44 of *The 1986 ARRL Handbook*. Table 6 lists 50-ohm, pi-network resistive attenuators.
[4]For further information, refer to *Antenna Theory, Analysis and Design*, by Constantine A. Balanis, Harper & Row, NY, 1982.

Conducted By Bruce O. Williams, WA6IVC
Assistant Technical Editor

Trio-Kenwood Communications TS-940S HF Transceiver

What a radio! This feature-packed box is Kenwood's newest state-of-the-art transceiver and their showpiece. Here, in one package, you will find a high-performance, general-coverage receiver; a 250-W input, solid-state, broadband transmitter; a sturdy power supply; lots of "bells and whistles" and even an optional all-band, automatic antenna-matching network.

There is more to say about the TS-940S than available space will allow. For that reason, this review will highlight some of the unique features of this radio and compare it to the TS-930S (see January 1984 *QST*).

Trio-Kenwood TS-940S Transceiver, Serial No. 51110330

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Transmitter frequency range: 160 m, 1.8-2.0 MHz; 80 m, 3.5-4.0 MHz; 40 m, 7.0-7.3 MHz; 30 m, 10.1-10.15 MHz; 17 m, 18.068-18.168 MHz; 15 m, 21.0-21.45 MHz; 12 m, 24.89-24.99 MHz; 10 m, 28.0-29.7 MHz.	As specified.
Receiver frequency range: 150 kHz-30.0 MHz.	As specified.
Modes of operation: A3J (USB, LSB) A1 (CW), F1 (FSK), A3 (AM), F3 (FM).	As specified.
Frequency display: Large fluorescent-tube digital main display and LCD dot-matrix 16-digit sub-display.	As specified.
Frequency resolution: 10 Hz	As specified.
Frequency stability: 10 PPM	Not measured.
Transmitter:	*Transmitter Dynamic Testing*
Power input: 250-W PEP (160-10 m bands, SSB, CW, FSK, FM); 140-W (AM).	Power output (CW): 160 m, 118 W; 80 m, 120 W; 40 m, 120 W; 30 m, 116 W; 20 m, 120 W; 17 m, 118 W; 15 m, 117 W; 12 m, 115 W; 10 m, 118 W.
Spurious signal and harmonic suppression: −40 dB or less (in CW).	−54 dB. See Fig 1.
Third-order intermodulation distortion: −37 dB or less (single-tone input).	−37 dB. See Fig 2.
CW keying waveform: Not specified.	See Fig 3.
Receiver:	*Receiver Dynamic Testing*
Receiver sensitivity: 10-dB S/N −14 dBμ (0.2 μV) or less in SSB, CW and FSK; 10-dB S/N 6 dBμ (2 μV) AM; 12 dB signal + noise + distortion/signal + noise, −6 dBμ (0.5 μV) or less in FM.	Minimum discernible signal (noise floor) (dBm): *80 m* *20 m* −140 −139
Receiver dynamic range: Not specified.	Blocking dynamic range (dB): *80 m* *20 m* 141 138 Two-tone, third-order intermodulation distortion dynamic range (dB): *80 m* *20 m* 93 97 Third-order input intercept (dBm): *80 m* *20 m* −0.5 +6.5
Receiver recovery time:	Receiver quieting (μV for 12-dB signal + noise + distortion/signal + distortion): 0.3 μV at 29.6 MHz.
Squelch sensitivity: −10 dBμ (0.32 μV) or less.	See Fig 4.
Receiver audio output at 10% total harmonic distortion: 1.5 W.	Min 0.13 μV, max 1.1 μV.
Color: Brown.	As specified.
Size (HWD): 7.5 × 15.4 × 16.0 in.	
Weight: 68 lb.	

Frequency Control

Like the '930, the '940 employs a push-button band switch. There is a button for each ham band from 160 to 10 meters, including the WARC bands. A pair of buttons, located immediately below these, allow UP/DOWN tuning in 1-MHz frequency steps. The 10 band switches in the '940 serve a second purpose. They can also be used to enter a frequency directly into the selected VFO. This is a handy feature indeed.

The A/B push button is used to select between the two VFOs that control the frequency synthesizer. The SPLIT push button allows split operation. The T-F SET button allows selection of transmit frequency during split operation. The A=B switch brings the unused VFO to the frequency in use. Rotating the weighted VFO knob at normal tuning speeds shifts the frequency in 10-Hz steps, or 10 kHz per VFO knob revolution. Turning the knob faster (over 5.5 to 6 rev/s), increases the frequency step rate proportionally.

If you like memories, you'll love the '940. Here you will find four switch-selected banks of 10 memories each. That's right—40 of your favorite frequencies ready for rapid recall. (A big increase over the 8 memories—16 if you make a modification—of the '930.) The bank switch is located inside a door in the top cover, so you'll want to organize memory contents into the four banks in a logical manner, like favorite nets in one bank, shortwave and standard BC stations in another, and so forth.

Each memory location contains both a frequency and a mode. This is possible because the mode is selected electronically by means of push buttons located to the left of the VFO knob. An annunciator indicates the mode selected by an audio signal—the international Morse code for the first letter of the mode (C for CW, A for AM, etc). Under the top cover is a switch that selects either 100- or 10-Hz resolution on the white digital frequency display. Beneath the digital display is an analog display with a red pointer to track tuning up and down the band. Another switch selects a pointer range of 1000 or 100 kHz.

The two digits to the right of the main frequency display show the RIT/XIT offset in 100-Hz increments. That's right—XIT has been added in the '940. The RIT/XIT range is a full ±9.9 kHz, and there is no conventional "center off" position. Instead, the

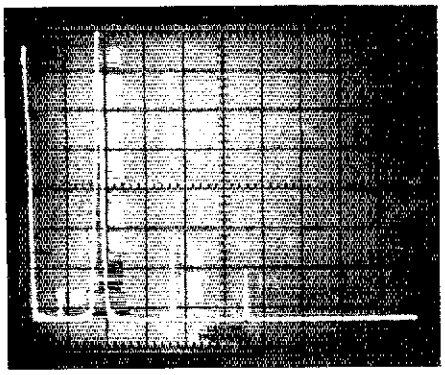


Fig 1—Worst-case spectral display of the TS-940S operating on the 160-m band. Vertical divisions are each 10 dB; horizontal divisions are each 1 MHz. Output power is approximately 100 W at a frequency of 1.85 MHz. All spurious emissions are at least 54 dB below peak fundamental output. The TS-940S complies with current FCC specifications for spectral purity.

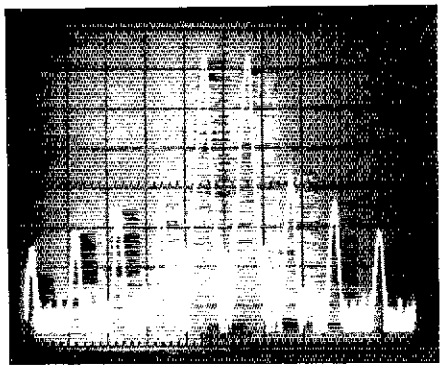


Fig 2—Spectral display of the TS-940S output during transmitter two-tone intermodulation distortion (IMD) test. Third-order products are 37 dB below PEP, and fifth-order products are 43 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The TS-940S was being operated at rated input power on the 20-m band.

CLEAR switch returns the offset to zero.

A unique green multipurpose subdisplay located to the right of the main display shows a clock, a graphical representation of the receiver bandpass characteristics, or frequencies contained in the VFOs or the selected memory bank. The clock function in the '940 includes a timer that can be used to turn the transceiver on and off at predetermined times.

Kenwood has even thought of the vision-impaired ham. An optional voice-synthesizer unit can be mounted inside the cabinet. The synthesizer announces the main display frequency on demand (pressing the VOICE push button). The review unit did not include this feature.

Receiver

The '940 features a quadruple-conversion receiver in SSB, CW, AM and FSK modes, and triple conversion in the FM mode. The first IF is at 45.05 MHz, the second at 8.83 MHz, the third at 455 kHz and the fourth at 100 kHz. An FM discriminator is fed from the 455-kHz IF output of the third mixer. The receiver lives up to Kenwood's fine reputation for producing high-dynamic-range receivers.

As with the '930, two noise blankers are included. The first, with a threshold control, is effective against pulse-type noise. The second is for pulses of a longer duration, such as those annoying woodpecker (over-the-horizon radar) pulses. Both blankers work effectively, but blankers can degrade receiver performance under high-level signal conditions. Judicious use of the NB LEVEL and RF ATTenuator controls will get rid of the noise while keeping overload problems to a minimum.

Several optional filters are available for the '940. There is a 6-kHz (AM) second IF filter, and 500-Hz, CW filters for the second and third IFs, and a 250-Hz filter for the third IF. The CW VBT control is a continuously variable bandwidth tuning control that may be used to tighten up CW selectivity. Used with the wide (SSB) filters, the VBT varies the bandwidth from 2.7 kHz down to 600 Hz. With either or both 500-Hz CW filters installed, the VBT range is 500 to 150 Hz. VBT is especially handy for those times when the narrow filter is too much and the wide filter is not enough. In fact, the casual CW operator may never need the selectivity afforded by the optional CW filters.

In addition to IF filtering, the '940 incorporates an effective audio filter. The AF TUNE circuit controls a peak-type audio filter with an 800-Hz center frequency, adjustable ±400 Hz. This filter is useful for reducing unwanted signals and noise.

Perhaps the most important feature for the CW operator is the PITCH control. The normal CW offset is 800 Hz. For those operators who prefer to listen to a different note, the PITCH control simultaneously shifts the IF passband, the received beat frequency *and* the sidetone pitch.

For the SSB operator, the SSB SLOPE TUNE controls (HIGH CUT and LOW CUT) allow independent adjustment of the high and/or low frequency slopes of the IF passband. These controls help cut interference from stations higher or lower in frequency. In addition, the NOTCH filter (also useful on CW) helps cut carriers or SSB QRM.

Transmitter

Kenwood chose a pair of rugged Motorola MRF-422 transistors, each capable of dissipating 290 W, for the final amplifiers. The finals operate at 28-V dc, and the net result is a clean, cool-running transmitter. Output power is at least 100 W on all bands. The transmitter is broadbanded, and no tuning is required. Internal protection circuitry reduces transmitter output if the load SWR is greater than about 2:1. Two quiet cooling fans, one for the final amplifier heat sink and one for the power supply, automatically activate when heat sink temperatures rise and shut off after the temperatures fall below set levels.

The review '940 contained the optional AT-940 automatic antenna-matching network. This T-network uses relay-switched inductors as well as two motor-driven variable capacitors. According to the manual, it is capable of matching antenna impedances from 20 to 150 ohms. The AT-940 works on all amateur bands—and that includes 160 meters!

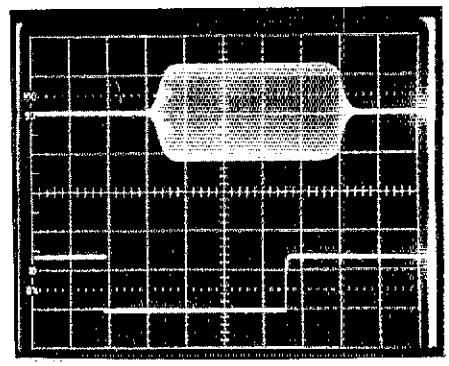


Fig 3—CW keying waveform of the TS-940S. The lower trace is the actual key closure; the upper trace is the RF envelope. Each horizontal division is 5 ms.

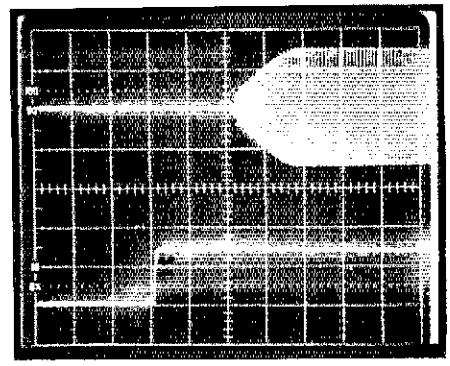


Fig 4—Receiver recovery (turnaround) time. The lower trace shows the key opening; the upper trace shows receiver audio output. Horizontal divisions are each 10 ms. There is an approximate 20-ms delay before receiver recovery.

Full-break-in CW, that is real QSK, is another feature of the '940. Proper sequencing is assured by CMOS logic circuitry, and reed relays provide nearly silent operation. Receiver AGC action is smooth with no annoying pops or thumps.

The built-in speech processor gives punch to the transmitted voice signal. I particularly appreciate the facilities for properly adjusting the processor. Use headphones and operate the MONI switch so that you can hear the audio signal as it will be transmitted. With the METER switch in the COMP position, adjust the PROCESSOR IN control for about midscale deflection as you speak into the microphone. Next, place the switch in the ALC position and adjust the PROCESSOR OUT control for mid-scale deflection as before.

Operation

To operate the controls of the '940 is to realize that this is a quality piece of equipment. All controls have the firm but smooth feeling that you expect from Kenwood. Panel layout is well done, making the rig very easy to use.

The features of this radio make sense—they work and they perform useful functions. Especially useful are all the QRM fighters. Accessories are easily added if desired, be they transverters or a Beverage antenna for receiving.

The manual covers what you need to know in plain, easy-to-understand language, and it is profusely illustrated. It is very well done, and especially useful for the beginner. The only shortcoming I found is a lack of connection details for the ACC1 jack.

In normal operation, I found the XIT to be particularly useful and easier to use than operating split with two VFOs. Variable-speed tuning makes rapid QSYs within a band faster. These and many other features make this a significant improvement over the '930. As in the '930, synthesizer switching transients can be heard when tuning the band at a moderate-to-fast rate. These "pops" are particularly annoying when tuning across a nearly dead band.

In my opinion, Kenwood has come up with another winner in the '940. If you are thinking about buying a state-of-the-art transceiver, you should check this one out. Manufacturer: Trio-Kenwood Communications, 1111 West Walnut St, Compton, CA 90220. Price class: TS-940S with AT-940 antenna tuner, $2000; YK-88A-1 6-kHz AM filter, $60; YK-88C-1 500-Hz filter for 8.8-kHz IF, $70; YG-455-1 500-Hz CW filter for 455-kHz IF, $100; YG-455CN-1 250-Hz CW filter for 455-kHz IF, $120; VS-1 voice synthesizer unit, $40. —*Chuck Hutchinson, K8CH*

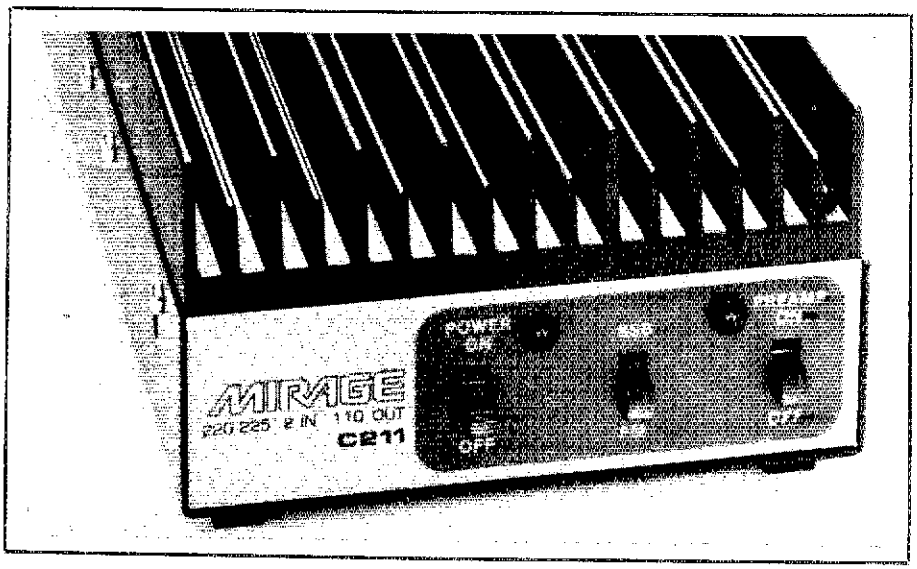
MIRAGE COMMUNICATIONS C211 220-MHz AMPLIFIER

With all the concern these days about the Amateur Radio Service keeping the allocation at 220 MHz, it's only right that we get on the band and use it. From an operator's viewpoint, it's a great band—the DX-communications possibilities are approximately the same as on 2 meters, and in many areas, the repeater segment is much less crowded. Several persistent amateurs have earned WAS and VUCC on the band. Commercial equipment for 220 MHz is not nearly as plentiful as for other bands because the market is much smaller; only North American amateurs are blessed with an allocation here. The lack of commercial equipment, especially for SSB and CW, is part of our 220-MHz population problem.

Enter Mirage Communications, a major manufacturer of VHF and UHF accessory equipment. Mirage markets several power amplifiers that are of interest to amateurs active on 220 MHz; the newest is the C211. This amplifier features 110-W output for just over 1-W drive and a preamp for the receiver. TR switching with a variable delay for SSB is standard. Like most other Mirage power amplifiers, the C211 may be used with the optional remote-control head (model RC-1), which duplicates the front-panel controls.

Circuit Highlights

There are three switches and two LED pilot lights on the front panel. The POWER ON/OFF switch controls the power amplifier. The PREAMP ON/OFF switch controls the preamplifier. The power amplifier and preamplifier may be used simultaneously or separately, as operating conditions dictate, and the two LEDs indicate the POWER ON condition of each. The SSB/FM switch controls the TR time delay. The rear panel is equally straightforward. There are two SO-239 connectors for input and output, a phono jack for TR control, a six-pin Molex connector for the RC-1 and two heavy wires for dc power. A 35-A fuse is provided in the dc power line. The cover must be removed to replace this fuse.



Mirage Communications C211 220-MHz Amplifier, Serial No. 018-384

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 220 to 225 MHz.	As specified.
Modes of operation: FM, SSB and CW.	As specified.
Power output: 110 W or more for 2-W input.	94 W for 0.8-W drive;
Input power 0.2 to 4 W.	110 W for 1.2-W drive.
Spurious signal and harmonic suppression:	
Not specified.	See Fig 5.
Receive preamplifier: 10-dB gain with 2.5-dB (±0.5 dB) noise figure.	9-dB gain. NF not measured.
Power requirements: 13.6-V dc at 18-20 A, nominal.	13.6-V dc at 19.5 A at 110-W output.
Size (height, width, depth): 3 × 5.5 × 12 in.	
Weight: 5 lb.	

The C211 is always biased for linear operation, even when the front-panel switch is set for FM. The only difference between the SSB and FM mode settings is the TR relay drop-out time delay. The relay drops out instantly in FM, but drop-out time may be set for anywhere between a few milliseconds and about 1.5 seconds for VOX SSB operation. This delay adjustment is made through a hole in the left side of the cover, behind the front panel.

Two stages of power amplification are used to get from the 2-W level up to the 110-W output. The first stage uses an MRF240A, while the second stage uses a pair of SRF2838 transistors. The preamp uses a U309 FET. All components are mounted on a PC board that is bolted to the hefty heat sink that forms the top of the amplifier. A built-in thermostat shuts off the C211 if the heat-sink temperature reaches 170°F; it will not come back on until the heat-sink temperature drops below 140°F.

It is important to note that the C211 manual cautions that input power must not exceed 4 W. Higher power may damage the driver transistor and will void the warranty. If your rig has more than 4-W output and no reliable means of controlling the power output, you should choose another power amplifier with higher drive requirements. The manual also states that the antenna should be matched to an SWR of 1.5:1 or better. Higher SWR will not damage the amplifier, but it will degrade performance.

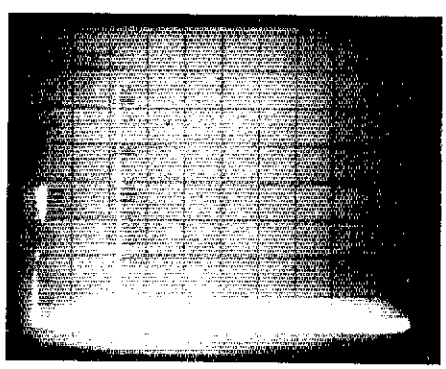


Fig 5—Worst-case spectral display of the Mirage C211 amplifier. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 110 W at 220 MHz. The fundamental (pip at the left of the photo) has been reduced in amplitude approximately 14 dB by means of a notch filter to prevent spectrum-analyzer overload. All harmonics and spurious emissions are at least 68 dB below peak fundamental output. The C211 complies with current FCC specifications for spectral purity.

RF-sensed switching is standard. Whenever approximately 0.2 W, or more, of RF drive is applied to the RADIO (input) jack on the

rear panel, the amplifier automatically switches into transmit. The phono jack on the rear panel provides a means of "hard wiring" the antenna relay to control it from the transmitter. Grounding the center pin of this phono jack places the amplifier in transmit.

Hookup and Operation

The C211 requires approximately 20 A at 13.6-V dc, so Mirage recommends using no. 8 wire between the amplifier and the power source. If possible, the wires coming out of the back of the amplifier should be connected directly to the battery or ac-operated power supply.

I had the opportunity to use the C211 on both FM and SSB/CW. For FM operation, the C211 was the perfect companion for an IC-3AT hand-held transceiver. The difference between 2 W or so from a hand-held radio and the 110 W from the amplifier is stunning. There's no comparison between what is workable with the C211 in the line and out of the line.

On the low end of the band, I used the C211 with a homemade transmit converter that delivers about 1 W in linear operation. The 1 W from the transmit converter is enough to drive the C211 to nearly full output. With this setup, an Advanced Receiver Research high-performance receive converter, and a long Yagi at a height of 100 feet, I was able to work stations throughout the first three call areas and VE3. I found that I can work the same range on 220 as I can on 2 meters with a similar setup.

The C211 is a solid piece of equipment that fills a need on a band where commercial equipment is scarce. If you have an FM transceiver that needs a boost, it's worth considering. If you're into homemade SSB/CW equipment, then the C211 can save you from building a 1-W to 10-W stage to get your signal up to the drive requirements of most other commercial power amplifiers.

Mirage offers a 5-year warranty on the C211 (except for power transistors which are warranted for one year). Price class: $315. Manufacturer: Mirage Communications Equipment, Inc, P O Box 1000, Morgan Hill, CA 95037, tel 408-779-7363.—*Mark J. Wilson, AA2Z*

(continued from page 9)

think of that," the amateur replied. "Shouldn't anyone who reaches for a telephone," the staffer went on, "have an expectation of privacy?" So far as ARRL can tell—and we heard this story independently from both parties to it!—all the concerns about amateur phone patches being affected by the bill arise solely from this incident. The ARRL's preliminary testimony drawn up by ARRL's counsel dwells heavily on the fact that Amateur Radio is a gigantic "party line" with 1.5 million participants worldwide; thus, there has never been an expectation of privacy. Moreover, since no communications relating to anyone's business activities can be handled by Amateur Radio, there is no unmet need for an expectation of privacy here.

- The House subcommittee staff is purposefully reaching out to all sectors who may wish to comment on the bill—for or against. The House hearing at which ARRL was scheduled to be a witness was canceled—but for reasons totally unrelated to H.R. 3378. The chairman of the parent Judiciary Committee preempted the time for a full committee meeting on a political issue, and all members were required to attend. The hearing may have been rescheduled by the time you read this; January 29 or 30 seems a likely date.
- The Senate subcommittee has been working with the Department of Justice on some of its concerns about the draft language. There may or may not be another hearing on that side; in any case, those groups who have expressed an interest will be given a chance to comment on amended language.
- Finally, on both sides of the Hill, drafters thought they were leaving Amateur Radio totally out of the bill. ARRL has been assured that the point will be made clear either in report language or through text changes to make this plain.

Summing up, amateurs are right to be concerned about any bill of this type, to follow its progress closely and, should it take a turn in a harmful direction or should it impact on some other phase of their lives, to contact their own Representatives and Senators. But is there need for collective panic in re S.1667 and H.R. 3378? In ARRL's view, no.—*Perry Williams, W1UED*

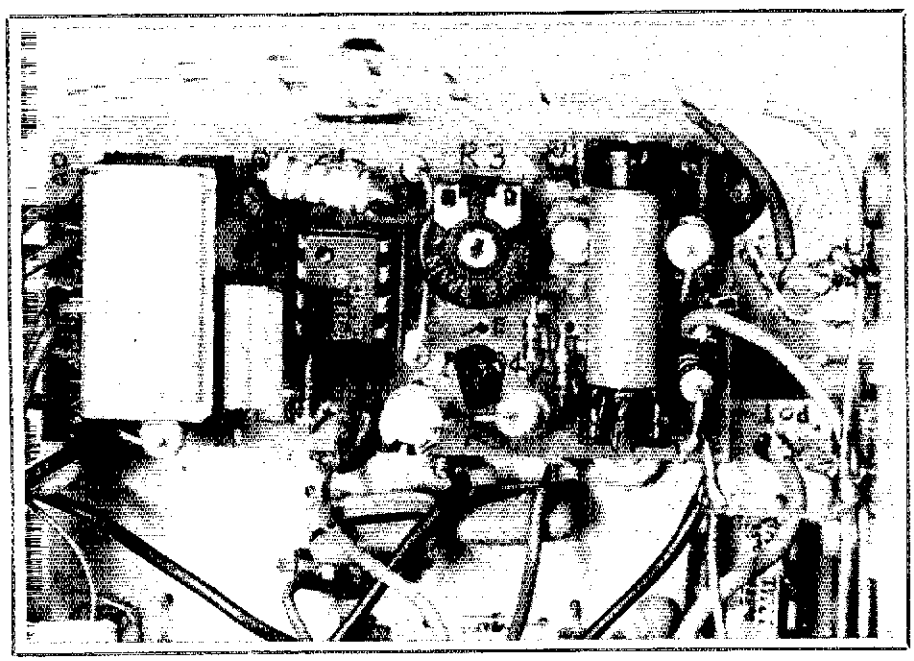


Fig 4—UNKEMO installed in a Ten-Tec keyer.

(continued from page 28)

board that measures 1.1 × 2.3 inches and mounted it inside my keyer (Figs 3 and 4).[1] All components are available from Radio Shack. Nothing is critical—the only adjustment is the time-delay resistor, R3. Once you have it set, put the lid back on your keyer and you're ready to go.

Conclusions

Since I really didn't do anything to my keyer, there's not much to conclude, except that in the course of designing the UNKEMO I discovered who Mr. Kirchhoff is. Even if you don't build the UNKEMO, look up Mr. Kirchhoff in *The ARRL Handbook*. It will brighten your day.

[1]For instructions on how I build and use this type of printed-circuit board, refer to "The Super ACadapt," *QST*, Dec 1985, pp 25-28.

Hints and Kinks

Conducted By Bob Schetgen, KU7G
Assistant Technical Editor

AGC AND RF-GAIN CONTROLS FOR THE TEN-TEC ARGOSY

☐ I have met many users of the Ten-Tec Argosy transceiver on the air and, while all agree the rig is a fine performer, most wish it had an RF-gain control. Since the Argosy operates QSK and uses only AGC to set the RF gain, the noise between dots and dashes can be quite raucous, as the receiver gain is wide open until the AGC takes control. My outboard RF-gain control requires absolutely no surgery to the rig and is within the ability of nearly anyone; the only disassembly required is removal of the top cover.

The circuit in Fig 1 applies an adjustable voltage to pin 5 of U1 (MC1350), which is the AGC input. It controls RF gain in the same fashion as the AGC and has no effect on normal AGC operation. S-meter readings decrease along with the RF gain. Place the outboard control on any breadboard, box or what have you. Connect the control to the transceiver by passing wires through the centers of the rivets that secure the phono-jack panel to the transceiver rear panel. The ground wire of the new control is connected to the ground wire of the jacks, just inside the '525 rear panel. Obtain + 12-V dc in the same manner from the 12-V AUX jack inside the rear panel.

To make the control lead, slip a ferrite bead over the diode lead (cathode), and form the shortest hook with which you can work. Solder the hook to the lead of R29 (10 kΩ), which is centered on the end of U1.

My control works nearly as well without the diode and ferrite bead, but I seemed to get a bit of filter blowby without them. This RF-gain control definitely improves CW operating convenience, especially on a noisy band.—*Ned B. Smith, NØCWW, Ryan, Iowa*

☐ Ten-Tec issued a bulletin, TN2-525, describing how to install an RF-gain control in the Argosy 525. It requires that a small, concentric, dual-10-kΩ potentiometer be installed in the AF-gain position. Such a "pot" I have not, so I added an outboard RF-gain control and found it to be a big help.

Then, inspiration struck: Why not reverse the Ten-Tec design and have a fixed audio gain with variable RF gain? My scheme worked well, and you can have the final version without drilling any holes. Furthermore, you can return to the original layout very easily by plugging the connectors from the original audio potentiometer back into terminal 43.

To perform the modification, proceed as follows: Remove the two connectors from terminal 43 of the IF/AF board and move them aside for future use. Wire a miniature 10-kΩ potentiometer to a four-wire connector that will plug into terminal 43. Adjust the potentiometer for an optimum audio level.

Next, turn your attention to the two connectors that are wired to the original audio-gain potentiometer and hook them up as follows: The adjustable arm of the potentiometer goes through a 1N4148 diode to the common junction of D9 and D10. Connect one end terminal of the potentiometer to ground and the other to + 12-V dc.

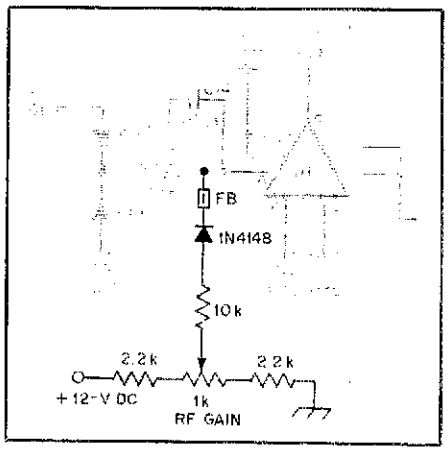


Fig 1—Schematic diagram of NØCWW's RF-gain control circuit for the Ten-Tec Argosy 525.

Set the RF-gain potentiometer to midscale and proceed with the "smoke test." I found the adjustment critical because the full range is only a couple of dial markings. (If the RF-gain control works backwards, reverse its battery and ground connections.) In spite of the RF-gain control, a strong signal still generates unwelcome audio pops, so I added an AGC ON/OFF switch. [An AGC-timing modification for the Argosy series appears in the November 1983 Hints and Kinks column. —Ed.]

The AGC ON/OFF switch was created by breaking the connection between D9 and Q5, and wiring in a switch. Disconnect the ac leads from the switch associated with the new RF-gain control and use that switch as the AGC ON/OFF control. [This leaves the radio without a power switch. When used with a switched supply, such as the Ten-Tec 225, the ac-switch leads may be connected, in which case power to the '525 is controlled by the switch in the power supply. When a battery or unswitched supply is used, place a power switch (15 V, 9 A) in the dc line to the radio, or add a new switch to the '525 in a location of your own choosing.—Ed.]

Full QSK CW operation is a most satisfactory experience using a manual RF-gain control and no AGC. SSB works well with the AGC on.—*Jack L. West, W6VD, Sacramento, California*

A GAUGE FOR ADJUSTMENT OF SLUG-TUNED RADIOS

☐ Many older radios, such as the Drake twins and Collins S line, have slug-tuned coils. The slugs are connected to controls on the front panel and move up and down as those controls are adjusted. According to the Drake T4XB/R4B manual, the coils must be set to precise positions (by measuring the distance from the top of the slug to the coil form) before alignment of the associated stages.

I had trouble locating a ruler marked with graduations smaller than 1/16 inch until I needed to rebuild a carburetor. The float gauge supplied in a carburetor-rebuild kit is about 4 inches long and marked off in 1/32-inch graduations. The gauge gets into tight spaces and, at least for me, is just what the doctor ordered.—*Rich Tashner, N2EO, Whitestone, New York*

[If you are not a "shade-tree mechanic," ask at the local garage. They discard the gauges when they rebuild a carburetor.—Ed.]

N CONNECTORS AND BELDEN 9913 COAXIAL CABLE

☐ I developed the following process to provide a solid connection between Belden 9913 cable and a standard "N" connector. UG-940 and UG-941 are conventional N connectors with all of the expected hardware parts. The only difference from UG-21/23 connectors is in the back-shell clamp device. This device is designed to anchor the armor braid of cables, such as RG-10 and RG-12. You might obtain this clamp separately as an MX-564A and use it with existing UG-21/23 connectors. I use the back-shell clamp to attach a 2-inch piece of ½-inch (OD) copper tubing, which, in turn, clamps the outer jacket of the 9913 cable.

Fig 2 shows the copper tube in several steps of preparation, from left to right: (A) Cut to length with a modeler's razor saw (do not use a rolling tube cutter as it deforms the tube excessively); trim the ends of the tube smooth and square. (B) Form one end of the tube to create a slight flare; a 60° flare is optimum, but any flaring tool can be used, including a large punch and hammer. (C) Cut four saw slots with a hack saw, as shown; these slots allow the small hose clamp to compress the tube and gently grip the 9913 cable.

Slide the clamp and connector parts (Fig 3) over the cable in their proper order (very important!). With a *dull* knife, carefully cut and remove ¾ inch of the cable jacket—do not cut or nick the braid wires. Carefully comb the braid wires straight and slide the clamping ring over the braid. Bend the braid wires back over the ring and trim off the excess length with sharp cutters. With a sharp razor blade, slit the soft aluminum foil shield in about eight equal places. Open the petals of foil and trim the excess length.

With a sharp razor blade, strip the inner

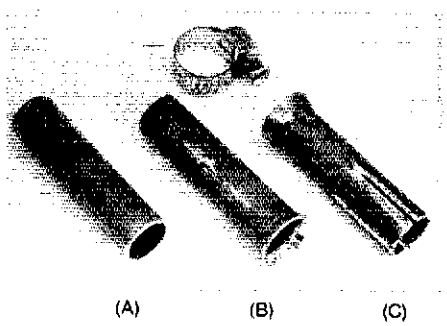


Fig 2—The copper connector extension shown in three steps of construction: (A) cut to length, 2 inches; (B) end flared; (C) slots cut to allow compression around the 9913 cable when the hose clamp is tightened.

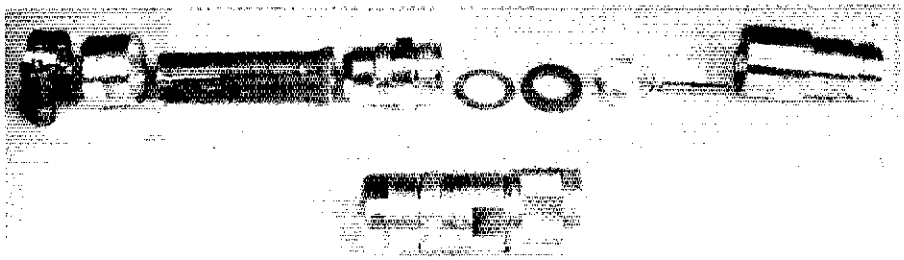


Fig 3—UG-940/941 connector parts (including the additional copper tube and hose clamp) laid out for placement on the cable. An assembled, stock UG-940/941 connector is shown below the parts.

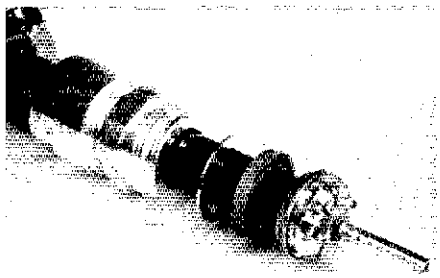


Fig 4—The prepared end of the cable with center pin attached.

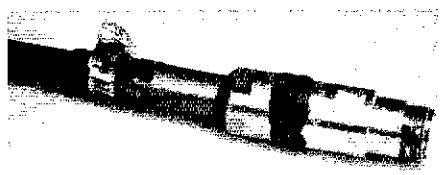


Fig 5—A completed connector/cable assembly with joints puttied for weather protection.

conductor to within approximately 1/32 inch of the shield. Then, carefully file the exposed center conductor down to 0.090-inch diameter (with a small, flat file) to fit the connector center pin. Trim the center conductor to 0.20 inch long (from the dielectric). Try to keep the copper wire round and be sure to clean any filings out of the end of the cable. Slip a clean center pin onto the wire and carefully solder the joint without excess solder. (When it is hot enough, the solder will be seen to wick into the soldering hole in the cup of the pin.) After the joint has thoroughly cooled, carefully carve any excess solder from the center pin with a very sharp knife or razor blade. The pin should slip cleanly into the connector body. Give the cable assembly a final inspection, remove any stray metal chips, copper powder, misplaced braid wires and shield foil. Fig 4 shows the prepared cable end with the center pin attached.

Assemble the connector body with the cable and clamps. Securely tighten the connector back shell (into the body) and the back-shell clamp nut (onto the copper tube) with open end wrenches. Slip the hose clamp over the slit end of the copper tube and gently tighten it to hold the cable without drastic cable deformation.

Weatherproof the connector assembly with small quantities of Coax Seal™. Roll the putty material between the palms of your hands to form small strings. Work this material thoroughly into the crevices of the connector assembly. There is no need to completely cover the entire connector; just fill the parting lines and crevices (Fig 5). Use the same technique with the connector pair when they are mated. (Clean the seal material from hands and old connectors with a hydrocarbon-based solvent.) Overwrap the connector assembly with a double layer of vinyl electrician's tape for extra weather protection. While the seal material may well be sufficient, the addition of the tape makes the process more certain.—*Dick Jansson, WD4FAB, Maitland, Florida*

A LOW-IMPEDANCE RF GROUND

☐ When I was a Novice, I experienced some RFI trouble, and the fellows at my club (W7AIA) suggested that I use two ground leads, one twice as long as the other. When one lead is quarter-wave resonant, the other is not. Thus, there is always a low-impedance path to ground.—*Bob Schetgen, KU7G, ARRL staff*

ROOF PATCH FOR PERMANENT SEALING

☐ I have discovered some products that effectively seal, protect and preserve exposed wires and solder joints. They withstand the elements to prevent corrosion and deterioration, as well as supplying added strength to plastic support components that are often used in antennas. I refer to synthetic roofing compounds that cure to a rock-like hardness. These tar-like materials can likewise seal ground-rod connections, transmission-line connections, nuts and bolts, and antenna elements. You can prevent damage to transmission lines or guy lines that bend over the edges of roof tops by spreading the compound on the contact areas. The compound binds them to the roof, thus preventing rubbing and fraying. Many other uses can be found by enterprising hams.

The material is sold in one-quart cans. It is applied in a semiliquid form by the use of a small brush, spatula or similar object. It cures in a few days and, once hardened, remains so indefinitely. (Once hardened, the material has no effect on the SWR or radiating properties of antennas.) The compound can be purchased in any hardware store or roofing supply house, but make sure to get the kind that hardens, as some kinds stay soft. I use a brand called Kool Seal Instant Patch. It sells for about $3.50 per quart. In the three years since I have applied this compound, it has resisted severe summer and winter weather and has remained in the same hardened state.—*Dr. Maurice I. Sasson, MD, W2JAJ, New Rochelle, New York*

FLASHCUBES SOLVE DIM-DIAL PROBLEMS

☐ Does the dial illumination in your equipment seem a little weak? Here is an easy and inexpensive way to brighten things up without making any electrical modifications. Simply disassemble a used flashcube and salvage the thin metalized reflector strip behind the flashbulbs. After the four sections have been snipped apart with a pair of scissors, they make excellent reflectors for panel lamps. Turn your radio on, slip the reflector over the existing bulb, and adjust its position for best focus. If necessary, the reflector can be trimmed to fit in tight corners. A drop of glue will hold the light piece of plastic in place on the bulb, and your "modification" can be removed as easily as changing the lamp! —*Penn Clower, W1BG, Andover, Massachusetts*

A FREE HOLDER FOR 9-V BATTERIES

☐ Fig 6 shows a 9-V battery holder that I have been using. It is made from a plastic 35-mm film can. Most metal battery clips take less space, but this battery holder does offer some advantages.

- The cap applies constant pressure to the battery contacts.
- As the battery-connector wires are inside the case for some distance, there is no strain on the battery contacts or connections.
- You can get the cases free from most photo-processing shops.

I mount the holder with no 4-40 pan-head screws through the base. Align the screws with the lead hole so they do not interfere with the battery. If you leave the leads long enough to remove the battery, you can seal the lead hole and have a moisture-proof battery compartment.—*Vaughn D. Nogle, W5TJT, Vadito, New Mexico*

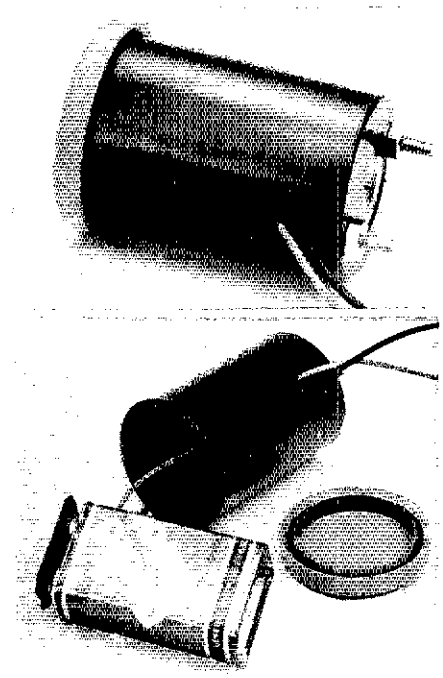


Fig 6—W5TJT's battery holder, which is made from a 35-mm film holder.

Technical Correspondence

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

REMOTE CONTROLLERS

☐ I have just skimmed through "Remote Control of Digital Communications," *QST*, Sep 1985. I won't concern myself with the project *per se*, but only with the BSR X-10 system mentioned. I am familiar with BSR equipment; I've had some of the units in my house for about a year.

The first problem to consider is availability. This project is a victim of the all-too-familiar "we don't carry it any more" syndrome. Radio Shack and Sears, like Leviton before them, have discovered that the system as a whole might be an interesting gadget, but it's too tough to sell. Both have discontinued most or all of the individual components. [Editor's Note: The Heath retail catalog 870R lists BSR devices on pp 16-17.] General Electric has recently begun marketing some of the components under their name, but I think they're even more expensive.

Next, these things are far from secure. In addition to the telephone controller, there are manual controllers operating on house wiring (actually they are much more common than the telephone units). Any of these will quite easily operate any modules in a neighbor's house or apartment. There is some limit on range, and pole transformers or modules operating on the "wrong" half of a 234-V circuit will decrease the maximum range. In fact, to lessen such problems as might occur when several homes are using the system, all manual controllers and modules have a "house code" dial that has 16 positions. If your modules seem to go on or off inexplicably, try resetting the dial. (This will not deter someone deliberately tampering with your system, however.)

Even if there's no one nearby with another system, the modules can trip themselves for no apparent reason. In my setup, I've divided my modules between a couple of controllers, and each is on its own house code (this helps prevent accidentally controlling the wrong module). But I have experienced spontaneous module turn-ons with both systems. Sometimes all modules on one system will go on; other times, only one or two modules are activated. The next time it will be the second system, but not the first. This is very disconcerting. Even brief (fractions of a second to several seconds) power failures will trip the module switch.

Anyone planning to use the BSR equipment for any purpose should take all of this into consideration.—*D. J. Christel, 219 Shady Lane Ct, La Crosse, WI 54601*

FM AND THE TS-430S

☐ Robert Witte deserves congratulations for providing quantitative data on the performance of SSB vs FM.[1] Fig 10 of that article tells the whole story for the TS-430S specifically. It is likely that most amateur gear will be within a few decibels of the results shown in the figure. The textbook formulations and curves, like Fig 8, are not very useful since the IF bandwidth selected by the designer is not known and the distortion due to the IF bandwidth/discriminator characteristic seems to be analytically impossible to find. Thus, those measurements are required for a realistic comparison.

Fortunately, the signal-level values are plotted in Fig 10. Actually, the difference in decibels in signal level for a specified value of post-detection SNR is the best yardstick of relative performance. It directly yields the relative radiated power (amplifier power plus antenna gain) required for the specified performance. His concern about the absolute value of the signal level can be eliminated by converting signal level to the ratio of signal level to spectrum level of the noise, N_0 (noise power per 1 Hz bandwidth). Then, the horizontal scale becomes S/N_0 and measurements made with other noise levels can be similarly plotted for direct comparison. The value for N_0 is obtained from the 16 nV/$\sqrt{\text{Hz}}$ noise level, which equals −143 dBm/Hz. S/N_0 is equal to signal level −(−143) = signal level + 143. S/N_0 is the most universally accepted measure of communication-system performance. The artificially derived values for SSB SNR and FM SNR should be discarded.

It is interesting to note that the noise level used for the tests was −143 dBm/Hz, while the resistance noise of the generator(s) was −168 dBm/Hz (assuming a 50-ohm impedance). Thus, the noise level used was 25 dB above the resistance noise floor of the generators and certainly was high enough to eliminate the receiver noise figure from consideration (I assume the noise figure of the TS-430S is well below 25 dB). The theoretical value for S/N_0 for an SSB system is easily obtained as S/N_0 (SSB) = post-detection SNR (PDSNR) + 10 log audio equivalent noise bandwidth. Using 10 dB for PDSNR and the signal level for SSB = −101.5 dBm from Fig 10, S/N_0 = −101.5 + 143 = 41.5 dB, which is a reasonable value for marginal voice communication (10-dB PDSNR). Solving backwards for the audio bandwidth of the TS-430S yields 1413 Hz—so maybe the designer of the TS-430S narrowed the SSB equivalent noise bandwidth somewhere (the audio amplifier maybe?) from the value assumed by Witte to be 2.4 kHz.

When S/N_0 is used as a yardstick, the equivalent noise bandwidth does not have to be known. However, N_0 must be known and few have access to the instrumentation required. I won't even speculate on the theoretical value for S/N_0 (FM) for the TS-430S since, as Witte points out, the academicians aren't in agreement, and who knows what the TS-430S parameters are! Perhaps Trio-Kenwood can explain why the FM PDSNR in Fig 10 seems to be flattening out instead of becoming parallel to the SSB curve. Thanks again to Robert Witte for providing the honest quantitative comparison of FM and SSB. (Do I hear the CW crowd in the background pointing out their 500-Hz bandwidth filters provide CW S/N_0 performance that is better than SSB by 10 log 1413/500 = 4.5 dB?)—*J. T. Kroenert, KA1PL, 349 New Meadow Rd, Barrington, RI 02804*

[1] R. A. Witte, "A Close Look at Frequency Modulation," *QST*, Sep 1985, p 31.

Feedback

☐ In "A CW Receive Program for Atari Computers" (Nov 1985 *QST*, pp 51-53), an omission has been discovered in the program listing supplied to us by the author. Please add the following lines to program listing page 20:

```
4584 LDA #ØØ
4586 STA (MEMRX),Y
4588 RTS
```

Thanks to Craig Scherer (KCØKP) and author Steve Stuntz for bringing this fix to our attention. Current program listings being mailed by the Technical Department have an errata sheet attached.

Please recognize that the program listing is supplied in assembler and cannot be entered as BASIC program statements. To enter this code, your Atari computer must be equipped with an assembler/editor cartridge. It is easy to make a typographical error when keying in programs. The code must be perfect before it will run properly. Often, a second pair of eyes will spot a typo you may have passed over.

☐ Author Richard Plasencia, WØRPV, says that line 1120 in his program for a "Computer-Aided Two-Band Vertical Antenna Design" should read:

```
G1 = O1 * (PI/18Ø) : G3 = COS(G1)
```

His article appears in Dec 1985 *QST*, p 21.

Strays

I would like to get in touch with...

☐ anyone using the VIC 20 keyboard keyer and code-practice program listed on page 16 of January 1984 *QST*. Glenn Wiebe, VE4GN, 81 Centennial Dr. East, Thompson, MB R8N 1J9, Canada.

Amateur Capsule 1985

A ham-in-space mission, federal preemption for amateur antennas and excellent grades for the ARRL/VEC are just some of the reasons 1985 became a banner year for Amateur Radio.

By Andrew Tripp, KA1JGG and Paula McKnight, N1DNB
Editorial Supervisor, ARRL Editorial Assistant, ARRL

The stage had been set for 1985 the year before. Thoughts in 1984 were on developing plans and fine-tuning strategies for achieving objectives on several fronts. Hams entered 1985 full of optimism and with new vitality. It's no wonder 1985 became a year of action. A second ham-in-space mission mesmerized the public again and helped attract even more hams, particularly young people, to get involved in space communication. Amateurs found relief from overly restrictive local antenna ordinances in 1985, in the form of limited federal preemption. ARRL Headquarters started the new year with a new look, having undergone a major organizational overhaul, to better serve its members in the modern world. An earthquake in Mexico City, a volcanic eruption in Colombia, South America, fires in California, and Hurricanes Elena and Gloria were some calamities that called amateurs into action to help disaster-struck peoples. Several milestones were met also. The International Amateur Radio Union celebrated its 60th anniversary. The ARRL Foundation surpassed the projected $50,000 goal for the Goldwater Scholarship Fund. A renewed commitment to pumping new blood into the ranks of Amateur Radio prompted a good look by the ARRL at enhancing Novice privileges and a membership drive that netted an increase of 13,875, the largest since 1977. With support from the ARRL, Volunteer Examiners brought convenient and fair exam opportunities to communities across the country. 1985 has all the markings of a banner year for Amateur Radio.

Along League Lines

ARRL demonstrated its ability to lead by first taking a good look at itself. The result was a major overhaul of the Headquarters operation, effective the first of 1985, to better be able to meet membership needs and the challenges Amateur Radio would face in coming years. With the creation of five offices—Adminstrative Services, Development, Membership Communications, Publications and Volunteer Resources—Headquarters' responsibilities were carefully redefined and better aligned. The move began to pay dividends early on: Membership growth ensued; the number and quality of ARRL publications grew, as evidenced by the impressive *1986 ARRL Handbook* and a new series of *License Manuals* designed to stay in step with FCC question-pool changes; and there was renewed emphasis by HQ in helping the volunteer field organization develop and promote Amateur Radio on the local level.

At the January Board Meeting, League officials fortified the HQ reorganization with supporting actions. Most important were fundamental changes to the ARRL By-Laws. To be more in keeping with today's corporate standards, General Manager David Sumner, K1ZZ, was named Executive Vice President and Perry Williams, W1UED, was elected corporate Secretary. Also, the Board Standing Committees were replaced by four new ones, which parallel HQ counterparts, to assist the HQ staff members in meeting League objectives.

Out of the July Board meeting came

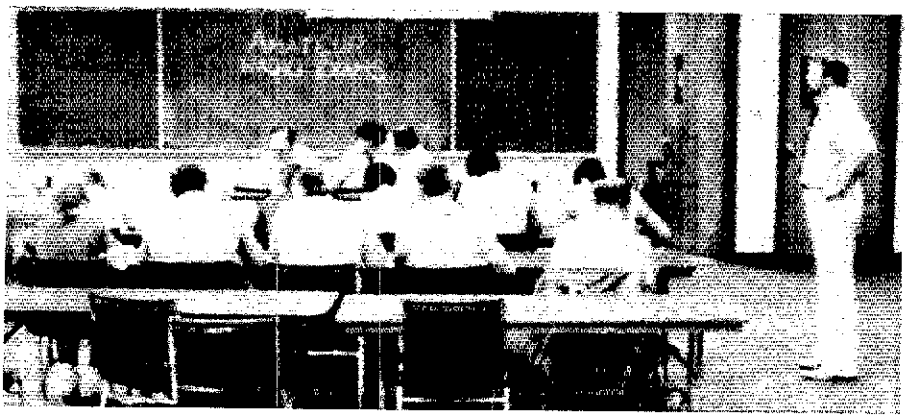
1) a Board directive for the ARRL Counsel to file in favor of preferred status for coordinated repeaters;

2) reduced Full membership rates for youths younger than 18;

3) Board support of FCC retaining responsibility for exam question pools, with Volunteer Examiner Coordinators responsible for creating actual tests;

4) some fine-tuning of the League's

Scouting + ham radio proved to be a magical formula for having fun while learning about electronics for some 30,000 Scouts and leaders from around the world who gathered July 24-30 at the 1985 National Scout Jamboree at Fort AP Hill, Virginia, to celebrate 75 years of Scouting. During the event, operators such as Shelly Weil, K2BS (shown here), and participating Scouts at special-event station K2BSA worked amateurs in over 100 countries and all 50 US states. *(WB2TRN photo)*



Test sessions under the Volunteer Examiner Program became commonplace during 1985, giving hams many more local exam opportunities than in the past. While expanding to all 50 states and some areas overseas, the ARRL/VEC served about 60% of all candidates tested during the year.

proposal to enhance Novice privileges, to make Amateur Radio more attractive to newcomers and provide more opportunities to acquire operating skills for upgrading.

In October, the ARRL Foundation had met—and exceeded—its goal of $50,000 for the Scholarship Honoring Senator Barry M. Goldwater, K7UGA. The contribution that sent the scholarship fund over the top was a $3000 donation from HAMCON, sponsors of the ARRL Southwestern Division Convention. Many others had selflessly contributed to the cause, making this tribute to ham radio's elder statesman a reality. The 1985-86 winner of the Goldwater Scholarship Fund is Clark S. Barrow, KI4UT, of Fort Walton Beach, Florida. Other ARRL award winners are Donald R. Santangelo, KA2RLW, Hiram Percy Maxim Memorial Award; Gordon West, WB6NOA, 1984 Herb S. Brier Instructor of the Year Award; and James C. Rautio, AJ3K, 1984 Technical Excellence Award.

On a sad note, Clarence Tuska, "The Old Man's partner," became a Silent Key in June. Tuska was the cofounder and first secretary of the ARRL, as well as cofounder and first editor of *QST*.

The Regulatory Scene

ARRL/VEC came on-line as the primary Volunteer Examiner Coordinator, serving hams in all 50 states as well as many locations overseas. ARRL-coordinated VE Teams held about 170 test sessions each month, serving about 28,000 candidates in 1985, or about 60% of all candidates tested during the year.

On September 16, amateurs received long-awaited federal relief in fighting overly restrictive local antenna ordinances with the adoption of PRB-1 by the FCC. Although not a cure-all, PRB-1 will make it easier for amateurs involved in local zoning cases to establish federal interest in their being able to maintain effective antenna systems.

Amateurs also gained some new operating privileges during the year, including access to the 900-MHz and 24-MHz bands, use of new modes on the 160-meter band and access to all of 10 MHz. Also, the FCC launched a major rule making on repeater coordination, but, at ARRL request, lifted a moratorium on new repeaters in metropolitan areas.

Public Service Activities

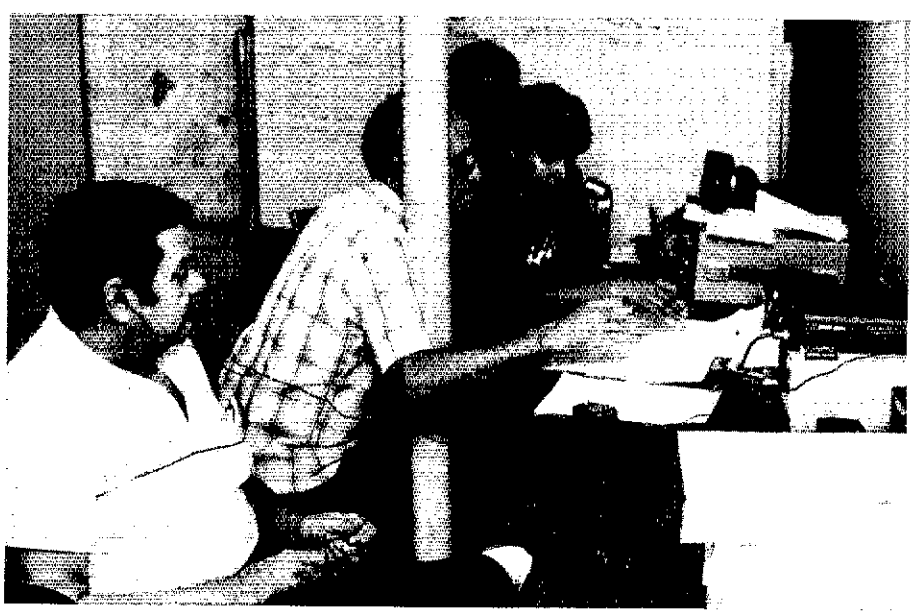
Several major disasters during 1985 drove radio amateurs to perform in an unparalleled fashion. Among them were fires that raged out of control in the hills of California; an earthquake in Mexico City; a volcanic eruption in Colombia (see page 13, this issue, for a full report); Hurricanes Elena, in the Gulf Coast, and Gloria, on the Eastern Seaboard; and a Delta airliner crash at the Dallas/Fort Worth airport. In all instances, clubs and individuals operating in the National Traffic System and independent nets helped disaster-relief officials by passing emergency and health-and-welfare traffic in and out of the affected areas around the clock for the duration.

Technical Developments

Experimentation continued in developing new communications modes for use by amateurs. The number of packet-radio terminal-node controllers (TNCs) grew from about 4000 at the beginning of the year to over 10,000 at year's end. The problem changed from stimulating growth to figuring out ways of alleviating congestion on existing 2-meter packet channels. The ARRL Ad Hoc Committee on Amateur Radio Digital Communication worked on easing congestion and developing candidates for networking and higher-level packet protocols. A Fourth ARRL Amateur Radio Computer Networking Conference was held in San Francisco during 1985, with a Fifth planned for March 9, 1986 in conjunction with the Orlando Hamcation.

The ARRL's packet-radio newsletter, *Gateway*, kept the news flowing to packeteers throughout the world. And the news was: Amateur packet radio was brought to the attention of the professional telecommunications world when Larry Kayser, WA3ZIA, in Hawaii, established two-way communication with Martin Sweeting, G3YJO, in England via UoSAT-

(continued on page 57)



Garland (Texas) ARC President NN5G (left) monitors the 2-meter repeater for messages as KS5P (second from left) and WD5FYD assist Spanish translator Julie Glover as she passes disaster traffic to Mexico City during the aftermath of the earthquake there.

ARRL's Honorary Vice Presidents: We Salute You!

By Andrew Tripp, KA1JGG
Editorial Supervisor, ARRL

Any organization's most important resource is people, particularly those individuals who have tirelessly contributed their time and talents over a period of time to making that organization the best it can be. For the ARRL, that distinguished group includes the Honorary Vice Presidents. In tribute to them, particularly for their dedicated service to Amateur Radio and ARRL members as well over the years, we take this opportunity to let members become better acquainted with these outstanding individuals who have helped place ARRL in the position of leadership it enjoys today.

Dr. R. O. Best, W5QKF

A dentist professionally, "Doc" Best has had a distinguished second career in League affairs. Elected Director of the West Gulf Division in 1961, Doc served in that capacity until 1968, when the Board of Directors elected him Vice President. As a member of the ARRL Board, he served on many committees, including Finance, Public Relations, and Membership and Publications. A Charter Life Member of ARRL, he was elected Honorary Vice President in 1974. First licensed in 1946, Doc has served as president (1954) and as secretary (1951) of the Corpus Christi ARC, and has been a radio officer for Texas Civil Defense and a member of the State Industry Advisory Committee. Active in fraternal and civic affairs, Doc is a past grand master of Corpus Christi Masonic Lodge 189, a past president of the Corpus Christi Rotary Club and a parade marshall for the 1964 Buccaneer Parade, his city's answer to the Mardi Gras.

Robert York Chapman, W1QV

Robert joined the ARRL Board in 1965, winning the race for Director of the New England Division. He served in that capacity until 1974, when he became the first elected President of the newly formed ARRL Foundation. He retired from that position in 1985, but remains a Director of the Foundation. As director of Acoustical Research and Development at the US Naval Submarine Base in New London/Groton, Connecticut, Robert contributed greatly to the development of underwater acoustics. Licensed with his present call since 1924, he was elected Honorary Vice President in 1975. A Life Member of the Tri-City Radio Club, Bob has served as its president, activities manager and (for many consecutive years) chairman of the club's annual New London (Connecticut) Festival. A past director of Civil Defense for the Town of Groton, Robert is a member of the A-1 Operator Club, has earned DXCC, and has held appointments as Official Phone Station and Official Bulletin Station. He is a Charter Life Member of ARRL.

Charles G. Compton, WØAF

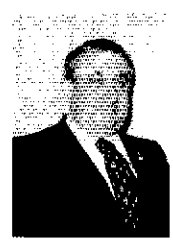
Charlie began his official association with ARRL in 1958, when he started a two-year stint as Vice Director of the Dakota Division. He became the Division's Director in 1960, serving 10 years in that post. As Director, he served on the Membership and Publications, Planning and Finance Committees, and served as chairman of the Public Relations Committee and the Ad Hoc Committee on Elections. From 1966 to 1968, Charlie did a hitch as ARRL Vice President, and in 1970 was elected to the post of First Vice President (which, according to the IARU Constitution then in effect, also made him Vice President of the IARU). Charlie was elected Honorary Vice President of the League in 1974. A Charter Life Member of ARRL, Charlie has held an appointment as Official Phone Station and is a member of the A-1 Operator Club. He lives in Cornelia, Georgia.

Robert W. Denniston, WØDX

Beginning in 1956, Bob served 10 years as Director of the Midwest Division. In 1966, he resigned as Director to become ARRL and IARU President, holding the former post until 1972 and the latter until 1974. Bob was elected Honorary Vice President in 1974. Licensed since he was 13, Bob has served as ARRL Emergency Coordinator and in RACES, and is past president of the Des Moines Radio Amateur Association, the Newton Amateur Radio Association and the Potomac Valley Radio Club. He has enjoyed many exotic DXpeditions, including the "Expedition GonWaki" to the Bahamas in 1948 and Clipperton in 1954 and 1961. While operating as VP1JH in the VHF Sweepstakes in 1960, Bob racked up the highest DX score ever recorded until that time in the ARRL DX contest. He served four years in the Army Signal Corps, during which time he was stationed at the Pentagon, and was a radio operator aboard the presidential train near the end of WW II. A Charter Life Member of ARRL, his QTH is now the British Virgin Islands, where he signs VP2VI.

Jean A. Gmelin, W6ZRJ

Amateur involvement for "Doc" goes back to 1947. His great attraction to traffic handling led him to such League appointments as Official Relay Station, Official Phone Station, Official Bulletin Station and Official Observer. From 1968 to 1977, Doc served as Director of the Pacific Division, where he earned a reputation for being one who puts 100 percent effort into everything he does. He was elected Honorary Vice President in 1980. Using his experience as a member of the ARRL Board of Directors, Doc for many years wrote a monthly column on League affairs for *Worldradio News*. He is a Life Member of the League and a member of the A-1 Operator Club. Doc lives in Cupertino, California.



John R. Griggs, W6KW

Continuously licensed since 1922, John began his association with the League as City Manager (the forerunner of Section Communications Manager) of San Diego.

(continued on page 79)

(continued from page 55)

OSCAR 11. Tucson Amateur Packet Radio (TAPR) announced its new TNC 2; Heathkit, GLB Electronics, AEA, Kantronics, Packeterm and MFJ introduced important new packet products. The ARRL Board-approved AX.25, Amateur Packet-Radio Link-Layer Protocol, was published and gained worldwide acceptance. Amateur packet radio was used operationally to move traffic in both actual and simulated emergencies. Automatic message forwarding became a daily reality using the WØRLI packet-radio bulletin-board software.

The years of groundwork by the Amateur Radio Research and Development Corporation (AMRAD) on amateur spread-spectrum experimentation finally paid off. In 1985, the FCC amended Part 97 of their rules to permit spread spectrum in the amateur bands above 420 MHz in mid-1986. The delayed implementation was to allow amateurs to develop standards. An ARRL Board-created Ad Hoc Committee on Amateur Radio Spread Spectrum Interoperability had its initial meeting in early December. The Committee is expected to generate some interim operating guidance for the June 1986 issue of *QST*. The ARRL Lab automated its printed-circuit layouts with Wintek smARTWORK and a Houston Instruments DMP-41 plotter. Throughout the year, *QST* carried many technical articles of interest to advanced as well as beginning experimenters, covering such topics as SSTV, AMTOR, packet radio, computers and ACSSB.

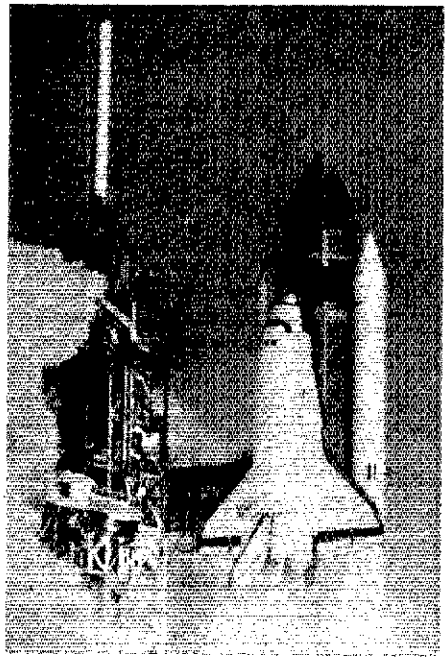
Canadian News

The Canadian Radio Relay League continued in its quest to become autonomous, as part of a five-year plan designed by the ARRL and CRRL. During the year, membership dues and records, heretofore handled in Newington, became the responsibility of the CRRL staff in London, Ontario. Also, for 1986, CRRL started handling its own financial affairs, operating on a budget approved by the CRRL Directors. CRRL Heaquarters moved to new and larger quarters, and a computer was purchased and software developed for HQ staff use.

In regulatory matters, the Department of Communications granted Canadian radio amateurs several power and frequency privileges: CW and phone operation on the entire 160-metre band; repeater use on 10 metres; use of amateur television with a 6-MHz bandwidth; and SSTV operation without a special endorsement.

International Scene

The IARU had a lot to celebrate in 1985, particularly the 60th anniversary of its founding. Today, the IARU is 124 strong, and enjoys a fine reputation with national telecommunication agencies worldwide.



The Space Shuttle *Challenger* rocketed Tony England, WØORE, into space and into the Amateur Radio history books as the second ham-in-space. During his off hours, Tony made two-ways with many youth groups across the country, many times delighting hams with live slow-scan images.

Among the conferences IARU representatives participated in during the year were WARC-ORB '85 (a world conference on the use of geostationary satellites) and the IARU Region 3 Conference in New Zealand (details to appear in a future issue of *QST*).

In the DX arena, the UK sovereign base areas on Cyprus (British Cyprus) were approved as a new DXCC country and added to the ARRL DXCC Countries List.

Space Communications

The big news of the year came when Tony England, WØORE, rode the Space Shuttle *Challenger* into Amateur Radio history as the second ham in space. During a Shuttle mission in August, Tony logged well over 100 contacts—many of which were via live slow-scan television—with youth groups and individuals across the country. The SAREX (Shuttle Amateur Radio Experiment) mission received rave reviews from NASA, opening the door for future Shuttle amateur missions.

To document SAREX, several media hams, including Roy Neal, K6DUE, Frosty Oden, N6ENV, and Bill Pasternak, WA6ITF, teamed up to produce a videotape highlighting all the excitement of this history-making flight. It can be purchased from the ARRL Circulation Department, or is available on loan from the ARRL Library to anyone who can have it shown to an audience of prospective hams.

In October, two West German radio amateurs operated from aboard the Space Shuttle *Challenger*, marking a first for German hams. The operators, Dr. Ernst Messerschmid, DG2KM, and Dr. Reinhard Furrer, DD6CF, both members of the Deutscher ARC, and another ham, W. Ockels, PE1LFO, of the Netherlands, operated DPØSL during their off hours.

What's Ahead?

Much was achieved by radio amateurs in 1985, and there are plenty of reasons to rest on our laurels. But if Amateur Radio is to stay alive and vigorous, there is much we have left to do. Membership rolls, although enjoying a healthy surge in the past year, need to be bolstered even more—something we can all help with on the local level. The ARRL/VEC got excellent grades during the year, despite a heavy workload, but 1986 should bring even more exam sites and qualified examiners into the Volunteer Examiner Program. Section-level activities got a renewed commitment from ARRL HQ to bolster volunteer field efforts even more, but there are many more clubs that can be brought into the ARRL fold, many more Novice and upgrading classes to be taught and many more Elmers needed to help newcomers.

Novice enhancement and the possibility of the ARRL helping the FCC issue call signs are just two of the many issues facing the ARRL—and all hams—in the coming year. Your feedback, as well as your active participation, is needed if Amateur Radio is to stride vigorously into the 21st Century.

(continued from page 14)

times be prepared to assist, and it can do so only if it has qualified trained operators. In recent natural disasters, the national Amateur Radio society in the affected country played a most important role. It is through organizations that are strong and fully recognized by government administrations that a real service can be provided. The International Amateur Radio Union (IARU) must continue to help its member societies become stronger and maintain leadership in Amateur Radio.

Most important, the role of Amateur Radio in natural disasters is one of the primary reasons why Amateur Radio exists and is recognized as a service within the International Telecommunication Union (ITU) Radio Regulations. It is our responsibility to continue to provide emergency public service.

Alberto Shaio, HK3DEU, is secretary of IARU Region 2. He has close ties to Colombia, having lived in Bogota for many years. Fred Laun, K3ZO, traveled to Colombia just after the volcano eruption. Formerly an officer at the US Embassy in Bogota, where he was HK3NBB, he is now a member of the US delegation to the Organization of American States.

Happenings

Conducted By David Newkirk, AK7M
Manager, Regulatory Information Branch

- *Unlicensed Video Links at 902 MHz?*
- *1500-W PEP Output Limit Affirmed for AM*
- *Third-Party-Traffic Agreement with 4U1VIC*

FCC Closes Loophole in Third-Party-Participation Rules

As related in January League Lines, on November 20, 1985, the Commission released a *Report and Order* in PR Docket 85-51, amending 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. These changes went into effect January 24.

In this action, FCC weighed a number of intriguing comments. It characterized as "unpersuasive" the comments of Richard A. Golden that the proposed rule would (1) in effect, be a constitutionally prohibited *ex post facto* law as far as those whose licenses have already been terminated are concerned; (2) deny former licensees freedom of speech; and (3) effectively censor existing Commission licenses in violation of their constitutional guarantee of due process. ARRL had strongly supported the Commission's proposal, with the caveat that any rulemaking retain express permission to engage in third-party traffic, a point left in doubt by the original FCC NPRM. FCC agreed and included a new paragraph in Section 97.114 expressly permitting third-party traffic. Some commenters suggested that licensees of *any* radio service having once had their licenses suspended or revoked be barred from third-party participation in Amateur Radio. It was also suggested that a person should have all other FCC licenses revoked if sanctions had been imposed concerning an Amateur Radio license. Wrote FCC, "These suggestions involve broad policy considerations concerning licensee character qualifications in various radio services that we regulate. They are outside the scope of this proceeding."

A most quotable quote, though, was drawn out of the Commission by commenter John S. Papay, who argued that no rules should be adopted which would restrict former licensees from third-party participation. He said that participation in Amateur Radio as a third party could be a positive factor in the rehabilitation process of that individual. FCC didn't mince words: "We do not concur. Third-party participation is a privilege extended to persons who are not control operators. The rest of amateur radio need not continue to accommodate the conduct of one who has lost the privilege and who now may or may not be able to conform to the law."

Here's the black-and-white of the resultant changes to Part 97. To update your copy of *The FCC Rule Book*, amend Section 97.79 of the Rules for the Amateur Radio Service by deleting paragraph (d). Section 97.114 ("Third-party traffic") is revised to read as follows:

a) Subject to the limitations specified in paragraphs (b) and (c) of this section, an amateur radio station may transmit third-party traffic.

b) The transmission or delivery of the following third-party traffic is prohibited:

(1) International third-party traffic except with countries which have assented thereto;

(2) Third-party traffic involving material compensation, either tangible or intangible, direct or indirect, to a third party, a station licensee, a control operator or any other person;

(3) Except for emergency communications as defined in this part, third-party traffic consisting of business communications on behalf of any party.

(c) The licensee of an amateur radio station may not permit any person to participate in traffic from that station as a third party if:

(1) The control operator is not present at the control point and is not continuously monitoring and supervising the third-party participation to ensure compliance with the rules;

(2) The third party is a prior amateur radio licensee whose license was revoked; suspended for less than the balance of the license term and the suspension is still in effect; suspended for the balance of the license term and relicensing has not taken place; surrendered for cancellation following notice of revocation, suspension or monetary forfeiture proceedings; or who is the subject of a cease and desist order which relates to amateur operation and which is still in effect.

902-928 MHz ACCESS ASKED FOR LOW-POWER VIDEO LINKS

Last September, Jerry Iggulden of Valencia, California, petitioned FCC to amend Part 15 of its rules to allow unlicensed operation of low-power video transmitters at 902-928 MHz. "The rules and regulations currently don't allow for the non-licensed, low power transmission in any band suitable for video," Iggulden wrote. "... The proposed rule changes would allow for a video transmitter and receiver/converter operating at 902 to 928 MHz. It is the perception that these devices would serve the public interest by offering the benefit of broadcasting a video signal from the home video cassette recorder (VCR) to a TV in a remote location(s) (ie, another room). It is virtually certain that the cost to the consumer for this benefit would be significantly less than a second VCR."

Iggulden, whose interest in the proposed rules changes is in "potential involvement with a company whose business would be to market the proposed devices," noted that the field strength presently allowed by the applicable subpart of Part 15 would be more than adequate for transmission over a short range or within a single-family dwelling. "In fact," he continued, "the Commission may wish to impose a lower field strength limit on the proposed devices in order to prevent interference problems."

What might this mean to amateur operations at 902 MHz? Iggulden's petition, designated as RM-5193 by FCC, appears to have been written without knowledge of the then-impending occupancy of 902-928 MHz by the Amateur Radio Service. Though our amateur allocation at 902 MHz is secondary, we're not secondary to the unlicensed emissions of devices operating under Part 15—so any such video links would have to suffer our interference and would be proscribed from interfering with us. Sounds good on paper ...

"NO, IT DOESN'T!"—LEAGUE COMMENTS TAKE 902-MHz LOW-POWER VIDEO LINKS TO CLEANERS

In the preceding item we told the tale of a petition by Jerry Iggulden of Valencia, California, requesting that FCC allow unlicensed operation of low-power video transmitters at 902-928 MHz. The idea behind the petition (RM-5193) is the operation of such transmitters to link video sources, such as VCRs, to television sets without the bother of interconnecting wires. Unlicensed low-power communication devices operate at quite a few places in the radio spectrum, it's true—but this proposal would plunk strong video sources smack dab in our new 902-MHz band!

"Ungood," is ARRL's response. "The consumer would be ill-served by the proposal. The largest potential market for such consumer devices would be for use in single- or

multiple-family dwellings in or near major metropolitan areas. The highest concentration of Amateur Radio stations also can be found in single- or multiple-family dwellings in or near major metropolitan areas." Such unlicensed devices must not interfere with *any* licensed services on any frequency—and the projected 902-MHz devices would provide quite a front-end-full:

> Calculations by the League's Technical Staff indicate that a radiated signal of the permitted intensity (50,000 microvolts-per-meter at 30 meters) would produce a voltage of over 540 microvolts at the receiver input of a good amateur station at a distance of 1 kilometer ... at 10 kilometers, the predicted signal would be 54 μV/m. The amateur receiving such interference at ranges of over 10 kilometers would face the problem of identifying one or multiple interference sources; calling on all neighbors within that range to determine which one(s) had installed such a video transmitter (a continuous-duty-cycle device when operated); and the difficult or impossible chore of convincing the consumer that the device should not be operated ...
>
> Neither the Commission nor the manufacturers of garage-door openers should have forgotten the problems which arose when those devices were operated on frequencies adjacent to voice frequencies in the Citizens Radio Service and on frequencies assigned to the Aviation Radio Service ... it would appear ... that Part 15 Rules as presently stated sufficiently provide for the type of device proposed by Petitioner (on frequencies other than those assigned to the Amateur Radio Service), provided that all technical rules are observed.

ARRL's *Comments in Opposition to Petition for Rule Making* in RM-5193 end there, but we'll add a few more lines. Beginning about a month after the filing of the Iggulden petition, FCC issued two *Public Notices* about illegal video transmitters—the first, on October 10, aimed at manufacturers and distributors of the things, and the second, on October 31, warning consumers against the *use* of the nasties. Seems there's been a proliferation of the things, FCC rules or no. Marketers and manufacturers stand to be on the receiving end of fines as high as $10,000, and/or up to a year in jail for the first offense. Consumers using illegal video transmitters may expect to fare as well.

The *Notice* to marketers and manufacturers included this comment, sure to light our eyes but blacken some others:

> It should be noted that the Commission has occasionally received petitions and requests to allow the transmission of video information on the TV broadcast frequencies. Most recently, two petitions seeking to allow this form of operation were reviewed by the Commission. These were filed by RF Power Labs and Mr. Robert C. Greene to allow operation on the UHF and VHF television frequencies, respectively. Both of these petitions were denied by Commission action. The denials were issued because of concern about possible interference to licensed TV broadcast stations. To date, no information has been submitted that would support claims that interference would not occur. Thus, there is no present expectation that the regulations would be amended to permit [such] video transmissions on the television frequencies.

Are You a Lawyer?
Amateur Radio Wants You!

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

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

What does the crystal ball presage for low-power video transmitter operation on *our* frequencies? Probably something you already know: Say such devices *were* allowed, *did* sprout all over the 902-928 MHz band in metro areas (although with the projected signal levels at 10 km and beyond, rural amateurs would be hit with this, too)—who would be blamed when your licensed amateur signal messed up someone's unlicensed video link, the video link that's supposed to *accept* harmful interference and *not cause* any? The answer's in your mirror: *you*.

1500-W PEP OUTPUT LIMIT FOR FULL-CARRIER DOUBLE-SIDEBAND AM PHONE AFFIRMED BY COURT

On July 22, 1983, the FCC adopted a *Report and Order* in PR Docket 82-624 replacing the former input-power-measurement standard in the Amateur Radio Service with a power-measurement standard based on peak-envelope-power *output*, with 1500 W being the maximum allowable power. The Commission recognized that this would have an impact on AM double-sideband full-carrier radiotelephone (A3E) operation, typically limiting such operations to half of their previous maximum allowable operating power. The FCC grandfathered the input-power measurement rules for AM DSB operations until June 1, 1990, to minimize the immediate impact of this rule change. ARRL had gone on record as favoring *permanent* grandfathering of the A3E output limitation, but FCC's response was that "... we cannot justify a permanent and continuous expense in terms of equipment and training that would be necessary for us to be prepared to make a special power measurement for this class of operations."

Glenn Baxter, K1MAN, fought this change for A3E all the way up to the US Court of Appeals, and the judgment of that court was issued October 15. The US Court of Appeals for the District of Columbia Circuit upheld FCC's decision, and its judgment was accompanied by an unpublished memorandum opinion.

In his appeal, Baxter had argued that the new standard, which permits A3E operators to continue to operate under the old standard (1000-W *dc input*, the output power of which might approach 3000 W peak), would decrease the range and quality of his operations, thus reducing the educational and economic value of his equipment. While the court acknowledged the importance of public service that Amateur Radio operators render, it could find nothing on the record to indicate that the Commission had violated its legal duties in this matter. It also concluded that the FCC possessed technical knowledge and expertise which exceeded that of the court. Baxter has indicated his intent to take his case to the Supreme Court.

SCRRBA ASKS FCC FOR F8E EMISSION ABOVE 928 MHz

As we gained access to the 902-928 MHz band September 28 (see October *QST*), we were also granted use of an emission not allowed the Amateur Radio Service previously: F8E. That's "F" for frequency modulation, "8" for two or more channels containing analog information, and "E" for telephony. The Southern California Repeater and Remote Base Association thought 902 MHz was a good place for Amateur Radio to make use of F8E and suggested this as FCC was considering what privileges should be allowed amateurs on the new band. The request paid off; we were granted F8E on 902.

In late October, SCRRBA petitioned FCC to allow F8E on all amateur frequencies above 928 MHz for the same reason advanced by FCC in granting its use at 902-928 MHz: Its availability would "... permit amateur operators to experiment with a new transmission mode and to efficiently utilize the spectrum when several different channels of information must be transmitted simultaneously from one location to another."

Why not F8E on lower frequencies? SCRRBA considers them too heavily utilized for such a bandwidth-consumptive emission, excepting perhaps the 420-450 MHz band. Concerning 420, the Association said it would "... prefer to wait until a little operating experience with the mode is achieved before considering including the 70 centimeter band within the authorization."

NEW THIRD-PARTY AGREEMENT WITH 4U1VIC

United Nations Vienna and the US government have concluded a third-party traffic agreement, effective January 2, 1986. The call sign at the Vienna International Centre is 4U1VIC, operated by the Vienna International Amateur Radio Club. The usual third-party-traffic guidelines in Section 97.114 of our Rules apply.

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

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: In memory of Thomas J. Wright, KB3XA, by the Peninsula Radio Operators Society; Edward F. Tukey, KA2EIO; James Webster, W6WZX; James E. Swafford, W7FF; In memory of Ward Jensen, WØTLE, by the St Paul Radio Club; Hal G. Syptak, KB4KMY/AA; Robert R. Rathbun, W8TGH; Arthur B. Lyon, KC4OM; James R. and Elizabeth Youse, N7GGE and KD7VR; Kenneth V. Hardman, W2DV; Hugh Unger, WB4UHN; Sherwin Goldman, WR4N; In memory of W. Garth Harris, W8GIE, by William Johnson, KD8KG.

SECTION MANAGER ELECTION RESULTS

The following Section Managers will begin a two-year term of office April 1, 1986:

Uncontested

Louisiana	John Wondergem, K5KR
North Carolina	Rae Everhart, K4SWN
Pacific	Army Curtis, AH6P
San Francisco	Robert O. Smith, NA6T
Virginia	Claude E. Feigley, W3ATQ

SECTION MANAGER APPOINTMENTS

In the Iowa Section, Rollin J. Sievers, WBØAVW, has been appointed to complete the term (until March 31, 1987) of Robert McCaffrey, KØCY (resigned). In the Pacific Section, Army Curtis, AH6P, has been appointed to complete the term (until March 31, 1986) of James Wakefield, AH6CO (resigned).—*Arline Bender, WA1VMC*

FCC AFFIRMS: "NO TECHNICIANS ON 160"

On December 16, 1985, FCC upheld the denial of a *Petition for Reconsideration and a Request for Hearing* by Shaler Hanisch of Pasadena, California. Hanisch had asked that Technicians be allowed operation between 1800 and 1850 kHz because they were limited to telegraphy for the long-distance communications afforded by Technician high-frequency privileges. The propagational limitations of medium-frequency radiotelephone privileges, he said, would still provide incentive enough to encourage Technicians to upgrade. FCC disagreed, saying that the incentive licensing system provided motivation enough for individuals to upgrade their technical and operational skills according to their needs and interests.

Moved and Seconded ...

MINUTES OF EXECUTIVE COMMITTEE No. 420 Atlanta, Georgia December 14, 1985

1. Approval of Minutes of August 24 meeting.
2. FCC matters:
2.1 Consideration of an ARRL position regarding RM-5241, the petition by Donald Stoner, W6TNS, for creation of a Public Digital Radio Service (PDRS) and reallocation of the 52-54 MHz band from the Amateur Service to the PDRS.
3. Local antenna/RFI matters.
4. Review of progress on Board Directives:
4.1 Specific action items from the 1985 Second Meeting of the ARRL Board.
4.2 Development program: Mr. Sumner.
5. Report of the Administration and Finance Committee: Mr. Metzger.
6. Report on IARU Matters:
6.1 Administrative Council meeting.
6.2 Region 3 Triennial Conference.
6.3 Other IARU matters.
7. Joint US/USSR amateur radio operation proposal by Western Washington DX Club.
8. Acknowledgement of a memorandum from the Publications Committee regarding new shipping fees.
9. Recognition of new Life Members.
10. Affiliation of clubs.
11. Conventions:
11.1 Approval of Division, State and Section Conventions.
11.2 Special considerations for the ARRL Diamond Jubilee National Convention, 1989.
12. Date and place of next meeting.
13. Other business.

Pursuant to due notice, the Executive Committee of the American Radio Relay League met at 8:45 A.M., Eastern Standard Time, Saturday, December 14, 1985, at the Airport Marriott Hotel, Atlanta, Georgia. Present were President Larry E. Price, W4RA, in the Chair; First Vice President Leonard M. Nathanson, W8RC; Executive Vice President David Sumner, K1ZZ, Directors Thomas B. J. Atkins, VE3CDM, Paul Grauer, WØFIR, William J. Stevens, W6ZM, and Hugh Turnbull, W3ABC. Also present were Secretary Perry Williams, W1UED, Director Edmond A. Metzger, W9PRN, Chairman of the Administration and Finance Committee, and Counsel Chris Imlay, N3AKD.

1) On motion of Mr. Atkins, the minutes of the August 24, 1985 meeting were accepted as printed in *QST.*

2.1) Next, the Committee considered an ARRL position regarding RM-5241, the petition by Donald Stoner, W6TNS, for creation of a Public Digital Radio Service (PDRS) and reallocation of the 52-54 MHz band from the Amateur Service to the PDRS. On motion of Mr. Stevens, Counsel Imlay

was directed to file comments, by the deadline of January 6, 1986, vigorously opposing the reallocation of 52-54 MHz.

3.1) Turning now to RFI matters, on motion of Mr. Grauer, the following resolution was unanimously adopted:

"Whereas, RF susceptibility of the current generation of VCRs and other home electronic devices is a growing problem; and

"Whereas, the public is not aware that responsibility for RF susceptibility of VCRs and other home electronic devices lies with the manufacturers of such equipment rather than with amateur radio stations operating in the vicinity of these devices; and

"Whereas, technical solutions—while being pursued through special committees of the American National Standards Institute (e.g., ANSI C-63) and by other routes—will not have a favorable impact on equipment reaching consumers in the near term; now,

"Therefore, Counsel is instructed to prepare for filing, after review at the 1986 Annual Meeting of the Board, a petition requiring the labelling of home electronic equipment, with regard to its susceptibility to RF energy, the filing to emphasize that such labelling is no substitute for technical solutions in the longer term."

3.2) Counsel Imlay reported briefly on local antenna matters. A decision is still pending re the Thernes [WM4T] case in the U.S. Court of Appeals for the Sixth Circuit, the first case in which FCC's PRB-1 declaration of preemption could be a factor.

4.1) Mr. Sumner reported on progress made by staff and by Standing Committees toward completion of tasks assigned at the 1985 Second Meeting of the ARRL Board of Directors. Distribution to Board members was ordered of the chart used in the presentation of this progress report.

4.1.1) The Executive Committee completed its review of Morse Code examination procedures as called for at Minute 66 of the 1985 Second Meeting. The Executive Committee concluded that there was no immediate need to revise the Rules in Part 97. However, the Executive Committee recognized that consistency of standards in the examination program continues to be a desirable objective, and the President is requested to continue to pursue this with Commission personnel as appropriate, keeping the Morse as well as the written test in mind.

4.2) Mr. Sumner presented a comprehensive report on the Development Program.

4.2.1) Membership. In 1985, the development program concentrated on membership recruitment. The steps involved are clearcut, the market is easily targeted, and an increase in League membership in 1985 adds to resources available for recruitment of new people into Amateur Radio. For the year, ARRL will show an increase of some 15,000 members.

4.2.2) Amateur Recruitment. To increase the number of amateurs licensed by FCC will require a cross-disciplinary coordinated effort, which is difficult if not impossible through a separate Development Office. Thus, the Development Office is being closed, and other organizational changes will be made. The following elements of an amateur recruitment program are contemplated for 1986:

a) An assertive effort through radio clubs.

b) Newsstand publication.

c) Use of a professional public relations firm for such projects as the placement of articles in non-amateur publications for targeted groups.

d) Cooperation with youth groups and senior-citizen organizations.

e) Revised instructor guides.

f) "How to Become" information tailored to the targeted groups.

At the close of this report, the Executive Committee recessed for luncheon at 12:38 P.M.

5) By unanimous consent, the group reconvened at 2:03 P.M. as a Committee of the Whole for the purpose of hearing a report from the Administration and Finance Committee by its Chairman, Mr. Metzger. Messrs. Sumner, Williams and Imlay were excused from the meeting at this point. At 3:20 P.M., the Committee of the Whole arose and reported, and Messrs. Sumner, Williams and Imlay returned. On motion of Mr. Atkins, the Report of the Committee of the Whole was accepted and its recommendations adopted.

6.1) Mr. Sumner, as Secretary of the International Amateur Radio Union, presented a brief oral report on the IARU Administrative Council meeting in Melbourne, Australia, and Auckland, New Zealand, November 8, 9, and 11. It was made clear that the Council's discussion of a possible World Administrative Radio Conference in the early 1990s (as has been postulated by ITU Secretary General Richard Butler) in no way implied IARU endorsement of such a WARC being held.

6.2) The President reported briefly on the IARU Region 3 Triennial Conference in Auckland, New Zealand, November 13-17, and the 75th Anniversary celebration of the Wireless Institute of Australia on the 9th.

6.3) A brief discussion of miscellaneous IARU matters followed. On motion of Mr. Grauer, the Executive Vice President was directed to contact the IARU Region 2 Secretary with regard to errors in a report of its Executive Committee meeting.

7) On motion of Mr. Turnbull, the Executive Committee endorsed a proposal from the Western Washington DX Association for a joint U.S./U.S.S.R. amateur DXpedition to the Diomedee Islands in the Bering Strait, in 1987.

8) A report was received from the Publications Committee of the Board that it had recommended new fees for shipping and handling of ARRL publications (other than *QST*, the DXCC Countries List or Net Directory). For shipment through the Post Office by book rate, the fee would be $2.50; by United Parcel Service, $3.50, both rates effective with the publication of the March 1986 issue of *QST*.

9) On motion of Mr. Turnbull, the names of 48 newly elected Life Members were recognized, and the Executive Vice President was directed to list their names in *QST*.

10) On motion of Mr. Turnbull, the affiliation of the following clubs was approved; all are in Category I except where noted:

Air Capital Amateur Repeater Assn., Inc., Wichita, KS
Association of Amateur Radio Operators, Columbia, LA
Baltimore Radio Amateur Television Soc., Inc, Baltimore, MD
Bay Area Amateur Radio Club, La Porte, TX
Bedford Amateur Radio Club, Bedford, VA
Big Bend Amateur Radio Club, Alpine, TX
Burr & Burton Seminary ARC, Manchester, VT (Category III)
Chippens Repeater Association, Bristol, CT
Dalton Amateur Radio Club, Inc., Dalton, GA
Echo Repeater Association, Hoffman Estates, IL
Faulkner County ARC, Inc., Conway, AR
Georgia Radio Amateur Packet Enthusiast Society, Conyers, GA
GTE Amateur Radio Repeater Group, Inc., Bothell, WA
Hamm/Ramm (Hams at Martin Marietta), Orlando, FL
Hewlett-Packard Lake Stevens ARC, Everett, WA
High School of Telecoms Arts & Tech, Brooklyn, NY (Category III)
Highlands County ARC, Inc., Lake Placid, FL
Madison DX Club, Marshall, WI
Mason County ARC, Shelton, WA
Mid-Coast Amateur Radio Repeater Club, Inc., Augusta, ME
Miracle Strip ARC, Inc., Panama City Beach, FL
Nanticoke ARC, Seaford, DE
Nassau County Wireless Association, Levittown, NY
New Fairfield High School ARC, New Fairfield, CT (Category III)
North Coast ARC, Cleveland, OH
North Coast Contest Club, Cleveland, OH
Samford University ARC, Birmingham, AL (Category III)
76 Alive, New York, NY
Snyder ARC, Snyder, TX
Sourland Mountain ARC, Belle Mead, NJ
South Shore ARC of Suffolk, Deer Park, NY
Southern California Six Meter Club, Fullerton, CA
Southern New England Assn. of Packeteers, Middletown, CT
Sperry Univac ARC, Blue Bell, PA
Texins ARS, Johnson City, TN
Tooele County ARS, Tooele, UT
Tradewater Amateur Radio Assn., Providence, KY
U.S. Army Intelligence School ARC, Ft. Devens, MA (Category III) (ratifying a mail vote of October 7, 1985)
Utica Shelby Emergency Communications Assn., Utica, MI
West Haven Amateur Repeater Assn., West Haven, CT

With this action, the League has the following number of active affiliated clubs: Category I, 1727; Category II, 12; Category III, 158.

11.1) On motion of Mr. Atkins, the following conventions were approved:

Great Lakes Division, February 21-23, 1986 (confirming mail vote)
Midwest Division, April 18-19, 1986, So. Sioux City, NE
Northwestern Division, May 30-31 and June 1, Vancouver, WA
Roanoke Division, August 23-24, 1986, Virginia Beach, VA
Pacific Division, October 3-5, 1986 San Jose, CA
Kansas State, October 11-12, 1986, Wichita, KS
Central Division, October 18-19, 1986, St. Charles, IL
New England Division, October 18-19, 1986 (Change of date) Boxboro, MA

11.2) In view of the special significance of the year 1989, as the Diamond Jubilee of the founding of ARRL, on motion of Mr. Stevens, the Executive Vice President was instructed to draft special criteria by which applications for sponsorship of the 1989 National Convention should be judged, for review and approval at the 1986 Annual Meeting of the Board. The criteria shall then be communicated to potential applicants, with the selection process to be completed at the 1986 Second Meeting.

12) The next meeting of the Executive Committee was tentatively scheduled for March 7 in Orlando, Florida.

13) A communication was received from Director Tod Olson, KØTO, concerning a matter in the Minnesota field organization but no action was called for. There being no further business, the meeting adjourned at 5:30 P.M.

Respectfully submitted:
Perry Williams, W1UED
Secretary

LIFE MEMBERS ELECTED
August 24, 1985

Julian H. Allen, WD8PYR; Alan L. Anderson, KA2GYL; Joyce M. Anderson, WB7TWC; Margaret A. Baker, N7FEE; Bruce K. Benton, N9ELT; Peggy J. Berg, NØFPU; J. F. Betemps, KU8G; Jack Calton, WB2MWI; Jocelyn K. Carson, WB7UGR; Alan W. Cross, WA5UZB; Shari A. Cross, N4CWL; Denis E. Eaton, NØGIH; Monica L. Eaton, KAØVLX; Roy Erismann, HB9BJJ; Helen K. Fast, KA4AEG; John P. Ganobcik, WD8OTY; Ronald Goldstein, KA2IIA; Christine M. Grandinetti, NN2Q; Betty J. Gregg, AB7U; Kazumasa Ibata, JE1HYR; Tsumugi Ikekawa, NK6J; John Ingraham, NG8L; Robert M. Jackson, AG5X; William J. Jones, Jr., WB5P; David E. Lattan, WD9EBQ; Mary E. Lattan, N9CNG; Bob Meyer, NC9M; D. E. Mooreside, AA4JW; Scott A. Newell, KA8HOK; Eloise J. Nordland, WD6BWN; Ashley J. Park, N6MTJ; Edward J. Picha, N9EP; Moe Lee Pierce, WBØRTF; Jean W. Rautio, KA2YZG; Jack B. Ray, K4MZW; Gregory S. Ross, KVØO; Ben Samsu, YCØEBS; Susan M. Scher, KA8YDY; Carl H. Schroeder, WB5KKM; Leigh M. Sedgwick, WA7BPI; Kenneth A. Sell, KZØX; Catherine Smitha, KA6TJJ; Clinton Spaar, WB2SSB; Arthur R. Taylor, KL7SK; William C. Trushel, II, WA3CWA; Greg Von Bokern, WB7TXJ; Wayne T. Yoshida, KH6WZ; Gene R. Ziegler, WDØEQP.

Correspondence

Conducted By Bruce Kampe, WA1POI
Information Services Assistant

THE NOVICE LICENSE

☐ I've been reading some negative comments about the proposals before the FCC to enhance Novice privileges. Both the ARRL's RM-5038 and my own RM-5022 through 5025 request small band segments, restricted power, and the inclusion of digital modes. We never intended to "give the store away" nor do we expect the FCC to grant all the privileges we requested. Our common interest is the growth of our hobby in a responsible way.

I fail to see what you opposers fear. There will be no loss of "higher class" privileges. Who protested the access we gained to 30 meters, or 12 meters, or 902 MHz? The Novice operators have gained nothing. The Technicians gained a band but it is not really an incentive to Novices to upgrade. The big incentive to Novices seems to be two meter FM and that is why my proposal did not include that band.

The ARRL's proposal includes more kHz than mine and is less practical with its inclusion of the 1246 MHz band. I have seen my proposal mentioned in only one publication (*Worldradio*, September 1985) and have received no comments. My aim is to offer non-hams a Novice license that will attract intelligent adults and young people. We need computer enthusiasts, story tellers, teachers, students, accountants, laborers, etc. Our record shows that we cannot lure them in any numbers with our CW-only Novice license.

If you teach a Novice or upgrade course like I do you will see the work that goes into each new ham. You old-timers may forget that ham radio and electronics are a new language to the nonham. We can help squash the myth that equipment is too expensive if we offer new hams phone and digital modes as well as CW. The equipment will be of more use and will seem a better value. Besides, Novices really do *earn* a license.

If, after reading this, you still think enhanced Novice privileges are a bad idea, go read the actual proposals and then comment to the FCC.—*Larry W. Garens, WD5H, formerly KC5OQ, Brady, Texas*

NO CODE FEEDBACK

☐ I find it difficult to dispute the logic voiced by Ed Mitchell (WA6AOD) in December '85 *QST* regarding "No-code," particularly in view of the general apathy of the vast majority of licensees toward the exercise of their code privileges and in view of the obvious reluctance of the ARRL to support preservation of the CW portions of the amateur bands.

On the other hand, as a reasonably competent CW operator I recognize that there are opportunities for handling emergency traffic where a couple of competent CW operators could have moved messages faster, more accurately and with less confusion than much of the emergency phone traffic that we have all been exposed to in the last few months.

CW is simply a slow speed form of record transmission, the basis from which reliable high-speed record transmission methods such as Baudot, ASCII and AMTOR have evolved. Efficient transmission of third party traffic requires CW or machine generated characters, not the phonetic fumbling, mumbling and stumbling we hear on the phone bands, particularly under the stress of emergency situations. Machine generated record transmission is far more efficient in spectrum utilization and dependability and offers opportunities for much wider applications to message handling than either phone or CW.

Why have a Morse license requirement? It is important as a simple, reliable communication mode which most people can acquire to an acceptable degree. If not acquired prior to licensing it will never be acquired at all and unavailable when needed. Learning to use the code is a small price to pay in the public interest, in return for the privilege of having use of a dedicated portion of the radio spectrum.

Years ago, when the code requirement was 10 WPM, we heard few complaints. Ever since the Novice class was introduced we have heard nothing but grumbling and complaints about the horror of having to copy code at five WPM. So making life easy really didn't buy Amateur Radio anything. Most of the Novice licensees don't ever get on the air anyway. Those that do could have stuck it out and made it at 10 WPM or 13 WPM if necessary.

If Ed Mitchell is right, and he obviously is, it isn't because there is something wrong with the license qualification, it's because so many Radio Amateurs have neglected the use of a developed skill and an earned privilege, and because of the weak support of the ARRL for CW.

I operate all bands on phone and CW. I can play the game both ways. It is possible to make a good case against any transmission mode including against Amateur Radio itself, as the commercial interests are already doing with great success. The fact that my new 42 buttoned, expensive, easy to operate, state of the art transceiver impresses me and my friends, means nothing to those whose first concern is the public interest. I have to justify the value of a license by the way I use it. The No-Code advocates would have us win a battle and lose the war. So stop complaining about the license requirements and privileges. Use it or lose it! CW represents about 50 percent of Ed Mitchell's license privileges. I wonder how long it has been since he has used it?—*Jim Pentland, KO3D, York, Pennsylvania*

☐ I feel compelled to respond to Edward Mitchell's comments appearing on page 70 of December 1985 *QST*.

To say the code portion of licensing exams is a test of morality is ludicrous. And what on earth does UHF packet operation have to do with Grenada?

Functioning effectively in emergency or public service communications requires operating skill. To develop any skill requires practice. Practice implies discipline. I really don't see the problem. We all want to be first-rate ops, capable of coming through when the chips are down, the odds are long, etc. Proficiency in radiotelegraphy is an essential operating skill. You may not (indeed, probably won't) use CW in all your ham operations, but you will be a better operator if you know how to. Any good, moral, bright individual should have no problem with element 1A.—*Ric Haworth, WI6I, Canoga Park, California*

☐ Your correspondence column of December 1985 carries a letter from Mr. Mitchell, WA6AOD, in which he describes his view (complaint?) as "slightly tongue in cheek."

Because the term "tongue in cheek" implies a certain degree of subtlety, Mr. Mitchell's heavy handed diatribe hardly fits the description given, leading your observer to make this suggestion to him: "Aw come on, Eddie. You too can learn the code if you persevere." —*John F. Martin, W6SE, Encinitas, California*

HERE AND THERE FEEDBACK

☐ Well! Well! Well! It sure does me good to know that we have an over-abundant supply of do-gooder, self acclaimed English Scholars out there in the ham ranks correcting all the "inappropriate, surplus, redundant, poor grammar, and stutters." Hooray! Hooray! Hooray! (Correspondence, Here and There, *QST*, November 1985, p 78.)

I am so happy, probably as well as all other Novice operators, that my first contact was not with one of those gentlemen. My usage of "R R R, OK OK OK, CFM CFM CFM, FB FB FB," etc, as a new operator may have consisted of one too many "nauseators." I would not like to have been the cause for someone to have been sick all over his equipment.

Oh how humble these gentlemen are! Of course, they became instant professionals upon obtaining their licenses and not the happy, proud—and scared—amateurs like the rest of us. Perhaps they should form their own "grammar-mistake-free" organization.

Please, gentlemen, if you even hear KA3FYX calling CQ, I would appreciate it if you don't answer. I hate to see anyone get sick.

As a fairly recent new subscriber to *QST* I am surprised to see garbage and junk like that in OUR fine magazine. And I was just beginning to think about upgrading my Novice license.

Well, sir, I wonder, they sure had their turn—will I get mine? I am willing to accept comments—good or bad.—*William C. Lewis, KA3FYX, Jersey Shore, Pennsylvania*

How's DX?

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

Reading the Mail—Part 2

Last month, this column discussed "dedicated" DX publications, promising that this second installment would cover varied representative organizational DX newsletters, such as: The Canadian DX Association's *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.

The Canadian DX Association's (CANAD-X) *Long Skip* is an imposing monthly journal of DX-oriented Amateur Radio information, edited by VE3XN. The November 1985 issue ran 32 standard pages, with a cover photo of King Hussein, JY1, and information on last November's special Royal Jordanian Radio Amateur Society celebration, marking the 50th birthday of King Hussein. Photo pages include some nice shots of G4WFZ, HV2VO, HV3SJ, G4UCB, IØSNY/ZB2, the CRRL September Convention, OK3JW, GW4BLE and CYØSAB. Editor Garry Hammond's monthly includes late DX news from many sources, awards and QSL routes. Further details from CANAD-X, PO Box 717, Station Q, Toronto, ON Canada M4T 2N7.

The Alaskan Goldpanner, a bimonthly publication by the officers and membership of the Alaska DX Association, is by its very nature a DX-oriented publication. The publication is sharp looking, with solid technical items, photos, etc. The Sep-Oct 1985 issue featured: an interesting commentary noting that the KL7 daytime was decreasing by 5-6 minutes daily (a half hour a week!), indicating that operating habits must adjust to fast sunrise/sunset times; 7 pages of coax tricks for newcomers, by club vice president KL7Y; a clever DX quiz; knockout photos of UA9CI's monster 4-element 40-meter interlaced with 6-element 20-meter quad, on top of what looks to be a 9-story apartment building; a rehash on a recent HF-propagation symposium at the University of Alaska, Fairbanks; a nice explanation of Oblast Charts, with a new USSR oblast list; and forms for the recent CQWW. Details from Sec/Treas Dave Vogel, NL7P, Box 111877, Anchorage, AK 99511.

The Western Washington DX Club, Inc puts out a monthly (averaging 8 pages) called *The Totem Tabloid,* edited by K7ZR. The November newsletter announces the next meeting ("Have Some Madeira, M'Dear?" by K7LAY/CT3), some bottom-of-the-cycle awardsmanship, K7ZR's classic "Zombie's Revenge," assorted DX, awards and contest news, low-band DX doings, ARRL contest criteria for club entries (by W7YF) and assorted ham ads. *The Totem Tabloid,* Western Washington DX Club, Box 224, Mercer Island, WA 98040.

The DXer, longtime publication of the Northern California DX Club (with a newsletter staff including WA6O, N6AN, KK6X, N6AUS and WB6WKM) is a monthly paper for a *very* DX-oriented group. (NCDXC meets monthly, joining for dinner in the San Francisco Bay area, followed by a club meeting.) The November issue of their club paper carries a touching obituary on two club members (W6s SC ZYC) by N6AN, how to upgrade your 402-BA by W6QHS, DXcerpts from DXperts, a DX crossword puzzle, contest calendar, information on the Maidenhead Locator System and an intriguing bar chart delineating numbers of members voted into the NCDXC from 1946-1985 (1979 was a *very* good year!). NCDXC's address is Box 603, Menlo Park, CA 94026.

Further downstate is the Southern California DX Club and their monthly *Bulletin,* edited by W6ABW. This highly competitive DX/contest club meets monthly. Their *Bulletin* for November includes an upcoming meeting notice, details on their Christmas banquet, a rundown on their monthly activity award, a mini-propagation forecast and a concise rundown of coming DX attractions. SCDXC can be reached via George Morris, W6ABW, 2106 Earnslow Dr, La Canada, CA 91011.

Not all DX clubs reside on the West Coast. An active group is centered in Kansas City, Kansas, putting out an interesting DX publication called the *Kansas City DX Club Newsletter,* edited by ABØX. A recent 10-pager includes details on the KCDXC contest DXpedition to Belize, CQWW log sheets, news and views on DXpeditions and contest forays, a good peptalk by prexy WØJLC and an interesting account of last fall's DXPO '85 in Atlanta. Check with KCDXC editor ABØX, 7871 Webster, Kansas City, KS 66109.

Worldradio, familiar to many of you readers, is published monthly in a small newspaper-like format (just recently changing from an unwieldly size to a 64-pager of handy dimensions). Though dealing heavily in Amateur Radio public service matters, DX is covered quite extensively. The November issue detailed the 33rd Pacific Northwest DX Convention, DX awards, DX World—a comprehensive survey of the DX scene by N6JM, propagation, etc. *Worldradio's* address is 2120 28th St, Sacramento, CA 95818.

A small monthly regular at my QTH is unique in one sense, in that it so indelibly carries the imprint of the personality of its DX editor, W8ZCQ. *Carascope* (Columbus Amateur Radio Association, Ohio) for November contains news of a recent item in *The New York Times* on the sun and sunspots (and the sad news that we've still a way to go before we're on the upside of the cycle!), kudos to locals for their work in the Mexican earthquake, Dan's inimitable tips on current DX doings and a typical parting shot indicating that Dan had heard the Pribilofs was a dead issue but personally felt that a close look should be taken at Parris Island, South Carolina.

Inc Spots for November, the official publication of DX Incorporated of Illinois, a fairly new arrival at our QTH, contains an alphanumeric list of stations heard/worked in the Illinois area (and QSL forwarding tips), lots of DX news by country, awards, a list of 10-meter beacons, QSL tips (the ARRL's QSL Service, Incoming and Outgoing), what to look for by bands for November propagation, etc. *DX Inc,* Box 1082, La Grange Park, IL 60525.

These publications are representative of the efforts of many DX-minded hams throughout the country, ready and willing to give *you* a hand in adding to your country total. Good luck to all of you in the upcoming ARRL International DX Test, and keep the How's DX? mailbag full!

OZ3Y

OZ3Y is a familiar occupant of the DXCC Honor Roll. Hans's interest in radio actually began with a hole in the ground! In 1927, when he was 8 years old, his schoolteacher wanted to demonstrate a radio receiver to the class. The older boys were to put an antenna on the school, and the younger boys were to dig a hole for the ground wire. About 10 years after that unusual introduction to Amateur Radio, Hans got his ticket. WW II delayed his DX QSOs somewhat, but that exciting day finally arrived when a 1982 *QST* showed OZ3Y in first place on the Honor Roll. OZ3Y also has close to 300 countries on his CW DXCC. He has DXCC aspirations for RTTY, also.

Hans notes that Southern Europe generally has better DX conditions than his far northern latitude, but that DXing isn't less exciting because of that. The most difficult part of the world for him to work is, he thinks, Juan Fernandez Islands, perhaps because the Andes

OZ3Y (see text). Note the number 1 Honor Roll plaque! *(Flemming Olsen photo)*

create sort of a "Faraday Shield," or possibly the skip isn't quite right. CEØZ was his last country for the Honor Roll. He finds 3.5/7-MHz conditions fairly good in the north-south directions. OZ3Y tips for working DX include rotating working hours, or being eligible for retirement!

Active in his society, EDR (The Experimental Danish Radio Amateurs), OZ3Y has been president, as well as vice president. For several years, he edited the DX column of his society's magazine, *OZ*. His station includes a TR7A, IC2KL linear and a Telereader. Antennas are dipoles for 80 and 40, an 18HR 5-band vertical and a Telrex 3-band Yagi at 60 feet. His QTH is 3 miles outside the town of Korsoer, on a small hill just 80 feet away from this bay, an excellent radio location.

K4LTA HEADS EXPEDITION TO GRENADA, J3

K4LTA of Oak Ridge, Tennessee has completed plans to head a group of 6 couples on a vacation/DXpedition to Grenada, Feb 12-Mar 5. Other operators will include N4FKO WA8FSX N4MMV NF5Z KØOSN N4KOV W5PWG and N6LHN, planning a multi-single effort in both sessions of ARRL's DX Contest. They should be QRV beginning Feb 13, operating all bands. J38A was requested, but if not approved the group will use their US call/J3. Look for them about 25-30 kHz above the bottom of the bands, around 7005, 3505, and on 160 as follows: in the DX window, 1825-30, or on 1823 and 1833. If you need Grenada on sideband, listen around 14,195 and 14,257. Other combinations will be announced. A weekday schedule on 21,123 kHz for US Novices and slow-speed operators will be kept at 2230Z. K4LTA is taking an amplifier this time and hopes to do better on top band.

The globe-trotting Colvins (W6KG and W6QL) at ZS6AF's (right) "key" museum in Johannesburg, South Africa.

This is your chance to finish J3 for your 5- or 6-band DXCC. Don, J37AH, is assisting the group with licensing. QSL info later.

EH9IA

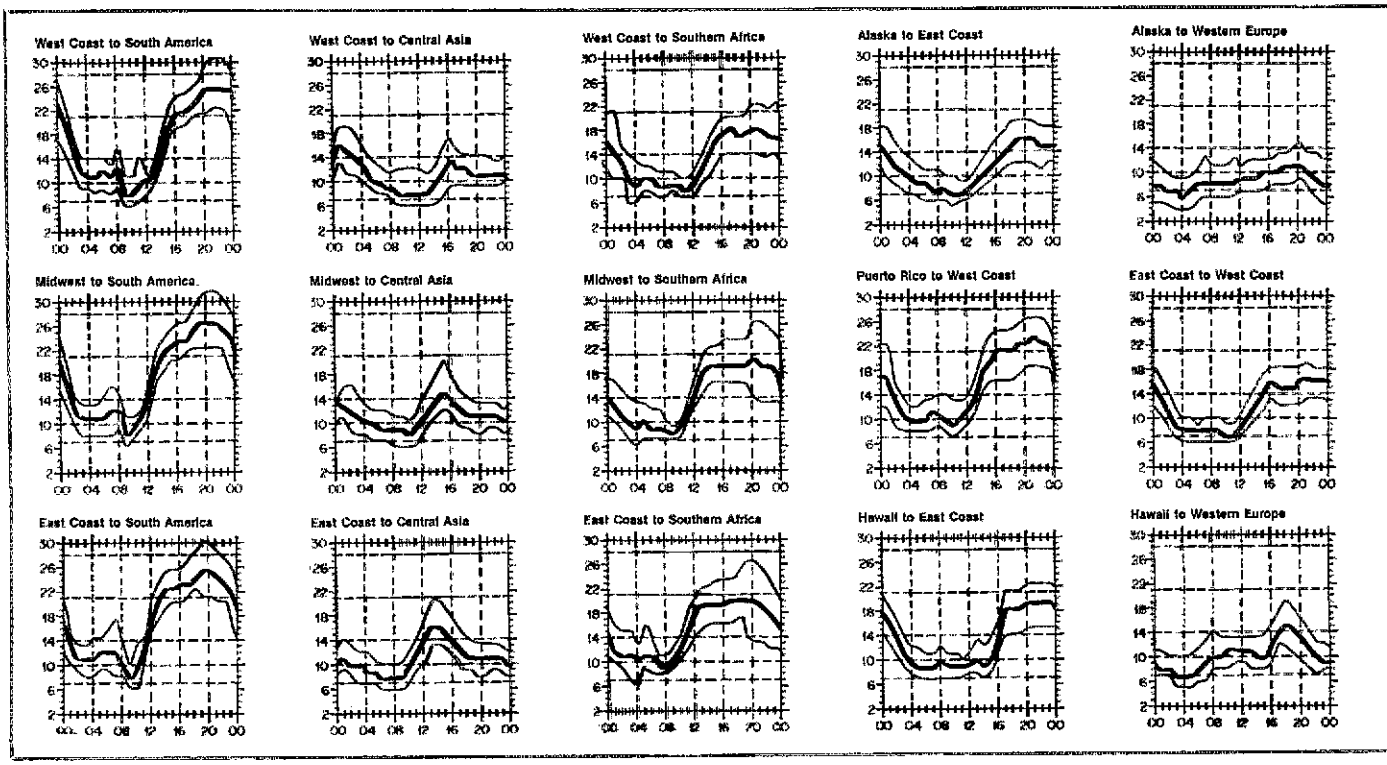
W4KM furnishes information from a ham friend, EA7BUD, of an interesting DXpedition: Alboran Island, located at about 36° north latitude and 3° deg west longitude (ITU Zone 37). The island is a Spanish possession located about 37.5 miles north of Morocco and about 55 miles south of continental Spain, in the Mediterranean Sea. It is a steep platform, averaging about 100 feet in height. The island is administered by the Spanish Armed Forces and is staffed by military personnel who operate a signaling beacon and assist fishermen. The DXpedition used the unique prefix EH9 (in lieu of EA9), and was undertaken by the Malaga (EA7) branch of Spain's IARU society. Operators included EA7s TK TL XC AAW AIN BUD. In three days of operation, 5000 contacts were made with 100 countries, all states, 10-160; phone/CW. On 2 meters, 25 countries were worked. Worked EH9IA? The card manager is Jose Sanchez Fortes, EA7GW, PO Box 2652, 29080 Malaga, Spain. Dex, W4KM, offers special kudos to EA7BUD, and notes that he and EA7AIN were active in setting up ED7ITU for the use of delegates attending a meeting of ITU held at Malaga in late 1984.

BEYOND DXCC?

WA7HHX (and others) call our attention to a Nov 22, 1985 item in *The Wall Street Journal*. In the feature, a Mr. Thompson of Ohio is trying to become the first person ever to visit all 308 countries on earth (this total is arrived at by the Travelers Century Club of Los Angeles, and includes independent territories and populated islands that aren't countries by UN standards). To get into the club you have to visit 100 "countries." Good heavens, do you think the Colvins know about this?

ISLAND NAMES

Islands are something we DXers know about by name, by prefix, by beam heading (and by much frustration, oftimes!). However, the same island (or group) may be known by more than one name, often a native one. We're all familiar with OHØ, the Åland Islands. Åland is a Finnish Island populated by Swedish speakers and is also known as the Ahvenanmaa Islands. Both names are in current usage because everything in Suomi/Finland has two names. 4S7 is great to



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

work whether we still refer to it as Ceylon or as Sri Lanka ("resplendent land" in Sinhalese). The name Sri Lanka is the resurrected old name for Ceylon. Other ancient names are Taprobane and Serendib. Noumea, in the island group New Caledonia, is also known as Port de France. (Port de France refers to the entire island of Noumea.) New Caledonia itself was originally known as La Grande Terre. Robinson Crusoe Island (Juan Fernandez) is known as Mas a Tierra ("closer to land"), distinguishing it from the other main island of the Juan Fernandez group, Mas Afuera ("farther away"). On an interesting windup note, Formosa is known as Taiwan, but the word Formosa is not Chinese but Portuguese, meaning "beautiful."

THE CIRCUIT

☐ **HC8EE et al.:** Rick Dorsch is slated to be the featured speaker at the South Florida DX Association DX Banquet, in conjunction with the Miami Hamboree extravaganza, Feb 8-9, at the Dade County Youth Fairgrounds at Miami's Tamiami Park. In addition to his assortment of Ecuadorian calls, Rick has operated under FØMH, FGØMH, KZ5GC, PJ8RD, VP2AAB, VP2EEL, ZF1CW and NE8Z/PJ3.

☐ **International DX Convention:** The 37th running of this classic will be held at the Holiday Inn at Visalia, California, April 18-20. For reservations, call 209-651-5000. More details from Grand Chairman W6AOA later.

☐ **Ecuador:** HC1ATG is new on the air from Quito. Back home he was KØWTM for about 30 years, before that ET3GB, and more recently OA6CV. Look for George mostly on 20 CW. Getting lots of cards and appreciates an IRC. George Brumley, HC1ATG, Apartado 8512, Quito, Ecuador.

Troster's Tips for Easy Listening

Don't ask a DX station working a pileup or a DXpedition such questions as: What is the QSL route, when are you going to QSY to 160, how about a sked for 40 sideband? Sooner or later, the station will usually give out this info. On a big DXpedition, don't worry about QSL info; it will be in all the mags anyway. About QSYing—if you monitor long enough, the DX station will often announce a move. Also, someone else is sure to ask the same question about 160. So, no need for you to waste time. It is amazing how much time a DX station will have to take to answer all the questions put to him.

More next month from W6ISQ.

☐ **W1OHA:** Paul likes to read about the BY operations, but would prefer working 'em, along with needed XZ ZA 3CØ 3X T31.

☐ **Macau:** WA4IKZ notes that he operated as CR9T during Jul 1982, Oct 1982 and Mar 1983. Since then he has moved several times and his mail is no longer being forwarded. Anyone needing cards can either go via the 4 Bureau or Dirk Tanis, WA4IKZ, 1517 Croston Dr, Plano, TX 75075.

☐ **Oops:** On the lead page of How's? for December please note an inadvertent switching of captions for the two right-hand photos. The top right-hand photo should be noted as YU3MA.

☐ **EL2AO:** Outstanding QSLs from EL2AO can be obtained for an SAE/IRC to the following address: Juan Tejero, 203 Fairway Rd, No. 7, Kitchener, ON N2M 2N7, Canada.

☐ **8J1XPO:** The Tsukuba '85 International Exposition station was supposed to QSL 100% via the bureau. But if you're an SWL, or somehow missed receiving your confirmation, write with SAE/IRC to JARL "Kanko District Office," PO Box 377, Tokyo Central, Japan.

☐ **Operating Manual:** Exciting news in the works, what with the 1986 ARRL *Operating Manual* to contain longterm propagation predictions from Eastern, Central and Western USA to 17 overseas areas. This edition should be a lulu, additionally carrying sunrise/sunset times for each DXCC country. Watch for it!

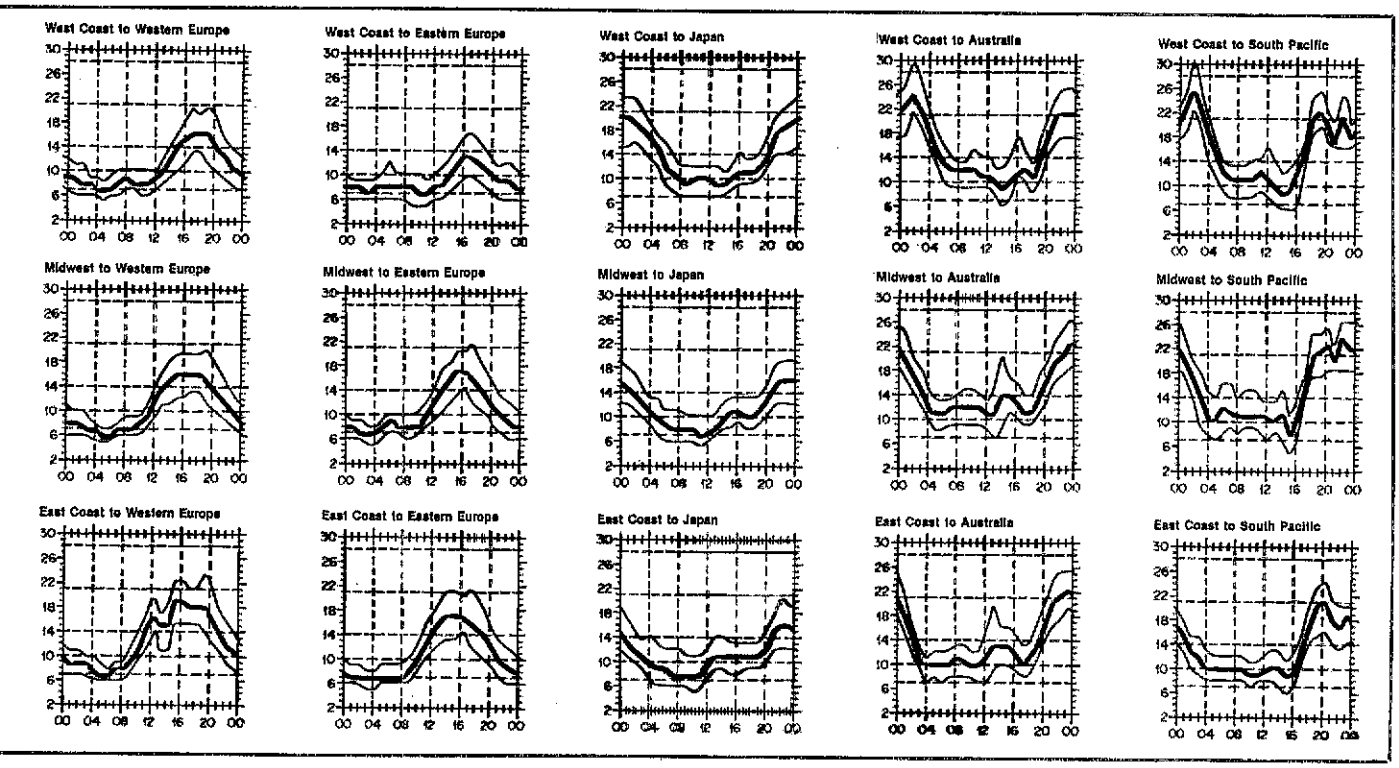
☐ **Anguilla:** K5RX operated 40-meter sideband during CQWW sideband as VP2ET (QSL via K5RX), while KC5EA operated 80 meters as VP2EC (QSL via N5AU).

☐ **HI:** HI8LC, active for 25 years and holder of the first HI 5BDXCC and 5BWAS, notes that cards for HI Radio Amateurs can be directed to him, Luis P. Caamano, Box 88, Santo Domingo, Dominican Republic.

☐ **P44B:** The correct address for this station's manager is Howard Miller, N2MM, 22 Mill Rd, Vincentown, NJ 08088.

☐ **FJL:** In response to WA8JOC's Franz Josef Land, UW3HY/1, query in the November issue, WB4WRM notes that *his* card from Valery took about 15 months via POB 88, Moscow.

☐ **OE2DYL:** Dieter reminds the faithful of his fifth edition of *DX Nets Around the World* (6 IRCs for "overseas") and his new *DXCC Country List* (5 IRCs). Write to Dieter Konrad, OE2DYL, Bessarabiestr 39, A-5020 Salzburg, Austria.



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 February 16 to March 15, 1986, assume a sunspot number of 11, which corresponds to a 2800-MHz solar flux of 73.

IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

THE IARU MONITORING SYSTEM

The name IARU Monitoring System will be a new name to many of you—but the name Intruder Watch will be familiar to almost all of you. The first Intruder Watch was organized by the Radio Society of Great Britain nearly 30 years ago. The ARRL, and then other IARU societies, soon followed that lead. Why an Intruder Watch? Because there is a provision in the international Radio Regulations which, freely paraphrased, says that in effect any administration can assign any frequency to any station provided no interference is caused to a station operating on that frequency in accordance with the Radio Regulations. Thus, if no interference is caused, there is no problem, and the "offending" station can continue its "out-of-band" operation.

So amateurs organized Intruder Watches in order to look for out-of-band operation in the amateur allocations. Thousands—nay, tens of thousands—of reports detailing such operation were submitted by enthusiastic radio amateurs participating in the Intruder Watches. Although success didn't crown every effort, nevertheless many nonamateur signals were removed from the amateur bands. Furthermore, the large volume of reports turned out to be useful in our preparation for WARC-79 and at the conference itself. The enthusiasm of many volunteer Intruder Watchers was fueled because they realized they were an important part of our WARC preparation.

But following WARC-79, it became obvious that some changes needed to be made in the operation of the Intruder Watch. It became clear that there had to be a more coherent operation of the Intruder Watch worldwide, that there had to be common goals and a common understanding of how interference complaints should be handled, and that there had to be a better understanding of what could realistically be achieved.

This became one of the first jobs of the new IARU Administrative Council, and it established an International Study Group whose terms of reference were: (1) Defining realistic objectives and identifying the framework within which those objectives can be achieved; (2) Having regard to (1), defining the role and method of the international coordination of the Monitoring Service; and (3) Recommending the best methods of improving the efficiency of the Monitoring Service, including special reference to the reporting systems, guidelines for operators and guidelines for national and regional coordinators.

This International Study Group met in Geneva last August. Participating in the meeting, both as delegates from the three regions and as observers, were W1RU, PAØVDV, HK3DEU, ZL1BAD, G3PSM, W3OKN, 9V1RH and JM1UXU. Early in its discussion the Study Group decided that the name of the Intruder Watch should be changed to the IARU Monitoring System, though recognizing that this does not preclude a national society from using some other appropriate name by which to designate its individual activity that seeks to eliminate harmful interference. For example, ARRL's activity in this area is now known as AIRS—the ARRL Interference Reporting System.

The new IARU Monitoring System is structured in a fashion similar to the rest of the IARU. There is an International Coordinator, an individual appointed by the Administrative Council who coordinates the Monitoring System activities of the three regions. Then there are three Regional Coordinators, individuals appointed by the respective regional organizations, whose task is to coordinate Monitoring System activities in the regions. Finally, there are National Coordinators, who are the IARU Societies in the countries concerned. The objectives of the IARU Monitoring System are: To collect data on the use of the amateur bands; to constitute a picture of harmful interference; to encourage monitoring activities by national societies; and to have available on a regional basis monitoring stations that meet the technical standards recommended by the CCIR.

The International Study Group went on to specify in quite some detail the responsibilities of the International Coordinator, the Regional Coordinators and the National Coordinators. We won't list all of that detail here—we just want to emphasize that, in accordance with the new IARU Constitution that was adopted a couple of years ago, each national society has the ultimate responsibility for properly representing the Amateur Radio Service in its own country—and the protection of its members from harmful interference certainly would seem to be one of those responsibilities. The Regional Coordinators will oversee the Monitoring System on a regional basis, making every effort to assist National Coordinators in effectively carrying out their functions within the Monitoring system. And, of course, the International Coordinator has overall coordination responsibility.

The report of the International Study Group was presented to the IARU Administrative Council at its meeting in Melbourne, Australia, in November 1985, and was approved. After suitable discussion and liaison with all of those involved, the IARU Administrative Council named Robert Knowles, ZL1BAD, as International Coordinator, effective immediately. ZL1BAD has been active in the work of the Monitoring System for a number of years and has most recently (again, for several years) been the IARU Region 3 Coordinator. He brings a great deal of enthusiasm and expertise to the job.

Although the post of International Coordinator is a new one, we have had regional coordinators for a number of years. As mentioned in the previous paragraph, our new International Coordinator has been serving as the Region 3 Coordinator. In the very near future, Region 3 will appoint a successor to ZL1BAD. In the meantime, the Regional Coordinators for Regions 1 and 2 continue their work, although with new guidelines and more clearly defined objectives. Jocke van der Velde, PAØVDV, is the Regional Coordinator for Region 1, and M. L. Gibson, W7JIE, is Region 2 Coordinator.

National societies, members of IARU, wanting to participate in this revitalized Monitoring System, should contact their Regional Coordinator. Individuals wanting to participate should contact their national society.

Through your individual participation in International Monitoring System activities, you make a contribution to the protection of the Amateur Radio Service. It is, in a sense, a "silent service," in that you will work alone without much glory or fanfare. But once you get hooked on looking for nonamateur stations causing interference to amateurs in the amateur bands, you're likely to find it a fascinating pastime. You will develop some expertise in locating and identifying interfering signals, some of which will be quite prosaic, others quite exotic. But, from the standpoint of IARU, the important thing is that although most of the time it will not seem very spectacular, you will be playing an important role in defending the Amateur Radio Service. It's a chance for you to make a small repayment for some of the benefits you have received.

THE G2BVN MEMORIAL TROPHY

Roy Stevens, G2BVN, was a driving force for many years in the work of the Radio Society of Great Britain and IARU Region 1. He served as president of RSGB and was for many years the secretary of Region 1. He participated to the utmost in the preparation for WARC-79 and was a member of the IARU team at WARC-79. By that time his physical condition, because of a crippling neurological disease, confined him to a wheel chair. Although he died not long after WARC-79, he had lived to see his work of many years brought to a successful conclusion at the conference.

His memory lives on with those who knew him, and there has been established the Roy Stevens, G2BVN, Memorial Trophy. The trophy is to be awarded to any radio amateur who best exemplifies the work and dedication of Roy Stevens, G2BVN, in international radio. Radio amateurs worldwide are eligible. All nominations are to be made through a national society and should be received by the IARU Region 1 Secretary before the commencement of the opening plenary of a Region 1 Conference. The winner is to be decided by a panel of five, chosen by ballot at the opening plenary of a Region 1 conference. If more than one nominee is proposed, the panel can name two recipients at any Region 1 Conference. Any society that wishes to nominate a person for the Roy Stevens, G2BVN, Memorial Trophy should take note that the next Region 1 Conference will be held in 1987.

KEN'ICHI KAJII, JA1FG

We regret to report the death on December 7, 1985, of Mr. Ken'ichi Kajii, JA1FG, past president of the Japan Amateur Radio League, at the age of 86. He was a pioneer in Japanese Amateur Radio, having first become interested during the 1920s. In 1927 he received the call J3CC, and after WW II became JA1FG. He became president of JARL in 1959, and continued in that post until 1968. He also led the Japanese delegation to the IARU congress in Sydney, Australia, in 1968, when the IARU Region 3 Association was formed.

Canadian NewsFronts

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

Last Spike Remembered

The two photographs shown are 100 years and 3000 kilometres apart. What's the connection? The first was taken by Alexander Ross on November 7, 1885, at Craigellachie, British Columbia. The Honorable Donald Smith, flanked by Sanford Fleming and William Van Horne, drives home an ordinary iron spike to complete the CPR (Canadian Pacific Railway) transcontinental line linking the Atlantic and Pacific Oceans. A short time later, CPR directors, senior officers and other notables would board a special train, the first to complete the journey from East to West.

(photo courtesy of CPRail)

The second photograph was taken by a CPR employee, Keith Baker, VE2XL, on November 7, 1985, in Brossard, Quebec. Jean Taillon, VE2BEU, Pascal Charlebois, VE2HAD, Solange Charlebois, VE2TSF, and Claudette Taillon, VE2ECP, all members of the CPR Amateur Radio Club, operated special-event station VG2CPR to mark the 100th anniversary of the driving of the Last Spike. These four, along with Keith Baker, VE2XL, and John Mann, VE2UM, worked in shifts to make over 250 contacts in a 24-hour period. A great way to celebrate a significant event in our Canadian history.

NOTES FROM ALL OVER

☐ Once again, Vancouver amateurs were successful in making CRTC (Canadian Radio-television and Telecommunications Commission) aware of harmful interference caused by a local cable-television company. When Rogers Cablevision, Vancouver, applied for a rate increase, the amateurs made formal intervention, arguing that the increase should be withheld until the cable company made good an earlier promise to tighten up its system. Concerned, CRTC asked DOC to investigate. DOC confirmed that the amateurs were right; the system leaked badly. CRTC did not withhold the rate increase. However, they instructed the cable company to tighten up its system and warned that the whole matter would be reviewed when the cable company's license came up for renewal.

☐ A number of Canadian amateurs, in possession of call signs with Q-signal suffixes, have received letters from DOC asking that they relinquish those call signs. CRRL reminds these amateurs that these are DOC requests, not orders! As announced earlier, amateurs and Amateur Radio groups who now have these call signs (this includes CRRL with its "QST" calls) can retain them. However, in the future, no additional call signs with Q-signal suffixes will be issued.

☐ Recently, DOC completed 191 tests consisting of 800-900 separate transmissions from the home of Jack Ravenscroft, VE3SR. DOC would not comment on the results. However, observers are confident that the results are in Jack's favour. Jack is the Ottawa-area amateur who was sued for $35,000 for allegedly interfering with a neighbour's microwave oven, furnace control, television set and electronic organ. To date, 400 individual amateurs and Amateur Radio clubs have contributed a total of $13,000 to help Jack with the legal expenses for this precedent-setting case. As Jack goes to trial (at press time, trial was expected to begin during the week of January 13), there is still need for additional support. Please send your cheque to the Jack Ravenscroft RF Susceptibility Defence Fund, Box 8873, Ottawa, ON K1G 3G2.

SECTION MANAGER ELECTION RESULTS

Congratulations to Bill Gillespie, VE6ABC, of Edmonton who was recently elected Section Manager, Alberta Section. Bill, who ran unopposed, has been Acting Section Manager, Alberta Section, and is also CRRL Prairies Region Director. Bill's new term of office begins on April 1.

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Manitoba Section: You are hereby solicted for nominating petitions pursuant to an election for Section Manager. Name of the incumbent appears on page 8 of this *QST*.

A petition, to be valid, must carry the signatures of five or more CRRL Full Members residing in the Section concerned. It is advisable to have more than five signatures. Photocopied signatures are not acceptable. Signatures must be on the petition.

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

(Place and date)

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

We, the undersigned Full Members of the Canadian Radio Relay League residing in the Manitoba Section, hereby nominate...as Manitoba Section Manager for the next two-year term of office. (Signatures...Calls...Addresses including postal codes...)

A Section Manager must be a resident of his or her Section, a licensed amateur holding a Canadian Amateur Certificate or higher and a Full Member of the League for a continuous term of at least two years prior to the receipt of the nominating petition at CRRL Headquarters. Petitions must be received at CRRL Headquarters before 1600 EST Friday, March 7, 1986.

If only one valid petition is received, the person nominated will be declared elected. If more than one valid petition is received, a ballotted election will take place. Ballots will be mailed from CRRL Headquarters on or before April 1, 1986. Returns will be counted on or after May 16, 1986. A Section Manager elected as a result of these procedures will begin his or her two-year term of office on July 1, 1986.

If no valid petition is received, the Section will be resolicited in July 1986 *QST*. A Section Manager elected after resolicitation will serve for 18 months.

Vacancies in any Section Manager office between elections will be filled by the CRRL Secretary, acting on advice from the CRRL Board.

You are urged to take the initiative and file a nominating petition immediately.—*Harry MacLean, VE3GRO, CRRL Secretary*

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.

It's Your Column

Is The World Above 50 MHz what you want it to be? Does it cover the subjects you want it to? Most comments received seem to infer that it scores quite well on both counts. Once in a while, however, a contrary opinion comes along. All comments are welcome, whether they be favorable or not, because they help in formulating the coverage of future columns. Some include suggestions for specific subjects. These are especially valuable since they serve as a reservoir of ideas. They are also useful because they indicate something that might be improved in the conduct of the column, or reveal problems facing VHF operation in general. Often the problem concerns operating procedures, such as the use or misuse of calling frequencies. In other instances, the subject may be the conduct of VHF contests.

One comment that recently arrived was quite critical with regard to the coverage given in these pages to 6 meters. This particular correspondent, although he states that he is active on the band and has his receiver turned on many hours per day, contends that "6 meters is dead" and that I surely must know it! Certainly, we are all only too well aware that our lowest frequency VHF assignment doesn't offer the excitement month after month that it did a few years ago; but, from the reports received, it's far from dead, anymore than are the higher bands. But if you, the readers, want future columns to devote less space to 6 meters, write and say so. From the amount of material I receive regarding the band, I can't conclude that most VHFers share the opinion of this one particular gentleman. In fact, the next two letters I opened after his concerned 6 meters. Nevertheless, I do try to aim for a balanced column, both from the standpoint of coverage given to the various bands and to airing news from different geographical areas. It is difficult, however, to report the news unless it is submitted. Occasionally, something really big takes place, such as the tropo openings last summer between the West Coast and KH6. In such cases, when not enough information is received to put together a decent report, I am forced to get on the phone and track down the story. In that particular instance, it required several calls to California and one to Hawaii to piece together an accurate account of the event. I even made a call to England to get a view from the other side of the pond regarding the exciting 6-meter opening between the East Coast and the UK last July 30. In most cases, however, I rely on mail or calls to the telephone answering machine (301-384-6736). This is a special number intended for receiving column inputs. It is not my regular telephone number. Those trying to contact me for something other than providing information for the column should leave a phone number where they can be reached.

Thus, I need your input of news as well as suggestions and information that might be used in writing lead material for future columns. For those who may be unfamiliar with the term, the lead is the first part of the column, the section you are reading now. The lead is the heart of the column, providing, as it does, an opportunity to address various subjects of current importance to the VHF scene.

The remainder of the column concerns news of what has been happening on the various bands as well as of VHF-related activities such as upcoming DXpeditions, contest operations and conferences. This section is especially valuable because it serves to let those who may be active only on one or two bands know what is happening on the others. Hopefully, it may serve as an impetus to convince some to try a new band. That's why I strive in particular to include information on less-populated bands like 1¼ meters or the microwave assignments. We need more activity on these bands, and I have always believed that one way to achieve that end is to provide news of the activity that does exist on them and highlight some of their more interesting propagation events.

Standings Boxes Deadlines

Box	*QST issue*	*Date Update Must Be Rcvd*
2 Meters	Jan, Jul	Nov 5, May 5
1¼ Meters	Feb, Aug	Dec 5, Jun 5
70 cm	Mar, Sep	Jan 5, Jul 5
33, 23 and 13 cm	Apr, Oct	Feb 5, Aug 5
6-Meter DX	Nov	Sep 1
EME Annals	May	Mar 1
VUCC Roundup	Dec*	Not applicable; information provided by HQ

*In addition to the annual publication of the totals for all VUCC holders, updates will appear throughout the year.

Of the approximately 100 pieces of mail I receive each month, a large percentage concerns updates for the various standings boxes. These go immediately into the appropriate file folder for use when that box is next updated. That's why I ask that box updates be on sheets separate from those providing general information intended for the column. Failure to do this means that I must remember to put the report into the proper file folder after it is reviewed for use in the column or employed to update another box. I always try to be sure to do this, but occasionally I fail. This is the most frequent cause of a submitted update not appearing in the next publication of the box. My best advice on this is to send for the forms that I have prepared and use them in the indicated fashion. One type of form is for updating the 6-Meter DX box; the other handles the remainder of the boxes. An SASE to the address at the top of this column will bring several of whichever types you may require.

Some have complained that they submit news but that it doesn't find its way into the column. Yes, I often receive more information than I can fit into the two pages allotted to The World Above 50 MHz, but I need and appreciate all the inputs I can get in order to piece together a representative account of what took place—for example, a widespread tropo opening. A frequent reason for information not being used in the column is that it arrives too late. Try to get reports off within one week of the event. If it occurs after about the 5th of the month, put an account on the answering machine.

Incidentally, beginning immediately, my deadline to submit the finished text to Newington has been moved up so that I must have inputs by the 10th of each month. Previously I could accommodate information reaching me up to the 15th. That's for material for the column appearing in the *QST* bearing a cover date two months from that time. For example, while you are reading this, I will be busy preparing April's column. The new deadline obviously forces a revision to the closing dates for updates to the various standings boxes, but it also means you will be receiving *QST* a few days earlier each month. The accompanying sidebar lists the dates that such information must now reach me in order to be included in the next publication of each box.

The reader who expressed the view with respect to 6-meter coverage was not entirely negative. He had several specific thoughts for future columns. Like all suggestions received, I certainly intend to consider them. As already stated, suggestions for subjects suitable for use as leads are especially welcome. It is frequently quite a task to come up with fresh, relevant subjects month after month without inputs from readers. Whatever your comments or suggestions, keep them coming. Remember, it's your column. It is written for you. Its contents reflect the information you provide as well as your views on what subjects should and should not be covered.

Let's hear from you!

ON THE BANDS

6 Meters—Feeling sorry for yourself because of the lack of 6-meter DX? Take heart; better times are coming. As a harbinger of more interesting days, the December 3 issue of NOAA's publication *Preliminary Report and Forecast of Solar Geophysical Data* includes a section on the spots attributable to Cycle 22. NOAA does not imply that the next solar cycle has actually begun. That declaration is not made until the number of spots from the new cycle equals those from the old. Nevertheless, NOAA does list 18 blemishes on the solar disk that have occurred between April 1983 and the end of October 1985, which they conclude are associated with the new cycle. Twelve of these have been noted since April 1985. Generally, new cycle spots occur at solar latitudes above 20 degrees and are of reverse magnetic polarity to those of the old cycle. Of the 18, two were not of reversed magnetic sense but were at latitudes of 32 and 49 degrees respectively, so they were considered to be associated with the new cycle. Incidentally, for the week, between November 25 and December 1, the report lists no spots detectable on the face of the sun. During that time, the 10.3-cm radio flux ran between 70 and 72. The lowest it seems to go is the high 60s. Despite these quiet conditions, there was a major magnetic storm attributable to a

1¼-Meter Standings

For WAS holders, listing 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. In order to make the standings a true reflection of stations currently active on 1¼ 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. It is not necessary to have worked additional states or grids in order to remain in the standings or to be reinstated. Merely indicate that you are still on the band. WAS holders are listed in any case. Compiled December 15, 1985. Deadline for next update is June 5, 1986.

WAS Holders

1	WØVB*	MN	13	—
2	WØSD*	SD	—	—
2	WBØTEM*	IA	—	—
4	K5FF*	NM	14	—
5	W5FF*	NM	13	—
6	WB5LUA*	TX	—	—
7	VE3EMS*		14	—

W1JR*	MA	43	14	65
W2SZ/1	MA	23	9	55
K1FO	CT	23	7	—
K1PXE	CT	18	6	—
W1GXT	MA	15	9	—
W1QXX	MA	15	5	21
W1YTW	ME	14	8	—
W1HDQ	CT	13	5	—
K1JIX	MA	13	4	—
K1LPS	VT	12	6	—
WA1JOF	MA	11	5	15
W1AZK	NH	10	3	—
K1BFA	MA	10	3	—

*some contacts via EME.

W2CRS	NY	21	—	—
W2PGC	NY	20	9	—
K2CBA*	NY	19	7	—
K2GK	NY	16	8	41
W2DWJ	NJ	15	6	—
K2DNR	NY	15	6	—
K2YCO	NY	14	7	—
WA2FGK	NJ	14	6	—
WA2FUZ	NY	14	5	—
N2WK	NY	13	8	37
N2BJ	NY	13	5	23
W2WW	NY	13	5	19
W2SEU	NY	13	5	—
WB2EIY	NY	12	7	24
WA2YWP	NY	6	2	—
W3GPY*	PA	40	12	—
K3HZO	MD	22	10	17
N3CX	PA	18	—	—
W3RUE	PA	16	9	12
W3UJG	MD	15	8	—
W3HMU	PA	14	4	—
W3IP	MD	13	6	—
WA3JUF	PA	12	5	—
K3IUV	PA	12	4	—

W3XO	MD	9	4	—
WA3FYJ	PA	8	6	14
WD4DGF	TN	31	9	61
WA4NMA	GA	25	8	—
W3IY/4	VA	23	10	—
KC4EG	KY	23	7	—
K4LHB	VA	21	9	—
WS4F	GA	20	7	28
WA4CQG	AL	20	—	—
WD4IIS	GA	18	7	—
WA4PCS	KY	18	7	—
WA4SBC	VA	17	6	—
N3AHI/4	GA	16	6	—
K4GL	SC	14	6	—
WA4MVI*	SC	12	7	—
K4CKS	GA	11	2	—
KC4P	AL	9	2	—
WA4LYS*	FL	6	6	6
K4IXC	FL	5	3	—
W5RCI	MS	30	7	—
K5CM	OK	22	—	—
W5HN	TX	21	—	—
K5SW	OK	16	5	32
N4JS/5	MS	13	7	—

N5KW	OK	12	—	—
WA5VJB	TX	11	5	—
K5JL	OK	7	4	—
W5NZS	OK	4	2	—
WA5DBY	TX	3	1	3
WB6NMT*		10	6	—
W6WSQ		6	4	—
N6AMG*		3	3	—
W4WD/7*	UT	37	10	25
K7NII*	AZ	16	11	—
W7JF	MT	8	5	—
W7CNK	WA	6	3	—
K7ICW	NV	4	2	—
WB8BKC	MI	31	9	55
W8IDU	MI	25	8	—
WA8TXT	OH	20	10	—
WB8PAT	OH	16	8	—
K8AXU	OH	12	7	—
K8HWW	MI	11	7	—
K9MRI*	IN	34	9	—
K9XY*	WI	28	13	—
K9HMB*	IL	23	10	—
WB9SNR	IL	22	9	—

K9KFR	IN	11	6	—
WØUC/9	WI	6	2	7
KB9NM	WI	5	4	—
KAØY*	IA	32	11	—
KØDAS	IA	29	10	—
KØALL	ND	24	10	—
WØPW*	CO	20	8	—
KØTLM	MO	18	5	35
KCØQR	NE	16	4	25
KFØM	KS	12	4	27
WAØNOK	MO	6	2	—
WBØZKG	IA	5	2	—
WAØQLP	SD	4	2	—
VE3DSS		13	7	—
VE3LNX		13	5	29
VE3AIB		10	12	—
VE2YU		8	3	—
VE2DFO		7	8	—
VE1UT	NS	7	4	—
VE2HW		5	2	—
XE2BC*		2	3	—

disappearing filament which occurred at 1614Z November 25. The magnetic storm conditions a few days later brought quite a few reports of 6- and 2-meter auroral contacts. W1ICW Fairfax, VT says that, in five hours beginning about 2100Z November 30, he filled two log pages with 6-meter QSOs. They ranged from WBØZKG Iowa to the west and W3IY/4 and KA3ECK/4 Virginia to the south.

From the column entitled "4-2-70," which appears monthly in the Radio Society of Great Britain journal, *Radio Communication*, comes an interesting account of 6-meter conditions in Sweden last summer. The December column includes comments from SM6PU, stating that he observed only one opening to North America during 1985. That occurred June 8, between 2054 and 2112Z, when Olof heard Florida station W3ZR/4, plus several others he could not identify, taking part in the ARRL June VHF QSO Party. During the big opening of July 2, he heard no 6-meter amateurs but, between 1845 and 2130Z, he did observe commercial signals from the US in the 35-MHz region. Of course, Swedish amateurs are still not allowed to transmit on 6 meters, but SM6PU continues to be ready for 6 to 10 crossband QSOs. Normally, he uses 28,885 kHz for this.

The Sable Island operation, conducted Nov 18-25 by VE1YX, AK4L and others, netted only six 6-meter QSOs. The lucky ones were WA1EKV, K1TOL, W2CAP/1, WA1AYS, W3IWU and W4CKD. For some of these, CYØSAB is known to represent a new country: number 57 for W3IWU and number 67 for W4CKD.

2 Meters—Excellent tropo and some very good aurora, the latter noted in the 6-meter section, dominated the propagation picture during the mid-fall period. W9BOZ Chicago says that the aurora November 29 netted him twenty 2-meter QSOs in 17 states plus VE3. Ralph was particularly impressed by the wide geographical extent of the propagation—from New Hampshire to the northeast to Georgia to southeast and Nebraska to the west. Another report on this aurora comes from WA2EXX New Jersey. Stan comments that he is new at the game, but was pleased with the performance of his 80 W and a Junior Boomer at 30 feet. The combination brought him 17 stations in 14 grid squares between 2310 Nov 29 and 0050Z Nov 30. Another for whom the mode is new is N4BG Roanoke, VA. Ben writes that, while monitoring the band on the evening of Nov 29, he heard "a horrible buzzing sound." Listening further, he discovered that it was CW and it was saying CQ AU. He knew right away that his first experience with aurora was underway. This first time out was a lot of fun, and produced 10 QSOs including W1JR Massachusetts and K9IGE Wisconsin.

VP9IB has now experienced a taste of moonbounce by virtue of contacts with WA1JXN/7 and W5UN. His appetite is sufficiently whetted, Tom says, that he will be on with an EME-capable 2-meter station by summer.

70 cm and Above—K1FO reports that he missed some of the excellent tropo in late September due to a five-day power outage following Hurricane Gloria. The big wind also bent Steve's mast that supports his eight RIWs. So, he took the whole thing down and replaced it with a new mast and 12 RIWs. So far, the new installation has paid dividends on both tropo and EME. On the tropo side, he describes 70-cm signals from Nova Scotia to Virginia as "unbelievable" during the evening of Oct 23. He was able to hear the WA4PGI beacon in southern Virginia for the first time. VE1UT's signal was 75 dB out of the noise. The next evening, with the band still open, Steve was able to work VE1AHM FM76 for a new grid square. That station was running 10 watts to an F9FT and was S-5 at his QTH near Hartford. Also worked were VE1RG and VE1APA FN65. Speaking of tropo, WA4MVI has been doing some research on the subject. Jim confirms, through his own actual measurement, the scenario in which warm moist air is pumped over cool dry air. He was able to collect his data by flying along a front and taking temperature and other readings. WA4MVI also notes a significant difference in wind direction and humidity along the front line. The altitude limit for ducts seems to be about 10,000 feet. On 70-cm EME, K1FO upped his state total to 40 by virtue of a random contact with WØSD South Dakota.

A new convert to 70 cm is NC9F Downers Grove, IL who writes that he originally got on the band solely to work OSCAR 10, but soon found that it has a lot else to offer. Now Tim has 20 states and holds 70-cm VUCC number 38. The station consists of an IC-471A to a 100-W amplifier and two Boomers at 60 feet. He declares that, in his 24 years on the VHF bands, his adventures on this band constitute the biggest kick he has had. How about some 70-cm DX? VP9IB says that he expects to back on 70 cm in the coming months. Tom is not exactly new to the band, having worked K2RIW several years ago.

Need the Bluegrass state on 13 cm? I would imagine that just about everyone does. WB4NXY says that he will be on next spring by virtue of a rig borrowed from W9ZIH.

Outstanding tropo conditions were not limited to North America. The Europeans experienced their share of good conditions also. From the 4-2-70 and Microwaves columns appearing monthly in the RSGB magazine, *Radio Communication*, comes word that the weekend of Oct 12-13 and several days thereafter represented some of the best tropo openings ever observed on the Continent. Numerous UK stations on bands from 2 meters to 23 cm logged contacts into central and eastern Europe, including the Soviet Union. As an example, G8IFT Birmingham reportedly completed 23-cm contacts with HB9AMH/P JN37 and DL2KAL, F6ECI JNØ5, F1BUU IN94 and EA1BLA IN53, the last a distance of 1090 km, or 650 miles. Note that QTHs are being designated with the Maidenhead System, the same system we have taken to so enthusiastically on this side of the Atlantic.

VHF/UHF Century Club Awards

The ARRL VUCC is awarded to amateurs who submit written confirmations for contacts with the minimum number of Maidenhead grid-square locators indicated in italics for each band listing. Initial qualifiers are shown first, followed by endorsements, for November 1, 1985 through December 15, 1985. An SASE will bring you the rules and application forms.

6 m (50 MHz)

100

100	N5DDT
101	KF5DB
102	K4LHB
WB4NJG	200
W5FF	250
WB8BKC	200

70 cm (432 MHz)

50

38	NC9F
39	WB2NPE
40	W1XX/2
41	W5NZS
42	K2GK
KC4EG	60
WB5AFY	90
WB8BKC	90
WB8ART	80

2 m (144 MHz)

100

71	N5BHO
72	WB2NPE
73	WB9CAS
74	K8TL
75	WB4NJG
76	AA4FS
77	VE1UT
78	KU8Y
79	WB4GFO
80	K4CKS
81	KB7Q
WB9MSV	175
WA4NJP	150
W4GJO	175
KFØM	150

On Line

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

Packet Radio for the Commodore

Hams on packet radio use either data terminals or computers to communicate with their TNCs (terminal node controllers), and those using computers must run "terminal emulation" programs in order to make their computers behave like data terminals. Until recently, the available terminal-emulation software was intended for communications with mainframe computers, information services and bulletin boards via the telephone. These telephone-oriented programs contain telephone-oriented commands, such as dial and hangup, that are useless in packet-radio communications and lack commands that could make packet-radio communications easier.

Times are changing. In the October 1985 installment of this column, I previewed MacPacket, a terminal program for the Apple Macintosh computer that was designed specifically to interface with a packet-radio TNC. In this installment, I am previewing a packet-radio terminal program written for the most popular computer in ham radio today, the Commodore 64®. The program is called TNC64, and it is the result of a project conducted by the Texas Packet Radio Society (TPRS) to provide packet-radio terminal programs for popular computers.

TNC64's large capture buffer is its principal operational feature. All packet and keyboard data that pass between the TNC and the Commodore 64 are captured in a 50,000-character buffer which can be viewed on the monitor, copied to disk, printed or erased. When the buffer becomes full, its contents is automatically saved on disk (each disk can save up to three full buffers, a total of 150,000 characters). As a result, the packet station can be left unattended and all incoming data will be saved for later viewing, editing or printing. As an added convenience, the captured data can be automatically stamped with the date and time for later reference. Also, data saved on disk can be transferred to the TNC for transmission.

The program supports all TAPR TNC 1 and 2 (or equivalent) terminal control functions, selected from plain-language menus. Easy-to-understand screen prompts guide the operator in using the many features of the program. Nine strings of frequently-used text can be preprogrammed for later retrieval with a single keystroke. Included with the program is 18 pages of documentation that clearly describes how to use the program and take advantage of all of its features.

The program requires a minimum system consisting of a Commodore 64, 1541 disk drive (or equivalent), a monochrome monitor and an RS-232-C interface card. A printer is highly recommended. TNC64 may be obtained from TPRS (PO Box 831566, Richardson, TX 75083) for a contribution of $20 for TPRS members and $25 for nonmembers. Your contribution will be used to support TPRS's other project—TEXNET, a high-speed backbone packet-radio network that will interlink the major population centers of the Lone Star State.

HAM RADIO BBSs

☐ Alabama's The Bulletin Board is run by Herky McDaniel, W4WYP, and Kelly Bruce, WD4DAT, at 205-758-5017. The board is on line every day (except Tuesday and Thursday) from 2000 to 0700 Eastern Time, and operates at 300 bauds, 8-character bits, 1 stop bit, no parity. (from WD4DAT)

☐ Iowa's Sunshine BBS operates 24-hours-a-day at 319-557-9659 (300 bauds, 8-character bits, 1 stop bit, no parity). Assistant SYSOP AI9D handles the large, active ham-radio section of the board. (from KAØJAW)

☐ MassHam BBS (bulletin board system) is a new board in the Boston area that can be dialed at 617-923-7605. It operates at 300 and 1200 bauds, 1800-0800 Eastern Time Monday through Friday and all hours Saturday and Sunday. (from K1OJH)

☐ Milwaukee County ARES has a 24-hour-a-day BBS that operates at 300 bauds, 8 character bits, 1 stop bit, and no parity at 414-543-0988. Jim Boos, WB9YSG, the BBS SYSOP, welcomes all hams to call in, especially those interested in ARES. Jim offers to help any ham group that wants to start a bbs using a Commodore 64 computer. (from WB9YSG)

☐ Southern California has a new BBS with space dedicated to ARES and packet-radio information. The BBS is run by James Fortney, K6IYK, tel 818-998-0319. (from Hamnet)

☐ Timex Sinclair Amateur Radio Users Group (TSARUG) has organized a FIDO Network node to serve its members and other interested folk. Messages can be sent to network 15 node 1006 (15/1006), and the BBS can be accessed directly at 505-646-5194. Files available on the BBS include articles scheduled to appear in future installments of *QZX*, the TSARUG newsletter. (from K5XY)

☐ The telephone number for W2FJC's Jersey Shore System BBS was wrong in the November 1985 installment of On Line. The correct number is 609-693-8849. (from W2FJC)

PX: VIC 20® Software

Six VIC 20 programs are being added to the PX library this month.

Program 107: Learn Morse Code by Art McLeod, KR5T.

Program 108: Propagation Index by Robert Armbruster, KB2MY (56 cents postage).

Program 109: QSL Manager by Stover Dale, KWØH.

Program 110: Shunt by Bud Dion, N1BBH, is a big help when you are trying to make up a particular resistance value from your junk box.

Program 111: Easy Series Match by Dennis Farr, WB4RJK, and Steve McCallum, K4URX. (56 cents postage)

Program 112: Filter by Ken Stringham, AE1X, will also run on a Commodore 64.

To obtain a listing of any PX program, send a business-size SASE with 39 cents postage (unless noted otherwise) to ARRL, Dept PX, 225 Main St, Newington, CT 06111 (CRRL members can send their SASEs to CRRL, PO Box 7009, Stn E, London, ON N5Y 4J9). Use a separate SASE for each program request and write the PX program number of the desired program at the lower left-hand corner of the SASE. Please do not send correspondence other than PX requests to Dept PX.

A list of all 112 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). This list may also be downloaded from CompuServe's Hamnet and People/Link's Hamlink.

HELP SOUGHT

☐ Tom Byers, WB9YTG (309 Plover La, Carbondale, IL 62901), and Guido L. L. Jansen, ON7JI (Guido Gezellestraat, 40, B-8390 Knokke-Heist 2, Belgium) seek AMTOR, ASCII, CW and RTTY programs for their Atari® 800XL computers.

☐ Robert Hinshaw, WD6L (1531 Merion St, Ontario, CA 91761), also owns an Atari 800XL and is looking for ham-radio programs, especially for tracking DXCC, Worked All States and Worked All Continents awards.

☐ T. K. Morrow, N3CWP (135 Underwood Ave, Greensburg, PA 15601), is looking for ham-radio software, especially a logging program, for his Heath Z-89 computer.

☐ A. N. Ringler, W2SAW (466 Weaver Rd, Webster, NY 14580), is looking for a data base management program (for logging) for his Commodore 64 computer.

LONG LIVE SINCLAIR, AGAIN!

The following information should be added to the announcement concerning the Sinclair Amateur Radio User Group (SARUG) that appeared in the July installment of On Line: SARUG will only accept $2 cash or 6 validated IRCs for a sample of their newsletter (cashing a $2 foreign check or money order in the UK costs more than $2, and unvalidated IRCs are not accepted by the British Post Office).

On the homefront, the Eastern Regional Sinclair Net meets Sundays at 11 AM Eastern Time on 7.240 MHz, with WD4DLU as net control. The QZX Net meets Wednesdays at 9 PM Eastern Time on 14.345 MHz, with NV4F as net control.

LEARNING BASIC

BASIC is the most popular computer language in the ham-radio world, as well as in the rest of the world. Our old friend, David A. Lien, W6OVP, has recently written two books, *Learning Apple II BASIC* and *Learning Microsoft BASIC for the Macintosh*, which present simple tutorials that will hone the BASIC skills of a ham programmer. Both books are published by CompuSoft Publishing, 535 Broadway, El Cajon, CA 92021.

The New Frontier

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

24-GHz NEWS

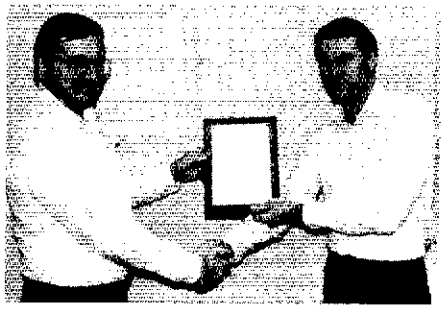
In the October 1985 New Frontier column I reported a 290-km contact on 24 GHz. This contact took place between I4BER and I3SOY (not I3SOJ, as previously reported). I4SN of ARI has written to provide more details of the contact.

The I4BER station was at Mount Catria, in central Italy, at an altitude of 1200 meters. The station consisted of a 100 mW Gunn oscillator, diode mixer receiver with a noise figure of 5.5 dB, and a 1-meter-diameter parabolic dish. The I3SOY station was located at Col Visintin, in northern Italy, at an altitude of 1700 meters, and used a 140-mW Gunn oscillator with a diode receiver (unknown noise figure) and a 1-meter dish. About half the path was over the Adriatic Sea, and the total path length was 289 km. It took about six hours to establish two-way communication on 24 GHz. Signals from I3SOY were copied quite quickly, but it took the rest of the time to receive signals from I4BER and make a two-way contact. The final reports were 5-7 for I3SOY on FM and 5-5-9 for I4BER on F2.

One interesting observation was that the two-way communication was achieved using horizontal polarization. All efforts to establish contact using vertical polarization were unsuccessful. (In horizontal polarization the broad face of the waveguide is in the vertical plane since the electric field, which defines its polarization, is oriented between the broad faces of the waveguide.) I am not sure why there should be such a difference, but the observation suggests that it might be prudent to have the capability to vary polarization when attempting long-haul microwave contacts.

VHF COMMUNICATIONS

The English-language version of the German magazine *VHF Communications* is again available in the United States and Canada from U V Comms, PO Box 432, Lanham, MD 20706. The subscription rate is $19 per year (4 issues). Back issues are available for $18 for any one year or $5 per single issue. *VHF Communications* covers the frequencies from VHF through 24 GHz, and includes articles on transmitters, receivers, antennas, test equipment, and much more. It is a particularly useful source (and just about the only one) for ideas about equipment for the lesser-used bands at 9 cm (3.456 GHz) and 6 cm (5.670 GHz). Though the constructional projects use some European semiconductors, which may be hard to find here, kits of parts are often available through the magazine. *VHF Communications* is a high-quality magazine typically containing about eight articles, usually constructional information, and running to 50-60 pages. It can be recommended to those interested in the higher bands and particularly those who build their own equipment.



Gerald Handly, WA5DBY (right), receives the North Texas Microwave Society's 2304-MHz Mobile VUCC number 1 from Al Ward, WB5LUA, holder of 2304-MHz VUCC number 1. Gerald also has 2304-MHz VUCC number 2. *(WA5VJB photo)*

2304-MHz NEWS

Kent Britain, WA5VJB, writes with information that the North Texas Microwave Society has presented a 2304-MHz Mobile VUCC Award to Gerald Handly, WA5DBY (see photo). Not only has Gerald worked 12 grid squares on 2304 MHz (VUCC number 2), but during his 2304-MHz mobile exploits he has worked one single grid square (EM13) from more than 10 grid squares.

PASSIVE REFLECTORS

In the January 1984 column, I described the operation of periscope antennas on the microwave bands. Such antennas use a plane reflector mounted at the top of a mast, illuminated by a feed antenna at ground level. WA6UAP has brought to my attention an article published some years ago in *73* Magazine that covers the subject of passive reflectors in some depth, including numerical design examples, and can be recommended to anyone considering constructing a passive reflector antenna system. The full reference is "Passive Reflectors for Amateurs—Something for Nothing (Almost)," R. Thrower, *73* Magazine, Jul 1969, pp 91-97.

NOTHING IS NEW

Though we may hear of 24-GHz contacts occurring quite frequently these days, it may come as a surprise to some readers that amateur contacts were made on this band back in 1946! Harry Sharbaugh, now KB2TV, has sent along some details of this early work he (as W1NVL/2 and W2UKL) and R. L. Watters (as W9SAD/2 and W2RDL) participated in.

In 1946, the distance covered was 800 feet—not far, but the first contact on the then new amateur allocation at 21-22 GHz. In 1959 this distance was extended to 14 miles, and a 50-GHz contact was made over 150 feet. In 1965, the 21-GHz distance was increased to 27 miles. All of these contacts were two-way using voice modulation (FM) and used Klystrons as the microwave signal source.

Though these distances may have been exceeded now, we should not forget the early pioneering work. An 800-foot contact in 1946 on 21 GHz was probably a lot harder to come by than a contact over 10 times that distance today. The following references document some of this early microwave work:

"Our Best DX—800 ft," A. H. Sharbaugh and R. L. Watters, *QST*, Aug 1946, p 19.
"The World Above 2000 Megacycles," A. H. Sharbaugh and R. L. Watters, *QST*, May 1959, pp 11-16.
"New Distance Record on the 21000 Mc Band," A. H. Sharbaugh, *QST*, Apr 1965, pp 26-27.

CALIFORNIA MICROWAVE ACTIVITY

Bob Dildine, W6SFH, has written with details of 10-GHz narrow-band work he and Lynn Rhymes, WB7ABP, have been involved with over the last three years. Their equipment consists of phase-locked Gunnplexers (20 mW out) operating narrow-band FM at 10.368 GHz. Also included in each station is a product detector for copying SSB and CW. IF bandwidth is about 15 kHz, and the final IF is at 21.4 MHz for a feed to 15-meter receiver (and potentially narrower IFs). Antennas are 4-ft fiberglass dishes, homebrewed using the center of a commercial 6-ft dish as a mold.

Their best DX to date is a 130-km path across the Sacramento Valley from Mt Vaca to Mt Aukum. Using the 4-ft dishes, their signals were full quieting; using only the standard Gunnplexer 3- × 4-inch horns, they were able to make a CW contact, demonstrating the value of a narrow-band system.

Bob would like to hear from anyone in the Northern California area who has narrow-band capabilities at 10.368 GHz. His address is 2321 Sycamore Ave, Santa Rosa, CA 95404.

MORE RAIN-SCATTER NEWS

A recent visit by G3WDG yielded more information on rain-scatter propagation on 10 GHz. G3WDG and G4KGC have been monitoring troposcatter signals from G3JVL, at a distance of about 100 miles. Small dish antennas are used at both ends of the path, with G3JVL running about 4 W from a TWT. During normal conditions, the troposcatter signal is just discernible in the noise. During rain storms at the receive end of the path, however, signal levels increased considerably, with signals detectable on a hand-held horn, pointing about 20° above the horizon. Such signal enhancements do not seem to be so strong on the lower bands, and on 24 GHz it would be expected that absorption by water vapor would severely attenuate signals. The unusual enhancement of scatter signals by rain at 10 GHz may make fixed-station operation possible even from relatively poor sites. Signals have been heard beaming straight up into rain clouds, and everyone has a clear path in that direction! I would be interested to hear from anyone here in the US who has observed rain-scatter enhancement on the higher bands.

FM/RPT

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

A Repeater in Every Pot

Amateur Radio is to be congratulated. Our hobby has achieved something that commercial radio cannot come close to accomplishing, even with the vast amounts of money at its disposal. Ham radio has managed to saturate the United States and Canada by means of the VHF/UHF FM-repeater mode of communications. Take your average 2-meter boom box (with 15 watts per channel) out to even the remotest spot in the lower 48, and you are likely to find at least one repeater on the band that you can access. Commercial radio doesn't even come close to that kind of coverage. How can that be?

The answer is dedication. The folks who build repeaters are a dedicated group. They always have a receiver within earshot that is tuned to the repeater output. They find it hard to sleep during thunderstorms. They are known to drive up mountains in even the worst weather conditions to find out why the repeater burped. They eat, breathe and sleep repeaters.

When they see a hill or a mountain, they see a need for a repeater. As a result, all of the good VHF and UHF sites in the United States and Canada are likely to have some kind of Amateur Radio repeater keeping the top of the mountain or top of the skyscraper warm. Thus, you have repeater coverage from sea to shining sea.

Some folks argue that there are too many repeaters, especially on 2 meters, and that the spectrum could be put to better use by other modes of amateur communications. I recently received a copy of a letter from John R. Cauvel, WA1OJX, who addressed these arguments.

John wrote that "the frequency spectrum allocated to 2-meter repeaters in no way detracts from any opportunity to conduct non-repeater operations ... Before the 144.5-145.5 sub-band was allocated to repeaters, there was a waste! Weak signal boys weren't using (the sub-band); FM simplex wasn't using it (most FM radios of that period didn't even include coverage below 146 MHz). If it were not for the tremendous number of 2-meter repeaters in the U.S., I suspect 2 MHz of that band would have been reallocated to Land Mobile some time ago. Like it or not, it is not to Amateur Radio's advantage to have any of its spectrum lying around not being used."

John's argument is valid in light of the situation on 220 MHz. In the past, commercial-radio interests have tried to grab some of the 220 amateur band by arguing that we were not using it. They claimed as evidence a small number of 220 repeaters. Although their evidence was faulty (there actually was a lot more repeater activity than they claimed), the basic premise of their argument has some validity. The radio spectrum is a limited resource. The demand for space, especially in the VHF and UHF spectrum, increases each day. The economics of the radio spectrum demands that if someone is not using their space, it should be allocated to someone who will use it.

The old "use it or lose it" school of thought is more valid today than when it was first proposed a decade ago. Each and every one of us should thank the folks who build repeaters for filling a need.

FREQUENCY COORDINATOR NEWS

☐ Hawaiian 2-meter repeater operators and trustees recently voted to adopt the 20-kHz plan for the separation of repeater channels in the 146-148 MHz spectrum. In other matters, the trustees voted to assign 145.01, 145.03, 145.05, 145.07 and 145.09 MHz for exclusive packet-radio use, and granted authority to the frequency coordinator to take away a repeater-channel authorization whenever the Hawaii Repeater Advisory Council advised him to do so under the following conditions: definite lack of use and/or upon advice from the FCC. Robert Ferguson, KH6NP, was elected frequency coordinator of Hawaii by the council to succeed retiring coordinator Jules Vetter, KH6YU. (from KH6YU)

☐ New England Spectrum Management Council (NESMC) was recently created to represent all six New England states. Each state has at least one District Director and all frequency requests must go through him. He, in turn, makes recommendations for the frequency coordinator to consider. The District Director is charged with making recommendations because he is more familiar with the lay of the land than the frequency coordinator, who may reside hundreds of miles away. The District Directors are K3ZJJ (Connecticut), W1IFL (Eastern Massachusetts), K1MON (Maine), W1OIQ (New Hampshire), W1XJ (Rhode Island), K1BKK (Vermont) and K1JHC (Western Massachusetts). The frequency coordinators for New England (excluding Connecticut) are WA1NYR (6 meters), K1VHR (2 meters), W1IFL (220 MHz) and W1GXT (440, 902 and 1200 MHz). (from NESMC Newsletter)

☐ New Mexico repeater trustees voted to adopt 20-kHz repeater channel spacing on 2 meters. Based on the views expressed by the repeater trustees, the New Mexico Frequency Coordinating Committee has adopted a policy that allows trustees to voluntarily change the operating frequency of existing repeaters in the 146-148 MHz segment that have a frequency that is an odd multiple of 10 kHz (146.01/61, 146.07/67 ... 147.99/39). (from W8GY)

☐ Mid-America Coordination Council, Inc (MACC) was recently formed as the exclusive frequency-coordinating authority for the states of Iowa, Kansas, Missouri, Nebraska and South Dakota. MACC represents approximately 558 repeaters in the five-state area and is represented by the following frequency coordinators: WBØGGI (Iowa), WDØBRZ (Kansas), N5DKQ (Wichita, Kansas area), K4CHS (Missouri), KAØE (Kansas City area), WØKUJ (St Louis area), WAØWRI (Nebraska) and WØSIR (South Dakota). MACC will be meeting at the ARRL Midwest Division Convention, April 18-19. (from WØTQ)

ARIZONA REPEATERS

Arizona Repeaters is a directory of repeaters in the state of Arizona. The 12-page booklet, published by the Amateur Radio Council of Arizona, includes state maps that pinpoint the location of 2-meter, 220-MHz and 450-MHz repeaters throughout the state. For a 35-cent donation, you may obtain a copy of the directory from its editor, William Oliver Grieve, W7WGW (4301 N 31st Ave, Phoenix, AZ 85017).

REPEATER LOG

According to November reports, repeaters were involved in the following public-service events: 19 drills/alerts, 12 public-safety events, 13 fire emergencies, 285 vehicular emergencies, 5 medical emergencies and 8 weather emergencies.

The following repeaters were involved (followed by the number of events): WA1DGW 16, W3UER 8, WB4UDS 3, WA4SWF 2, WA6BJY 6, W6FNO 272, KH6H 1, K8DDG 9, KD8GL 9, W8ICN 1, WA8ULB 11, WD8IEL 6.

Strays

***QST* congratulates...**

☐ Dave Bell, W6AQ, of Hollywood, California on receiving from the Academy of Television Arts and Sciences an Emmy for best comedy/drama special in 1985.

☐ Steve Bauer, KCØHF, of Wichita, Kansas on receiving the 1985 Kansas Amateur of the Year Award.

HAMFEST CALENDAR RULES AND REGS

☐ *QST* will list your hamfest in its monthly Hamfest Calendar, free of charge. Here are some guidelines:

Hamfests will be listed only once. When you send in your announcement, feel free to specify the issue you'd like it to appear in. Normally, the event will be listed in the issue of the month of the event (May *QST* for an event scheduled for May 10, for example).

Information must arrive *by the 5th of the second month before the issue date.* For example, the material on the May 10 hamfest must arrive at ARRL HQ by March 5 if it is to appear in May *QST*.

We will acknowledge all information received at HQ for Hamfest Calendar with a postcard stating the date of publication. If you don't receive an acknowledgment within a couple of weeks or so, your letter may not have arrived, so please send us a duplicate copy.

Oh, yes. Hamfest Calendar is separate from the Ham Ads. See the first page of the Ham Ads section in this issue for information on how to advertise your event there.—*Lori Chadwick, Hamfest Calendar Coordinator*

YL News and Views

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

1986 Officers, Young Ladies Radio League

President—Jacquelyn van de Kamp, W6YKU: First licensed in 1957, as WN6YKU. OM "Van" is W6CKV. YLRL activities: District Chairman, 1968; Publicity Chairman, 1968-69; Receiving Treasurer, 1970-73, 1975; Secretary, 1976-77; Disbursing Treasurer, 1982-83; Continuous Membership Chairman, 1974-present. Memberships: ARRL, Los Angeles Young Ladies Radio Club, BAYLARC. Jackie is the bookkeeper for her church, and enjoys sewing, needlework and reading. She has traveled extensively, and has felt privileged to have met amateurs from all over the world.

W6YKU

Vice President—Mary Lou Brown, NM7N: First licensed in 1981, her other calls include KA6QER, N7DHA. OM Bob is NM7M. YLRL activities: Receiving Treasurer, 1984-85. Memberships: RACES/ARES Assistant Radio Office; Assistant EC, ARRL; QRP-ARCI; Western Washington DX Club; Northern California DX Foundation; Radio Amateurs of Skagit County. Radio interests: QRP operation, county hunting, YL nets, emergency communications, contesting. Mary Lou is a former professor and chairman of the Department of Physical Education, University of California at Berkeley. She finds time for various outdoor and camping activities, music and computers.

NM7N

Secretary—Carol Shrader, WI4K: First licensed in 1980, as KA4RTH, she has held WI4K/PJ3 and WI4K/C6A. OM Steve is WA4GOX. YLRL activities: District Chairman, Nominating Committee Chairman, Prize Chairman of the 1985 Convention. Memberships: Metro Atlanta Ladies Amateur Radio Club (Charter President), Kennehoochee Amateur Radio Club (Secretary), Southeastern DX Club (Treasurer), Atlanta Radio Club, Dixie DXers Contest Club, Chief Volunteer Examiner-Metro Atlanta Area for the Central Alabama VEC and a volunteer for the W4 2-letter QSL bureau. Carol enjoys DXing, contesting, reading and playing the piano, and she is an accomplished flutist.

WI4K

Disbursing Treasurer—Karla Holmes, WA1UVJ: Licensed in 1971, her other calls include EP2KH, JY9AC, WB6PBY, WAØVXI, OM Jerry is WA1UVI. YLRL activities: Vice President Committee, Disbursing Treasurer, 1984-85. Memberships: Treasurer of the Amherst ARC, WRONE, YLISSB, ALARA and SAYLARC. Karla is the first DX YL to receive the DL-YL silver pin for 500 points.

WA1UVJ

WA2BGE

KA6SOC

WD8MIO

She enjoys ragchewing and participating in the YL contests, and has traveled in 40 countries.

Districts 1-4 Receiving Treasurer—Jean Chittenden, WA2BGE: Licensed in 1975. Memberships: YLISSB, SAYLARC (three-time past president), WRONE, Buckeye Belles, CLARA, IDXF, ARES, NCDXF, RACES, LIDXA, LIMARC, Larkfield ARC, Wantagh ARC. In 1980, Jean traveled to mainland China, where she, W6AM and W6GC met with members of the Central Committee to discuss the possibility of China returning to the Amateur Radio world. Jean is an avid DXer, with 280 countries confirmed. When not chasing DX, Jean, a retired high school English teacher, is busy with her many hobbies, including photography, freelance and nonfiction writing, and traveling.

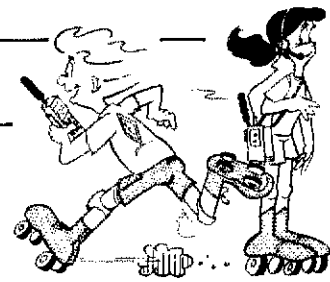
Districts 5-7 Receiving Treasurer—Sue Ludemann, KA6SOC: First licensed in 1982, she has operated as DL/KA6SOC. Memberships: DLYL, QRP ARC, Inc, East Bay ARC, ARRL, RACES and ARES. Sue is primarily a CW operator, but does use SSB for nets, contests and skeds. She can be found on the Western States QRP Net, YL Open House, YL Tangle Net. She owes her interest in Amateur Radio to her friend and former college teacher, Mary Lou, NM7N. Sue is a volunteer in fire prevention with the California Division of Forestry; she goes on fire-prevention patrols during periods of high fire danger and provides radio communication during forest fires. She also enjoys handicrafting and outdoor sports and activities.

Districts 8-Ø, KH6, KL7, VE and US Possessions Receiving Treasurer—Connie Hamilton, WD8MIO: First licensed in 1977; OM Jerry is KA8WJN. Memberships: Mariette, Ohio ARC; Parkersburg, West Virginia ARC; Buckeye Belles, ARRL and YLISSB. Connie was responsible for starting the Volunteer Examiner Program in the Marietta/Parkersburg area. She also enjoys knitting, camping and swimming, is a member of two Eastern Star Chapters, sings in the Ohio OES Grant Chorus, and plays both the piano and organ. When she does find time to be in the shack, she enjoys traffic handling and participating in various YL nets.

YL/OM CONTEST REMINDER

Don't forget to see Jan 1985 *QST*, p 95, for details on times and frequencies for the YL/OM Contest. See you there!

Making Waves



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

CONCERNED HAMS TAKE ACTION

There is much talk and concern about the lack of young people becoming involved in ham radio. Should this situation continue, we could find ourselves an endangered species. Talking about the problem is one matter, but getting up and doing something about it is entirely different. The following stories are examples of hams doing something toward preventing what could become a sad situation.

Spreading the Word via TV

Randy Staradub, KA1KLZ, is 15 years old and a member of the Nashua Area Radio Club in New Hampshire. He recently appeared on the WNDS-TV 50 children's show "Just Kidding Around" to make a presentation about Amateur Radio.

Randy's five-minute presentation began with a brief explanation of Amateur Radio and the club and how he became involved in the hobby. This was followed by a demonstration of HF equipment. To complete the presentation, Randy asked a member of the studio audience to come on stage and send his name in Morse code using a code-practice oscillator. The youngster, who had no previous code experience, sent his name perfectly, proving just how easy it is to learn Morse code!

Randy has been an amateur for two years and currently holds the Technician class license. He is active on 80, 40 and 2 meters. He attends Nashua High School, where he is in the 10th grade.

Vikings at JOTA

On the weekend of October 19-20, the 28th Annual Jamboree-on-the-Air (JOTA) took place. This is a worldwide Scouting/ham radio event, and is a perfect way to introduce Scouts to Amateur Radio. However, hams can't just sit back and let the Scouts come to them. It is an unfortunate fact that many Scout troops have never heard of Amateur Radio. Keith Graham, KØHJC, decided to do something about it.

Keith, who is manager of the Courage HANDI-HAM System, at the Courage Center in Golden Valley, Minnesota, contacted various Scout troops. Several responded, including Troop 100 of the Viking Council in Minneapolis. Thomas Hess, the Troop's assistant scoutmaster, took half a dozen of his Scouts to the Courage Center club station, WØZSW, to participate in JOTA.

Scout Troop 100 is not much different than any other Scouting group in the country. The boys are bright and eager to try all aspects and activities of Scouting. They ski, raise funds by selling fruit, and do overnight and wilderness survival camping. The only thing that might set the group apart is the fact that most of the boys are Laotian. In fact, most are members of the Hmong people, a mountain tribe of Laos.

Their reaction to the JOTA weekend, however, was typical of many Scouts when they encounter Amateur Radio for the first time—enthusiasm! They managed QSOs with several British Columbia stations, but the big excitement came from a contact with K2BSA, the Boy Scouts of America HQ station in Fort Worth, Texas. The Scouts really enjoyed talking to them.

Randy Staradub, KA1KLZ, enjoys Field Day with the Nashua Area RC.

Tou Chao Yang shows his enjoyment at making a JOTA contact. *(photo by Tom Hess)*

Thanks to Keith, and the Courage Center station, there are now a half-dozen highly charged youngsters who have had that first taste of how great ham radio can be.

These are just two examples of hams out there trying to expose other people to our fine hobby. Few people, especially young ones, know anything about Amateur Radio, but people like Randy and Keith are helping to solve this problem. For their fine efforts, these amateurs deserve to be commended, as do all the young people out there making us better known. If you have been involved in any activities such as these, write to me and let me know about them at the address given at the top of the column.

NET IDEA OPEN TO SUGGESTIONS

I have received many inquiries about youth nets, but very few letters about any nets actually in existence. I am just curious what the actual interest is in starting a net for just kids. Please write to me and let me know of your feelings on the subject—whether you would be interested and what suggestions you have to make the net work more smoothly. I am not interested in running the net myself, but if you would like to run it, or at least help in some way, let me know about that, too. If a net already operating would like to take on what could become a large responsibility, again, let me know.

This is just an idea and no details have been worked out as yet. If people seem to be in favor of it, then it would be nice to try and make a go of it. Let me know what you think and if you would be willing to help take on this responsibility, and I will keep you informed through Making Waves as to what the general feeling is and what progress the net has made.

I STILL CAN'T HEAR YOU!

I am still not getting any large amount of mail from you, so if you have anything to report regarding ham radio and yourself, send it in! If you have any innovative ideas you would like to get some feedback on (such as the proposed net), send it in to get some reader feedback through the column. I think you get the point, so enough said. I hope to be hearing from many of you soon!

Silent Keys

Administered By Nancy A. O'Neill

It is with deep regret that we record the passing of these amateurs:

W1AZT, Leon L. Paskus, Southington, CT
W1BRI, Arthur Kybert, Waltham, MA
WA1CVW, Ellery W. Price, Milford, CT
*K1GKR, Richard G. Moore, North Grafton, MA
KA1KKY, Donald P. Harris, Norridgewock, ME
KA1KQQ, Richard Talbot, Cranston, RI
W1NRX, Carlton E. Brown, Gloucester, MA
W1OV, James E. Jolliff, West Newton, MA
K1PTG, August "Gus" Rosati, Springfield, MA
W1ZML, Russell D. Munro, Acton, MA
N2BDQ, William P. Fisher, Jr, Maple Shade, NJ
WA2CRS, Reuben W. Pike, Niverville, NY
K2DPB, Charles A. Sparling, Bemus Point, NY
W2EMN, Herbert Schor, Miami, FL
W2FEM, Earl C. Simpson, Hudson Falls, NY
KA2GIB, Leo V. Shanahan, Lanoka Harbor, NJ
W2HXI, Robert B. Caris, Southampton, NY
*W2ILN, Harold N. Magowan, Magnolia, NJ
K2INQ, Margaret A. Bergin, West Deptford, NJ
W2RB, William H. Reuman, Amityville, NY
W2SKA, Joseph K. Murphy, Rochester, NY
K2SQY, Alden O. Jones, Georgetown, NY
W2UU, Frank B. Jordan, Jr, Coeymans Hollow, NY
KA2VBY, Joseph M. Boa, Neptune, NJ
W2WCL, Kathryn S. Sanders, Rockaway, NJ
WB2WSX, John Frank Chaffee, Binghamton, NY
KC2XP, Andrew M. Suter, Rochester, NY
KA3CSH, Kenneth G. Close, Rockville, MD
N3CYS, George T. Legge, Fort Washington, MD
W3EFT, Howard C. Melcher, Philadelphia, PA
WB3INT, John J. Casino, Pottstown, PA
W3JLC, John E. Clark, King Of Prussia, PA
K3RJF, Herbert Kartluke, Allentown, PA
W3TX, Kenneth F. L. Miskinis, Philadelphia, PA
WA3UET, Edward W. Buetikofer, Erie, PA
W4AEO, George E. Smith, Camden, SC
W4BEY, Charles W. Stebbins, Marietta, GA
N4BFA, Charles A. Bardin, Roswell, GA
*W4BVV, Thomas J. Peruzzi, Jr, Clarksville, MD
W4FDN, George D. Lovelace, Warm Springs, GA
KA4GWS, Elijah H. Johnson, White's Creek, TN
W4IVN, Richard D. McGlathery, Summerland Key, FL
WA4KLQ, Hugh H. May, Sr, Augusta, GA
K4LFF, Richard D. Ralston, Thomson, GA
N4LUU, Lyman T. Newell, Virginia Beach, VA
WD4PWE, Steve P. Hoover, Alexandria, VA
*WA4SGF, Edward C. Edwards, Jr, Interlachen, FL
K4TI, William P. Hunter, Weaverville, NC
WB4UOI, Evans M. Crush, Richmond, VA
WA4VAL, Calvin L. Moore, Charlestown Heights, SC
W4VDL, Eileen S. Pendleton, Mobile, AL
K5AKS, Sam C. Housley, Harrison, AR
KA5BBP, James R. Sartin, Irving, TX
KA5DCA, Gerry Manktelow, Austin, TX
W5DU, Louis Du Treil, Sr., Harahan, LA
K5HHA, Clifton N. Francis, Sr, Silsbee, TX
N5IIN, George R. Fersch, Albuquerque, NM
W5IVD, Robert Nelson, Marshall, AR
W5KRT, Michael A. Genovese, Opelousas, LA
KO5M, Roy A. Simmons, Dry Prong, LA
W5QGX, James E. Shannon, Tinnie, NM
K5RYD, Fred K. Little, El Paso, TX
W5WZX, Charles W. Galbreath, Bowerston, OH
KB5YJ, Wilbur W. Lewis, Bellmead, TX
W5YK, Wayne E. Perry, Mexia, TX
W5YZA, Russell Morgan, Moore, OK
K6CWU, T. L. Kidd, Kingsburg, CA
WB6DDO, John R. Wright, San Jose, CA
K6DIU, Ray E. Straschewski, Van Nuys, CA
WA6DQO, Robert W. Conley, Albany, CA
KF6FN, Stanley H. Williams, Pacific Palisades, CA
N6GB, Giles E. Barton, La Canada, CA
K6HPD, Gary A. Komatsu, Gardena, CA
WA6MFU, Thomas M. McKelvy, Fresno, CA
WA6NQG, Clyde V. Pearce, Lemon Grove, CA
W6OCQ, Daniel DeCamp, El Cerrito, CA
WB6OHL, Alan G. Richmond, Los Angeles, CA
*K6PJG, Alan D. Rosen, Santa Monica, CA
KA6RUN, Earl H. Bryden, Mira Loma, CA
W6RXN, Gerald C. Von Bargen, Santa Rosa, CA
N6UY, Earl M. MacRae, Newport Beach, CA
K6YIT, Olga Lusitana, Spring Valley, CA
W6YMH, Robert R. Phelps, Cedar Ridge, CA
W6YZC, Don Keys, Fremont, CA
W7DFN, Daniel J. Gibson, Des Moines, WA
KA7FVY, Duane E. Williams, Mossyrock, WA
KB7HB, Robert W. Clay, Sierra Vista, AZ
W7LSP, Otis T. Kingsbury, Sr, Concord, NH
WA7VEZ, Oliver C. Pilkenton, Las Vegas, NV
N8BGK, Frank R. Denton, Jr., Brecksville, OH
W8CDB, Irwin R. Struhar, Lakeland, FL
W8CQM, Ben Turpen, Cincinnati, OH
W8JHA, Melvin H. Rand, West Richfield, OH
W8JHI, Samuel E. Umans, Erie, PA
W8KHX, Joseph T. Anderson, Minneapolis, MN
W8NTL, Donald W. Gallagher, Chillicothe, OH
K8ZCC, Robert L. Starks, Avon Lake, OH
W9AAG, Dallas L. Johnston, Woodhull, IL
KB9AJ, Edward Kieskowski, Palos Park, IL
W9BLT, O. W. "Watty" Gibbs, Aurora, IL
WD9BMC, Robert C. Baither, Sterling, IL
W9DMW, Orvin A. Koher, Syracuse, IN
K9ESI, Robert T. Smith, Elmhurst, IL
W9FT, Theron Wayne Wigton, Plano, IL
W9GCX, Sydney W. Shaw, Covington, IN
W9KNU, Robert T. Thompson, Bruce, WI
W9LGO, Ottmar W. Noeske, Milwaukee, WI
W9LQE, Joseph A. Terstegge, Poland, IN
WB9TGK, John C. Calhoun, Indianapolis, IN
KØEUU, Edward E. Reed, III, Thornton, CO
WAØGKO, Arthur Hinz, Denver, CO
WBØJIX, Wilfred Ray Santhuff, Arnold, MO
WØMDT, Thomas F. Leonard, Lakewood, CO
WØUWP, John P. Kelley, Rocky Ridge, MO
KP4CO, Jose Medina Hernandez, Mayaguez, PR
*KH6EVY, Glenn B. Hickman, Mililani, HI
VE3AHE, Douglas McClellan, Downsview, ON
VP9KA, Colin P. Middleton, Southampton, Bermuda

*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

February 1936

☐ For some months now a raw a.c. signal, so mysterious it has been dubbed "The Shadow," has been wandering the spectrum interfering with numerous radio services including amateur. It has finally been traced to one of those new-fangled "diathermy" machines. We need regulation!

☐ More than a thousand amateurs, mostly members of the Army Amateur Radio System network, copied the Chief Signal Officer's message on Armistice Day transmitted by WLM/W3CXL. The Navy Day message brought only some 400 copies, but the 25 best received letters of commendation from the Secretary of the Navy.

☐ Jim Lamb's dedication to improving receiver performance hits a milestone with a new noise-silencing circuit in the i.f. of superhets. He amplifies the noise peaks above the desired signal, rectifies them and uses the resultant voltage to control the gain of a subsequent r.f. stage. Classic!

☐ W3LW takes a different approach, employing an audio output limiter for improving the signal-to-noise ratio. The graphs of results should inspire us to add the few components to our own receiver output.

☐ For c.w. reception we normally adjust a regenerative circuit just past the point of oscillation. W9SHC uses a separate beat oscillator and finds it gives greater selectivity, sensitivity and stability.

☐ Some 92% of voting in recent director elections was by licensed amateurs. The rest were League members holding continuous membership ever since the by-laws were changed.

☐ If your superhet doesn't have 10-meter coverage, get in on the hot activity with George Grammer's inexpensive converter with output just below 3.5 Mc.

☐ The 8th International DX Competition will run the usual 9-day marathon in mid-March. Swap 6-digit numbers (RST plus a self-assigned figure). There is a new quota of 3 DX stations in each country for W/VE participants.

☐ W1AF's RK-23/RK-28 rig has no revolutionary concepts, but its clean design and construction may give us ideas on improving our own setups.

☐ The National Bureau of Standards has an experimental 175-300 Mc. receiver using ¼-wave concentric lines in four r.f. amplifiers (954 "acorn" tubes). It's beyond most ham capabilities at this point but perhaps we can adopt some of the concepts.

☐ Most of the new metal tubes are essentially counterparts of standard glass types, but one exception is the 6L7, which can considerably improve performance of superhets when used as a mixer.

☐ W5VU analyzes distortion in our present-day transmitters, pointing up frequency and phase problems as well as amplitude.

25 Years Ago

February 1961

☐ The Editor recounts the history of the terrible "Wouff Hong," the instrument of torture conceived by The Old Man to be used on "rotten radio" operators. A Royal Order of the Wouff Hong initiation takes place at many ham conventions where participants pledge to observe high operating standards.

☐ After 15 years hams are still making good use of war surplus. W2PPL embodies a BC-453 receiver as the tuning element in his 80-through-10 superhet to achieve better image suppression.

☐ Another example is the APX-6, which W1CUT has converted into a deluxe 1215-Mc. rig, with carrying handles and a hooded panel lamp for field work at night. W1HDQ adds a few pointers on corner reflector antennas and appropriate transmission lines for that band.

☐ W1ICP built a code practice oscillator with enough output for class work and shows how it can be used also as a monitor.

☐ Electronic keying is all the rage, and W1PKC has modified the popular "Oskey" to use blocked grid keying in addition to cathode.

☐ A compact beam with loaded elements is still the best answer for the ham who wants multiband directivity, and DL1FK shows us a light yet rugged version, employing a unique method of band shifting.

☐ Hurricane Donna wreaked havoc in its path tracing the coastline from Florida to Maine. National Emergency Coordinator George Hart summarizes the work of hundreds of amateurs who helped provide vital emergency communication links.

☐ An amateur satellite? Preposterous! But West Coast amateurs have picked up a far-out suggestion by W6TNS in a *CQ* magazine article and are gung-ho to build an *Orbital Satellite Carrying Amateur Radio* on 2 meters. All we need is a piggy-back ride.

☐ The Navy Underwater Sound Research Group undertook a return visit to Fletcher's Ice Island north of Alaska, and expedition members W1IJD and W1FVY got a second opportunity to do some DX hamming at 50 degrees below zero.

☐ The "backfire" Yagi has drawn interest in some of the professional radio fields, but W1HDQ points out it is useful only for 1215 Mc. and above, because of the required dimensions of the reflector.

☐ FCC's Chairman expresses appreciation for our Board of Directors' congratulations on the Commission's 25th anniversary.—*W1RW*

In Training

Conducted By John Foss, W7KQW
Training Manager, ARRL

CLUB CLASSES CAN WORK!

Stand by for the floodgates to open with applicants wishing to earn their Novice class ticket. The word is fast spreading that Novices may soon obtain voice privileges on the 28-, 220- and 1250-MHz bands. Since the Novice license is so easy to obtain with just a little studying, I expect to see local clubs deluged with requests to offer a Novice ham radio course.

Offering a 10-week Novice class through your club can be an exciting proposition for club members and a rewarding experience for everyone involved. I bet I can anticipate your next comment: "We'd like to do it, but our club doesn't have any instructors."

Let's take a look at how easy it is for your club to become a leader in the offering of entry-level ham radio classes by describing a hypothetical well-organized class.

A good, fun Novice class is held once a week for 10 weeks from 7 to 10 PM. Nine weeks will be for the instruction, and the last week for the Novice class examination.

Most cities offer a community room for nonprofit organizations to hold meetings and teach classes. These rooms are usually free of charge, and often can accommodate up to 50 students. Your class size between 20 to 45 students will be just fine. Double check that there is convenient and safe parking, adequate lighting, restroom facilities, desks, a chalkboard and provisions for persons with special needs. You may also wish to review with your club officers the matter of insurance at the classroom site. (In my 20 years of teaching, however, I have never had an accident in the classroom or out in the parking lot!)

Once the meeting room and schedule have been secured and agreed on, the next step is promoting the class. The local ham radio store is your very best place to post class flyers. I have found that most prospective students first call the ham radio store to find out where the class is. This is especially true after local hams have provided public service communications for a community event or following an emergency or disaster.

It takes approximately two months to promote a class; during those two months you may begin lining up your instruction specialists. Within your club you will find individuals who have a specific interest in a certain area of ham radio operating. There's always an antenna expert, someone who is up-to-date on rules and regulations, an engineer who is good at formulas, and that young person who just joined the club and is an excellent contest operator. And in every club there are always a few who excel in the Morse code.

First-time "specialists" often are hesitant to teach a class because they may not know exactly what needs to be taught. This can be overcome easily by giving each of them a copy of FCC Bulletin 1035A, which contains the 200 Novice-class questions broken into nine subject areas. [The latest version appears in the ARRL's *Tune in the World* booklet.—Ed.] Each evening one subject area is covered. Rather than teaching the exact questions and answers, your new instructor teaches around the questions in a logical manner, as outlined in *Tune in the World*. This allows the instructor to weave in the precise questions on the exam in his general dialogue on rules and regulations, operating procedures, antennas, etc. The syllabus will also keep your instructors on course, an extremely important part of ham radio instruction. The ARRL has a *Novice Instructor's Guide* that gives specific details on how much time to spend on certain topics. This manual, a must for any instructor, is available from the ARRL Publication Sales Office for $3 plus $1 shipping/handling.

Our guest columnist this month, Gordon West, WB6NOA, was awarded the 1984 Herb S. Brier, W9AD, Memorial Instructor of the Year Award, cosponsored by the ARRL and the Lake County (Indiana) Amateur Radio Club.

I recommend the first part of class for theory. Then take a break with some live demonstrations that allow students to come up and actually see the equipment in operation. The last hour of class should be devoted to the Morse code. The instructor should send the code with an electronic keyer set to 13 WPM, but spacing between each letter sent should be slowed down to approximately 1½ seconds per character sent.

Each evening, five new code characters are learned. Random and text transmissions should be sent using already learned code characters plus the five new characters. By the sixth week, everyone should have all the letters down cold, plus the numbers and a couple of punctuation marks. Now is the time to decrease the spacing slightly between letters to give the student elbow room for the exam at 5 WPM.

The student should be encouraged to listen to W1AW code-practice sessions during the week out of class, as well as to play code-training tapes to back up the new letters and numbers they have just learned. Teaching all the letters and numbers in six to seven weeks is an attainable code goal, providing that one hour each class session is spent on code learning. For added excitement in the classroom, have the students build their own simple code oscillator and take turns having different students send predetermined messages.

Week 9 should be your final review, as well as finishing up on antennas, and week 10 will be the exam. Bring in outside examiners to test your students—don't test them yourself. Make sure each outside examiner is familiar with the elements of a Novice examination—20 questions total taken from specific categories, and a 5-WPM code test that is generated at 13 WPM but spaced down to 1½-second intervals between characters. I also recommend a transmitting test for all students.

The 610 form should be completed and sent off to the FCC the very next day. The entire class should be encouraged to start up again shortly to pursue the Technician and General class licenses. The class also should be encouraged to get on the air on Novice frequencies to begin upgrading their CW skills.

You don't need to be a college professor to teach a Novice class. What you *do* need is a good background in the specific area you are teaching, enthusiasm, a gift of gab and a built-in plan to stick specifically to the topics you are teaching that evening.

Club classes can be fun, and the League makes it easy with the *Novice Instructor's Guide* as well as the newly revised *Tune in the World* textbook that will get your students off to the right start.

Sound interesting? Contact ARRL Training Manager John Foss, W7KQW, and he'll give you all the details. Good luck with your class. It's easy!—*Gordon West, WB6NOA*

Strays

I would like to get in touch with...

☐ anyone with a manual for a Hallicrafter S40B receiver. Chuck Grandgent, K1OM, 50 Westvale Dr, Concord, MA 01742.

☐ anyone with information on RTTY/CW programs and hardware for the Commodore Plus 4. Gary Flechtner, WB8HLI, 188 North St, Rte 101, Tiffin, OH 44883.

☐ anyone with a manual or schematic for an RCA WO-56A oscilloscope or Precision Apparatus Series E-400 sweep generator. Frank D'Arrigo, N4MNU, 2820 E Robinson St, Orlando, FL 32803.

Affiliated Clubs in Action

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

MORE GREAT IDEAS FROM KB9UM

Details on Stanley W. Henson's booklet of "14 Ideas for More Radio Club Fun" were given in the December 1985 column. Here's the next idea from the Meetings and Members heading.

Displays

For many clubs, regular meetings always seem to be business-related with limited opportunity for visiting, and then the visiting is limited to old friends since time is short. One way to promote more circulation among the members is to have an interesting display at the meetings. Keep it simple; drag out an extra table or two at the side of the meeting room, put out a few gizmos and watch the crowd gather before and after the business session. Displays provide things to talk about and are long on fun and short on work to set them up.

Three Proven Displays

• Homebrew Night—One meeting was declared to be Homebrew Night, and everyone was asked to bring along a piece of home-built equipment to display. Both kits and items built from scratch were requested. The question posed during the member-introduction period was about home construction, and several members admitted to building equipment even though they hadn't brought anything to display. Home construction may be in decline, but it's not dead.

• Hunting Foxes—At the meeting immediately following our fall hidden-transmitter hunt some of the antennas and other equipment used were displayed. The display caused considerable interest. The Fox Hunt would have had better participation if the display had been held the month before the hunt.

Dr. Harry Watson, W5AXQ, and his wife, Helen, hold the Life Member Number One citation. *(photo courtesy W5GGP)*

• Vintage Equipment—As part of Old Timers' Night, when Life Member nominations are announced, a display of vintage radio gear was held. "Vintage gear" is loosely defined as anything out of warranty; that's not the same as "antique," which implies something old and worth money. Most items displayed turned out to be tube radios, adding a nice warm glow to the meeting honoring the Old Timers.

Gotta Great Club Member?

Every club has one, the stalwart supporter of the club from Day One, always there, always willing to give more than his share of time, always helping to improve the club's image. What can you do to reward such an outstanding person?

The Jackson (Mississippi) Amateur Radio Club came up with an answer: They made their number one club member the club's Life Member Number One, presenting the honor to him at their monthly meeting with a hand-lettered citation on parchment. (See photo).

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.

Brazos Valley ARC, Missouri City, TX (74)
Central Kansas ARC, Inc, Salina, KS (58)
Pilot Knob ARC, Leavenworth, TX (54)

New Special Service Clubs

Becoming a Special Service Club is not for every Amateur Radio group. It takes commitment, planning and, mostly, a membership that sets the highest standards for itself. During the last three months, these clubs have undertaken the commitment and become SSCs.

Number of members is in parenthesis.

Lake County ARC, Gary, IN (170)
Polytechnic RC, Glendale, NY (10)
Siouxland ARA, Sioux City, IA (53)
Top of Panhandle ARC, Booker, TX (8)
Two Rivers ARC, McKeesport, PA (55)

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.

Coming Conventions

GREAT LAKES DIVISION CONVENTION
February 22-23, Cincinnati, Ohio

Cincinnati's "sure cure" for cabin fever, the Sixth Annual Cincinnati ARRL Convention and Flea Market, becomes the Great Lakes Division Convention for 1986. Come and join in the fun of this all-indoor, goodbye-to-winter event in Cincinnati's northern suburb, Sharonville. The location will be the Great Oaks Career Development Campus, 3254 E Kemper Rd (just south of I-275, between the Mosteller Rd and Ohio State Rte 42 exits).

Saturday-only special activities include FCC exams, banquet, Wouff Hong and Cincinnati FM Club-sponsored hospitality suite. Forums, women's activities, meetings, vendor displays, exhibits, flea market and food are available both days. Meet and talk with ARRL Executive Vice President Dave Sumner, K1ZZ, Great Lakes Division Director George Wilson, W4OYI, ARRL/VEC Manager Jim Clary, WB9IHH, and many more Division, Section and local officials. Forums include 10-10 International, Weather Amateur Radio Net, Home Satellite TV Systems for Hams, Mexico Earthquake Recap, Tri-Service MARS, Novice Enhancement, ARRL, Volunteer-Examiner Program, Computers and Ham Radio, Packet Radio and Public Service. Meetings include the annual QCWA luncheon. The convention opens at 9 AM each day and closes at 5 PM Sat and 4 PM Sun. Extended hours on Friday evening and each morning for vendor, exhibitor and flea-market setup. Registration is $5 for both days (children under 12 free if accompanied by paying adult). Banquet fee is $13.50. Flea-market spaces (both days) are $5 for standard locations or $10 for choice locations; contact Joe Halpin, W8JDU, at 513-851-1056 for information and reservations. Vendors contact Dick Leffler, WB8MCX, at 513-825-7227 for information and reservations.

Special convention rates on request at LaQuinta Motor Inn, 11335 Chester Rd, Cincinnati (Springdale), OH 45246 through February 6. Single beds, 1 or 2 persons, $38. Hotel telephone, 1-800-531-5900, or 513-772-3140. For general convention information, write: Cincinnati ARRL '86, PO Box 11300, Cincinnati, OH 45211, or tel 513-921-3844. Talk-in 144.61/5.21, 146.07/67, 146.10/70, 146.28/88.

FLORIDA STATE CONVENTION
March 7-9, Orlando

Hamcation and Computer Show, sponsored by the Orlando Amateur Radio Club, will be held at the Expo Centre, 500 W Livingston St.

Friday 5-9 PM features a swap shop (in 100% air-conditioned comfort). Doors open Sat 9-5, Sun 9-3. Plenty of free parking available, also for self-contained RVs.

Show features: Amateur Radio motorcycle riders meeting, 4 DARS meeting, national VEC meeting, women's activities on Sat, FCC exams on Sun and much, much more. Fifth ARRL Amateur Radio Computer Networking Conference, hosted by FADCA, runs all day Sunday, 8:30-4:30.

200 commercial exhibits and 600 swap tables available. Tickets are $5 in advance (with SASE), $7 at door. For tickets, hotel special rates or additional information, contact Al Huber, KC4CT, Chairman, PO Box 15142, Orlando, FL 32858, or tel 305-422-ARRL.

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

Hamfest Calendar

[*Attention*: The deadline for receipt of items for this column is the 7th 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 (Pinellas Park)—Feb 16: The Pinellas Park Boys Club will hold their 1986 Hamfest beginning 8 AM. Location is 7790 61st St, Pinellas Park, Exit 15 from I-275, heading west on 74th Ave. Registration tickets $2, flea-market tables $4; $30 commercial tables (provided with electricity). New state-of-the-art radio equipment will be displayed. All ham radio, computer or related businesses are invited to participate. Large indoor flea-market area, FCC exams from Novice to Extra and a QLF contest to demonstrate your code proficiency. Free doughnuts and coffee. For more information and/or reservations, contact Lee, WB4TEJ, PO Box 1313, Pinellas Park, FL 34290-1313.

Florida (Hideaway)—Feb 22: The Martin County Amateur Radio Assn will hold their Stuart Outdoor Freefest at Langford Park, between Stuart and Jensen Beach. Doors open 8 AM-4 PM. Free admission. Activities include packet demo, swap tables, ARRL tables. Talk-in on 146.46/147.06. For more information, contact K8BXT at 305-286-4782, KI4NF at 305-858-1784 or Jim Foster at 305-287-3018.

Florida (Ft Myers)—Mar 1: City of Palms ARC Annual Hamfest will be held 8 AM-4 PM inside air-conditioned Moose Lodge Hall, 1900 Park Meadow Dr, a half block off US 41 South. Exhibitors, dealers, forums every hour (including antennas, packet radio, DX), computers. Swap tables $10. Admission $3. Free parking; food. Talk-in on 28/88.

Indiana (La Porte)—Feb 23: The La Porte ARC's winter Hamfest will be at the La Porte Civic Auditorium. Plenty of room; tables $2 in advance, $2.50 at the door, with all reservations held until 8:30 AM CST. La Porte is 50 miles southeast of Chicago. Talk-in on 52. Donation is $3 at the gate. For more information and reservations, write to LARC, PO Box 30, La Porte, IN 46350. For table reservations: Attn KA9PHA. Include SASE.

†**Indiana (Winchester)—Mar 2:** The Randolph Amateur Radio Hamfest sponsored by the Randolph Amateur Radio Assn will be held at the Winchester National Guard Armory from 8 AM-5 PM. Admission $2.50 in advance, $3 at the door. Children 12 and under free with an adult. Activities include electronics and Amateur Radio exams. Food and drinks available; free parking. 3 × 8-ft table space $5 (tables limited); space only $2.50. Setup March 1, 6 PM-8 PM EST, and March 2, 6 AM-8 AM. Talk-in on 90/30 and 224.80/223.30. More information from RARA, c/o Jake Life, W9VJX, Box 162 Winchester, IN 47394, tel 317-584-9361 or Herb James, WB9UZZ, 317-584-4995.

Iowa (Davenport)—Feb 23: The Davenport Radio Amateur Club will hold their 15th Annual Hamfest at the Davenport Masonic Temple, Brady St (Highway 61) and 7th St from 8 AM to 4 PM. All indoors. Food and drink. Admission: $2 in advance, $3 at door. Tables available by reservation for $7, with $2 extra for AC hook-up. Table setup begins at 7 AM. Talk-in on 28/88, WØBXR. For table reservations and advance tickets, contact Dave Johannsen, WBØFBP, 2131 Myrtle St, Davenport, IA 52804.

Kentucky (Glasgow)—Feb 22: The annual Glasgow Swapfest will be held at the Glasgow Flea Market Building, 2 miles south of Glasgow, just off Hwy 31E, from 8 AM CST till everyone goes home. Large, heated building with free parking. No meetings or forums; just free coffee, large flea market and the friendliest gathering of hams anywhere. Admission $2; no extra charge for exhibitors. One free table per exhibitor with extra tables available at $3 each. Talk-in on 34/94. Additional information from N4HCO, Rte 4-Box 354, Glasgow, KY 42141.

†**Louisiana (Lafayette)—Mar 8-9:** Hamfest 86 sponsored by the Acadiana Amateur Radio Assn will be at the Holiday Inn Central-Holidome on Sat at 9 AM-5 PM and Sun at 9 AM-1:30 PM. Admission $2 at the door. Activities include commercial dealers, forums, flea market and exams. Services include hospitality suite and women's activities. Talk-in on 146.22/82, and 81/21. More information: June Bodensteiner, 129 Patricia Anne, Lafayette, LA 70508, tel 318-837-9484.

†ARRL Hamfest

Hamfest site includes indoor swimming pool, sauna, children's playground, tennis and jogging track.

Massachusetts (Norwood)—Feb 22: The Norwood ARC will hold its annual flea market at the Norwood Junior High School South, Washington St. Plenty of free parking as well as facilities for the handicapped. Food available. Dealer tables $10. General admission $2. Setup at 8 AM, open at 9 AM. For further information or to reserve a table, contact Stan Cottrell, WA1NCV, tel 617-762-5184. Talk-in on 146.520 and 146.895.

Massachusetts (Springfield)—Mar 2: The Mt Tom Amateur Repeater Assn is having its annual flea market at the Knights of Columbus Elder Council 69 on Granby Rd in Chicopee, MA. Open 8 AM-3 PM. Table reservations are $7 in advance, $8 at the door. Entrance fee $1; women and children under 12 free. Food available. For reservations, write to MTARA, PO Box 3494, Springfield, MA 01101.

Michigan (Traverse City)—Feb 8: The Cherryland ARC announces its 13th Annual Swap 'N Shop to be held at the Immaculate Conception Middle School Gymnasium, 218 Vine St. Doors open 9 AM-2:30 PM. General admission $2.50; single tables $3. Talk-in on 146.85 and 52.

†**Missouri (Kansas City)—Feb 16:** The FM BASH sponsored by the Mid-America FM Assn will be held 10 AM-4 PM at the National Guard Armory, 7600 Ozark Rd. Admission free. Social activities and flea market. Coffee and doughnuts available. Talk-in on 34/94. For information, contact Bob Atkeisson, WØAT, PO Box 188, Raymore, MO 64083, tel 816-331-6033.

New Jersey (Orange)—Feb 9: The West Orange ARC will hold its 1st Hamfest at the Orange Elks Club, 475 Main St, at 8 AM-4 PM. Admission at the door; buyers $3, sellers $10/table. Talk-in 146.550 and 224.80. For further information, reservations and tickets, call Mike at 201-736-4611 after 5:30 PM, Rob at 201-731-9506, or 201-674-8148 anytime.

†**New York (Melville, Long Island)—Feb 16:** The LIMARC Hamfest sponsored by the Long Island Mobile Amateur Radio Club will be held at the Electricians Hall, 41 Pine Lawn. Doors open 9 AM-3 PM. Admission $3, $2 after 12 PM. Activities include UHF

rig-checking clinic, ARRL and Section information. Tables $10 for 4 × 6, bring your own for $1/ft. (Sold only in advance.) Food and beverages available. Talk-in on 146.24/85. For more information, contact Hank Wener, WB2ALW, 53 Sherrard St, East Hills, NY 11577, tel 516-484-4322 or 201-569-8888.

†**North Carolina (Elkin)—Feb 16:** The ninth annual Elkin Winter Hamfest will be held at the Elkin National Guard Armory, 2 miles off I-77 at Exit 85. Breakfast and lunch will be served. Talk-in on 144.77/145.37, 69/09 and 52. For table reservations and information, contact Buck Stewart, N4GGN, Rte 6-Box 269-A, North Wilkesboro, NC 28659, tel 919-670-3358.

Ohio (Circleville)—Mar 2: The Teays ARC will hold its annual hamfest at the K of C building located at 2489 North Court St, 8 AM-4 PM. Tickets are $3 in advance, $4 at door. Tables are $5 in advance, $6 at door. Early setup 6 AM. For more information, contact Dan Grant, W8UCF, 22150 Smith Hulse Rd, Circleville, OH 43113, tel 614-477-3026, SASE preferred.

†**Ohio (Lorain)—Feb 2:** The NOARS Winterfest, sponsored by the Northern Ohio Amateur Radio Society, will be held at Gargus Hall. Doors open to dealers at 6:30 AM; general public at 8 AM. Admission $2 advance, $2.50 at the door. Talk-in on 10/70. Tables assigned on a first-come, first-served basis. 8-ft table $7 each. Swap, shop, food, fun, FCC exams. For information and reservations on FCC exams, call Dave at 216-324-4574. Tickets may be purchased from NOARS WINTERFEST, PO Box 354, Lorain, OH 44053. Dealers should contact John Paul Jones, WA8CAE, 4612 Timberview Dr, Lorain, OH 44053, tel 216-282-4256.

†**Ohio (Mansfield)—Feb 16:** The Mansfield Mid*Winter Hamfest/Auction will be held at the Richland County Fairgrounds. Auction and flea market in large, modern, heated buildings. Doors open to the public at 7 AM. Tickets $3 in advance, $4 at the door. Tables $5 in advance, $6 at the door. Half tables available. Talk-in on 34/94. Advanced ticket/table orders must be received and paid by Feb 10. For additional information or advanced tickets/ tables, send SASE to Dean Wrasse, KB8MG, 1094 Beal Rd, Mansfield, OH 44905, or call 419-589-2415 after 3 PM EST.

†**Ohio (Tallmadge)—Feb 23:** The Cuyahoga Falls ARC 32nd Annual Electronics Equipment Auction and Hamfest will be held at the Tallmadge High School 8 AM-3 PM. Admission $3 in advance, $4 at the door. Sellers may bring their own tables; free flea-market space; 8-ft tables $5 in advance, half tables available. Deadline for tables Feb 9. SASE for tables, tickets and info. Talk-in on 87/27. Hamfest location 1 mile east of Tallmadge Circle on East Ave and 2.3 miles west after getting off I-76 at exit 31. Details from Bill Sovinsky, K8JSL, 2305 24th St, Cuyahoga Falls, OH 44223, tel 216-923-3830.

Vermont (Milton)—Feb 22: The Northern Vermont Hamfest will be held 9 AM-3 PM at Milton High School on Rte 7. Flea market, amateur TV, demonstrations. Amateur Radio exams at 1 PM, Novice through Extra Class; no preregistration required. Talk-in on 146.61 and 146.85. Admission $2. For more information, contact Mitch Stern, WB2JSJ, tel 802-879-6589, evenings.

†**Virginia (Vienna)—Feb 23:** The Vienna Wireless Society will hold its 13th annual Winterfest™ at the Vienna Community Center, 120 Cherry St. Doors open at 8 AM. Program includes exhibits and demonstrations of new and used Amateur Radio equipment. Admission $4 per person; children 12 and under free. Refreshments. For further information, call John Arnold, N4IXD, at 703-255-2076.

†**West Virginia (Fayetteville)—Feb 23:** The Plateau Amateur Radio Assn will hold their 7th annual Hamfest at the Fayetteville High School. Doors open at 9 AM. Admission $3. Children under 12 free. Activities include exhibitors, flea market, DX shows. Hot food and drinks available. Talk-in on 146.74 and 52. Information: John Witt, W8OQC, 135 Daniels St, Fayetteville, WV 24840, tel 304-574-0532 or 574-1176.

Wisconsin (Milwaukee)—Mar 8: The Milwaukee School of Engineering ARC will hold its annual hamfest at 1121 North Milwaukee St. Doors open 8 AM-2 PM. Tickets $2; 4-ft tables $3. Limited table space, so reserve early. Doors open at 7:30 AM for sellers only. Plenty of food, beer and free parking. Talk-in on 19/79 and 52. For more information, send large SASE to W9HHX FEST, PO Box 644-Room C-6, Milwaukee, WI 53201-0644.

Wisconsin (Spooner)—Feb 16: The Wild Rivers ARC will hold their mid-winter swapfest 10 AM-3 PM at the Spooner Experimental Farm, east of Spooner on Hwy 70. Talk-in on 81/21. VE exams will be given; advance registration only. Tables available. For more information, contact Tom Young, KD9FC, Rte 5-Box 5239, Hayward, WI 54843.

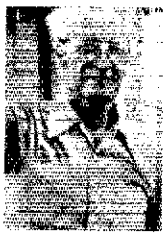
[*Note:* Sponsors of large gatherings should check with League HQ for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL HQ for up to two years in advance.]

(continued from page 56)

Before retiring from ARRL duties in 1978, John had the distinction of serving as Director, Vice Director or Assistant Director in the Southwestern Division from 1949 to 1978. A resident of Los Osos, California, he was elected Honorary Vice President in 1980. A member of the ARRL Executive Committee between 1972 and 1976, he also was Board Liaison to the VHF Repeater Advisory Committee, and chairman and member of the Membership Affairs Committee. A Charter Life Member of the ARRL, John is a past president of the San Diego ARC, past chairman of the San Diego Council of Radio Clubs and a life member of OOTC.

Wayland M. Groves, W5NW

Wayland, better known as Soupy (because a good friend thought his lanky frame resembled a soup bone), was elected Honorary Vice President in 1970. First licensed in 1923, as 5NW, Soupy gave 35 years of service to the League, 20 of which were as First Vice Presdent of ARRL and IARU. He first joined the Board in 1935 as Director of the West Gulf Division, serving in that position until 1939 and again from 1942 to 1950. In 1950, Soupy was elected Vice President, which was changed to First Vice President a year later. In 1970, he achieved the post of Honorary Vice President. A Charter Life Member of ARRL, Soupy's Amateur Radio interests have been varied, but his main pleasure has been working DX. While working and traveling for an oil company in 1930, he was able to visit many corners of the world—an experience he repeated after retirement, enabling him to rekindle many on-the-air friendships, some going back 40 years. Soupy calls Odessa, Texas home.

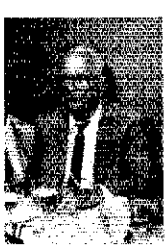


George Hart, W1NJM

First licensed in 1930, George earned quite a reputation as a traffic handler at W8YA, on the Pennsylvania State College campus. After getting his BA from Penn State, George joined the staff of the new Headquarters station, W1AW, in 1938; in 1942, he was named Acting Communications Manager. After serving as a lieutenant in the Army Airways Communications System, George rejoined the Headquarters staff in 1946. In 1949, as National Emergency Coordinator, he developed the National Traffic System, still the backbone of Amateur Radio's commitment to public service. A Charter Life Member of ARRL, George served as ARRL Communications Manager from 1967 until his retirement from the League in 1978, capping a 40-year career at HQ. In 1984, the ARRL Board elected George Honorary Vice President. A resident of Newington, Connecticut, George is still active on traffic nets and sponsors high-speed code practice.

J. Lincoln McCargar, W6EY

Having served as an alternate director, and thus having been able to attend several Board meetings in the Director's absence, Mac had excellent qualifications when the opportunity came for him to run for a division directorship. In his first contest, Mac ran unopposed, becoming the Pacific Division Director in 1938. Director until 1946, he left that post to become ARRL Vice President, until 1950. Mac was elected Honorary Vice President in 1980. An amateur since 1911, he became proficient in Morse as well as Continental code while railroading with the Southern Pacific. A chief radioman in the Navy in WW I, Mac was the chief in charge of radio on the *USS George Washington* during one of President Wilson's peace trips to France. He lives in Capitola, California.



Conducted By Michael R Riley, KX1B
Public Service Manager, ARRL

National Disaster Medical Services

Five o'clock AM on a weekend is no time for healthy, normal and intelligent individuals to be getting out of bed, but there I was, responding to the alarm clock, trying to shrug off the effects of too many hours spent dancing at Philadelphia's "hottest new nightclub." I still had a ringing sound in my ears. This was November 16, the day of the drill, I reminded myself, trying to wash away the toxins of the night under a hot shower.

The Scenario

I was in Philadelphia for a day, returning to the scene of past indiscretions to witness the National Disaster Medical Services Drill (NDMS) and its Amateur Radio elements. The NDMS is a program designed by the federal government to coordinate hospital care for disaster victims when their own local hospital systems are overwhelmed by the scope of an emergency. NDMS drills are to be conducted throughout the country.

The first exercise of 1985 occurred in the Baltimore-Washington DC metro area in mid September. Over 100 radio amateurs participated in a variety of roles, and the network they provided linked 18 hospitals in the District of Columbia and Northern Virginia as well as airports and command centers.

When a natural disaster, such as an earthquake or tornado, strikes, injuring or killing hundreds or thousands, few local hospitals would be able to provide the measure of health care necessary to help those who need it the most. The hospitals in the disaster area themselves would probably be having a hard enough time trying to keep their vital services going, with commercial power, water and sewer lines cut off by the catastrophe.

NDMS leaps into action under such dire circumstances, interfacing military, civilian and municipal groups in a coordinated, all-out effort to provide medical care for the ones who need it the most. The operative concept is that the injured are transported to hospitals physically distant from the disaster site. Everything and everybody works toward that goal. Now it was Philadelphia's turn to test the system. Amateur Radio's role in the Pennsylvania exercise was cast by ARRL Eastern Pennsylvania Section Emergency Coordinator Bob Josuweit, WA3PZO.

A Tour of Duty

At 6 AM I was picked up by Bob Haacke, KA3DVY, in his fiery red turbocharged sportscar, and we floored it through the cold, rainy city streets to the outskirts of the international airport. We parked at a corporate airplane hangar, which the fuel company had kindly lent out for the day to act as the main staging area. The drill was scheduled to begin at 7:45 AM. I looked around the hangar, noticing the doughnut truck, Amateur Radio station and emergency medical gear setups.

Coordination is the best word to describe what had to be rehearsed that day. The individual players—amateurs, military, hospital and county emergency-management personnel—were each experts in their chosen fields. The task was to transport the victims from the disaster to the staging area, evaluate the severity of their injuries and transport them again to a hospital that was ready to accept a rush of patients. Amateur Radio was the only communications mode used between the airport, hospitals and county seats, where the Emergency Management Directors would be kept up-to-date.

Navy personnel and Steve White, WA3IAO, at the operations center during the NDMS drill in Philadelphia. *(Photos submitted by KC3LM and WA3PZO, taken by KA3NXM)*

Neil Halin, WA3RPG (left), and Steve White exchange notes during the NDMS drill.

The drill scenario was a tornado that had touched down less than 72 hours previously in western Pennsylvania, causing widespread destruction, loss of life and injury. The local hospitals were unable to handle the patient load, so the NDMS system was activated, with the military notifying the Section Emergency Coordinator (SEC) of the need for amateurs to provide their communications skills within the next 72 hours.

Contacts

The SEC contacted his District Emergency Coordinator (DEC), who contacted five county Emergency Coordinators who, in turn, established a roll call of ARES/RACES members who had previously agreed to participate in NDMS activities. The ECs and their staff knew from previous planning sessions with the other NDMS parties which hospitals and checkpoints needed staffing. The next two days saw coordination of staffing for these sites, filling gaps in personnel and confirmation that the necessary repeaters were operational. By Friday evening, 149 amateurs had committed to participation and had been briefed on where they should go.

While the amateurs were recruiting and preparing, so too was the military, procuring transport planes, helicopters, medical and supervisory personnel, and medical equipment. Ambulance companies were notified through the county emergency-medical systems. A seven-county area was to be involved, including sites up to 100 miles away from the airport.

In the Philadelphia area, the Navy was contacting the 37 local hospitals that had previously agreed to participate in the NDMS. The hospitals were notified that their emergency-room services were to be called upon within the next 72 hours. Bed counts were obtained, as was a summary of available facilities. These counts were updated daily.

The Scene

All this preparation came together at 7:45 AM, when the first amateur stations in the drill began checking in to the NDMS net, continuing to do so in pre-scheduled steps for the next hour. Everyone was ready and in place. The NDMS net began, using tactical call signs. The hospitals were staffed with amateurs who could relay information to the attending physician. So too was the Willow Grove military airport in northeast Philadelphia that was also receiving and evaluating victims.

The helicopters and transport planes began arriving around 9 AM, discharging the "victims," military personnel who had volunteered, through the use of makeup, to appear as people who had had their town destoyed by a tornado and subsequent fires and damage.

As soon as they were unloaded from the planes, the victims were moved on stretchers to the triage area. There they were assessed according to the severity of their injuries and tagged.

Tagged, You're Out

A black tag meant the patient was dead. Red tags indicated life-threatening injuries, causing them to be among the first groups transported to the hospitals. Yellow-tagged victims were badly injured, but not likely to die at any minute because of their wounds. They would be transported as part of the second wave. Green-tagged victims were the "walking wounded," those who could wait

at the triage area until the higher priority injured had been taken care of.

Airports are always exhilarating places to be, and the cold rain was not sufficient to dampen the electric tension in the air as the first helicopter landed about 50 yards away. The hangar doors had to be opened wide to accommodate the stretchers and personnel, which admitted a blast of chill air that was to plague the net control all day; having set up directly in front of doors they thought would stay shut throughout the operation, their papers and internal body temperatures blew away in the wind.

The military medical people worked efficiently, directing the stretcher-bearers to lay their burdens on army blankets that had been set up in rows on the concrete hangar floor. Intravenous (IV) units were soon hanging here and there, and the appropriately colored triage tag adorned each injured, being attached to their garments. The triage tag had a place on it for a one-letter code that corresponded to the type of injury the victim had—"G" for oral maxilo facial injury, "M" for thoracic injury, for instance.

The first in a number of ambulances drove up, halfway through the open hangar door into the hangar, stopping about 10 feet from the triage area. Eight of the red-tagged triaged patients were loaded aboard, and the ambulance sped to one of the participating hospitals. Before it left, however, a list of the patients and their triage codes was handed to the triage net control, who had his station set up about 10 feet away.

Because the area to be covered was so vast, WA3PZO and his planning team divided it into two areas, each covered by a control point. Control points were used for relaying point-to-point communications around the city and to and from the hospitals.

Relayed Traffic

Triage net control contacted the appropriate control point and passed the information about the ambulance that had just departed. The control point contacted the hospital to which the ambulance was speeding and relayed patients' specifics, which were *then* handed to the attending physician. The first of the day's NDMS patients would soon be arriving. Arrive they did, and the emergency room crew was ready with the appropriate specialty doctors, nurses and equipment.

This was the scenario, the superbly executed ballet, part of which I watched there in the growing-ever-colder corporate hangar. Some of the Philadelphia hospitals were able to handle helicopter traffic, so triaged victims were loaded occasionally onto the 'choppers and ferried to their destinations. It was an exciting, exhilarating operation to witness. Amateur links were also used to inform the Red Cross of the names and status of the injured, so they could answer the health-and-welfare inquiries that always accompany a natural disaster of this magnitude. The Emergency Operations Centers (EOCs) were also tied into the information network, in some cases during this drill, through packet-radio data transmissions. The EOCs were able to route more ambulances where they were needed, or could coordinate any police or auxiliary assistance, if needed.

Filling in the Background

The NDMS is a new program coordinated through the Department of Defense and the Federal Emergency Management Agency. Thus far 70 metropolitan areas have agreed to make their areas' facilities available in the event of a nearby disaster. The successful drills in the Washington, DC/Baltimore area and Philadelphia have laid a foundation for future activity. Plans for next year include an NDMS drill covering all the six states that surround Pennsylvania and extending the Philadelphia participation to 45 hospitals. Because of the geographical area to be covered, plans are being laid in place for high-frequency links.

Benefits

Quite a number of good publicity and other aftereffects have fallen on SEC WA3PZO and his section as a result of the NDMS:

- Two grants totalling $7000 have been awarded to equip and improve the two control points.
- Seven local hospitals have requested that permanent 2-meter antennas be installed on their premises.
- The Red Cross has requested that a fully equipped HF-VHF and packet station be placed in their southeast Pennsylvania chapter office. The Red Cross is currently seeking grants to pay for the station.
- The Lower Bucks County EOC has requested that a permanent 2-meter station be installed in their emergency center.
- Navy Lieutenant Commander Michael Wendling, who coordinated the NDMS, has requested that WA3PZO and KA3DVY (DEC and SEC) meet with him monthly to develop Amateur Radio communications systems for future NDMS activities.
- Emergency Management Directors from three counties have requested that packet-radio stations be set up at their county seats.
- The Navy has offered to possibly provide and equip a communications van to be used for Amateur Radio communications.
- Six articles on the NDMS and the amateur connection have been published in local newspapers.
- And best of all, says WA3PZO, the operation has brought together public-minded amateurs from a very large community and given them a good sense of comradeship, helping to pave the way for future cooperative drills and services.

Al Taylor, KN3U, the Emergency Coordinator for Montgomery County (MD), reported that valuable lessons were learned from the Washington, DC/Baltimore NDMS drill. "There can never be too much planning," he wrote. "Most importantly, it is essential to tie down the exact functions that amateur radio is to perform." In summary, Taylor concluded that "in NDMS we were given an opportunity to demonstrate our capabilities and weaknesses right on center stage. Military and civilian officials were highly complimentary of our efforts in the exercise. We are already working on ways to improve our operation next time." [Our thanks to both outstanding groups for a job well done.—Ed.]—*Leo D. Kluger, WB2TRN, ARRL Club Program Manager*

IN SERVICE ...

☐ Whatcom County, WA—October 27-28. KD7RQ received notice from the Department of Emergency Services at 12:30 PM (PST) on October 27 that the Nooksack River was rising to flood stage. River-gauge readers were needed at Ferndale and Lynden by 1:30 PM.

Three radio amateurs operated the command-post radio at the Department of Emergency Services, and eight amateurs monitored the river gauges for the next 17 hours. The operation was secured at 6:30 AM on October 28. (Ryan T. LePage, KD7RQ)

☐ Kansas City, MO—October 27. Eight members of the Heart of America Amateur Radio Club provided communications for the Kansas City Biathlon. The biathlon consisted of a 2-mile footrace, an 18.4-mile biking segment and ended with a 4-mile cross-country run. WØAIB was net control and KØUAA arranged the amateur participation. (Mike Bellinger, KØUAA, PIA MO)

☐ Kanawha County, WV—November 14. More than 6500 residents in Rand, Malden and Kanawha City were evacuated from their homes when bromine leaked from a tank at a small chemical plant. Seven ARES members activated a net after reporting to two evacuation centers and the Red Cross command post. The net was in operation until the evacuation ended in early evening. No casualties resulted from the incident. (Bill Pace, KB8ZM, EC Kanawha County, WV)

☐ Detroit, MI—November 15. Shortly after 6 PM, KA8EAO passed an accident on northbound I-75. He called for someone to contact the police, and KA8WPM brought up the automatic police patch on the W8ICN repeater. When the phone was answered, the call was given to dispatch where WA8YXM took it, and KA8EAO reported that there appeared to be an injury.

The proper post was contacted, and state troopers arrived about five minutes later to find a one-car accident involving a driver who had been drinking in excess. (John Davis, WA8YXM)

YOUR CONDUCTOR'S CABOOSE

Last month we discussed the many opportunities that knocked at our door late last year. This month, we would like to inform you that another opportunity will be knocking at your door next month.

For the first time in several years, we intend to survey the readers of this column. Your likes and dislikes are important to us. So sharpen your pencils, tell other amateurs and watch for the March *QST*. The results of the survey will be important to us. We hope the survey is equally important to you.

ARRL Section Emergency Coordinator Reports November 1985

Forty-one SEC reports were received, denoting a total ARES membership of 20,536. Section Emergency Coordinators reporting were: AB, AZ, EMA, ENY, EPA, CO, GA, IA, KS, MAN, MDC, ME, MI, MN, MO, NC, NFL, NLI, NV, NNJ, OH, OK, ONT, ORG, PAC, SC, SCV, SD, SDG, SFL, SJV, SK, SNJ, UT, VA, WA, WI, WMA, WNY, WPA, WV.

SEC monthly reports for February should be received in the Public Service Branch at ARRL HQ no later than Mar 12. Reports received after the 12th will be entered as time permits.

Transcontinental Corps November 1985

February reports should be received in the Public Service Branch no later than Mar 12.

Area	Successful Functions	% Successful	TCC Function Traffic	Total Traffic
Cycle Two				
TCC Eastern	110	91.7	619	1243
TCC Central	83	92.0	410	834
TCC Pacific	112	93.3	605	1155
Summary	305	92.3	1634	3232
Cycle Four				
TCC Eastern	132	87.3	744	1495
TCC Central	49	81.7	237	515
TCC Pacific	91	76.0	542	970
Summary	272	81.6	1523	2980

TCC Roster

KA1AE N1BHH W1CE W1EFW K1EIC K1EIR WA1FCD K1GRP KN1K KT1Q W1QYY KW1U W2CS N2IC WA2FJJ N2XJ W3ATQ N3COY WB3EPU KK3F WB3GZU KB3UD AA4AT N4EXQ N4GHI WD4FTK W4JL WA4JTE NW4X WF4X W4UQ W4ZJY K4ZK N5AMK N5BB N5BT WB5CIC W5CTZ W5GHP K5GM W5JOV W5KLV KD5KQ K5OAF WB5OXE N5TC K5TL K5UPN ND5T W5TFB W5TNT KB5UL KD5RC KS5V KV5X WB5YDD VE6CHK KU6D N6DT W6EOT W6INH K6LL WF6O K6UNH K6UYK W6VZT KA7CPT VE7EIL W7EP KD7EY KB7FE W7GHT NN7H K7HLR KR7L W7LYA K7OVK W7TGU KF7R W7VSE WB7WOW KA8CPS K8OZ W8PMJ W8QHB AF8V N8XX WB8YDZ KA9FEZ KW9J W9JUJ WB9NVN WB9UYU AD0A NJ0B KC0D K0EZ KA0EPY W0HI N0IA KJ0G KS0U WA0YI

National Traffic System November 1985

February reports should be received in the Public Service Branch no later than Mar 12.

Net	Sess.	Tfc.	Avg.	Rate	% Rep.	% Rep. to Area
Cycle Two						
Area Nets						
EAN	30	1150	38.3	.754	97.2	
CAN	30	832	27.7	.563	100.0	
PAN*	51	687	13.5	.537	84.4	
Region Nets						
1RN	60	778	13.00	.506	96.4	100.0
2RN	56	367	6.60	.354	82.0	100.0
3RN	30	298	9.90	.500	96.0	100.0
4RN	60	709	11.80	.490	83.0	100.0
RN5	60	806	13.43	.472	93.7	100.0
RN6	54	288	5.30	.340	100.0	100.0
RN7	58	601	10.40	.466	82.8	100.0
8RN	60	483	8.05	.320	94.0	93.3
9RN	60	434	7.00	.383	94.0	100.0
TEN	60	482	8.03	.372	85.0	100.0
ECN						90.0
TWN	60	403	6.71	.443	84.6	98.0
TCC						
TCC Eastern	110	1243				
TCC Central	83	834				
TCC Pacific	112	1155				
Cycle Three						
Area Net						
EAN	30	428	14.27	.663	90.5	
Region Nets						
1RN	30	140	4.67	.330	84.0	96.6
2RN	30	240	8.00	.474	81.3	100.0
3RN						90.0
4RN						66.6
8RN						76.6
ECN						93.3
Cycle Four						
Area Nets						
EAN	30	1306	43.5	1.08	92.8	
CAN	30	930	28.8	.93	99.4	
PAN	30	889	29.6	.91	99.4	
Region Nets						
1RN	46	359	7.80	.410	85.1	90.0
2RN	58	198	3.40	.295	79.0	90.0
3RN	60	263	4.38	.391	92.2	90.0
4RN	60	593	9.90	.410	100.0	100.0
RN5	27	242	9.00	.450	85.2	100.0
RN6	60	490	8.00	.600	100.0	98.3
RN7	60	341	7.40	.482	91.9	100.0
8RN	56	324	5.79	.322	83.0	86.6
9RN	58	449	7.74	.394	90.9	100.0
TEN	60	258	4.30	.322	80.6	98.3
ECN	60	140	2.33	.280	88.3	100.0
TWN	58	375	6.40	.360	90.0	100.0
TCC						
TCC Eastern	132	1495				
TCC Central	49	515				
TCC Pacific	91	970				

*PAN operates both cycles one and two.
TCC functions not counted as net sessions.
ARRL Section Traffic Managers reporting: AB, AL, AR, AZ, CT, DE, EMA, EPA, GA, IL, IN, KS, MDC, ME, MI, MN, MO, MT, NC, ND, NE, NFL, NH, NLI, NNJ, NTX, OH, OK, ONT, OR, ORG, RI, SC, SD, SDG, SFL, SJV, SNJ, STX, TN, UT, VA, VT, WA, WIN, WMA, WNY, WPA, WV, WY.

Note: February Section Traffic Manager reports should be received in the Public Service Branch no later than Mar 12. Incomplete, illegible or late STM reports will not be entered in the Public Service column.

Public Service Honor Roll November 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 nets, 3 points each, max 12; (5) Performing assigned NTS liaison, 3 points each, max 12; (6) Delivering a formal message to a third party, 1 point each, no max; (7) Handling an emergency message, 5 points each, no max; (8) Serving as Emergency Coordinator or net manager for the entire month, 5 points max; (9) Participating in a public service event, 5 points, no max.

This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that qualify for the Public Service Honor Roll 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from HQ.

February reports submitted by SMs for this column should be received at ARRL HQ no later than Mar 12. Late reports will not be published. PSHR reports should be listed separately from Section News reports.

253
KD8RD
210
K7VW
189
KC9CJ
162
K4SCL
147
KK3F
146
KA0EPY
142
K3RXK
140
WD8LDY
138
KA2SPH
132
WB4WYG
131
KA3DLY
N4EXQ
N4GHI
129
W9FZW
128
K4NLK
126
WB1CMQ
KB8Z
KK1A
WB2VUK
124
N1CPX
123
WX4H
WB1HIH
122
WF6O
W3FA
121
WA4QXT
N4KFU
KB1AF
119
KB4WT
WB2OWO
KD8KY
118
VE4AJE
117
WA2ERT
116
AE5I
115
K4ZK
WB1GXZ
114
N1AKS
KW1U
KT1Q
112
KD7ME
W9YCV
111
WB2EAG
110
W7VSE
WD8RHU
109
W9JUJ
WA2FJJ
KA2MYJ
108
AA4AT
107
NJ0B
W2MTA
K5CXP
WB8RFB
K2ZVI
106
KD0CL
105
WA4PFK
WA4JDH
W2PKY
104
W9DM
KZ8Q
103
N7FXJ
NG2T
N0GCC
KA1KPS
N2XJ
AF8V
102
K4JST
NN2H
NC9T
W0OYH
WB2MCO
101
KT5Y
WB7WOW
AG9G
KA8VOZ
WA4CCK
K2GCE
W4PIM
100
W9CBE
NT4S
N4KSO
N1DMU
W4ANK
99
KC4VK
K6UXO
98
WA6ZUD
WB2IDS
97
WD8KQC
KA1GWE
WB0TED
96
K6UYK
KA9FFO
N9BDL
WB2RBA
WB8JGW
KA8GJV
W2RRX
95
WA4EIC
K4VWK
94
KB4LB
W6INH
KS5V
N8FXH
93
WD5GKH
W4CKS
92
VE4IX
WB4WII
WA2KOJ
W1RWG
WB6DOB
91
K3JL
KJ3E
N8AWH
90
VE3DPO
WB4HRR
KI4YV
WB0WNJ
N3EGF
W3YVQ
WD0AIT
KA5SPT
W6VOM
89
VE3GT
AA4HT
WD8PAF
W7JMH
WA1YNZ
NO0A
88
WB6QBZ
N3COY
W7GHT
N8EFB
K2YQK
K5UPN
KB5UL
87
WB4ADL
N6HYM
KJ9J
N5DFO
KV5X
K4EV
86
KB9LT
KB7FE
WD8OUO
KA8CPS
KA8TNT/T
N8GJO
85
N4PL
N0BKE
KA4GUS
WD4KBW
84
VE3GNW
W5CTZ
KC3Y
KF8J
KA2IWS
K0GP
83
NM8I
WB4WQL
82
KA0BCB
81
WA0TFC
WD4ALY
N8AEH
WB2QMP
80
W1TN
ND0M
W5VMP
79
NJ8R
K5OAF
K3NNI
W0KK
78
VE4RO
WA6WJZ
ND2S
KG2D
W9HBI
77
N0EVC
W7LG
KA1KTH
K6AGD
76
KK1E
NI0R
WB8SYA
N1CVE
AE1T
75
WA4EYU
KC0AF
74
VE3KK
VE3WM
KB1PA
KB4OZ
NF8B
KC2FT
73
KA9RII
WA4RUE
KA0ODQ
WA1TBY
N1BJW
W0FRC
72
N7BGW
N4JOA
KN1K
KA4MTX
K2YAI
KA4YEA
WD0BOX
K6APW
71
KI1M
K7GXZ
W0IKT
70
AI0O
W5KLV
VE2FMQ
KA8KHS
69
KA4RSC
W5AC
K4JUM
KB5EK
KB4BZA
68
NK8B
W4FMZ
KF7R
NI6A
67
WB9PFZ
KA4FZI
KA1ON
N7BHL
K4ZN
66
K6YD
KA0ARP
WA6QCA
N1BGW
W3DKX
WB5EPA
KA2UBX
WA4RNP
ND9V
65
KA4YHS
WB8YDZ
WB5YDD
AA4GL
WD8KBW
64
KB4IVV
KA7AID
KP4DJ
KB0ZL
K0PCK
W0OUD
KA0KPY
W0YMB
WD0GUF
KC3AV
W2UYE
WB8KWC
W7TGU
63
W4SME
NZ5J
AJ5K
KA2DQA
62
K7OVK
N1DDC
WA4TVS
KA7KAI
N0DZA
WA7WZP
K4MOG
W4HON
KQ3T
WA3UNX
61
WA4MNR
KA9RNY/T
KA0FSM
KA7QZK
K8ND
K8JDI
W4ZJY
AK2E
60
WB4TZR
WA8DHB
WD6BZQ
N1DVI
NN4I
KA5QYV
59
VE2EDO
56
KA6HJK/T
55
W1YOL/T
54
N2EVG/T
50
KB4MHH/N
N6FWG/T
48
KA1HPO/T
N2FQP/T
47
WB1CBP/N
N5IGR/T
45
N9EQP/T
43
WD5EEH/T
42
N9EJO/T

Brass Pounders League November 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.

February reports submitted by SMs for this column should be received in the Public Service Branch at ARRL HQ no later than Mar 12. BPL reports should be listed separately from Section Traffic reports. All BPL reports should be complete and legible. Late, illegible or incomplete reports will not be published.

Call	Orig	Rcvd	Sent	Dlvd	Total
W3CUL	764	819	1372	91	3046
N0QP	36	1255	73	721	2085
WA0HJZ	0	746	26	510	1282
WD4IIO	551	83	581	51	1266
W3VR	312	329	457	39	1137
WA4JDH	0	557	532	4	1093
KW1U	0	552	430	13	995
WX4H	11	482	362	8	863
KK3F	13	408	373	26	820
N4GHI	52	393	359	14	818
K6UYK	114	352	310	7	783
W9JUJ	1	381	358	8	748
N4PL	148	214	337	31	730
KA9FEZ	2	323	351	0	676
N4EXQ	23	303	294	14	662
N1CPX	—	—	—	—	583
W7VSE	2	282	282	9	575
WB0WNJ	0	341	201	16	558
WB4ADL	33	268	229	24	554
WB2OWO	35	238	246	30	549
N1NH	—	—	—	—	532
K0RXK	12	254	0	266	532
KD8RD	102	143	172	114	531
WF6O	22	252	233	21	528
KT1Q	2	244	295	13	524
W0ACH	0	256	256	0	512
WA2HSB	14	248	244	5	511
WA4QXT	65	156	257	25	503

BPL for 100 or more originations plus deliveries:

W0BMA	211
W8GK	200
W1FYR	159
KA0EPY	151
K0JAN	149
W0QBK	131
W0FIR	112
W9FZW	110

Independent Nets November 1985

February reports submitted for this column should be in the Public Service Branch at ARRL HQ no later than Mar 12.

Net Name	Sess	Tfc	Check-Ins
Amateur Radio Telegraph Society	60	1040	323
Central Gulf Coast Hurricane Net	30	187	3382
Clearing House Net	30	209	359
Early Bird Net	30	762	391
Empire Slow Speed Net	30	80	410
Golden Bear Amateur Radio Net	30	93	1918
Hit and Bounce Traffic Net	29	422	661
IMRA	26	945	1707
Midwest RTTY Net	44	27	301
Mission Trail Net	30	216	996
New England Novice Net	30	59	144
North American Single Sideband	25	24	110
NYSPTEN	30	62	589
Southwest Traffic Net	30	217	1318
West Coast Slow Speed Net	30	118	430
20ISSBN	26	866	319
75 Meter Interstate SB Net	30	385	1180
7290 Traffic Net	45	825	2880

Awards Program, 1986 ARRL International DX Contest

Listed below are all of the plaques that will be awarded in the 1986 ARRL International DX Contest. Sponsors as of December 16 are shown adjacent to the corresponding category. If you are interested in sponsoring one or more of these awards, contact the Contest Branch at ARRL HQ.

The list of sponsored plaques may change before you read this because of *QST* lead time, so please call or write to us for a list of what is available before sending payment. Additionally, the Trio-Kenwood Employee's Radio Club, WD6DJY, has agreed to sponsor all plaques that are still available by results time. We salute all who have helped make the Awards Program such a success!

W/VE Phone

Single Operator

All Band	Frankford Radio Club
1.8 MHz	Butch Greve, W9EWC, Memorial
3.5 MHz	Lance Johnson Engineering, KØCS
7 MHz	Dave Thompson, K4JRB
14 MHz	Dayton Amateur Radio Assn
21 MHz	
28 MHz	
QRP	Woodbridge Wireless—KA2TPA and KZ2E

Multioperator

Single Transmitter	Trio-Kenwood Employee's RC, WD6DJY
Two Transmitter	Trio-Kenwood Employee's RC, WD6DJY
Unlimited	Western New York DX Assn, W2RR

W/VE CW

Single Operator

All Band	Frankford Radio Club
1.8 MHz	W1TX Memorial—Conn Wireless Assn
3.5 MHz	Dayton Amateur Radio Assn
7 MHz	Northern Arizona DX Assn
14 MHz	Fox Cities ARC, W9ZL
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	W5MYA
QRP	Hollywood ARC, Inc

Multioperator

Single Transmitter	Mike Kaczynski, W1OD and Billy Lunt, KR1R
Two Transmitter	Trio-Kenwood Employee's RC, WD6DJY
Unlimited	Colorado Contest Conspiracy

DX Phone

Single Operator

World	North Jersey DX Assn
Africa	Trio-Kenwood Employee's RC, WD6DJY
Asia	Acadiana DX Assn
Europe	
North America	Chod Harris, VP2ML
Oceania	N7AVK Doc Sayre and DX Int'l Society
South America	
1.8 MHz	Fred Race, W8FR, CPO USN
3.5 MHz	Trio-Kenwood Employee's RC, WD6DJY
7 MHz	Central Arizona DX Assn
14 MHz	Don Wallace, W6AM Memorial, Central CA DXC, Inc
21 MHz	Trio-Kenwood Employee's RC, WD6DJY
28 MHz	Trio-Kenwood Employee's RC, WD6DJY
QRP	Gerald Griffin, MD, W8MEP/6

Multioperator, Single Transmitter

World	Gloucester County Amateur Radio Club
Africa	David Vogel, NL7P
Asia	Trio-Kenwood Employee's RC, WD6DJY
Europe	Metro DX Club
North America	Nick G. Lash, K9KLR
Oceania	
South America	

Multioperator, Two Transmitter

World	Trio-Kenwood Employee's RC, WD6DJY
Asia	Trio-Kenwood Employee's RC, WD6DJY
Europe	Tom Middleton, WB4CKY, Joy Middleton, KB4OMW
North America	John Brosnahan, WØUN
Oceania	

Multioperator, Unlimited

World	Phil Sager, WB4FDT, "Mac" Crush, WB4UOI Memorial
Asia	Trio-Kenwood Employee's RC, WD6DJY
North America	Willamette Valley DX Club, Inc

DX CW

Single Operator

World	North Jersey DX Assn
Africa	Trio-Kenwood Employee's RC, WD6DJY
Asia	Alamo DX Amigos
Europe	Trio-Kenwood Employee's RC, WD6DJY
North America	Potomac Valley Radio Club
Oceania	Tom Morton, KT6V
South America	Southern California DX Club
1.8 MHz	Jim Dionne, K1MEM and Bill Poellmitz, K1MM
3.5 MHz	Mad River Radio Club
7 MHz	
14 MHz	Bencher, Inc
21 MHz	Southern New England DX Assn
28 MHz	
QRP	Woodbridge Wireless—KZ2E and KA2TPA

Multioperator, Single Transmitter

World	George Schultz, WØUA and John Brosnahan, WØUN
Asia	Trio-Kenwood Employee's RC, WD6DJY
Europe	Trio-Kenwood Employee's RC, WD6DJY
North America	Trio-Kenwood Employee's RC, WD6DJY
Oceania	
South America	Phil Sager, WB4FDT, W4KFC Memorial

Multioperator, Two Transmitter

World	Tom Frenaye, K1KI
Asia	Trio-Kenwood Employee's RC, WD6DJY
Europe	Texas DX Society
North America	

Multioperator, Unlimited

World	Trio-Kenwood Employee's RC, WD6DJY
Asia	Trio-Kenwood Employee's RC, WD6DJY
Europe	Schenectady Amateur Radio Assn
North America	Willamette Valley DX Club, Inc
Oceania	

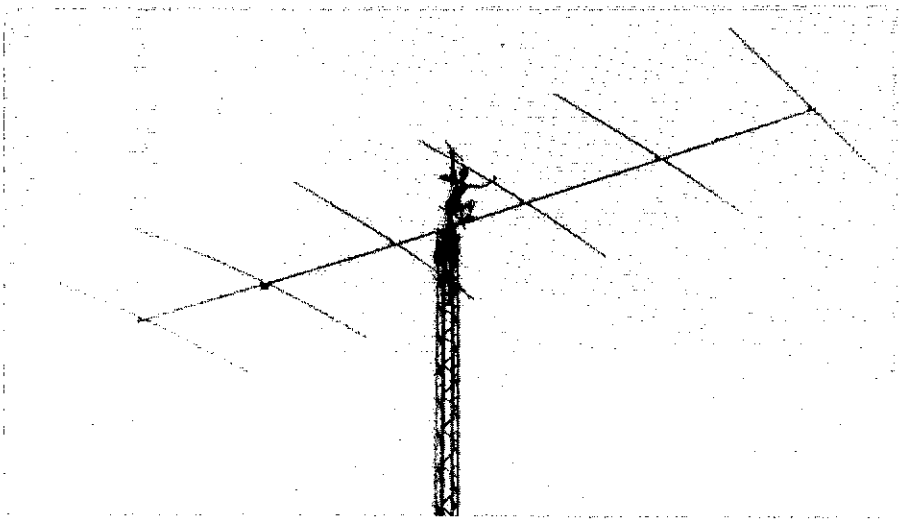
Special

Single Operator

W/VE Combined Score	National Contest Journal
W/VE Low Power Combined Score	Rochester (NY) DX Assn
Africa Combined Score	Tom Gregory, N4NW
Arizona (CW)	Central Arizona DX Assn
Arizona (Phone)	Central Arizona DX Assn
Fifth Call Area (CW)	Red Stick DX Assn
Japan (Phone)	Western Washington DX Club
USSR—All Band (CW)	K1KI, W1DA, W3XU, NC5K, WB4TDH, W9LOF, WØZV
USSR—All Band (Phone)	K1KI, WA2VUY, NC5K, NE8K, WØZV

Multioperator

Caribbean (CW)	The YASME Foundation
Caribbean (Phone)	W5MYA
Multi-Multi World (Combined Score)	W2PV Memorial Award



HA7UG surveys the 6-element long-boom Yagi used at HG7B.

Results, Ninth IARU Radiosport Championship

By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

and Mike Kaczynski, W1OD
Contest Manager, ARRL

The ninth IARU Radiosport Championship is now history. Scores have been tallied for the 1297 who gave up picnics for QSOs on the second weekend of July 1985. After nine years, it is clear that this contest is well established and is holding its own mark as a major world-class operating event. Not only has this contest gained international recognition, it has helped spread goodwill and technology throughout the world during its near-decade of existence.

Even though propagation and sunspots are at a minimum, the number of participants holds steady year after year. Activity was plentiful on all bands from HF to VHF, although 20 meters again proved the mainstay of the contest for the highest QSO and multiplier totals. In all, entrants from 46 ITU Zones submitted their results to our Box AAA address in Newington. Although the total number of countries listed in the results didn't quite qualify for DXCC this year, 83 countries are represented. Not bad for a contest that's still in the single-digit age category.

As could have been predicted, LU8DQ pounded brass in Radiosport number nine—to the tune of 1.637M for another top-place CW finish worldwide. Jorge continues to hold the record for being the top CW entrant every year since the contest's first running in 1977. He has amassed 13,080,802 points, *all on CW*, with his 1981 1.797M record assured a permanent place in Radiosport history books. RB7GA mustered 1.2M from the Ukraine for a second-place finish.

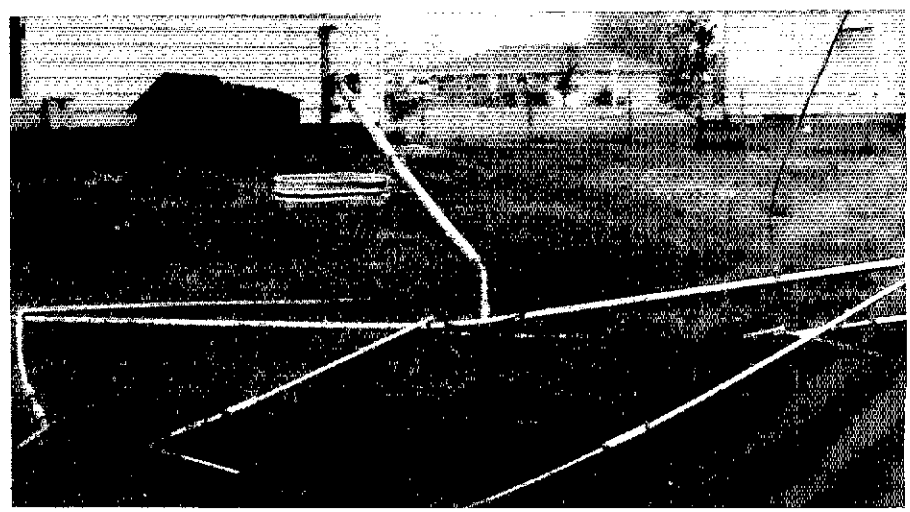
Two Asian entrants ran away with the world mixed-mode category. UH8EA was number one (1.15M), with JA1YWX (JA6-9330 opr), topping the 1M mark for second place. KN6M/5 took stateside honors with 678k, which was good enough for a seventh-place finish worldwide. The US runner-up was a West Coaster, NI6W, with 625k.

The top phone operators in 1985 were from South America. Luis, ZP5JCY, took first place with 941k, closely followed by LU6ETB and LU1BR, with 867k and 834k, respectively. Carl, AI6V again took top honors on phone in the US with 617k. Even though his score was down from his 1984 effort, it was good enough for a fifth in the world. The second place US finisher, John, N8CXX, just missed making the world top ten by 25k, finishing in slot number 11. Great try, John!

In the multioperator category, LZ2KTS lead the pack all the way with an impressive 2.4-million points. The Bulgarian crew of LZ2s CC, DF, HE, PO and LZ1-A-310/2 even topped their first-place 1984 score of 2.2 million. World multiop runner-up R2FAA from Kaliningradsk scored 1.6 megapoints to edge out a field of four 1.5M-plus entries (LZ5A, 1.59; UZ4FWO, 1.57; RL8PYL, 1.52; N5TR, 1.5). In the US, the fight for second place was ferocious, with N4WW,

Top World Scores

Mixed		*CW*		*Phone*		*Multioperator*	
UH8EA	1,152,014	LU8DQ	1,637,768	ZP5JCY	941,760	LZ2KTS	2,413,224
JA1YWX (JA6-9330)	1,035,900	RB7GA	1,239,796	LU6ETB	867,516	R2FAA	1,681,812
IO2UIY (I2UIY)	873,180	VP2VCW (N6CW)	841,896	LU1BR	834,093	LZ5A	1,595,933
UA1DZ	846,296	OH0BH	708,064	RB5FF	820,002	UZ4FWO	1,572,669
TU4BR	808,918	K5RC (K5GN)	644,666	AI6V	617,120	RL8PYL	1,527,864
RB5AA	726,414	UA9SA	636,273	UA9YX	456,258	N5TR	1,503,378
KN6M/5	678,432	N6BT (WA6VEF)	546,355	RB5MF	427,937	UP1BZZ	1,367,312
K5KG/VS6	674,082	UL7CW	505,176	PP2ZDD	411,616	N4WW	1,263,093
UA6LV	665,856	K4VX/0 (KM9P)	487,620	XE1OX	357,480	HG6N	1,217,565
OK3CSC	635,361	OH1AF (OH1HS)	467,452	XE1VIC	353,174	HG5A	1,179,288



Steve, N2BVJ, reported that broken bands weren't all he had to face in Radiosport '85. Winds gusting to above 90 mi/h left him without any aerial supports, as well.

Top W/VE Scores

Mixed		CW		Phone		Multioperator	
KN6M/5	678,432	K5RC (K5GN)	644,666	AI6V	617,120	N5TR	1,503,378
NI6W	625,014	N6BT (WA6VEF)	546,355	N8CXX	327,600	N4WW	1,263,093
W5XZ	576,868	K4VX/Ø (KM9P)	487,620	N4UH	251,484	K5LZO	1,153,144
KM9L (WB9JKI)	425,661	K1ZM	455,124	WBØCHS	166,209	N6ND	863,226
WA6DBC	418,122	W3GM	342,860	XJ3XN	165,850	K6TMB	815,832
WC4E	371,120	N4ZC	326,274	VE3CPU	111,012	K1KI	775,280
K9ZO	334,980	AA5B	319,899	XJ1CBF	106,128	W5WMU	745,614
KØSCM	332,422	W8UA	268,866	KR1R	105,470	K1NG	676,500
K3ZO	306,306	KBØG	256,806	KC3EK	102,920	KFØH	626,990
AA4M	302,430	KF3M	214,700	N3ADE	80,024	WB8JBM	607,601

1984's fourth-place finisher, clipping K5LZO by 100k. This battle wasn't sufficient, however, to stop the 1.5M effort of N5TR from sneaking away with a stateside victory.

Thanks to all for your help and support in promoting this contest over the past nine years. Watch for new rules, to be announced later this year, that will give the contest a new name and a different flavor. CU then!

SOAPBOX

We did manage to work several BYs during the contest. The irony is that from Hong Kong, they are only worth one point apiece! (K5KG/VS6). Had fun; hope there are better conditions next year (W1CNU). Great contest! Will look forward to next time (WB1CNM). Enjoyed the contest very much, although not very much DX (KB4GID). Special thanks to SM4CMG for taking 5 minutes to give me Zone 18, and to my OM, KA4HWG, for giving up the shack for a full weekend (KA4JMZ). DX QSOs were way down, but had fun anyway (N4UH). Bands were bad, but had a great time as always (KA4RVS). This is a great summertime contest (WB4IUX). With 4 hours to go, we fried the relay in the amp (KZ2E). Five pointers were very few and far between, but three pointers were everywhere (KA5KWX). I am amazed at the DX achieved with my antenna (NØFFZ). First contest from new QTH (N6ND). One should not try to work a 40-hour week and then try to put in enough time to make the contest worthwhile (K6LRN).

FEEDBACK

Please refer to February 1985 *QST*, page 74, for the following correction to the results of the 1984 Radiosport contest: KG3Y was accidentally listed as K3GY.

Scores

Scores are listed by ITU zone, then by country within that zone. The line score (example—KL7Y 314,010-882-90-A) indicates the call sign used, the total score, the number of valid contacts, the number of ITU zone multipliers and the entry class. The entry class letters indicate: A—single operator, mixed mode; B—single operator, CW only; C—single operator, phone only; D— multioperator, single transmitter.

ZONE 1

Alaska

KL7Y 314,010-882-90-A
KL7UR 39,200-292-35-B

ZONE 2

Alberta

VE6ADK 11,818-192-19-B

British Columbia

VE7UBC 44,480-350-40-B
VE7XYL 2338-57-14-C

ZONE 3

Manitoba

VE4QST 8294-109-22-A
VE4AEX 39,331-335-37-B
VE4CCC 28,800-257-36-C

Saskatchewan

VE5BAF 11,396-144-22-B
VE5AAD 5175-119-15-B

ZONE 4

Ontario

VE3KP 141,848-732-56-B
VE3NBE 27,956-309-29-B
VE3OMU 18,576-220-27-B
XJ3XN 165,850-809-62-C
VE3CPU 111,012-580-58-C
VE3AXV 35,485-321-35-C
KB2XP/VE3 252-28-3-C

ZONE 6

W6

East Bay

W6DNY 11,753-156-23-B
K6CSL 3857-80-19-B
KS6Q 2167-61-11-C
K6TMB (+ W6RGG, W6SZN) 815,832-2295-108-D

Los Angeles

K6EID 283,770-1001-90-A
AI6Z 30,742-273-38-A
WA6R 117,078-682-57-B
N6IBP 15,065-209-23-B
AA6DP 5282-102-19-B
W8AKS/6 27,144-240-36-C

Orange

NX6M 11,206-167-26-A
WA6TMY 5660-100-20-A
AA6XX 37,728-312-36-B
NM8L 17,298-174-31-C
W6VLD (N6KN, N7NR, WA6DPQ, KB6EKL, oprs) 53,360-386-46-D

Sacramento Valley

KF6A 25,488-323-27-A

San Diego

NI6W 625,014-1639-177-A
WA6DBC 418,122-1588-61-A
AA4M 302,430-1178-85-A
N6JMV 4944-109-16-A
K6ZH 42,126-270-51-B
N6ND (+ K6XT, N6AYW) 863,226-2245-119-D

San Francisco

K6LRN 26,016-244-32-A
WB6SRM 12,704-153-32-A
KK1A/6 1860-70-10-B

San Joaquin Valley

KD6FW 65,065-382-55-A
WC6U 35,451-305-39-B
W6SX 5808-135-16-B

Santa Barbara

WA6FGV 150,212-1104-47-A

Santa Clara Valley

K6XO 17,094-194-33-A
N6UW 9525-139-25-A
N6BT (WA6VEF opr) 546,355-1459-113-B
N6PT 19,096-212-31-B
AI6V 617,120-1770-112-C

W7

Arizona

K7KH 110,898-612-61-A
WA7LNW 44,440-395-40-A
W7FGT 99,840-721-48-B
N7CIX 55,825-710-29-B
K7OX 16,510-221-26-B
K7KZ (+ NØADI) 357,924-1483-84-D

Idaho

W7KDB 1296-38-12-C

Montana

KS7T 46,728-492-36-A

Nevada

WB7VVH 4600-80-20-C

Oregon

W7YAQ 117,530-551-70-B
W7TC 33,896-347-38-B
KA7FEF 5976-131-18-B
KA7KDU (+ WB7RPJ) 157,943-988-59-D

Washington

NK7V 4431-59-21-A
K7LXC 1656-55-12-A
N7DX 2220-57-15-B

Wyoming

KB7WN 504-30-7-C
KB7M 330-25-6-C

ZONE 7

W5

Arkansas

AF5M 150,016-786-64-B
KA5PGA 59,120-514-40-C
W5EIJ 14,016-150-32-C

Louisiana

W5XZ 576,868-1625-116-A
KA5MSD 34,000-256-40-A
W5OB 4959-50-29-B
W5WMU (+ KZ5D, W5ZR) 745,614-2285-106-D

Mississippi

WA5OYU 86,088-568-51-A
AE5H 48,258-417-42-A
KA5KWX 48,804-398-42-B
KF5AU 50,876-382-46-C

New Mexico

AA5B 319,899-1253-87-B
NC5O 90,800-658-50-B
K7UP (+ KF7E) 114,764-803-52-D

North Texas

KN6M/5 678,432-1964-111-A
K5NW 158,295-823-61-B
NF5P 18,038-224-29-B
KY5N 16,268-213-28-B
N5TR (+ KM5X, N5RZ, WB5VZL) 1,503,378-3130-153-D

Oklahoma

W5TZN 30,400-316-32-A
KA5SXN 36,894-326-39-C
NW5H 12,312-219-19-C
K5DEC 511-17-7-C
N5OK (+ WB5TFM) 243,804-1275-66-D

South Texas

WB5BIR 29,808-284-34-A
K5RC (K5GN opr) 644,666-1481-132-B
K5DX 166,532-859-68-B
W5PWG 83,350-568-50-B
KN5H 71,073-481-53-B
WA5IYX 28,300-194-59-C
K5LZO (+ AK5B, K2TNO, KA5SBS, KE5IV, WB5RUS) 1,153,144-1168-139-D
NT5D (+ KA5DXZ) 58,140-569-38-D
W5AC (+ oprs) 15,428-205-29-D

W0

Colorado

AC0S 38,496-439-32-B
WØIZV 29,505-306-35-B
NØFFZ 11,400-213-20-B
KCØHH (+ NØEKK, WABAAU) 183,312-984-67-D

Iowa

WBØCHS 166,209-1123-51-C
WØPPF 4504-86-18-C
KFØH (+ NØGCR, WDØEWD) 626,990-2300-91-D
NEØP (+ KABs GOA, RIU, N2AWE, NØFZR) 66,150-624-42-D

Kansas

WBØYJT 8560-196-16-A
KBØG 256,806-1381-66-B
NØFMR 14,532-252-22-B
WAØCFZ 13,312-245-26-B
WBØISW 41,650-406-35-C
NØCBG 5833-123-19-C
KCØXH (+ WBØTOM) 178,640-1090-58-D

Minnesota

KØMPH 4560-96-19-A
WA2HFI/Ø 25,004-332-28-C

Missouri

K4VX/Ø (KM9P opr) 487,620-1489-105-B
KØSI 4452-86-21-B
WDØELL 16,224-236-26-C
KCØLX 12,850-166-25-C

Nebraska

KØSCM 332,422-1650-71-A
AKØG 38,036-406-37-A
KØSW 20,088-224-31-B

South Dakota

KDØIS 3564-82-18-C

ZONE 8

W1

Connecticut

K8HVT 47,816-427-43-A
WA2WIP 14,150-243-25-A
KD1Z 5344-112-16-A
W1AW (WA1MBK opr) 2832-96-12-A
W1VH 23,616-244-36-B
W1CNU 7780-150-20-B
WA1UUL 3692-122-13-B
KB1H 63,008-539-44-C
KA1YP 20,031-218-33-C
W1KKG 1833-61-13-C
K1KI (+ W1OD, KA2MXO) 775,280-2165-110-D

Eastern Massachusetts

K1VUT 299,154-1407-73-A
N1CGL 3400-98-17-A
W1FM 1484-36-14-A
N1CWU 82,244-540-58-B
K1XM 64,344-318-56-B
WB1CNM 21,261-395-19-B
NA1G 13,192-149-34-B
W1WEF/M 6600-193-22-B
KO1F 5700-102-19-B
K1UCA 2058-36-21-B
W1OPJ 414-25-6-B
N6EK/1 8004-162-23-C

Maine

K1SA 27,343-283-37-A
K1BZ 23,256-282-34-A
WA1YXL 7560-209-14-B
KR2K 912-54-8-C

New Hampshire

W1END 24,948-269-36-B
K1UGU 46,596-344-44-C

Rhode Island

KA1GQW 103,740-698-57-B
KZ1C 14,400-253-25-B
KY1G 4358-169-12-B
K1NG (+ KI1G) 676,500-1934-125-D

Vermont

W1KQ 2975-45-17-B

Western Massachusetts

KB1W 138,186-783-54-B
WB1HIH 104-24-4-B
KR1R 105,470-804-53-C

W2

Eastern New York

K1ZM 455,124-1322-97-B
K2QF 36,876-284-42-B
W2DW 16,116-164-34-B

New York City-Long Island

W2GKZ 23,030-273-35-A
N2FBV 5424-339-16-A
K2SX 61,389-429-57-B
K2LE 24,480-205-36-B
KD2HE 14,856-322-24-B
W2DUN 10,511-199-23-B
KS2G 21,607-320-31-C
WB2PXA 4496-131-16-C
K2KTT 1582-54-14-C

Northern New Jersey

WA2PID 24,024-268-39-A
WB2FUE 23,834-331-34-B
K4IKM (+ K2SC, N2FQF, NG2J, WB2QMP) 26,486-277-38-D

Southern New Jersey

W2OFB 20,048-300-28-B

Western New York

W2HG 10,750-228-25-A
W2TZ 14,688-850-56-B
NG2X 74,358-515-54-B
KW2J 67,648-468-56-B
W2FTY 54,213-403-51-B
NI2T 41,632-476-32-C

W3

Delaware

N3AHA 56,025-505-45-A

Eastern Pennsylvania

W3BGN	94,974-	455-	66-A
K4JLD	26,112-	276-	32-A
W3ARK	16,071-	197-	33-A
W3GM	342,860-	1198-	79-B
N3DRM	2430-	107-	10-B
N3GZB	574-	40-	7-B
KA3LCF	17,458-	292-	28-C
WA3DMH	7434-	99-	18-C
WA3SPJ (+ KS3F)	185,220-	1204-	54-D

Maryland-District of Columbia

K3ZO	356,306-	1207-	77-A
WA3VPL	22,464-	302-	36-A
KC3EK	102,920-	832-	62-C
N3ADE	80,024-	545-	56-C
KR3M	31,853-	369-	39-C

Western Pennsylvania

KF3M	214,700-	941-	76-B
KA3HIE	49,343-	451-	49-B
KA3P	32,428-	283-	44-B
KL7IK/3	2035-	69-	11-C

W4

Alabama

AA4FU	68,715-	523-	55-B
KB4FAI	28,462-	394-	38-B

Georgia

W4GLS	32,379-	303-	43-A
K4BAI	36,720-	376-	45-B
KB4GID	32,040-	496-	36-B
W9UIX/4	60-	7-	4-C

Kentucky

N4XM	106,260-	776-	55-B
KA4JMZ	38,360-	499-	40-B
KB4IAV	12,600-	312-	20-B
KI4DC	2920-	200-	8-B

North Carolina

N4ZC	326,274-	1183-	94-B
K4PB	60,996-	493-	52-B
WA4IVR	7917-	185-	21-B
KB4LFD	6195-	240-	15-B
N4UH	251,484-	1405-	76-C
KA4RVS	23,961-	535-	21-C
N4RVR	8967-	267-	21-C
KF4MZ	1680-	80-	12-C

Northern Florida

WC4E	371,120-	1824-	80-A
KA4MOC	607-	25-	10-C
N4WW (+ KØLUZ, KA4SVT, NX4N, WA4SVO, WY4A)	1,263,093-	3155-	139-D

South Carolina

WB4IUX	4056-	221-	8-C

Southern Florida

WB4BBM	62,481-	343-	59-A
KYØT	57,783-	467-	51-A
K4MF	69,960-	442-	53-B
WB4TDH	59,710-	251-	70-B
WB4QNX	25,515-	491-	15-B
AA4GS	17,784-	345-	24-B
W4YN	1708-	30-	14-B
WK4F	18,200-	159-	40-C

Tennessee

N4JRG	1430-	67-	11-B
K4XO	640-	20-	10-B
K4JHT	34,230-	319-	42-C
WB4PHW	4539-	117-	17-C

Virginia

AA4II	32,868-	321-	44-A
VE3JGC/W4	18,292-	176-	34-A
KZ2E (WY4T opr)	214,401-	899-	73-B
WC4B	113,216-	748-	58-B
W4YE	13,662-	161-	25-B
KB4KEM	3546-	95-	18-B
WD8FLB/4	3878-	93-	14-C

W8

Michigan

NE8T	50,024-	410-	52-A
W8UA	268,866-	1139-	78-B
KQ8J	69,874-	624-	49-B
K8CV	32,718-	353-	38-B
N8CQA	5733-	113-	21-B
N8CXX	327,600-	1463-	80-C
K8DU (+ K8GL)	272,322-	1185-	82-D

Ohio

NJ8L	98,439-	700-	57-A
KD8KY	72,300-	427-	60-A
K8EF	27,550-	301-	38-A
NC8V	21,607-	296-	31-A
K8MR	8680-	111-	31-A
KU8E	159,448-	861-	76-B
WB8KKI	130,918-	806-	67-B
N8BC	88,245-	517-	53-B
WD8AUB	78,768-	607-	48-B
N8FLS	31,416-	392-	34-B
NI8W	20,700-	308-	30-B
W8KKF	77,650-	665-	50-C
N8DDL	21,747-	273-	33-C
WD8MCH	18,630-	291-	30-C
WB8YFD	145-	13-	5-C
WB8JBM (K8NZ, KA8ETK, KC8MK, KV8M, KW8N, N8s ATR, DMM, WD8s AJF, LLD oprs)	607,601-	1942-	113-D
W8LT (K3JT, KD8NS, NZ4K, NI8L, WD8LXX oprs)	404,019-	1603-	99-D
KV8Q (+ KC8UR)	190,421-	997-	77-D

West Virginia

W8VEN	7656-	156-	22-C

W9

Illinois

KM9L	425,661-	1729-	93-A
K9ZO	334,980-	1600-	90-A
KB9PC	13,130-	251-	26-A
NA9J	79,618-	780-	47-B
WB8NSF	2522-	90-	13-B
W1YO	87-	15-	3-C
K9SD (+ K9s BGL, FD, KC9AL, KD9M, KF9F, WØHBH)	422,829-	1641-	99-D
WB9EEA (+ AA9D, KJ9O, WB9WAX)	137,982-	1049-	58-D
N9WA (KA9SLM, WD9GYX oprs)	112,168-	847-	56-D

Indiana

W9RE	12,192-	210-	24-A
W7KZK	65,455-	514-	53-B
N9ACD	31,045-	407-	35-B
KØVGR/9	9875-	173-	25-B
AB9P	2618-	114-	11-B
KC9FC	32,671-	332-	37-C
N2BVJ/9	8235-	136-	27-C

Wisconsin

NB9C	37,481-	444-	37-A
WA9RMP	19,899-	284-	33-A
KB9S	99,491-	687-	61-B
KA9OIE	15,950-	347-	22-B
N9EJL	59,388-	641-	42-C

ZONE 9

Maritimes-Newfoundland

XJ1DH	32,393-	364-	29-B
VE1BEI	16,094-	197-	26-B
XJ1CBF	106,128-	468-	66-C

ZONE 10

Mexico

XE1OX	357,480-	1267-	90-C
XE1VIC	353,174-	1377-	82-C

ZONE 11

Cuba

CM8CB	804-	44-	6-C

Saint Martin

FG5DL/FS	19,776-	206-	24-B

Haiti

HH2VP	187,384-	890-	58-B
HH2WL	51,282-	386-	37-C

Dominican Republic

HI0A	13,216-	250-	14-A
HI3AMF	21,900-	220-	30-C

Panama

HP1AC	44,385-	339-	33-B
HP8AHF	2736-	49-	16-C

Puerto Rico

WP4F	155,116-	826-	52-B

Costa Rica

TI8RC (TI4BGA opr)	128,240-	653-	56-B
TI1W	65,150-	771-	25-C

British Virgin Islands

VP2VCW (N6CW opr)	841,896-	2468-	88-B

Cayman Islands

ZF2AA	3523-	91-	13-B

ZONE 12

Ecuador

HC1OT	138,104-	502-	61-C

Colombia

HK3JJM	14,413-	222-	29-C

Venezuela

YV5JUX	102,985-	490-	43-A
YV7QP	27,962-	182-	31-B
YV6BXN	25,648-	188-	28-C
YV1DWQ	21,432-	304-	19-C

ZONE 14

Argentina

LU8DQ	1,637,768-	2241-	148-B
LU1EWL	157,530-	546-	59-B
LU6ETB	867,518-	1328-	134-C
LU1BR	834,093-	1451-	117-C
LU8DYV	84,035-	495-	35-C

Paraguay

ZP5XGG	59,901-	301-	41-B
ZP5JCY	941,760-	1777-	108-C

ZONE 15

Brazil

PY1HQ	70,004-	424-	36-B
PY1AJK	38,930-	233-	34-B
PY2RRG	36,410-	333-	22-B
PY1BVY	22,290-	153-	30-B
PY2LMA	6821-	75-	19-B
PP2ZDD	411,616-	1099-	76-C
PY5EG	66,750-	185-	125-C

ZONE 17

Iceland

AI5P/TF	5200-	115-	13-A

ZONE 18

Norway

LA2HFA	8891-	168-	17-A
LA2EG	46,966-	283-	46-B
LA4O (LA9EEA opr)	21,084-	572-	12-B
LA8DY	30,473-	303-	31-C
LA9ZV	24,628-	166-	47-C
LA9PT	23,384-	188-	37-C
LA1XDA	9867-	128-	23-C
LA2ZN	7312-	133-	16-C
LA2IZ	6300-	131-	14-C
LA2AD	4914-	101-	14-C
LA9FY	2057-	35-	17-C

Finland

OH7KA/4	740-	24-	10-A
OH1AF (OH1HS opr)	467,452-	1413-	92-B
OH6YF	251,652-	1039-	67-B
OH2PM	155,516-	567-	68-B
OH3NM	7280-	120-	16-B
OH8SP	1722-	75-	7-B
OH9KA	1309-	35-	11-B
OH4NL	40,300-	230-	50-C
OH4RH (+ OH4YE)	185,110-	834-	55-D

Aland Island

OH0BH	708,084-	1841-	109-B

Denmark

OZ1APA	38,612-	194-	54-A
OZ3Q	8896-	66-	32-A
OZ1HET	32,697-	388-	27-B
OZ1JLX	12,528-	119-	27-B
OZ1EUO	1858-	32-	16-B
OZ5EV	83,300-	342-	68-C
OZ1IFP	7425-	155-	15-C
OZ3KE	2418-	61-	13-C
OZ1GLO	973-	47-	7-C
OZ7AIR (OZ1CFV opr)	536-	21-	8-C

Sweden

SM5BMB	50,908-	265-	52-A
SM3CCM	128,843-	730-	53-B
SM4CMG	78,996-	374-	58-B
SM1BVQ	49,995-	333-	45-B
SM7LAZ/6	40,716-	353-	36-B
SM6DED	11,647-	207-	19-B
SM7TV	7740-	111-	20-B
SMØGDB	6380-	93-	22-B
SMØKV/Ø	3447-	125-	9-B
SM7CVU	1968-	78-	9-B
SM6DUA	1001-	21-	13-B
SM6NZA	372-	37-	4-B
SM5CCT	120-	10-	3-B
SM5IWC	57,948-	405-	44-C
SM6JY	4004-	110-	11-C
SM5ARR	612-	32-	6-C

ZONE 19

European RSFSR

UA1DZ	846,296-	1996-	118-A
RA1NB	158,850-	956-	50-A
RA1NA	50,848-	496-	32-A
UA1OGA	45,725-	456-	31-A
UA1ZCX	26,524-	342-	24-A
UA1ZGD	50,728-	461-	34-B
UA1OB	22,260-	235-	28-B
UA1CED	15,312-	230-	22-B
UA1AKC	9645-	206-	15-B
RA1AA	147,015-	797-	55-C
UW1BM	17,928-	205-	27-C
UZ2AWT (UA1s ALZ, ARF, RA1CA oprs)	147,606-	576-	73-D
UZ1ZWO (UA1s 154-464, 143-465, 143-176, ex-UA4AMZ oprs)	85,613-	542-	43-D

ZONE 20

Asiatic RSFSR

UA9XR	287,040-	926-	69-B
UV9CC	104,608-	1868-	56-B
UA9KK	93,483-	438-	51-B
UA9XBV	38,692-	256-	34-B
UA9XHJ	16,000-	183-	20-B
UA9XFO	18,066-	246-	16-B
UA9XS	9180-	99-	20-B
UZ9XWX	27,768-	253-	24-C
UZ9XWA (UA9s XF, XDG oprs)	231,188-	866-	58-D
UZ9CWG (UA9CPL, RV9CBT oprs)	205,326-	743-	61-D
UZ9XWH (UA9s XBV, XFY, 090-553 oprs)	39,510-	296-	30-D

ZONE 21

Asiatic RSFSR

UA9JCF	32,650-	295-	25-B
UA9BCK	21,000-	230-	21-B
UA9BDZ	11,920-	171-	16-B

ZONE 23

Asiatic RSFSR

UA9CA	309,060-	752-	102-B
UZ9QWA (UA9s QAS, QBB, QCA, QDC, QDL oprs)	466,920-	1271-	90-D

ZONE 24

Asiatic RSFSR

UA9CO	111,000-	427-	74-B

ZONE 25

Asiatic RSFSR

UA9XAJ	2112-	46-	12-B

ZONE 26

Asiatic RSFSR

UA9KBO	64,907-	325-	47-C

ZONE 27

Republic of Ireland

EI4DW	52,290-	383-	45-A
EI8AU	20,118-	249-	26-C

France

HW5PN	46,656-	415-	32-B
F8GCP/P	36,285-	265-	41-B
F9DK	12,749-	201-	19-B
FD6MSV	11,998-	299-	14-B
F6CCI	7980-	53-	21-B
F6EQV	4851-	139-	11-B
FE8GDK	19,866-	278-	21-C
FD1JOT	7964-	106-	22-C
F6ENV	828-	42-	6-C

England

G4OKN	30,192-	278-	34-A
G6QQ	12,012-	121-	28-A
G3ESF	153,352-	784-	58-B
G3ZRH	17,940-	83-	60-B
G3DFV	16,492-	261-	19-B
G6NK	4956-	117-	12-B
G4XKR	105,072-	442-	66-C
G4WZA	25,839-	259-	33-C
G3ICG	11,063-	147-	23-C
G4ZFE	9994-	163-	19-C
G3NT	6201-	166-	13-C
GB4DX (G4s BWP, GIR oprs)	1,013,840-	2308-	116-D

Isle of Man

GD8AVF (W2KN opr)	28,492-	244-	34-A

Northern Ireland

GI4LVC	9163-	191-	17-C

Wales

GW4RHW	23,545-	259-	27-A
GW3JI	80,014-	495-	49-B
GW3LAB (G4s EOF, GEE, GW3XHG, GW4s OFQ, VDW oprs)	594,560-	2067-	80-D

Luxembourg

LX1RQ	33,348-	270-	42-C

Belgium

ON7BX	3315-	55-	17-B
ON5FV	3024-	64-	14-C

The Netherlands

PAØYN	1881-	54-	11-A
PA3BFH	33,496-	426-	62-B
PAØLOU	27,370-	171-	46-B
PAØNA	18,810-	174-	30-B
PA3BTH	18,117-	170-	33-B
PA3DCS	5660-	81-	20-B
PA3BDK	4256-	84-	16-B
PA3BNT	4066-	54-	19-B
PAØLKR	2090-	69-	10-B
PA3DJC	17,319-	211-	23-C
PA2NJN	10,580-	134-	23-C
PA3CEF (+ PA3CEE)	837,556-	2241-	109-D
PAØKHS (+ PA3s ADJ, DGM, DQW, PAØVVH, PE1LBX oprs)	331,578-	1284-	78-D

ZONE 28

Federal Republic of Germany

DL6RAI	212,563-	816-	83-A
DFØAQ (DL5LAW opr)	28,768-	315-	32-A
DJ2YE	1070-	45-	10-A
DL2YAK	600-	22-	10-A
DL1KCW	516-	38-	6-A
DL8IU (DL4AAE opr)	184,348-	837-	68-B
DL1RB	105,388-	634-	58-B
DL8MBS	88,677-	503-	59-B
DK1GF	37,708-	301-	44-B
DL4FN	31,883-	315-	39-B
DL1TH	25,940-	252-	35-B
DL1ZQ	18,410-	212-	35-B
DF3QN	4332-	100-	19-B
DJØR	945-	41-	7-B
DL6EBN	585-	21-	9-B
DK9BR	165-	11-	5-B
DL8PC	279,752-	1073-	88-C
DK1HX	8520-	92-	30-C
DL8DAX	2016-	89-	9-C

Hungary

HA8UB	357,660-	1354-	90-A
HA7KLF	105,192-	711-	54-A
HA8LC	20,874-	359-	21-A
HA5LZ	263,516-	744-	106-B
HA1VE	51,600-	405-	43-B
HA7RB	36,520-	225-	44-B
HA8DD	17,115-	248-	21-B
HA8AT	8406-	135-	18-B
HA8MJ	8160-	149-	17-B
HA9MAT	5488-	370-	7-B
HA7XL	4818-	208-	8-B
HA3GJ	434-	22-	7-B
HA3GO	110-	5-	5-B
HG5AAS	2584-	91-	11-C
HG9TL	244-	25-	4-C
HG8N (HA6s NF, ND, NQ, NY, ON, OQ oprs)	1,217,565-	2787-	135-D
HG5A (HA5s FM, GF, MK, ML, OM, UA, WE, HA7RY oprs)	1,179,288-	2732-	132-D
HG9R (HA9s PP, PV, RB, RP, RU, RX oprs)	1,071,092-	2864-	121-D
HG7B (HA5s MY, WA, HA7s UG, UL, UO oprs)	868,733-	2676-	107-D
HA5KKC (HA5s KP, LV, MA, MD, MO, OG oprs)	557,336-	1958-	92-D
HA7KLG (HA7s LC, LD, MC, MY oprs)	478,484-	1764-	89-D
HA2KMR (6 oprs)	342,541-	1463-	83-D
HA8KVK (3 oprs)	322,299-	1377-	81-D
HA8KUC (HA8s GBI, GT, GZ, UC, VX, ZX oprs)	223,535-	1139-	65-D
HA6KNX (2 oprs)	190,632-	770-	67-D
HA1KRR (HA1s DRM, DRR, XO, XU, ZN, Z2 oprs)	169,120-	1564-	32-D
HA5KNI (6 oprs)	120,528-	814-	54-D
HA6KLC (3 oprs)	116,930-	787-	55-D
HA7KMP (HA7s FA, FOK, JB oprs)	103,896-	708-	54-D
HA5KDB (HA5s CP, WZ oprs)	26,448-	209-	38-D

Switzerland

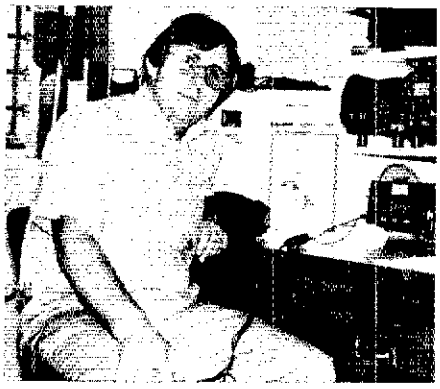
HB9CSA	32,672-	236-	32-A
HB9DX	20,826-	198-	39-B

Italy

IO2UIY (I2UIY opr)	873,180-	2096-	126-A
I2KYM	76,793-	597-	41-A
I8NOA	38,598-	307-	42-A
I1XPQ	148,864-	795-	64-B
I3FDZ	72,675-	564-	53-B
I8BYG	167,090-	1026-	62-C
I6FLD	93,024-	533-	57-C
IO2MQP	69,711-	387-	57-C
I4CSP	16,796-	183-	38-C
IK1DYU	2067-	70-	13-C
IQ8RAI (I8s GEJ, KBL, ZUT, IK8s AZG, EFR, FWI oprs)	310,849-	1391-	77-D

Bulgaria

LZ1GZ	36,052-	386-	39-A
LZ2ZC	7176-	210-	13-A
LZ2VP	76,328-	617-	47-B
LZ2RM	10,648-	118-	22-B
LZ2SL	3546-	49-	18-B
LZ1KTS	6696-	113-	18-B
LZ1NM	4392-	158-	12-B
LZ1BY	41,882-	391-	43-C
LZ1KOZ	41,228-	309-	44-C



Perennial Radiosport top-tenner K5KG. This year, George placed number 8 mixed-mode worldwide from a Hong Kong QTH.

Luis, ZP5ICY, used this fine setup to score 942k from Paraguay.

Paolo, IO2UIY, operated all moves from his QTH for top spot in Italy and a number-3 finish worldwide.

LZ1IR 31,424- 403- 32-C
LZ1OT 24,901- 232- 37-C
LZ1BJ 3300- 63- 20-C
LZ2KTS (LZ2s CC, DF, HE, PO, LZ1-A-310/2 oprs) 2,413,224-3529-198-D
LZ5A (LZ1s IU, JY, LZ2UU oprs) 1,595,933-3139-163-D

Austria

OE9SLH 36,765- 251- 45-B

Czechoslovakia

OK3CSC 635,361-1785-109-A
OK6RA 137,052- 527- 81-A
OK3CUM 86,040- 507- 60-A
OK1KZ 83,846- 523- 53-A
OK1MHI 64,930- 538- 43-A
OK1EP 44,115- 249- 51-A
OK3CDZ 34,817- 328- 37-A
OK1AD 31,524- 272- 37-A
OK1AOT 31,356- 294- 39-A
OK1ALQ 30,590- 291- 35-A
OK3CSQ 28,730- 273- 33-A
OK2PDT 23,360- 188- 40-A
OK1HA 22,700- 272- 36-A
OK3FON 18,858- 115- 42-A
OK1DWG 8925- 261- 15-A
OK1VMA 2106- 64- 13-A
OK1DMS 5472- 96- 19-A
OK2SWD 658- 34- 7-A
OK1DBM 239,410- 886- 89-B
OK1DKW 68,796- 448- 52-B
OK3DT 56,007- 358- 49-B
OK3CEL 54,516- 461- 42-B
OK3CAL 44,076- 403- 41-B
OK3TAY 39,732- 361- 42-B
OK1MZC 35,588- 312- 41-B
OK3KYG (OK3CLW opr) 32,872- 411- 28-B
OK3ZWX 30,834- 342- 27-B
OK1MKU 29,558- 205- 39-B
OK1AXB 27,510- 250- 35-B
OK3CND 23,448- 424- 24-B
OK1FCA 18,183- 265- 29-B
OK3IAG 17,312- 178- 32-B
OK2PFP 15,828- 262- 22-B
OK3CWF 14,950- 263- 25-B
OK3IF 12,616- 192- 19-B
OK2BGR 11,004- 147- 21-B
OK3CDN 10,488- 178- 24-B
OK3KZA (OK3-28011 opr) 8440- 164- 20-B
OK2PLH 7332- 304- 12-B
OK1AII 6780- 76- 30-B
OK1DZL 6069- 165- 21-B
OK1DZJ 4199- 101- 13-B
OK2SMO 3640- 96- 13-B
OK1MAW 2655- 64- 9-B
OL8CQB 2576- 150- 7-B
OL8CRG 1752- 127- 6-B
OK2BBQ 1697- 118- 9-B
OL1BKO 1525- 125- 5-B
OK1DRO 714- 52- 6-B
OK2KVI 516- 30- 6-B
OK1JDX 315- 116- 9-B
OK2BQU 52- 14- 2-B
OK2PGT 5- 5- 1-B
OK1AJN 92,974- 566- 58-C
OK2BQL 43,239- 273- 51-C
OK3YK 14,906- 186- 29-C
OK1BB 14,094- 209- 29-C
OK1AJY 10,727- 224- 17-C
OK3YEI 4466- 150- 11-C
OK2PCL 3204- 89- 12-C
OK3CAJ 2724- 105- 12-C
OK1KUZ 155- 11- 5-C
OK3KII (+ oprs) 401,200-1282- 84-D
OK1KNR (+ oprs) 35,898- 373- 31-D
OK1ORA (OK1AYD, OK1-22310 oprs) 34,047- 445- 27-D
OK2KMR (+ oprs) 21,252- 188- 33-D
OK1KNC (+ oprs) 876- 63- 6-D

Poland

SP8AJK 220,284- 713- 87-A
SP5MXZ/4 107,008- 662- 64-A
SP6CIK 38,220- 293- 39-A
SP7NJX 35,910- 172- 54-A
SP2AYC 33,840- 403- 30-A
SP8NXP 26,296- 262- 38-A
SP3LWU 3624- 45- 24-A
SP6FER 311,168- 907- 88-B
SP7IIT 154,050- 743- 75-B
SP6BEN 95,880- 572- 60-B
SP2BKF 77,748- 638- 44-B
SP3HC 72,875- 519- 53-B
SP9BBH 64,872- 428- 51-B
SP5JTR 64,337- 384- 49-B
SP2NA 33,120- 210- 46-B
SP4EAK 18,212- 220- 29-B
SP9IGY 15,650- 263- 25-B
SP3AZO 5580- 110- 20-B
SP9CVY 2981- 100- 11-B
SP8HPW 2024- 62- 11-B
SP2BMX 1092- 22- 12-B
SP3AOT 900- 36- 9-B
SP5BAK 280- 30- 4-B
SP6ZFU/2 29,718- 270- 39-C
SP6JZB 10,121- 95- 29-C
SP6AGD 8352- 104- 29-C
SP9MRO 7100- 260- 20-C
SP9AVZ 6464- 154- 16-C
SP3CDR 1750- 63- 10-C
SP5NHV 900- 44- 10-C
SP8ECF 300- 10- 6-C
SP6DVP/6 (+ SP6HEK) 384,183-1455- 93-C
SP5PBE/3 (+ oprs) 54,940- 498- 41-D
SP8KAF/8 (SP0s 057RA, 249LU, 288LU oprs) 46,371- 536- 39-D
SP5PMT (+ oprs) 44,252- 498- 37-D
SP9PRH 10,244- 148- 27-D

Greece

WA1ZCE/SV8 42,094- 572- 59-C
W4MAT/SV1 7850- 102- 26-C
SV0AA 1024- 52- 8-B

Romania

YO4BSZ 2403- 109- 9-A
YO3AAQ 44,548- 346- 43-B
YO3RF 40,480- 275- 46-B
YO4BEX 25,004- 381- 28-B
YO6UX 18,942- 334- 22-B
YO6EZ 17,191- 248- 27-B
YO7BGA 9990- 154- 27-B
YO5ALH 7092- 124- 18-B
YO2AQO 5544- 286- 9-B
YO5NY 5340- 122- 15-B
YO3CFF 4880- 82- 20-B
YO4BQV 2205- 121- 9-B
YO4DCF 1397- 41- 11-B
YO6ODF 505- 59- 5-B
YO6BTY 58- 21- 2-B
YO6AKN 30,969- 305- 37-C
YO5GYG 23,072- 346- 28-C
YO7DAA 22,112- 307- 32-C
YO6CVA 1184- 78- 8-C
YO5KAU (YO5s 6AT, RE oprs) 121,688- 761- 56-D

Yugoslavia

YU1KQ 191,232-1192- 48-A
YU7BW 95,904- 636- 54-A
YU7ZZ 76,300- 520- 50-A
YU1NZW 29,248- 274- 32-A
YU4VEF 19,040- 219- 32-A
YU7PXT 177,468- 883- 69-B
YU7SF 92,232- 575- 56-B
YU3ND 33,740- 308- 35-B
YU7FN 32,300- 278- 38-B
YU7MGU 31,388- 250- 38-B
YU7ORQ 20,376- 181- 36-B
YU7MHS 11,445- 251- 15-B
YU3XJ 2592- 116- 9-C
YT2B (YU2s LNI, LMF, RS-801, RS-805 oprs) 447,430-1588-101-D
YU2AKL (4 oprs) 19,092- 215- 37-D

German Democratic Republic

Y23VB/A 104,490- 714- 54-A
Y41WM 33,530- 351- 35-A
Y55XD 26,009- 336- 31-A
Y53XN/P 24,716- 211- 37-A
Y22XF/A 18,228- 249- 28-A
Y53YN/P 17,765- 222- 55-A
Y65ZF 13,718- 126- 38-A
Y51TG 13,662- 154- 33-A
Y66YF 11,742- 176- 24-A
Y42YG 11,275- 177- 25-A
Y31PA 8856- 169- 18-A
Y28GO/A 5560- 106- 20-A
Y62NL 4199- 70- 17-A
Y79VN/A 4153- 64- 21-A
Y35TA 3895- 67- 19-A
Y25OF/A 3794- 81- 14-A
Y62QN 3552- 98- 12-A
Y54TO 3078- 71- 18-A
Y64ZF 2405- 70- 13-A
Y34OL 1404- 40- 13-A
Y31MB 860- 36- 10-A
Y36SG 352- 12- 8-A
Y54PL 232,092- 989- 84-B
Y25FF/A 92,046- 767- 45-B
Y47LN 72,912- 586- 48-B
Y58SA 72,384- 713- 39-B
Y23OM 28,811- 181- 47-B
Y43VA 20,335- 229- 35-B
Y53UN/P 18,122- 141- 34-B
Y46QA 16,472- 253- 29-B
Y63YF 12,719- 167- 23-B
Y22HF 9930- 125- 30-B
Y21EA 8892- 158- 19-B
Y22UB 8840- 153- 20-B
Y21DG/A 7905- 67- 31-B
Y67ZL 5425- 67- 25-B
Y33VA 3740- 72- 17-B
Y23WO/A 1309- 39- 11-B
Y33YA 1308- 33- 12-B
Y23HN 1305- 50- 9-B
Y24XA 760- 74- 5-B
Y27HN 756- 60- 7-B
Y64ZL 376- 19- 8-B
Y23JA 300- 16- 6-B
Y32ZF 33- 4- 3-B
Y46XF 16- 6- 2-B
Y37RB 2- 2- 1-B
Y54TA 210,824-1035- 73-C
Y63TI 9456- 116- 24-C
Y44TN 8320- 137- 26-C
Y22WD/P 3680- 107- 15-C
Y22VI 3570- 98- 15-C
Y41NK 2352- 44- 14-C
Y33ZL (+ Y26IL, Y33VL oprs) 418,770-1715- 90-D
Y32ZC (Y32s OC, UC, WC oprs) 105,326- 757- 54-D
Y72ZG (+ Y63UG) 38,700- 372- 45-D
Y51ZC (Y51s YC,ZC,Y2-17548/C) 37,354- 354- 38-D

ZONE 29

European RSFSR

UA6LV 665,858-1512-136-A
UA3RAR 447,544-1590- 86-A
UA4LCH 159,300- 989- 59-A
RW3DR 154,210- 743- 70-A
RA6LRW 123,618- 608- 66-A
RW3AL 109,007- 593- 61-A
UA1QD 84,476- 609- 49-A
UA3AGW 75,400- 508- 52-A
RZ3DM 57,178- 406- 46-A
UA1QBE 53,500- 322- 50-A
UA4FY 37,590- 296- 42-A
UA6WBF 29,543- 367- 31-A
RW3QA 29,295- 337- 31-A
RZ3DZ 21,854- 140- 49-A
RS3A 16,975- 252- 25-A
RV6AF 13,824- 135- 36-A
RV6AB 7476- 146- 21-A
UA4CDL 6807- 97- 22-A
UA4CLV 1183- 91- 7-A
UZ3WWW 118- 47- 7-A
UW3AA 442,272-1503- 96-B
RA4FA 350,610-1392- 87-B
RA1AO 271,656-1056- 88-B
UA6LAM 214,584- 922- 79-B
UA6BJF 186,783-1049- 69-B
OK3IA/UA3 176,880- 952- 66-B
UA4NZ 150,040- 901- 55-B
UW3ZV 127,750- 731- 50-B
UA4CJJ 126,825- 809- 57-B
UA4HDV 108,585- 644- 57-B
UA6LTI 91,960- 575- 55-B
UA1QCM 70,068- 655- 46-B
UA3DJG 63,366- 352- 59-B
UA3DIJ 61,705- 531- 43-B
UA3DVS 58,360- 504- 40-B
RA3RN 50,924- 240- 58-B
UA6BPM 49,452- 550- 39-B
UA3PGZ 47,970- 356- 45-B
UA4LCL 42,783- 402- 39-B
UA1AFF 41,220- 510- 30-B
UA6BPU 36,720- 397- 36-B
UA6LAK 30,240- 294- 36-B
UA4ANZ 29,568- 312- 32-B
RV4LA 27,552- 313- 32-B
UA4SSS 27,055- 326- 35-B
UA3XBB 25,990- 175- 46-B
UA3YAO 23,328- 336- 27-B
UA3XDS 17,064- 208- 27-B
UA4AO 15,281- 115- 37-B
UA1AFM 11,344- 240- 16-B
UA6BBH 7614- 229- 18-B
RA6AP 4608- 119- 16-B
RA3DVC 4550- 156- 13-B
UA6LIG 4452- 172- 21-B
UA3SBV 3813- 70- 31-B
UA4CHH 3168- 68- 18-B
RA3VA 3728- 69- 16-B
UA3MED 3016- 100- 13-B
UA4CFQ 2434- 160- 14-B
UA3ZFT 2356- 142- 7-B
UA4CLT 1863- 118- 9-B
RA3XA 1860- 76- 10-B
UA1TAE 1600- 56- 10-B
UA3PPS 1470- 140- 5-B
UA3TAM 426- 25- 6-B
UA4CIF 288- 24- 4-B
UV6AGF 225- 19- 5-B
UA4NC 91,760- 467- 62-C
UW1AE 58,676- 388- 42-C
UA4CAK 45,864- 374- 39-C
UA3TN 24,796- 261- 36-C
UW3RR 17,980- 203- 29-C
UA3ZU 13,000- 174- 26-C
UZ3QWM 1940- 48- 13-C
UA3HE 1512- 74- 7-C
UZ3DWR 984- 55- 6-C
UZ4FWO (UA4s FCR, FDS, FEF, FER, FZ, 148-4731 oprs) 1,572,669-3078-159-D
UZ6LWA (UA6s LD, LF, UW6s LZ, MA, NV oprs) 1,106,428-3405-108-D
UZ3DXW (3 oprs) 523,392- 767- 48-D
UZ8AWJ (RA6ATL, UA6s 101-667, 101-641, UV6s ACM, ACV oprs) 318,955-1277- 89-D
UZ3AYR (UA3s 170-481, 170-528, 170-793, UO5-093-166 oprs) 271,576-1162- 83-D
UZ3AXX (UA3s AQP, AQV, 170-79, 170-503, 170-521, RA3DUU oprs) 169,092-1003- 53-D
UZ3AWP (UA3s AKR, 170-563, 170-567 oprs) 109,150- 881- 50-D
UZ4AXM (3 oprs) 53,361- 733- 33-D
UZ3PWJ (UA3s PGS, PNN oprs) 38,988- 401- 38-D
UZ6LWM (RA6LM,UA6-150-959 oprs) 13,720- 130- 49-D
RZ3DWO (RZ3DZ, UA3DLC oprs) 2387- 81- 11-D

Kaliningradsk

UA2EC 17,360- 136- 40-B
R2FAA (RA2FA, RB5GD, RC2s AA, AB, UA2s FF, FJ, FM, FZ, UA4NW, UC2AAB, UT5DL, UW3FH, UY5HF oprs) 1,681,812-3977-137-D
UZ2FWN (UA2DC,UA2-125-902 oprs) 3555- 101- 15-D

Ukraine

RB5AA 726,414-1661-139-A
UB5EC 558,005-1749-107-A
UB5NQ 300,636-1239- 84-A
RB5IA 248,320-1098- 80-A
UB5MLP 203,892- 920- 78-A
UY5TE 115,923- 883- 51-A
UB5IPJ 27,824- 257- 37-A
UB5KW 33,495- 365- 35-A
UB5ITW 24,215- 281- 29-A
UB5CCP 19,620- 389- 20-A
RB5QR 4981- 86- 23-A
UB4MF 2052- 83- 12-A
UB5IFW 1398- 101- 6-A
RB7GA 1,239,796-2565-148-B
RB5IZ 410,176-1211-104-B
RB5QP 219,936- 994- 79-B
RT4UF 204,136-1071- 68-B
UB5IJA 133,168- 848- 56-B
UB5LIE 111,210- 743- 55-B
UB5QGD 102,979- 705- 53-B
UB5ZX 86,238- 573- 54-B
UT5EH 85,277- 524- 53-B
UB5CBA 83,490- 569- 55-B
RB5LM 82,585- 595- 49-B
UB5EF 66,435- 580- 43-B
RB5WR 64,890- 600- 42-B
RB5HB 50,307- 437- 41-B
UB5FBV 45,678- 373- 46-B
UT5UCO 44,462- 305- 43-B
UB5UHT 44,184- 349- 42-B
UB5FAN 43,554- 844- 34-B
UB5EEP 41,760- 479- 32-B
UB5IAN 38,522- 410- 34-B
UT5UBW 36,120- 293- 43-B
UB5CN 31,904- 353- 32-B
UB5LAL 29,637- 297- 37-B
UB5IDS 27,512- 258- 38-B
UB5IHQ 27,120- 354- 30-B
UB5UEG 24,500- 360- 25-B
UB5IPH 23,820- 256- 30-B
UB5UKH 16,320- 298- 20-B
UB5LEE 14,976- 183- 26-B
UB5VK 8854- 106- 21-B
UB5AFL 6749- 173- 17-B
UB5VEG 6174- 122- 18-B
UB5ELN 5016- 217- 11-B
UB5IOD 4961- 207- 11-B
UB5CGN 3718- 96- 13-B
UB5RR 3632- 227- 16-B
UB6QDU 2124- 84- 9-B
RB4IHR 2090- 93- 10-B
UB5XAM 2041- 55- 13-B
RB5VAU 544- 86- 4-B
RB5IIU 15- 3- 3-B
RB5FF 820,002-2236-114-C

RB5MF 427,937- 1342- 101-C
UB5CE 298,896- 880- 104-C
UB5IRM 210,609- 895- 63-C
RB5EG 55,440- 379- 48-C
UB5KN 41,308- 289- 46-C
UB4JB 28,002- 234- 39-C
UB5JNQ 23,301- 305- 27-C
UB4DWL 9600- 134- 20-C
UT5RY 5166- 115- 18-C
UB5VCK 123- 13- 3-C
UB3IWA (UB5s IFZ, IOK, IML, RB5s II, IKF oprs) 986,670- 2851- 114-D
UB4IXZ (RB5IIU, UB5s INO, ITU oprs) 543,864- 1848- 102-D
UB4QWW (RB5QW, UB5s QCJ, QDU, QVV oprs) 380,072- 1497- 88-D
UB4MWA (UB5s MDA, MDD, MOJ oprs) 9358,720- 1226- 91-D
UB4WZA (UB5s WBY, WCX, 068-883 oprs) 274,638- 1217- 78-D
UB4MZL (RB5MLB, UB5s MIF, MRN, MRO, MTV oprs) 253,561- 1136- 77-D
UB4IWI (UB4IUK, UB5s IQW, 073-4002 oprs) 212,190- 1172- 66-D
UB4JWT (UB5s JKU, 057-2250, 057-2457 oprs) 189,819- 1191- 63-D
UB4MZU (RB5MDB, UB5s MPD, MSW oprs) 179,496- 823- 72-D
UB4EYN (3 oprs) 160,284- 1016- 57-D
UB4HXQ (RB5HZ, UA9-098-107, UB5-071-73 oprs) 153,536- 870- 64-D
UB4AWW (3 oprs) 145,620- 888- 60-D
UB4IXQ (RB4IUM, UB5IJZ oprs) 86,632- 646- 49-D
UB4WWE (UB5s WAE, WAH, WDD oprs) 70,136- 579- 44-D
UT4UWE (UT5s UCU, UDI, 186-158 oprs) 64,774- 540- 47-D
UB4VWA (3 oprs) 56,760- 425- 43-D
UB4SWM (UB5s SBF, SBN, SBZ oprs) 28,578- 333- 33-D
UB4FWC (UB5s FBV, BZ, FEF oprs) 22,919- 431- 41-D
UB4WYA (3 oprs) 6822- 134- 18-D

Byelorussia

UC2AFZ 49,530- 479- 39-A
UC2ACT 36,648- 368- 36-A
UC2CAM 8417- 180- 19-A
UC2BA 2352- 35- 16-A
UC2OBB 59,312- 486- 44-B
UC2WO 32,508- 301- 42-B
UC2WBM 6734- 81- 26-B
UC2OM 5040- 86- 18-B
UC2WAO 1295- 94- 7-B
RC2AF 62,036- 383- 52-C
UC2IDC 6252- 215- 12-C
UC1AWW (UC2s ACR, ACZ, CFG oprs) 439,437- 1873- 87-D
UC1AWA (3 oprs) 42,416- 483- 42-D

Azerbaijan

UD6DKW 42,208- 452- 32-B
UD6DR 24,525- 151- 45-C

Georgia

UF6FFF 388,550- 1172- 95-A
UF6FEH 8946- 147- 18-C

Armenia

UG6GDS 4872- 134- 21-A
UG6AG 2145- 57- 15-B
UG7GWB (3 oprs) 229,501- 1121- 47-D
UG7GWA (3 oprs) 26,325- 444- 15-D

Moldavia

UO5OEK 880- 34- 8-A
UO5ODA 67,344- 515- 48-B
UO5OO 34,200- 327- 40-B
UO5OLW 472- 42- 4-B
UO4OWQ (3 oprs) 5628- 153- 14-D

Lithuania

UP2NK 544,899- 1625- 111-A
UP2BR 294,669- 1207- 87-A
UP2BIC 99,534- 662- 53-A
UP2BN 174,855- 923- 65-B
UP2BHN 91,190- 565- 55-B
UP2BCW 54,378- 566- 38-B
UP2BB 25,760- 324- 28-B
UP2BLV 5127- 183- 12-B
UP2BPO 2702- 171- 7-B
UP2BNL 2625- 86- 5-B
UP2AV 34,992- 353- 38-C
UP2TP 320- 36- 4-C
UP1BZZ (UP2s BIG, BIL, BIX, PAJ oprs) 1,367,312- 2748- 146-D
UP1BZO (RP2s BA, BGK, BIH, BIT, BP, UP2s BFN, BJK, BNC, BNQ, BNV, BM, BMQ, BW, OU, UP3s BO, BQ, BX oprs) 959,858- 2206- 149-D
UP1BZA (UP2s BIM, OX, 038-1893, 038-1730,038-1732, 038-1734 oprs) 618,000- 2066- 100-D
UP2BBF (oprs) 141,561- 900- 63-D
UP1BYO (RP2BIP, UP2s BPK, BPU oprs) 20,727- 495- 21-D
UP1BXB (RP2s BHY, BIT oprs) 15,825- 219- 25-D

Latvia

UQ2GD 533,816- 1577- 106-A
UQ2GM 379,496- 1430- 89-A
UQ2GLW 23,584- 281- 32-A
UQ2GJV 10,928- 275- 16-B
UQ2GEC 9780- 278- 15-B
UQ2GBF 3048- 168- 8-B
UQ1GWW (UQ2s 037-83, 037-116 oprs) 551,493- 1999- 87-D
UQ1GXT (2 oprs) 55,880- 470- 44-D
UQ1GWB (3 oprs) 35,010- 408- 30-D
UQ1GXF (UQ2s 037-436, 037-437 oprs) 924- 34- 11-D

Estonia

RR2RR 682- 14- 11-A
UR2FU 59,770- 470- 43-B
RR2RW 32,499- 448- 23-B
UR2RND 11,616- 95- 32-B
UR2RJJ 5260- 136- 15-B
UR2RZ 3626- 71- 14-B
RR2RN 4503- 79- 19-C
UR1RWX (UR2s RNA, RRJ, 083-165 oprs) 2093- 107- 13-D

ZONE 30

European RSFSR

UA4WBG 125,048- 704- 58-A
UA4WBV 59,556- 609- 28-B
UA4WEJ 23,100- 350- 22-B
UZ4PZZ (UA4s PMW, 094-1069, 094-1046 oprs) 405,408- 1173- 96-D
UZ4HWS (UA4s HSV, HUG, 133-1874, 133-1995 oprs) 405,326- 1526- 82-D

Asiatic RSFSR

UA9WEE 407,524- 1356- 68-A
RW9AA 133,308- 255- 44-A
UA9FKW 71,838- 407- 39-A
UA9SG 67,452- 354- 42-A
RA9FA 45,043- 307- 31-A
UA9CBO 27,231- 215- 29-A
UA9SA 636,273- 1423- 99-B
UV9WW 215,040- 854- 60-B
UW9SW 202,230- 827- 54-B
UA9SF 157,795- 699- 55-B
UA9ACV 142,604- 729- 44-B
UA9ALD 111,769- 519- 49-B
UA9AIA 75,696- 458- 38-B
UA9WKO 72,694- 429- 38-B
UA9LDX 53,440- 410- 32-B
UA9AKS 32,160- 365- 20-B
UA9FGJ 23,936- 260- 22-B
UA9AU 5130- 63- 19-B
UA9MEK 520- 28- 10-B
UA9FFE 390- 15- 6-B
UV9FM 262,197- 752- 81-C
UA9CB 28,840- 307- 20-C
UV9FR 17,879- 206- 19-C
UZ9FWR (UA9s FAL, FAR, FM, 140-142, UV9s FB, FJ oprs) 1,001,110- 1981- 110-D
UZ9CWW (UA9s CJK, CIR, CDT, CPB, ex-UA1TAC oprs) 933,317- 1739- 119-D
UZ9WWH (6 oprs) 273,465- 1014- 59-D
UZ9AWH (UA9s ACA, AE, 165-1458 oprs) 216,486- 883- 54-D
UZ9AXB (UA9s ANI, AOV, 165-942 oprs) 204,408- 921- 51-D
UZ9CYP (UA9s CKF, CON, CUA oprs) 62,316- 403- 36-D

Turkmenistan

UH8EA 1,152,014- 1966- 131-A

Uzbekistan

UI8OAA 40,410- 317- 30-B
UI9BWI 30,473- 229- 31-B
UI8ZAA 104,499- 492- 51-C
UI9BWF (RI8BQ, UI8s 053-243, 053-245 oprs) 194,760- 755- 60-D

Tadzhikistan

UJ9JWI (RJ8JQT, UJ8s 040-214, 049-233 oprs) 31,320- 307- 36-D

Kazakhstan

UL7CW 505,176- 1229- 93-B
UL7BY 374,913- 1043- 77-B
UL7BX 308,982- 1054- 69-B
UL7CAZ 10,689- 121- 21-B
UL7LEZ 148,326- 574- 59-C
RL8PYL (RL7PAV, RL8s PA, PY, UL7s PAE, PAZ, PCZ, PHO, 023-158,023-500 oprs) 1,527,864- 2336- 156-D
UL8LWA (RL7LCT, UL7s 026-577, 026-587 oprs) 178,552- 856- 44-D

Kirghizia

UM8MBA 37,352- 311- 28-B

ZONE 31

Asiatic RSFSR

UA9PP 180,810- 574- 70-B
UA9YX 456,258- 1201- 93-C
UA9YP 309,525- 1037- 75-C

Kazakhstan

UL8FWA (RL7s FFF, FFQ, UL7-027-321 oprs) 50,496- 365- 32-D

Kirghizia

UM8MM 401,803- 1138- 83-A
UM8MO 382,847- 1008- 79-A
UM8MAH 97,020- 408- 55-B
UM8MU 15,280- 212- 20-C
UM9QWC (2 oprs) 84,700- 560- 35-D

ZONE 32

Asiatic RSFSR

UA0SAU 585,901- 1395- 101-A
UA0SR 105,615- 552- 45-B
UA8BL 88,200- 438- 49-B
UA8ABL 85,344- 564- 42-B
UA0SLE 41,814- 454- 23-B
UZ8AWB (UA8s AFQ, 103-235, 103-257, 103-347, 103-712, 103-729 oprs) 588,084- 1578- 94-D
UB4UWN/UA8T (RB5UC, UB5s UER, UIG, UIJ, UIZ oprs) 96,840- 566- 45-D

ZONE 33

Asiatic RSFSR

RA0JD 40,464- 248- 48-B

ZONE 34

Asiatic RSFSR

UA0LCZ 227,892- 776- 84-A
UW0LO 149,240- 646- 65-A
UW0CW 4170- 41- 30-A
UA0LJ 64,251- 312- 59-B
UA0CFF 45,080- 281- 46-B
UA0CGN 40,410- 264- 45-B
UA0LT 35,793- 276- 41-B
UA0FFU 7060- 115- 20-B
UA0IBB 4460- 66- 20-B
UW0CM 3184- 66- 16-B
UA0FEP 12,209- 119- 29-C
UZ0LWO (UA0s LD, LF, LS, LGK, NL, 107-65, UW0s LT, MF oprs) 582,576- 1526- 106-D
UZ0LWX (3 oprs) 244,866- 965- 74-D

ZONE 35

Asiatic RSFSR

UA0ZDD 1840- 28- 20-C

ZONE 36

Madeira Islands

CT3E1 2630- 56- 10-C

Canary Islands

EA8BIE 57,420- 202- 58-B
EA8TE 6336- 80- 16-C

ZONE 37

Portugal

CT1DIZ 12,151- 125- 29-C

Spain

EA1CIM 239,040- 856- 72-A
EA2CR 15,420- 166- 30-A
EA3DXO 78,846- 542- 44-B
EC5BZF 60,488- 551- 34-B
EA7FPG 53,306- 362- 43-B
EA3BOW 33,810- 317- 30-B
EA3FKS 13,414- 212- 19-B
EA4CPI 8832- 112- 24-B
EA7AZA 1365- 25- 15-B
EA1DOD 801- 28- 8-B
EA4HD 60,024- 268- 61-C
EA5AP 18,876- 170- 33-C
EA3ELM 12,183- 109- 31-C
EA5DLX 6885- 123- 17-C
EA5FAG 2354- 70- 11-C
EA7CDN 1452- 40- 11-C
EA1AHA 1106- 54- 7-C
EA2SN 520- 23- 8-C

Balearic Islands

EA6GP 12,168- 163- 24-A
EA6VQ 261,801- 1283- 57-C
EA6SK 19,887- 287- 21-C

ZONE 39

Israel

4X6NM 30,016- 228- 28-A
4X6IF 46,695- 289- 33-B

ZONE 44

Korea

HL0K 197,568- 1018- 63-A
HL9TX 117,970- 724- 47-A
HL1LW 40,662- 488- 27-A
HL2XP 36,036- 379- 36-B
HL9TW 92,435- 863- 35-C
HL5FAL 41,009- 628- 23-C
HL0U 7200- 266- 9-C
HL0J (HL1AYE opr) 4184- 354- 4-C
HL1AQB 3400- 292- 4-C

Hong Kong

K5KG/VS6 674,082- 1623- 114-A

ZONE 45

Japan

JA1YWX (JA6-9330 opr) 1,035,900- 1594- 150-A
JA6BIF 135,999- 472- 81-A
JA9RPU 120,633- 382- 79-A
JR1ZTT 112,752- 447- 72-A
JH8JYV 110,376- 369- 72-A
JH8NVX 90,480- 349- 80-A
JE7BIZ 61,408- 408- 38-A
JA7NVF 47,470- 323- 47-A
JA4ESR 40,656- 208- 56-A
JJ3JJL 31,428- 190- 54-A
JA0BMS/1 26,169- 251- 39-A
JA9EYI 26,163- 129- 51-A
JH7XGN 16,200- 88- 50-A
JA2SAP/1 11,040- 87- 32-A
JK1RJQ 8200- 104- 25-A
JR4SRW 6026- 60- 23-A
JF2OHQ 4599- 61- 21-A
JH0XUP 2176- 48- 16-A
JL1EJO 730- 29- 10-A
JN1ENK/3 511- 30- 7-A
JA7DLE 303,784- 772- 104-B
JA7YAB 287,960- 750- 92-B
JE6MQW 199,626- 648- 97-B
JA1ZLO 173,642- 622- 79-B
JH7WKQ 150,417- 507- 81-B
JA1GTF 53,270- 207- 70-B
JR3WXA 50,064- 258- 56-B
JA1BNW 39,672- 250- 38-B
JA1DFQ 22,080- 134- 40-B
JA2MYA 8505- 99- 45-B
JA8EJO 7152- 102- 24-B
JA1JGP 5772- 60- 28-B
JF1NZW 5313- 47- 23-B
JA3ARM 5060- 67- 20-B
JH1MTR 4584- 51- 24-B
JR4ISK 3576- 53- 24-B
JA2IIT 1088- 23- 12-B
JF6TMH 552- 35- 8-B
JA2KPV 186- 9- 6-B
JI2HZH 175- 9- 7-B
JH7LRS 287,100- 767- 87-C
JH3DPB 40,248- 274- 36-C
JA2BNN 27,720- 171- 42-C
JJ2GKA 7276- 30- 12-C
JA2BEY 6700- 75- 25-C
JA0VHI 6048- 70- 28-C
JA8AD 3038- 53- 14-C
JH1UUT 2704- 62- 16-C
JO1TMU 1470- 53- 10-C
JL3WSL 880- 34- 10-C
JL1MWI 783- 46- 7-C
JA1AAT 714- 33- 7-C
JJ2FJM 648- 38- 6-C
JA8PIF 260- 24- 4-C
JE4PNH 88- 8- 4-C
JO1MCC 88- 8- 4-C
JE3WWH 48- 8- 2-C
JE6NPA 30- 6- 3-C
JR8EHA 18- 6- 1-C
JA3YBF (JA9UXW, JE3MAS, JE6BXJ, JG3LZG, JH9GRM, JR4AGT oprs) 984,560- 1623- 155-D
JA1YAD (JA9UFS, JG6AFD, JH5s GHM, MXM, JH7UCC, JH8XTP, JA9AMJ, JP1DMX, JR6JOE, JS1PAQ oprs) 263,488- 714- 92-D
JA2YKA (JJ1BTC, JE2VYM, JF2UTL, JG2s MTC, VTD, JG3OET, JI2JXR, JJ2NJF, JR2GMC oprs) 196,416- 589- 88-D
JA7YCQ (JN1LIG, JR7MZC oprs) 97,034- 442- 58-D
JA7YFB (JH8QNT, JN1RON, JR7JLU oprs) 45,838- 250- 43-D

ZONE 46

Guinea-Bissau

J5WAD 360- 17- 8-C

Ivory Coast

TU4BR 808,918- 1972- 83-A

Nigeria

JG1FVZ/5N8 17,556- 172- 21-C

ZONE 50

Philippines

WA7LUU/DU2 224,835- 707- 65-A
WA7CQE/DV2 172,320- 737- 48-C
DV1TV 7452- 168- 9-C

ZONE 54

Indonesia

YC8BLO 17,771- 282- 13-C
YB8ZDB (YC8HD, YD8s EEF, GMZ, KSL oprs) 9375- 91- 25-D

West Malaysia

9M2RT 138,379- 515- 71-A

ZONE 55

Australia

VK2DSS/4 13,730- 204- 42-A
VI4XA 84,150- 356- 51-B
VK4TT 16,737- 174- 21-B

ZONE 58

Australia

VK8AJ 55,225- 243- 47-B
VK6DU 47,783- 357- 27-B
VK6IR 143,165- 553- 55-C

ZONE 59

Australia

VK2APK 523,736- 812- 82-B
VK2BQQ 31,976- 145- 28-B
VK5AGX 26,338- 168- 32-B

ZONE 60

New Zealand

ZL1AIZ 20,034- 101- 42-B

ZONE 61

Hawaii

KH6CP 19,190- 123- 38-A
KH6WT 34,110- 153- 45-B
KH6SP 19,480- 200- 20-B
KH8SC 4016- 50- 16-B
KH6DW 291,224- 1006- 59-C
W7DTL/KH6 161,059- 695- 47-C
AH6EK 11,201- 111- 23-C

ZONE 64

Guam

AH2U 21,049- 141- 31-B
KB6DAW/KH2 (+ NY6M/KH2) 162,239- 693- 49-D

ZONE 73

Antarctica

LU6UO/Z 33,120- 221- 32-B

Checklogs

CT1AVR, DF5WN, HA8LKK, JA6FYM, N4UM, K5RVK, K6FM, KD6GO, KU7Y, LA1HCA, LA2QM, LA3BX, LA8CE, LZ1KKZ, LZ2EE/MM, LZ2KSO, LZ2SD, OH1LO, OK1AR, OK1US, ON5CW, OZ1FGS, OZ1NF, OZ2ATK, OZ4RS, OZ5PA, PA3AIR, PA3CWR, PA3DDK, PA8UV, PY1OL, PY2WR, SM6GOR, SM6OLL, SM6OOI, SM7KWE, SP1DMD, SP2UUU, SP3BYZ, SP3CDQ, SP3JHY, SP4EEZ, SP4JWR, SP5CCC, SP8GSC, SP9JPA, SP9MQE, Y2-EA-10884/043, Y21DC, Y21UD, Y22EO/A, Y22TD, Y22XF/A, Y23BF, Y23DO, Y24EA, Y24RLI/A,Y25TG, Y26JD, Y26ML, Y41TA, Y54QL, Y55ZD, Y75YL, YO6ADW, YU7BCF, UA1ZO, UW1PA, RA3AR, RA3DPD, UA3AGF, UA3DLD, UA3DNV, UA3DPM, UA3DQS, UA3DTT, UA3PB, UA4ADL, UV3DN, UA4HLD, UA4NBD, UA4YZ, UA6BFI, UA6HON, UA6JY, UA6LLW, UA6YW, UW6HF, UW6OE, UZ6EWA, UZ8HXK, UA9CR, UA9MBX, UA9QBT, UA9WYL, UV9CP, UW9QA, UZ9CWY, UA0FDX, UA0KAB, UA0QEZ, UA0ZC, RT5UO, UB4DWA, UB4EXZ, UB4HWB, UB4JXM, UB4ME, UB4TWL, UB5CEI, UB5EES, UB5FDM, UB5HJF, UB5HKM, UB5KDD, UB5WFG, UB5ZFX, UT5UDI, UY5GG, UC2LAR, UC2-188-101, UJ8JJ, UJ8JMM, UM8MV

Contest Corral

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

FEBRUARY

Jan 25-Feb 2

ARRL Novice Roundup, Jan *QST*, p 93.

1

AGCW-DL Handasten Party (Straight Key Party), Jan *QST*, p 95.

1-2

New Hampshire QSO Party, Jan *QST*, p 95.

RSGB 7 MHz Contest, Jan *QST*, p 95.

North Carolina QSO Party, sponsored by the Alamance ARC from 1400Z Feb 1 until 0500Z Feb 2. Phone and CW. Work stations once per band and mode. Work mobiles again as they change counties. Exchange RS(T) and ARRL section (county for NC stations). Count one point per phone QSO, two points per CW QSO. NC stations multiply by total NC counties and ARRL Sections worked. Others multiply by total NC counties worked. NC mobiles add 500 points for each county outside their home county in which they make 15 QSOs. Awards. Mail logs by March 1 to NC QSO Party, c/o K4EG, PO Box 3064, Burlington, NC 27215.

Vermont QSO Party, sponsored by the Central VT ARC, from 0000Z Feb 1 until 2400Z Feb 2. Phone, CW and RTTY. Work stations once per band and mode (may be worked on all modes). Exchange RS(T) and state/province/country (RS(T) and county for VT stations) Score 1 point per phone QSO and 5 points per CW or RTTY QSO. Multiply by number of VT counties. VT stations multiply by number of VT counties, states, provinces and countries. Add 20 points for working W1BD. Suggested frequencies: phone—3.910 7.230 14.260 14.320 21.360 28.570 50.110 144.200; CW—3.540 3.720 7.040 7.120 14.040 21.040 21.140 28.040; RTTY—3.620 and 90 kHz from lower edge of other bands. Send logs (SASE for results) by March 1 to D. Loverin, WA1PDN, 50 Liberty St, Montpelier, VT 05602.

2

North American Sprint, Jan *QST*, p 95.

Winter Fireside Sprint, sponsored by the QRP ARCI from 2000Z-2400Z Feb 2. SSB only. Work stations once per band. Exchange RS, state/province/country and power output (QRP ARCI number for members). Score 5 points per member QSO and 2 points per non-member QSO. Multiply by state/province/countries per band. Bonus multipliers: 8-10 W ×2, 6-8 W ×4, 4-6 W ×6, 2-4 W ×8, less than 2 W ×10 (More than 10 W checklogs); battery or natural power ×1.5; single element nonrotatable antenna ×1.5 (if last two both apply ×2.5 once instead of ×1.5 twice). Bonus points: work all 10 US Call Areas add 200 points; work 5 Canada provinces add 200 points; work 5 non-US/Canada countries add 200 points. Suggested frequencies: 1.810 3.985 7.285 14.285 21.285 28.885 50.385. Separate logs per band. Awards. Send logs (SASE for results) to Eugene Smith, KA5NLY, PO Box 55010, Little Rock, AR 72225.

4

West Coast Qualifying Run, 10-35 WPM, at 0500Z Feb 5 (9 PM PST Feb 4). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large SASE will help expedite your award or endorsement.

7

W1AW Qualifying Run, 10-40 WPM, at 0300Z Feb 8 (10 PM EST Feb 7). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.55 MHz. See Feb 4 listing for more details.

8-9

YL-OM Contest, phone, Jan *QST*, p 95.

YL-ISSB QSO PARTY, phone, Jan *QST*, p 96.

PACC Contest, Jan *QST*, p 96.

9

North American Sprint, phone, Jan *QST*, p 96.

15-16

ARRL International DX Contest, CW, Dec *QST*, p 93.

19

W1AW Qualifying Run, 10-35 WPM at 2100Z (4 PM EST) Feb 19. See Feb 7 listing for more details.

21-23

CQ World Wide 160-Meter Contest, phone, Jan *QST*, p 95.

22

RTTY World Championship Contest, sponsored by *The RTTY Journal* and *73* Magazine, from 0000Z until 2400Z Feb 22. Single ops work 16 hours max, and off-times must be at least 30 minutes long and noted in the log. Multiops may use all 24 hours. Work stations once per band; no crossmode QSOs. Single and multioperator, single transmitter only. Single band and all band (10-80 m). W/VE stations send signal report and state, province or territory. Others (including KH6/KL7) send signal report and serial number. Count 5 points per W/VE QSO, 10 points per DX QSO.

W1AW Schedule

October 27, 1985—April 27, 1986 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0300, 1400; TThS: 0000; TThSSn: 2100; Sn: 0300
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	CW Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 AM, 7 PM; TThSSn: 4 PM, 10 PM
	Fast Code Practice	MWF: 4 PM, 10 PM; TTh: 9 AM; TThSSn: 7 PM
	CW Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Teleprinter Bulletins	Dy: 6 PM, 9 PM, 12 PM; MTWThF: 11 AM
	Voice Bulletins	Dy: 9:30 PM, 12:30 AM
CST	Slow Code Practice	MWF: 8 AM, 6 PM; TThSSn: 3 PM, 9 PM
	Fast Code Practice	MWF: 3 PM, 9 PM; TTh: 8 AM; TThSSn: 6 PM
	CW Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Teleprinter Bulletins	Dy: 5 PM, 8 PM, 11 PM; MTWThF: 10 AM
	Voice Bulletins	Dy: 8:30 PM, 11:30 PM
MST	Slow Code Practice	MWF: 7 AM, 5 PM; TThSSn: 2 PM, 8 PM
	Fast Code Practice	MWF: 2 PM, 8 PM; TTh: 7 AM; TThSSn: 5 PM
	CW Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Teleprinter Bulletins	Dy: 4 PM, 7 PM, 10 PM; MTWThF: 9 AM
	Voice Bulletins	Dy: 7:30 PM, 10:30 PM
PST	Slow Code Practice	MWF: 6 AM, 4 PM; TThSSn: 1 PM, 7 PM
	Fast Code Practice	MWF: 1 PM, 7 PM; TTh: 6 AM; TThSSn: 4 PM
	CW Bulletins	Dy: 2 PM, 5 PM, 8 PM; MTWThF: 7 AM
	Teleprinter Bulletins	Dy: 3 PM, 6 PM, 9 PM; MTWThF: 8 AM
	Voice Bulletins	Dy: 6:30 PM, 9:30 PM

Code practice, Qualifying Run and CW bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.
Teleprinter bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.
Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

On Monday, Wednesday and Friday, 1400 through 2200 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz; on Wednesday at 2300 UTC they are beamed south.

Slow code practice is at 5, 7½, 10, 13 and 15 WPM.
Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 WPM.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from July 1985 *QST*, pages 9 and 76," indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 76.

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

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

On alternate Saturdays at 2330 UTC, Keplerian Elements for active amateur satellites will be sent on 45.45 baud Baudot on the regular teleprinter frequencies. The next date for transmission will be given in regular satellite bulletins.

W1AW bulletins are sent on OSCAR 10, Mode B, when the satellite is within range. Look for CW on 145.840 MHz and SSB on 145.962 MHz.

Teleprinter bulletins are 45.45-baud Baudot, 110-baud ASCII and 100-baud AMTOR, FEC mode. Baudot, ASCII and AMTOR (in that order) are sent during all 1600 UTC transmissions, and 2300 UTC on TThFSSn. During other transmission times, AMTOR is sent only as time permits.

CW bulletins are sent at 18 WPM.

W1AW is open for visitors Monday through Friday from 8 AM to 1 AM EST and on Saturday and Sunday from 3:30 PM to 1 AM EST. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 PM Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, teleprinter at 15 minutes past the hour, and CW on the half hour.

W1AW will be closed on February 17 and March 28.

Multiply by total states/provinces/countries worked per band. (MD and DC count as one multiplier). Use official entry forms. Separate logs by band. Awards. Mail entries by March 22 to RTTY World Championship, c/o *The RTTY Journal*, 1155 Arden Dr, Encinitas, CA 92024.

22-23

Alabama QSO Party, Jan *QST*, p 96.

YL-OM Contest, CW, Jan *QST*, p 95.

REF French Contest, phone, Jan *QST*, p 95.

RSGB 7 MHz Contest, CW, Jan *QST*, p 95.

MARCH

1-2

ARRL International DX Contest, phone, Dec *QST*, p 93.

5

West Coast Qualifying Run, 10-35 WPM at 0500Z Mar 6 (9 PM PST Mar 5). See Feb 4 listing for more details.

8

W1AW Qualifying Run, 10-35 WPM, at 0300Z Mar 9 (10 PM EST Mar 8). See Feb 4 listing for more details.

8-10

Virginia State QSO Party, sponsored by the Sterling Park ARC from 1800Z Mar 8 until 0200Z Mar 10. Exchange QSO number beginning with 001 and QTH (county for VA stations; state, province or DX country for others). Score one point per phone QSO; two points per CW, RTTY and SSTV QSOs. No crossmode QSOs. VA stations multiply QSO points total by the sum of states, Canadian provinces, DX countries and VA counties worked. Others multiply total QSO points by number of VA counties worked. Work the same station on each band and mode for QSO credit. VA stations may contact in-state stations for both QSO and multiplier credit. Mobile stations may be worked in each county they operate for both QSO and multiplier credit. County-line stations count for only one QSO. CW frequencies are 60 kHz up from the low end of 10-80 meters, anywhere on 160 meters and Novice bands. Phone frequencies are 3.930 7.230 14.285 21.375 28.575, and anywhere on 160 meters except DX windows. Other modes in usual frequencies. Follow ARRL Standard Contest logging guidelines. Mail logs by April 1 to Virginia QSO Party, c/o Barry Pybas, KW4I, 313 W Derby Ave, Sterling Park, VA 22170.

9-10

Wisconsin QSO Party, sponsored by the West Allis RAC, from 1800Z Mar 9 until 0100Z Mar 10. CW and phone. Work stations once per band and mode. Work mobiles again as they change county. No repeater QSOs. Exchange signal report and QTH (county for WI stations; state, province or country for others). Suggested frequencies: CW—3.550 3.725 7.050 7.125 14.050 21.150; phone—3.890 7.290 14.290. Count 1 point per phone QSO, 2 points per CW QSO. WI stations multiply by total WI counties, states and provinces worked. Others multiply by total WI counties worked (max 72). WI mobiles may add 500 points to their score for each county outside of their home county that they make 15 QSOs from. Mail logs by Apr 15 (include large SASE for results) to WARAC, PO Box 1072, Milwaukee, WI 53201.

15-16

YL-ISSB QSO Party, CW.

Bermuda Contest

Iowa QSO Party

20

W1AW Qualifying Run, 10-35 WPM.

22-24

BARTG Spring RTTY Contest

29-30

CQ World Wide Prefix Contest, phone.

Special Events

Conducted By Billy Lunt, KR1R
Assistant Contest Manager, ARRL

Wrightwood, California: WB6FNI will operate from the Jet Propulsion Laboratory's Table Mountain Observatory during the months of **February** and **March** to commemorate astronomical observations of Halley's Comet. Frequencies and times: CW—7.120 at 0400Z-0500Z; phone—7.228 and 7.249 at 0400Z-1000Z. Certificate and Halley's Comet photo for No. 10 SASE or 5 IRCs via PO Box 576, Wrightwood, CA 92397.

Johnson City, Tennessee: The Johnson City, East Tennessee State and Carter County ARCs will operate W4ABR **Feb 1-2** in celebration of Homecoming '86. Operation will be in the lower portions of all bands and Novice bands as conditions permit. Send SASE to W4ABR, PO Box 3682 CRS, Johnson City, TN 37602.

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 96555-0008.

Punxsutawney, Pennsylvania: The Punxsutawney ARC will operate KA3CUY on **Feb 2** starting at 1400Z to commemorate Groundhog Day. Suggested frequencies are 3.950 and 7.230. Colorful certificate for SASE to PARC, RD 5, Box 14, Brookville, PA 15825.

Lancaster, Ohio: The Lancaster and Fairfield Co ARC will operate K8QIK from 1300Z **Feb 8** until 0100Z **Feb 9** to honor the 166th birthday of Civil War General William T. Sherman. Suggested frequencies: CW—3.720 7.120 21.120; phone—3.875 7.275 14.275 21.375. QSL via Lancaster and Fairfield Co ARC, Box 3, Lancaster, OH 43130.

Taylor, Arizona: The Kachina ARC will operate WA7GWG from 1500Z-2300Z on **Feb 14** to commemorate the anniversary of Arizona and Valentine's Day. Operation will be in the 40 and 20 General phone and CW bands and Novice bands. QSL via Kachina ARC, WA7GWG, PO Box 781, Taylor, AZ 85939.

George, Washington: W7WMO/7 will operate during George Washington's birthday party 1800Z-2400Z **Feb 17**. Suggested frequencies: 3.950 7.250 14.295 21.425 28.600. Certificate for 9- × 12-in SASE via Eugene Bye, W7WMO, 18 J St NE, Ephrata, WA 98823.

Brooksville, Florida: The Clover Leaf ARC will operate WD4IIO 1500Z-2100Z **Feb 22** to commemorate the 145th anniversary of Brooksville, the Hernando County seat. Operation will be CW—14.065; phone—14.265; FM—146.715/.115. Certificate via Clover Leaf ARC, 900-2032 US 41 N, Brooksville, FL 33512.

Wales: The Saint David's Day special-event station, GB2SDD, will operate 0000Z-2400Z **Mar 1** to celebrate the National Day of Wales. Operation will be on all bands. QSL via R. R. Jones, GW4HOQ, Bryn-Ynys, 13 Strawberry Place, Morriston, Swansea, West Glam SA6 7AG, Wales.

San Antonio, Texas: To commemorate the Battle of the Alamo and the Texas Sesquicentennial a special-event station will operate from the Alamo **Mar 1-2**. Operation will be on 7.235 and 14.280. QSL via Barry Brewer, WA5DTK, PO Box 65, Randolph AFB, TX 78148.

Strays

LET'S REMEMBER HERTZ

☐ 1986 is the centennial year of Heinrich Hertz's pioneer experiments in electromagnetic waves. It was in November/December 1886, when he was a professor at the Technical University of Karlsruhe, Germany, that Hertz first watched the discharging of a Leiden jar (nothing else than a large capacitor) through a spark gap, which was in the center of a 3-meter-long copper wire. He realized that in a similar wire with a gap 2 meters apart, small sparks were also generated without any physical connection between the two wire-gap systems. These were the first transmitter and receiver of electromagnetic waves.

Only a few months later, Hertz found the wavelength of the oscillations (8 meters), their velocity in free space, the influence of resonance, nodes of zero electric effects on the wires, the rectilinear propagation of the waves and their reflection from metal surfaces. Performed in the largest auditorium available, he experimented with wavelengths down to ½ meter.

Thus, Heinrich Hertz laid down the fundamentals of all varieties of modern-day communications, including Amateur Radio. But he didn't live long enough to see the results of his work; he died January 1, 1894.—*Dr. Wolff Parmentier, DJ5JH*

QST congratulates...

☐ Dana Atchley, Jr, W1CF, of Lincoln, Massachusetts, on receiving The Radio Club of America's Sarnoff Citation for significant contributions to the advancement of electronic communications.

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
ARRL Operating Events and Conventions, 1986	Jan 1986, p 61
Club Contest Rules	Jan 1986, p 94
Frequency/Mode Allocations	Jan 1986, p 62
License Renewal Information	Jan 1986, p 62
MARS Information	Jul 1985, p 46
QSL Bureaus	
Incoming	Dec 1985, p 73
Outgoing	Sep 1985, p 63
Volunteer-Examiner Information	This issue, p 77
902-MHz Interim Band Plan	Jan 1986, p 74

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. Month-end rolls around and band condx are terrible. Northern Alberta Radio Club to handle communications for Bantam A Hockey in 8 ice arenas at the end of December. Alberta Public Safety Service placing 4 generators in hands of Alberta amateurs. They are 3500 watts each and on wheels. Planning one in Calgary area and one in Grande Prairie with final here. Best wishes for a Happy New Year to all radio amateurs. Traffic: APSN, QNI 1047, QTC 30, and informal 66. ATN, QNI 208, QTC 58. Personal - VE6BLY 179, VE6CHK 135, VE6CPE 36, VE6ABC 15, VE6YW 2.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB—British Columbia Public Service Corp Net (BCPSN) 3729 kHz at 0130Z - Check-ins 4775 Average 159 Lo 70 High 266. Net Manager, Ford, VE7DDF. British Columbia Emergency Net (BCEN) NM VE7DIR reports net QNI 779 QTC 235 QTR 534. Pacific North West Amateurs, Second Annual Banquet 1986 Committees have been formed and Expo Year will be a gala year. We are pleased to say Brian, VE7OJ is working in Kamloops. VARC's Christmas Party at Capilano Gardens Dined and Danced the night away. Allan, VE7AL after years been off the air is heard again and on two meters. B.C. F.M.C.A., Christmas 1985 issue thanks to you all for the nice front page. Traffic: VE7BNI 373, VE7CDF 229, VE7DIR 84, VE7FB 43, VE7CCJ 43, VE7EJW 29, VE7EDN 26, VE7FME 18, VE7XA 16, VE7EGM 12, VE7BZI 12, VE7DJ 5, VE7EJU 5, VE7EIR 1.

MANITOBA: SM, Jack Adams, VE4AJE—ASM: VE4IX. SEC: VE4ANR. STM: VE4OO. TC: VE4ALO. ATC: VE4ADP. OO: VE4FK. NMs: VE4ANR, VE4AFO, VE4IX, VE4TE, VE4VJ. Jim, VE4FK, has resigned as Section Emergency Co-ordinator due to lack of help and work commitments, that's the bad news, the good news is that Terry, VE4ANR, has accepted the appointment as S.E.C. Thanks Terry. I am excited about your appointment and know that you are of the same feeling—Let's all work together with Terry to get this very important amateur commitment together. Section Net reports: WRJN 374 QNI in 8 sessions—MMWN QNI 748, QTC 36 in 30 sessions, CRRL Evening Net QNI 1022 QTC 12 in 30 sessions MTNCW Net QNI 271 QTC 58 in 28 sessions. Traffic: VE4AJE 69, VE4AFO 39, VE4IX 40, VE4TE 39, VE4RO 30, VE4PG 22, VE4FK 13, VE4AAD 12, VE4BI 6, VE4DT 6, VE4CR 2, VE4HA 2, VE4NE 2, VE4JK 1.

MARITIME-NEWFOUNDLAND: SM, Don. R. Welling, VE1WF—ASM: Aaron Solomon, VE1OC. Saint John Bicentennial Hamfest very successful. Congratulations to *Committee* consisting of VE1ASJ, VE1LG, VE1SJ, VE1SY and VE1WF. Congrats also to Trophy Winners VE1CCO, VE1CIT, VE1CL and VE1UT; and Draw Winner VE1TD. *New Call Holders:* VE1BXI is now VE1BE; VE1AHO now VE1VN; VE1AUX now VE1JZ; ex-VE1FD now VY1CF. *New Residents:* KA1KXE resident of the Annapolis Valley; VE1JA resides in Halifax; VE7CAM back teaching at Dalhousie University. *New Executives:* NSARA-Pres. VE1JI, Sec'y. VE1FO. NBARA-Pres. VE1JJ. *Silent Keys:* VE1NH; ex-VE1DB; VE7IK ex-VE1MQ. Seasons' Greetings from your Section Managers, VE1WF and VE1OC.

ONTARIO: SM, Larry Thivierge, VE3GT—BM: VE3LST. PGL: VE3AR. SEC: VE3GV. STM: VE3BDM. TC: VE3EGO. For the second time in three years the team of VE3UR VE3JPC and VE3JHC have won the VK ZL RTTY contest in the multi operator category. VE3KK and his myf are off to California for an extended visit with their jr op there. Due to a small amateur population VE3EYW is looking for donations from amateurs and clubs to help support and keep on the air northern Ontario repeaters VE3SJI on St. Joseph Island and VE3TOP in Elliot Lake. Cheques can be made out to St Joseph Is Repeater Assoc and sent c/o VE3EYW, Box 57, Manitouwadge, ON P0T 2C0. Your help is appreciated. While testing new software, VE3GFN worked 65 Sections in the CW portion of the recent SS contest. VE3LFV has been appointed EC for Windsor, Thornhill RAC, using the Club call VE3RAT successfully operated a demonstration station from Thornhill Square where a number of pieces of formal traffic were put into the NTS by VE3WV. VE3CAB presented a very comprehensive, technical yet lucid talk to the North Shore ARC of the link system based at repeater VE3ULR (Aurora). Terry has indicated he would be quite willing to visit other clubs with his presentation. Oxford Co. ARC enjoyed the 27 minute DOC promotional film of M-Sat, Canada's Mobile Satellite. VE3ISD has joined the Trylon club with a big tower planned and also a 40 meter beam over a TH-6. VE3KYA, VE3FIO and VE3BIW are busy putting their new ICOM 751s through its paces. VE3SH is now VE4YU in Winnipeg. VE3HG has moved into the Bowmanville area. VE3OSN/VE8 is the only station on HF packet from above the Arctic Circle (450 miles from the North Pole, and in Zone 2). He has special authorization to operate digital above 14100, the limit for Canadian stations—QSL via VE8RCS. Welland Co. ARC report that a Scout group is being formed to work as runners supporting amateur radio operators in emergency situations. There are presently 4 boys in training in Port Colborne with 2 more to be added in the future. Traffic: VE3KK 258, VE3GSQ 240, VE3FAS 217, VE3GT 124, VE3DCX 112, VE3GNW 98, VE3DPO 92, VE3FGU 77, VE3AJN 58, VE3WM 51, VE3WV 28, VE3JSM 27, VE3BB 26, VE3CYR 26, VE3BAJ 22, VE3GOL 20, VE3KCZ 20, VE3EAM 12, VE3BUO 11. (Oct.) VE3AWE 65, VE3BUO 33, VE3GFN 27, VE3KXB 23, VE3EAM 10.

QUEBEC: SM, Harold Moreau, VE2BP—STM: VE2EDO. BM: VE2ALE. PIO: VE2YW. TC: VE2ED. A/TC: VE2CP. NM: VE2EDO. Comments on DOC's proposal for "Restructuring of the Amateur Service" should go to: Director General, Radio Regulatory Branch, DOC, 300 Slater St., Ottawa, ON K1A 0C8. Please send a copy to CRRL. With regret I have to report W2PCG a Silent Key, a friend to many whitecaners. Felicitations a VE2TVA, le president du nouveau club sur la rive sud de Montreal, VE2CLM. Avec regret je dois vous annoncer le deces de VE2VI. Traffic: VE2EDO 110, VE2SD 71, VE2EC 46, VE2BP 44, VE2EKC 35.

SASKATCHEWAN: SM, W.C. Munday, VE5WM—SEC: VE5CU. STM: VE6HG. TC: VE5GF. ATC: VE5XZ. BM: VE5WM. OBS: VE5CU, VE5JA. NM: VE5EX, VE5HG, VE5AEJ, VE5AEM, VE5BAF. NET REPORTS: MJARC 2 meter—29, 286 WNI RARA 2 meter—30 sessions, 573 WNI: PWXN—30, 794 QNI. ASTN and SPN reports not available. A speedy recovery is extended to VE5AAI who underwent heart surgery. ARES membership is now over the 100 mark. Thanks to SEC VE5CU and EC VE5AQ, VE5FF, VE5HG and VE5WM for their efforts. The Regina Repeater Group Emergency Repeater, VE5RRG, has been installed with a new, state of the art controller. Special thanks to VE5TH, VE5RG and VE5OI who were instrumental in making this a reality.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY—STM: W3DKX. SGL: AF3R. PSHR: K3JL W3DKX. SARA had its 4th annual dinner Nov 14. It was a very nice affair and was greatly enjoyed by all. AWARE will have classes for advanced and extra in May, taught by Dr. Smith. Congrats to Dot Whisler, KA3LUN on upgrade. Aware net 147.225 Mon. 8 PM Meetings 3rd Thurs. DARC now has a rig for Field Day and as a loaner donated by WA3FQU. Meetings 2nd Mon. First State ARC Meetings 4th Thurs. except Nov and Dec. Delaware Traffic net meets Mon. thru Fri. 6:30 PM on 3.905 Delaware Emergency Phone Net, Sat 6 PM 3.905. All are welcome. DTN QNI 359 QTC 50 in 21 sessions. DEPN QNI 79 QTC 18 in 5 sessions. SEN QNI 50 QTC 7 in 4 sessions. Traffic: W3QQ 94, W3DKX 48, K3JL 37, WB3DUG 32, WA3WIY 32, N3AXH 10, KC3FW 9, K3ZXP 7. KC3JM 7, KA3IXV 7, KA3OIQ 2.

EASTERN PENNSYLVANIA: SM, James B. Post, KA3A—ASMS: KC3LM, KA3GJT, K3ZFD. ACC: KB3UE. STM: KB3UD. PIO:D W3AMQ. SEC: WA3PZO. EC5 KC0XC, AA3C, W3EEK, KB3UD, N3BFL, K3MWA, KB3LR, WA3JRL, N3AIA.

EPA NETS

EPA	3610	0000/0300Z	531	212	58
EPAEPTN	3917	2300Z	510	179	31
PTTN	3610	2330Z	262	76	30
LOCAL NETS					
D3AREA	145.37	1930OR M	100	6	5
D5ARES	146.865	2100R S	94	6	5
D5TRIC	146.655	2100R 1 Wed			
D6ESN	147.00	2000R T/TH	92	11	8
D8ARES	147.300	1900R T			
PWA/ARE	147.715	2000R Sun			
MARC/AR	147.060	2030R Sun	85	0	5
MARCTN	147.060	2030R MWF	208	73	13

NET NOTES

Regret to announce that Karl, W3VA, is stepping down as Net Manager of the D3ARES net. His years of hard work are appreciated and he will be missed. Jim, N3COY, will be acting Net Manager for the EPA while Bud, AA3B, is caught up in business travel. No stranger to these tasks, Jim provides this station with much needed help on a monthly basis. EPAEPTN was fired up for Gloria's sake for several hours, providing liaison between several of the active ARES nets that were up and running during the hurricane's presence. Not much damage reported around the nets (thankfully). Hope everyone had a happy holiday and had a stocking full of new equipment to play with. Reports from around the section show many upgrades from VE testing. From RF Hill Steve, WA3RKB, received note for co-ordinating the Halloween Safety Patrol. Reading Radio Club VE's will test on Jan. 25. Pack Rats had Boyd McCloskey from GE as their speaker who discussed phase locked loop synthesis. Congrats to our new Special Service Club MARC. Our SEC WA3PZO deserves note for his handling of the simulated emergency. This national disaster medical system drill was run in cooperation with the Navy and many Philadelphia area hospitals. Murgas Radio Club reports a big effort for the PAQSO Party. They had an outstanding effort in order to retain the trophy.

MARYLAND-DC: SM, John A. Barolet, KJ3E—The news in this column is two months after the fact. An expanded Official Bulletin Station network reading ARRL national bulletins and ADC section bulletins on many of the 2-meter repeaters would bring you timely news. Consider becoming an OBS; ask me for detailed info. KC3EK, Official Observer Coordiator, reported a growing and active group of OOs, who now become appointed only after successfully completing a training program and certification as an FCC amateur Auxiliary. Congratulations to the MDC OOs. Others contact KC3EK to help the Group to continue ham radio's self-policing record. Appointments: K3RXK, Section Emergency Coordintor; K3RXK is successfully expanding MDC AREW. Other appointees: N3CNJ, EC for Harford County; W4FBA, EC for Washington County; N3RO, OBS; K3HPG, OBS/OO; K3RXK, OBS/OES/OBS. New club officers are: Laurel ARC: W3DQI Pres., W3GFS, VP, K3LDE Sec., N3CKD Treas., KA8HRD member at large; and at Delmarva ARC: KX3J Pres., WA5MTZ VP, K3TKJ Sec/Treas. KA4SWV, a LARC member, is an AEC in PG County ARES for the Laurel area. K3RXK signed up 20 Frederick County stations for ARES. Two weeks after the SET the Mountain ARC worded in the real thing, the WV and MD floods. Allegany County EC W4DFW said operators there handled 2498 flood- related massages. The MARC got good publicity in the Cumberland News for that effort. W3DFW also reported that the two meter ham communication coverage was greater and often more effective than that of the local government agency systems. Congratulations to the "mountaineer hams" for a job well done in a real emergency. KC3DW reported that Antietam RA members set up communications for the JFK 50-mile run on the trails and by-ways of Washington County. AK3B sent a Rock Creek ARA Newsletter and said club members are intersted in 2-meter traffic work. W3CBG, just retired from foreign service, keeps daily skeds with VU-land and plans to get into traffic nets. Newsletters form LARC, BARC, DARC, SMARC, and AARC were much appreciated. PSHR: KK3F 147, K3RXK 142, W3FA 122, WA2ERT 117, KJ3E 91, N3EGF 90, W2YVQ 90, KC3Y 84, K3NNI 79, KC3AV 64. MDD Brass: W3QQ 109, W3FA 107, KC3Y 85. With the Nets: Net/manager sessions/traffic/average QNI: MEPN/WA2ERT 35/282/29; MDD/W3FA 60/263/10; MSN/KC3Y 30/64/14; FREDCARES/K3RXK 5/38/14; WAPON/WB3BFK 22/22/11; MDCPON/W3OYY 4/4/12; WC2MN/KC3DW 4/3/25. Traffic: KK3F 820, KC3DW 326, KJ3E 168, W3FA 161, KC3Y 157, WA2ERT 155, K3MR 143, K3OMN 127,K3NNI 88, K3RXK 88, N3EGF 84, KC3AV 81, KX3U 64, WB3BFK 62, W3YVQ 53, W3UT 43, W3QQI 31, W3LDD 24, W3ZNW 19, WB3FUE 15, KA3IID 11, KC3NS 7, W3FZV 5.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB—SEC: K2QIJ. STM: WB2UVB. ACC: K2IXE. TC: VACANT. PIO: VACANT. SGL: KA2KMU. BM: WB2UVB. OOC: WA2HEB. ATCs: N2BQT and K2JF. It looks like folks in our section are conducting a packet radio awareness campaign. Every time I download the NJ list of active packet stations, I notice more and more "packeteers" online in SNJ. With the price of Terminal Node Controllers TNC—the "box" that actually combines the computer/terminal and rig into a system) being in the $200 range, it's no wonder the list gets bigger by the week. From an emergency preparedness standpoint, the possibilities of virtually error-free communications is crucial. From a hobby and information standpoint, the amount of Packet Bulletin Board Systems (PBBS) is also growing steadily. Access to a PBBS follows the pretty much the same protocol as accessing a telephone line BBS except the fact that the airwaves are free and there are no toll charges. The PBBSs in our section that I know of on the "standard" packet frequency of 145.01 MHz in our section are KC2TN in Atco, WB2MNF in Medford and K3GYS in Crowfoot. For those of you working 220 MHz, 220.01 in Medford is the KA2MOV PBBS. HPE to CU on packet SM. 73. Traffic: NG2T 144, WA2HEB 54, W2IML 30, W2IU 3.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA—CONGRATULATIONS to W2BCH the newly elected Atlantic Division Vice Director, and to W3ABC continuing as Division Director for the League. THANKS to W2BCH for his several years of service as SEC in this Section, including expansion of the EC force to 37 appointed county Emergency Coordinators amongst the forty counties of Western New York, and the establishment of five ARES districts and appointment of five DECs (WA2AIV), WB3CUF, NN2H, KB2KW and WB2NAO). Outcome of the selection process for the new SEC will be addressed in the next WNY Section News . . . standby. BPL: WA2HSB WB2OWO. PSHR: KG2D KA2DQA N2EVG WA2FJJ VE2FMQ N2FQP NN2H WB2IDS WA2KOJ W2MTA WB2OWO WB2RBA ND2S KA2UBX W2UYE K2YAI. CONGRATS: GRAM HAM-OF-YEAR KC2RF; AJ3K for ARRL Technical Excellence Award. Upcoming HAMFESTS: STARC at Owego May 3; Rochester NY State/Atlantic Division May 17-18; Rome June 1.

NYS/M*3677	351-265-30	NYS/E*3677	436-285-30
WDN/M*04/64	342-116-30	JCARC/10/70	396-004-30
Mike Farad	225-040-30	Lewis ARES	041-000-04
NYPON*3913	703-465-30	OARCN/25/85	038-003-04
NYSPTEN 3925	589-062-30	BRVSN/.555	248-004-30
ESS Net 3590	410-080-30	CNYTN*90/30	218-039-30
OCTEN/E*.94	640-099-30	OCTEN/L*.88	209-025-30
Q Net 31/91	293-003-30	STAR*99/39	010-005-04
WDN/E*57/17	583-246-30	WDN/L*04/64	500-149-30
Blue Line	264-026-25	Mohawk VTN	007-005-02
VHF THIN	039-000-04	NYS/L*3677	279-110-30

*NTS Net. WELCOME newly affiliated Chenango Valley Amateur Radio Association! Club Officers: CVARA WA2TDO KA2NKD W2RME N2EHD: Drumlins KA2JOV WB2KIO KX2T N2DIT; Salt City K2TQC KQ2K NA2C KB2G. Reports: (OBS) WB2DSR WA2ZPE. (OES) W2MVH. Western New York EC Net meets at 8 PM third Sunday on 3955 kHz. Got a letter from the Old Geezer the other day expounding on such things as divisiveness and counter-productivity in the way the League's sixteen Divisions are formed. The Old Geezer views the splitting of the States of California, New Jersey and New York between the Pacific/Southwestern and Atlantic/Hudson Divisions as not being in the best interests and wellbeing of Amateur Radio! What do you think? Let your elected officials know, if you have an opinion on such matters. The MSO (Mailbox) on Cycle 1 Eastern Area Net is operating daily on 7090 kHz (down) from 1100 to 1300 local time. Activating at 100 baud with a switch to 60 baud at about 1200 local time. Traffic: WB2OWO 549, WA2HSB 511, WB2IDS 450, WA2FJJ 428, W2MTA 346, VE2FMQ 243, WB2QIX 179, ND2S 172, KA2DBD 118, WA2KOJ 115, KG2D 113, N2EVG 95, K2YAI 82, KA2UBX 75, WB2RBA 72, NN2H 69, W2UYE 69, KA2DQA 68, W2FR 65, AF2K 36, N2FQP 29, W2PPS 12, K2IUT 5, WA2OEP 4. (Oct.) VE2FMQ 207, WB2NAO 11.

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.

Net	QNI	QTC	Sess.	kHz	T/D	NM
WPACW	253	132	30	3585	7:00P	WA3UNX
WPAPTN	438	115	30	3983	6:00P	WA3HLN
NWPA2TN	612	9	29	145.13/53	1499Z	KC3NY
WPA2MTN	479	152	30	146.28/88	8:00P	KA3BGC
PFN	227	115	30	3958	5:00P	WA3THT

Silent Keys are W3ASV, W3SKU & W3NCB their families have our deepest sympathies and they will be missed by their many friends on the air. N3ACE also became a Silent Key and we also extend our sympathies to his family. As we approach the end of 1985 I hope everyone gets the equipment he would like to order and maybe his stocking will be full. Again I expound on ARES & RACES we need ECs in the following counties Lawrence, Greene, Warren, McKean, Potter, Forest and ELK. I know some of these counties have very small amateur population but maybe we can find one willing to assist and give some time to assist our traffic nets handle messages to some of these same counties can be a very rewarding part of the hobby. If you desire to help get in touch with the STM or Net Managers or SM we need you. WA3UFN the SEC will also be glad to have you get in touch with him, also needed are DEC's to coordinate counties. We have a great many amateurs in the WPA section but some counties have few if any due to conditions on the 80 and 75 meter band we are missing some reports and traffic is not as usual. Traffic: W3EGK 450, KQ3T 325, N3EMD 134, W3OKN 118, W3NGO 98, W3KMZ 87, WA3DBW 80, WA3UNX 75, K3SMB 48, K3LTV 43, K3NPW 40, N3FM 37, W3RUL 35, WN3VAW 30, W3KUN 29, KQ3M 23, KC3JQ 23, N3CZW 8, W3TTN 6, KA3EGE 3.

CENTRAL DIVISION:

ILLINOIS: SM, David E. Lattan, WD9EBQ—SEC: W9QBH. STM: KB9X. OOC:W9TT. BM: K9ZDN. SGL: W9KPT. PIO: K9IDQ. ACC: WB9SFT. TC: N9RF. ASM: K9QRP. NET MEMBERS . . . *as will be old news by now, and possibly* back to normal, the two early nets, ISN and the 6:30 ILN have been moved up a half hour due to band conditions so that ISN is now 5:30 local and early ILN is 6:00 local. This will be subject to change as the bands dictate, so keep an ear to the nets and the net newsletter for timely info on session time changes. CTN A BIG SUCCESS IN

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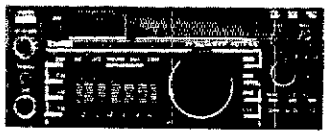

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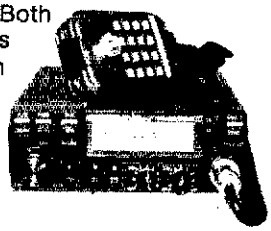

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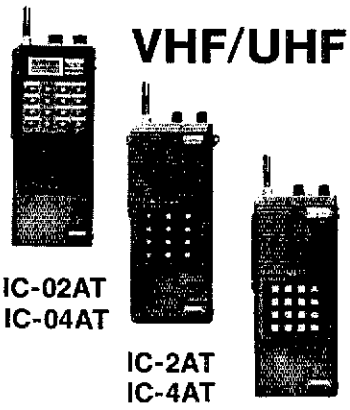

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Frequency range: 26-520 MHz. continuous coverage.
With optionally equipped RF converters 150KHz.-3.7 GHz.
To celebrate our 15th anniversary, when you order the *JIL* SX-400 synthesized scanner before March 31, 1986, from CE, you'll get your choice of the RF-8014-DA or RF-5080-DA converter ***free.*** Or if you prefer, you can get the RF-1030-DA converter for only $50.00 more with your SX-400 order. The *JIL* SX-400 is designed for commercial and professional monitor users that demand features not found in ordinary scanners. The SX-400 will cover from 150 KHz to 3.7 GHz with RF converters. You may also order the following RF converters for your SX-400 scanners separately at these prices. **RF-1030-DA** at $234.95 each for frequency range 150 KHz. - 30 MHz. USB, LSB, CW and AM (CW filter required for CW signal reception); **RF-5080-DA** at $194.95 each for 500-800 MHz.; **RF-8014-DA** at $194.95 each for 800 MHz.-1.4 GHz. Be sure to also order **ACB-300-DA** at $99.95 each which is an antenna control box for connection of the RF converters. The **RC-4000-DA** data interface at $259.95 each gives you control of the SX-400 scanner and RF converters through a computer. Add $3.00 shipping for each RF converter, data interface or antenna control box. Add $10.00 for shipping both the scanner and free converters. If you need further information on the *JIL* scanners, contact JIL directly at 213-926-6727 or write JIL at 17120 Edwards Road, Cerritos, California 90701.

SPECIAL! JIL SX-200-DA

List price $499.95/**CE price $157.95/SPECIAL**
Multi-Band - 16 Channel • No-Crystal Scanner
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 read-outs 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.

NEW! Regency® HX1200-DA

List price $369.95/**CE price $219.95/SPECIAL**
8-Band, 45 Channel • No Crystal scanner Search • Lockout • Priority • Scan delay Sidelit liquid crystal display • EAROM Memory New Direct Channel Access Feature
Bands: 30-50, 118-136, 144-174, 406-420, 440-512 MHz.
The new handheld *Regency* HX1200 scanner is fully keyboard programmable for the ultimate in versatility. You can scan up to 45 channels at the same time including the AM aircraft band. The LCD display is even sidelit for night use. Order **MA-256-DA** rapid charge drop-in battery charger for $68.95 plus $3.00 shipping/handling. Includes wall charger, carrying case, belt clip, flexible antenna and nicad battery.

NEW! Bearcat® 100XL-DA

List price $349.95/**CE price $209.95/SPECIAL**
9-Band, 16 Channel • Priority • Scan Delay Search • Limit • Hold • Lockout • AC/DC
Frequency range: 30-50, 118-174, 406-512 MHz.
The world's first no-crystal handheld scanner now has a LCD channel display with backlight for low light use and aircraft band coverage at the same low price. Size is 1⅝" x 7⅛" x 2⅛". The *Bearcat* 100XL has wide frequency coverage that includes all public service bands (Low, High, UHF and "T" bands), the AM aircraft band, the 2-meter and 70 cm. amateur bands, *plus* military and federal government frequencies. Wow...what a scanner!
Included in our low CE price is a sturdy carrying case, earphone, battery charger/AC adapter, six AA ni-cad batteries and flexible antenna. Order your scanner now.

Bearcat® 210XW-DA

List price $339.95/**CE price $209.95/SPECIAL**
8-Band, 20 Channel • No-crystal scanner Automatic Weather • Search/Scan • AC/DC
Frequency range: 30-50, 136-174, 406-512 MHz.
The new Bearcat 210XW is an advanced third generation scanner with great performance at a low CE price.

NEW! Bearcat® 145XL-DA

List price $179.95/**CE price $102.95/SPECIAL**
10 Band, 16 channel • AC/DC • Instant Weather
Frequency range: 29-54, 136-174, 420-512 MHz.
The *Bearcat* 145XL makes a great first scanner. Its low cost and high performance lets you hear all the action with the touch of a key. Order your scanner from CE today.

NEW! Bearcat® 800XLT-DA

List price $499.95/**CE price $317.95**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4⅛" x 12½"

OTHER RADIOS AND ACCESSORIES

Panasonic RF-2600-DA Shortwave receiver $179.95
Panasonic RF-B300-DA Shortwave receiver $195.95
RD95-DA *Uniden* Remote mount Radar Detector $128.95
RD55-DA *Uniden* Visor mount Radar Detector $98.95
RD9-DA *Uniden* "Passport" size Radar Detector $239.95
BC 210XW-DA *Bearcat* 20 channel scanner **SALE** $209.95
BC-WA-DA *Bearcat* Weather Alert™ $49.95
DX1000-DA *Bearcat* shortwave receiver **SALE** $349.95
PC22-DA *Uniden* remote mount CB transceiver $99.95
PC55-DA *Uniden* mobile mount CB transceiver $59.95
R1060-DA *Regency* 10 channel scanner $98.95
MX3000-DA *Regency* 30 channel scanner $198.95
XL156-DA *Regency* 10 channel scanner **SALE** $129.95
UC102-DA *Regency* VHF 2 chan. 1 Watt transceiver $124.95
RH250B-DA *Regency* 10 ch. 25 Watt VHF transceiver $329.95
RH600B-DA *Regency* 10 ch. 60 Watt VHF transceiver $454.95
RU150B-DA *Regency* 10 channel UHF transceiver $449.95
RPH410-DA 10 ch. handheld no-crystal transceiver $399.95
P1405-DA *Regency* 5 amp regulated power supply $69.95
P1412-DA *Regency* 12 amp regulated power supply $119.95
BC10-DA Battery charger for *Regency* RPH410 ..... $79.95
MA256-DA Drop-in charger for HX1000 & HX1200 ..... $68.95
MA257-DA Cigarette lighter cord for HX1200 ..... $19.95
MA917-DA Ni-Cad battery pack for HX1200 ..... $34.95
EC10-DA Programming tool for *Regency* RPH410 ..... $24.95
SMRH250-DA Service man. for *Regency* RH250 ..... $24.95
SMRU150-CA Service man. for *Regency* RU150 ..... $24.95
SMRPH410-DA Service man. for *Regency* RPH410 ..... $24.95
SMMX7000-DA Svc. man. for MX7000 & MX5000 ..... $19.95
SMMX3000-DA Service man. for *Regency* MX3000 ..... $19.95
B-4-DA 1.2 V AAA Ni-Cad batteries (set of four) $9.00
A-135C-DA Crystal certificate $3.00
FB-E-DA Frequency Directory for Eastern U.S.A. $12.95
FB-W-DA Frequency Directory for Western U.S.A. $12.95
TSG-DA "Top Secret" Registry of U.S. Govt. Freq. $14.95
TIC-DA Techniques for Intercepting Comm. $14.95
RRF-DA Railroad frequency directory. $10.95
CIE-DA Covert Intelligence, Elect. Eavesdropping $14.95
A60-DA Magnet mount mobile scanner antenna $35.00
A70-DA Base station scanner antenna $35.00
USAMM-DA Mag mount VHF/UHF ant. w/ 12' cable $39.95
USAK-DA ¾" hole mount VHF/UHF ant. w/ 17' cable $35.00
USATLM-DA Trunk lip mount VHF/UHF antenna $35.00
Add $3.00 shipping for all accessories ordered at the same time.
Add $12.00 shipping per shortwave receiver.
Add $7.00 shipping per scanner and $3.00 per antenna.

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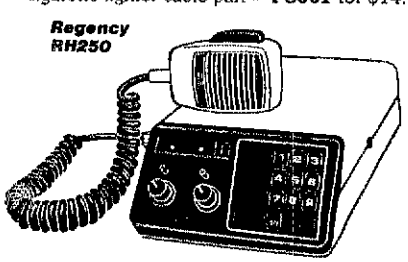

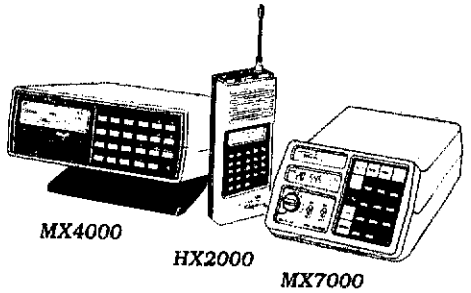

FIRST MONTH . . . The Net logged 565 checkins and 168 pieces of traffic in its first month. Congrats to NM WB8RFB for the concept and its successful implementation. Join the activity nightly at 9:00 PM local on the NORA repeater (147.69/09) in Chicago. SM WD9EBQ, SEC W9QBH, BM K9ZDN and TC N9RF moved the net radio and telegraph equipment of the Northeast Illinois Emergency Net (NEIL) form Bob's shop to the Brookfield ESDA EOC the weekend after Thanksgiving. Any of you who have been to the 'QBH EOF' know what a chore that was. As a result, there was no ILARES net on December 1. SM WD9EBQ visited the monthly meeting of the OKAW Bailey ARC. Half the program was under the 'SM hat' and half under the 'RC hat'. The turnout was excellent as was the group. Tnx to W9KXQ and WB9YVE for the invitation. Traffic: KA9FEZ 676, KW9J 369, W9NXG 207, WB8RFB 201, NC9T 169, K9BVE 163, W9HLX 153, W9HOT 95, W9HBI 74, W9HBI 74, KA9EWN 58, W9KR 57, KA9BBV 52, W9EHS 43, ND9V 40, KD9K 28, K9EUI 24, WD9IBH 23, W9OBU 22, W9LDU 18, KA9RBI 16, W9DBO 13, W9LNQ 12, W9RTD 12, W9KPI 11, WB9TVD 11, K9EHP 10, W9VEY/M 10, K9WMP 9, KZ9I 7, WA9RUM 7, KW9X 4, WD9HQW 4, N9ELU 3.

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, VHF W9PMT, IWN KA9ERC.

November Net Reports:

Net	Freq.	Time Daily UCT	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3534	454	2722	89
QIN	3656	1430/0000/0300	669	353	1816	89
ICN	3708	2315	45	6	315	18
IWN	3910	1310	1542	0	371	30
IWN	VHF	Bloomington	1096	0	300	30
IWN	VHF	Kokomo	1218	0	262	30

Hoosier VHF Nets for November QNI 6081, QTC 163, Bulletins 129, QTR 5045 in 183 sessions for 20 nets. D9RN 434 messages in 1034 minutes. IN. 85% Stns. K9CGS, W9JUJ, KC8XE, KA9EIV, CAND 832 messages in 30 sessions. D9RN 100%. Stn. W9JUJ. Appointments: EC KD9JB for Gibson County. ORS KD9CC Valparaiso. OBS W9JZV Indianapolis and KZ9R Fort Wayne, NM N9DYC, W9PMT, KA9ERC and KA9LAU. Silent Keys KB9EZ Parker City and K9GDB South Bend. The Indiana RTTY Net has now been canceled. KB9SU, Net Manager reports lack of participation as the problem. Due to the loss of the RTTY Net I am discontinuing the Indiana ARRL Bulletins. It is time the section staff took charge of their area of interest. If you have reason to contact one of them please do so. I am looking for an Assistant Section Manager to assume some areas of responsibility. Congratulations to K9KTB upon his appointment as Communications Officer for the Red Cross. Congratulations to WB9PFZ for his assistance to the ARC in Louisiana during the aftermath of Hurricane Juan. Congratulations to WB9ZHC and K9PS on the birth of their daughter Christine Lynn. Traffic: W9JUJ 748, KJ9J 254, W9JZV 222, W9CNE 158, W9FC 142, WB9UYU 127, K9WWJ 81, KA9FFO 74, KB9HH 62, K9TKE 49, WA9QCF 47, W9UMH 45, WD9DWD 42, WD9GWM 41, WA9OKK 38 KA9EIV 38, K9KTB 37, WB9AWI 34, K9DFK 33, KA9ER 25 W9BTZ 24, K9BRF 23, KA9RNY 23, WD8HII 20, KW9D 18, WB9PFZ 17, AB9A 16, WB9OZZ 14, KA9RBY 12, WB9IHR 12, W9ZGC 12, N9DYC 11, N9DHX 9, W9DKP 7, KK9N 7, K9ZBM 6, KW9C 6, W9XD 6, K9OUP 6, K9CGS 6, KB9WI 5, K9PS 5, W9URS 4, KC9ED 3, W9BDP 3, W9EI 2, K9SBW 2, W9RTH 1, W9KMY 1, K9DIY 1, KA9LAU 1.

WISCONSIN: SM, Richard R. Regent, K9GDF—SEC: W9OAK. STM: K9UTQ. ACC: KA9FOZ. BM: WB9JSW. OOC: NC9G. PIO: K9ZZ. SGL: AG9V. TC: K9GDF. New ATCs W9FSH and KD9PR. New OBS NI9D. The Madison DX Club is now ARRL affiliated. Please contact KA9FOZ if your club needs information about the ARRL. Special PSHR certificate to WD9IID for qualifying 12 consecutive months. W9SNK awarded for 60 years of loyal ARRL membership. Welcome to W9CXY on returning to CW-traffic nets after being off for a while to recover his good health. Congratulations to KA9BAE, son of past SM K9FHI, for passing his General. W9YCV received coveted QSL after three robot channel QSOs with RS-5 and now proudly displays it with his RS-7 robot QSL. W9YT and W9YCV are now on packet radio. Have questions about packet radio? Write to Wisconsin Amateur Packet Radio Association, P.O. Box 1215, Fond du Lac, WI 54935. Wisconsin Experimental Radio Association has new repeater in New Berlin on 449.85/444.85 MHz with WB9TRO perfecting its operation. W9WI, ATC in Madison, designed a CW keyboard for a blind ham, constructed a bulletin board system at W9YT, and refined his homemade ATV setup. Latest Wisconsin member of QCWA is K9BED. ARRL VEC exams in Stevens Point on March 8th, contact N9JW. Got any ham radio news? Let our Public Information Officer, K9ZZ, in on the news details. Let me know about your ham radio events at least three months in advance so they can be listed in this column or so I plan to visit them. WA9HXM, Steve, was seen leaving a swapfest tightly holding an old portable sewing machine he acquired—should we be needling Steve about taking up sewing as another hobby? Traffic: KC9CJ 302, W9YCV 222, KA9RII 211, K9GDF 206, W9CBE 154, WD9IID 114, WA9WYS 111, N9AUG 109, KA9BHL 102, W9UCL 101, WB9ICH 92, N9BDL 87, W9ODV 83, KA9OBP 81, K9AKG 71, AG9G 63, W9IEM 58, WB9ESM 56, KA9JJY/T 26, N9EQP/T 22, KA9BHK/T 3. (Oct) KC9CJ 265, WB9ICH 96. (Sept) KC9CJ 317.

DAKOTA DIVISION

MINNESOTA: SM, George Frederickson, Jr., KCØT—SEC: KAØARP. STM: KDØCI. Hello again and welcome to winter. The Minnesota Section Emergency Weather Net came alive for the first time this season during the Thanksgiving weekend. Amateurs from Minnesota and surrounding states responded to requests for wx info for the National Wx Service in Minneapolis and the info was handled via two and ten meters after the 75 meter band could no longer be used due to the evening change in propagation. The Twin City FM Club reports big success with the first ever "Hamfest Minnesota & Computer Expo" held at the Richfield High School early in November. The over 1300 attendees form all over the midwest broke all projections. I regret I was not one of them. I hope I can make up for it next year, it sounds like too good of an event to miss. Next year's Expo is being planned now so you might want to make a note of it for next year's calendar. I'd like to take this opportunity to salute the TCFMC for the job they did to make the Expo a success. TCFMC is a very active club and is sponsor of the KØHB/Rptr in Mpls. The officers include KØBUD/Pres, WBØPVL/Vice Pres, KØADI/Sec, WDØHSD/Treas, KØHB/Trustee and program Chmn. Board members are WDØFTR, NØBRG and WDØHQY. WØVDI, KØGTT and NØBRG are the Tech Committee and Editors

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In addition, KPC-2 features totally new hardware and software — KPC-2 is not a clone. And, of course, KPC-2 is enclosed in the now industry standard Kantronics extruded aluminum case. For more information contact Kantronics or a Kantronics dealer.

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2 Watts In—18 Watts Out
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C106—1¼ Meter Dual Purpose Amplifier
10 Watts In—60 Watts Out
2 Watts In—23 Watts Out
All Mode Operation with Rx Preamp

C211—1¼ Meter Amplifier
2 Watts In—110 Watts Out
High Power H/T Amplifier
All Mode Operation with Rx Preamp

C1012—1¼ Meter Dual Purpose Amplifier
10 Watts In—120 Watts Out
2 Watts In—40 Watts Out
All Mode Operation with Rx Preamp

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for the "Quarterwave" newsletter are W6ANC and WD0HSD. NET NEWS: It looks as though it will be another long winter for out nets on 80/75 Meters. Lets hang in there folks. Our "Ham of the Month" for November is Elmer Gelhar, W0WRL of Elk River. A reminder that one of our monthly awardees from 1985 will be selected as Minnesota Amateur of the Year during January. The new editions of the ARRL Net Directory are now out and completely up to date, as far as I can determine. If your net is not listed in it, then make sure I get the necessary info in time for the 86-87 edition. KA0EVR of Mora informs me that the annual Vassaloppet Ski Race is Feb 16th and help with communications would be appreciated. Our regrets to family and friends of WA0LOH who became a Silent Key recently. He was active with the Mora Amateur group. Need a new challenge? Go QRP. KA0SYL of Mpls is patiently going after all he can with his QRP CW rig, a very worthwhile venture. With his ambition, I look for him to rack up a few awards before long. Finally, congrats to KA0EPY who has earned a BPL Medallion with this months' totals. He has worked hard for us in public service and deserves this award for his efforts. 73 de KD0CI.

NET	TIME	FREQ	QNI/QTC/SESS.	MGR
MSN/RTTY	7:00P	3620	90/4/12	WA0LUT
MSN/1	6:30P	3685	308/92/30	KA0EPY
MSN/2	10:00P	3685	173/29/30	NC0E
MSSN	6:00P	3710	222/9/30	KA0ODQ
MSPN/N	12:00P	3929	516/168/30	WB0WNJ
MSPN/E	5:30P	3929	1241/182/30	WD0BGS
MNAMWXNT	6:15P	3929	358/288/26	KA0IZA
PICONET	9:00A	3925	4357/327/160	WD0BAC

MN EMERGENCY FREQ: 3929. MN/MSO: 3620. Bulletins: 3620, 3685, and 3929. TRAFFIC: WB0WNJ 558, KA0EPY394, WA0TFC 249, KD0CL 202, WA0ONJ 140, KT9I 133, KA0IZA 99, WD0HDD 95, K0OGI 81, N0CLS 80, W0GRW 64, NE0D 55, WA0ONE 51, W9DM 50, KT0R 46, KA0ODQ 44, KA0ARP 35, KD0CI 35, KB0WV 35, KC0T 31, WD0BGS 30, N0BEI 26, WD0GUF 26, KA0PQW 21, NI0X 20, KA0AJF 17, N0JP 14, K0CVD 9, N0EWA 8, KA0BFP 6, KA0CDC 4.

SOUTH DAKOTA: SM, Roland Cory, W0YMB—Ole Johnson, N0ABE, STM & Bob Olson WA0FPR, ASST. SM. New officers Mobridge ARC are: K0FUG Pres. KA0RBN VP, K0ERM Sec/Tres. Lake Area Radio Klub "LARK" at Watertown meets last Thur of each month at 1930, Prairie Dog ARC at Yankton/Vermillion meets 2nd Tue on even months, Mitchell ARC meets first Sun each month in the Johnson Bldg at 1930. A request, when submitting information for the column and if calls are included please give the first and last name of the individual. 73 WA0FPR Traffic: WA0VRE 44, K0ZBJ 41, KC0AF 32, WB0OMF 28, KA0KPY 13, W0MZI 11, W0YMB 10, K0ERM 6.

DELTA DIVISION

ARKANSAS: SM, Joel M. Harrison, WB5IGF—ASM: K5UR. STM: W9OK. SEC: N5BPU. ACC: NI5D. TC: W5FD. BM: W5HYW. SGL: W5LCI. REPEATER COORDINATOR: WB5FDP. It is with deep regret that I report the passing of Charlie Smith, K5HY. Charlie was a very dear friend to each of us and will be missed. Several Arkansas hams are now active in the Pine Bluff area and can offer assistance to anyone in that area. New ADXA officers for 1986 are Pres. Earl Smith KD5ZM, V.P. Ollie Gade, K9GPN, Secretary/Treas. Bill Kennamer, K5FUV. Our traffic handlers did an outstanding job during the Holiday season. The NW Arkansas ARC has received a Certificate of Recognition from Gov. Bill Clinton for the help during the Mexico Earthquake. They are also to be commended for their work during flooding at the Washington Regional Hospital. Traffic: W5QFU 110, W9OK 48, W9YCE 25, W4AZJ 22, W4UAU 22, W5RIT 21, WB5GWU 12, AC5W 8.

LOUISIANA: SM, John "Wondy" Wondergem, K5KR—During the past few years the ARRL Directors have initiated several new programs to increase the League membership and increase the number of licensed Radio Amateurs. Particular emphasis has been directed toward that vast group of young folks that have never been exposed to our wonderful hobby or don't know how to get started. We have developed an efficient process whereby nearly everyone can take an examination at frequent intervals within a reasonable distance from his home. Walk-in examinations at each of the Louisiana hamfests and frequent examinations by most of the clubs provide ample opportunities to take the exam. Further, we are trying to help the newcomer learn the technical and operating requirements by running classes at clubs throughout the state. Well then, what is there left to do? It's the desire to SHARE your hobby and to PUBLICIZE it. Take every opportunity to put ham radio on display at fairs, shopping centers and public events. Let everyone know about a forthcoming class with a notice at schools, scouts, shopping centers, newspapers, radio, etc. If we did these things we could double the Louisiana amateurs. Call or send me a short note for some four page ARRL handouts for your next display. Traffic: W5GHP, W5LHL, K5WOD, W5WBZ, WA5V, WB5NCM, WA5TQA.

MISSISSIPPI: SM, Paul Kemp, KW5T—ASM: K5QNE. SEC: AL7GO. VHF Coord: N5DWU. ACC: KC5VD. STM: KB5W. PIO: KA5VBE. NA5Y sends thanks for your many kindnesses on loss of her mother. Hattiesburg ARC reported only activity in SET. Attention appointees: we need more reports; remember, they help keep your appointments current. Poor propagation has played havoc with our Section nets and the ARRL Info Net; bear with us... things WILL improve. Congrats to new Hattiesburg ARC officers: K5QNE, president; KA5ROA, VP; and WB5ZET, secy-treas. Packet activity growing northward form the Gulf Coast, thanks to efforts of WA5DVV, WD5IKD and others. Pat and Alan talking up both packet and satellite to several area clubs. hamfest season upon us again; would like to see additional clubs plan hamfests to augment Jackson and Gulf Coast. Hattiesburg hams going RF CRAZY. Sporting new beams or loops are KA5ROA, KA5NNX, WB5FXR, N5GRW, K5QNE and KA5VBE. New Hattiesburg repeater should be up by now: 145.37/144.77. CAND (W5KLV) sess 30 QRC 832, DRN5(WB5YDD) sess 60 QTC 806, MSBN(W5HKW) sess 30 QNI 2103 QTC 44. MTN(K5OAF) sess 30 QNI 103 QTC 21. MMN(KF5QK) sess 30 QNI 640 QTC 8. MLEN(KE5WP) sess 4 QNI 112 QTC 3. CAEN(NF5O) sess 4 QNI 106 QTC 3. HAEN(KA5ROA) sess 4 QNI 46 QTC 0. Traffic: K5OAF 174, KT5Z 139, K5QNE 25, W5LSG 20.

TENNESSEE: SM, John C. Brown, NO4Q—ASM/ACC: WA4GLS, OO/AA: W9FZW, PIO: N7EJI, SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J & TC: W4HHK. It is again my pleasure to report some mighty fine work by KA4MNH working with the Southern Baptist Convention distributing relief and food to the victims of the hurricane in the Apalachicola, Florida disaster area. Departed west TN on Friday and returning five days later. He stated traffic was

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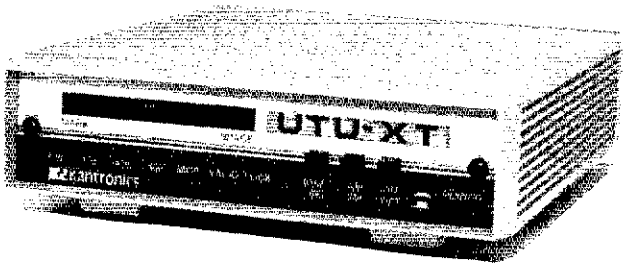

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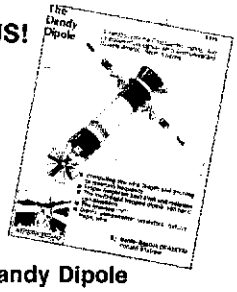

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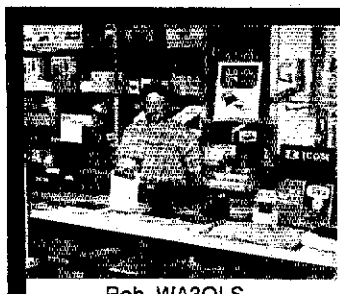
PREREGISTRATION: Jack Arnold, KD4JC, 1333 Picadilly Dr. Charlotte, NC, 28211, phone 704-366-2382
FLEA MARKET: Jeffrey Blythe, KA4AYC, 634 Northway Dr. Charlotte, NC, 28208, phone 704-393-7130
C.W.CONTEST: Jack Mitchell, KA4FHS, 442 Mammoth Oaks Dr. Charlotte, NC, 28211, phone 704-366-2235



Rob, WA3QLS

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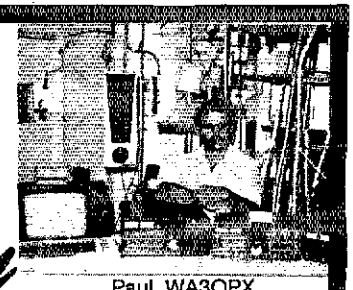

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handled for many relief agencies other than the SBC. I am sure his assistance was appreciated by recepients of the relief service. Thanks for a job WELL DONE. We had several SK reported this time. Our sympathy to ALL the families for their great loss. It is requested that all such reports be sent to the Section manager as soon after the occasion with date as possible, so that I can forward same to ARRL. All appointments should have renewal stickers on as of January 1. Check with the appointing official if you do not receive yours. Section Staff, Net manager, SEC, DEC OO, TC etc. Would like all VE Teams around the section to pass along their 1986 schedules so that your SM can pass it out whenever it is appropriate to have as much coverage as possible. The Jackson area had candidates form Franklin on the east to Cauthersville, MO on the west. It does pay to get the word around. It should be mentioned that there is a new DX Countries list out and is still one dollar. Same for net directory. There is a one dollar charge for this now. The cost of everything is still going up. It might be good to acquire a copy of the new Operating manual for the shack as it does contain a lot of very good information that is useful for about any mode of operation. The Section traffic for the period is as follows: LF-Sessions-81, QNI-3840, QTC-108; VHF-Sessions-55,QNI-1251, QTC-475; TN CW-Sessions-43, QNI-235, QTC-54. The CW Honor Roll includes W4DDK and K9IMI. The DRN5 had come 5757 messages with TN being represented 98% by K4WWQ, NO4Q and NG4J. Traffic: W9GZW-220 and a BPL, WA4GMR 115, K4WWQ 112, KA4RSC 90, K4WWQ 62, W4DDK 56, NN4S 30, W4TYV 24, KE4LS 22, W4PFP 22, KB4UQ 15, KA5KDB 12, K4UMW 8, W4HET 8, KA4BSG 8, W4PSN 6, & N4KQX 5. (Oct.) K4WWQ 62.

GREAT LAKES DIVISION

MICHIGAN: SM, James R. Seeley, WB8MTD—ASM: WA8DHB. SEC: WB8BGY. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: W8YZ. OO Coord: NJ8S.

Net	Freq.	Time	QNI	Tfc.	Sess.	Mgr.
QMN*	3663	1800**	1078	258	85	WB8SIW
MITN*	3953	1900	620	163	30	WD8EIB
MACS*	3953	1100**	474	114	30	—
UPN*	3922	1700**	1348	88	34	WA8DHB
MNN*	3722	1730**	256	55	58	KA8VOZ
160-M	1950	2000	326	42	30	WB8EMV
GLETN	3832	2100	551	39	25	
WSSBN	3935	1900	834	36	29	WB8EYM
VHF nets	10 rpts		965	17	78	N8EXS

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Su, 1300; UPN also Noon Su. 3932 is MI HF emer. freq. ARES net Su, 3932, 1730. I regret to report K8LNE as a Silent Key. With his passing, MACS is without a manager. K8OCP, who has been serving as ass't mgr for some time, is filling in. UPN's QNI of 1348 is their 25th consecutive month of new record-setting. Congratulations to Genessee County RC for achieving their 50-year ARRL charter. They join a small but growing group of MI clubs who have earned this distinction. I have mixed feelings about announcing the retirement of WD8RHU from the STM post. Larry has earned the break after four years of truly excellent service in this demanding job. His work has been exemplary of what being STM is all about. I'm sure my expression of thanks here speaks for the whole MI section. A new appointment will be announced shortly. The upcoming MI State Convention in Saginaw, April 11-12, promises to be one of the best ever. Don't miss it! Traffic: KA8CPS 495, NJ8S 342, AF8V 281, WD8KQC 186, KA8VOZ 186, W8QHB 149, WD8RHU 116, WB8YDZ 83, WB8SYA 76, K8GXV 58, NJ8R 58, WA8DHB 56, W8CUP 52, W8SCW 52, N8EXS 42, K8EQO 39, WD8MJB 38, WB8MTD 37, WD8OUO 36, K8HAP 32, K8UPE 28, K8OCP 25, K8ZJU 16, KI8Q 13, W8VIZ 13, W8EOI 11, WB8WJV 8, WD8PAF 3.

OHIO: SM, Jeffrey A. Maass, K8ND—

NET	QNI	QTC	Sess.	Time(Local)	Freq.	MGR
BN(E)	203	150	30	1845	3.577	W8JMD
BN(L)	157	89	30	2200	3.577	W8BO
BNR 322	110	30	1800	3.605	W8EK	
BSSN	395	233	60	0845,1915	3.885	N8AKS
ONN	146	32	27	1830	3.708	WD8KBW
OSN	302	119	30	1810	3.577	N8AEH
OSSBN	2127	739	90	1030,1615, & 1845	3.9725	WB8MZZ
OSSM	155	72	30	0646	3.577	KA8GJV
O6MN	203	20	28	2100	50.16	WD8CTX
Ohio	Section	ARES	Net	1500	3.875	WD8MPV

February hamfests: NOARS Winterfest February 2, mansfield Mid-Winter Hamfest February 16. I hope to see many of you at these two events, after a couple of uneventful months. We've begun a period when many clubs elect officers for 1986, and as apace allows I will record them officer for 1986, and as space allows I will record them here. I receive over thirty club newletters each month: Is yours among them? 1986 officers for the Northern Ohio Amateur Radio Society (NOARS)-Pres W8ANM; VP W8QWI; Secretary KD8SC; and Treasurer N8BW. Congratulations. Among the staff at the Ohio State university Radio observatory in Delaware are W8JK (Director), W8ERD (Vice Director), and N8EE. They are currently upgrading the facility for projects which include the Search for Extraterrestrial Intellegence (SETI): some very exciting DX. Since I find myself with a minimum of material this month, I'll take advantage of this space to review some of the Section programs begun in the past year. We have reorganized the ARES in Ohio by establishing eleven ARES Districts and are in the process of naming District Emergency Coordinators for them. In addition, the Ohio Section ARES Net (OSAN, see above) was begun to improve communications between the SEC and the DECs and ECs. An Ohio Section Emergency Response Plan (OSERP) is in preparation by Asst. SM N8AUH in cooperation with SEC WD8MPV, STM KF8J, and your SM. We hope to have copies of the initial plan available for distribution at the Dayton Hamvention. As a part of this, we are working to establish closer ties with ARRL officials of adjacent Sections, and with the SKYWARN/Weather Watch programs in Ohio through the ARES and NTS. N8AUH, WD8MPV, and Jerry Murphy, K8YUW, are the key players in this process. The First Annual Ohio Section Conference and picnic, held in August at the Columbus Zoo, provided an excellent forum for the discussion of Ohio's ARRL programs. We have had a tremendous growth in the number of ARRL Appointees (ORS, OO, ATC, etc.) in the past year, and I hope that this trend will continue into 1986. Finally, a new Ohio Section Newsletter should be a reality by the time you read this. Ron, N8AEH, has agreed to edit what will hopefully become a great resource for Clubs and individuals involved in Amateur Radio in Ohio. There have been other projects in this first year, but these are the ones that stand out in my mind as most important. I want to thank

Our numbers talk

424B

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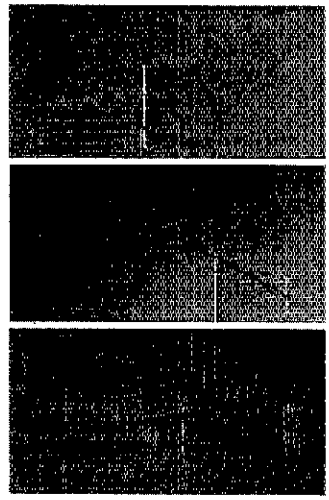

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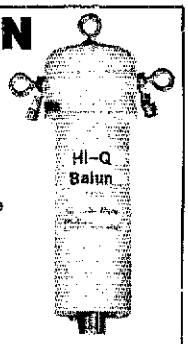

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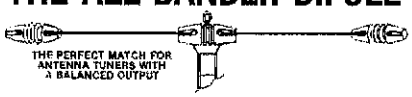

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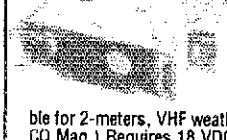

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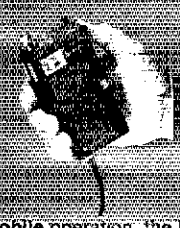

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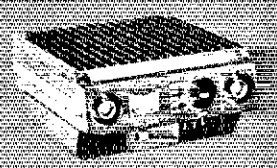
In **mobile** operation, the MT-20A transceiver provides 20 W output when used with the LA-20 Linear Amplifier and plugged into the vehicle cigarette lighter through an SD-1 adapter.

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

Frequency	144-148 MHz in 5 kHz steps
Emission type	F3 (FM)
RF output impedance	50ohm unbalanced (BNC socket)
Power source	6.4V DC (5.5-11V DC)
Current drain	150mA Max. on reception 25mA on reception with no input signal 550mA Max. on transmission
Dimensions/weight	Main unit (without battery pack) (38mm(H) x 80mm(W) x 34mm(D)/250g Battery pack (Model BA-2/BA-3) 40mm(H) x 60mm(W) x 33mm(D)/130g
Repeater device	Built-in -600kHz transmit down shift switch +600KHz transmit up shift switch
Illuminated Dial	

■ Receiver

Circuitry	Double-conversion Superheterodyne
Sensitivity	Better than 1 μV for 20dB S/N
Selectivity	Greater than ± 7.5kHz/ -6dB Greater than ± 15kHz/ -60dB
Image rejection	Better than - 50dB
Audio output	300mW (8 ohms)

■ Transmitter

RF output power	High 1.5W Low 150mW
Modulation	F3 (FM)
Spurious emission	Better than - 60dB
Microphone	Electret condenser Microphone, built-in (impedance 2K ohm)
TU-1	CTCSS unit optional

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everyone who has helped to make this a very interesting year for me. In 1986, I would like to concentrate my efforts on some of the other programs in Ohio: Affiliated Clubs, the Volunteer Monitoring program (Official Bulletin Stations), and the Public Relations programs. If you are willing to help, please contact me: there is work enough for all of us. Your suggestions and ideas are always welcome additions to my reading. Traffic: W8BO 483, K8JDI 277, WD8KFN 247, WB8DMF 201, W8QZK 188, KD8KU 187, W8JMD 179, WD8RAO 177, NJ8P 173, KD8KY 172, WB8MEK 168, KA8KHS 162, K8ND 157, WB8JGW 137, KF8J 123, W8EK 122, K8TVG 122, K8CMR 105, N8XX 104, WB8HHZ 93, NM8I 92, WA8GMT 87, WA8DYS 86, N8FWA 83, WD8MPV 82, KA8CGF 81, KA8GJV 77, N8AEH 74, KD8IC 74, NF8B 68, N8EFB 64, KA8JTT 58, WD8KBW 58, K3RC 57, WD8RIB 56, WB8BWY 51, N8FPH 51, WD8IKC 49, KD8XL 49, W8SKP 48, N8AKS 45, WA8HED 44, WA8HGH 44, W9SWM 42, W8BHL 41, KC8YV 41, NE8X 40, WB8KWC 39, WD8JYE 38, KA8TNT 38,W8ZOL 38, KA8ICB 37, K8LQM 36, KA8THO 35, KC8UZ 34, WA8SSI 33, K8DXZ 30, N8GOB 30, K8EF 29, W8FPA 29, N8CW 27, W8RG 27, WD8HDZ 26, KV8Q 25, N8CJS 24, KA8DJZ 24, KC8WH 24, NK8C 22, N8FAZ 21, K8NJQ 21, NK8B 20, WD8CTX 20, W8WEG 20, WB8HMI 18, N8CDN 17, KJ3O 16, K8CKY 14, WB8KWD 14, NI8W 13, N8AJU 12, WD8CSP 12, N8EEK 12, N8GIY 12, KA8OQF 12, KA8RIX 12, WB8RSM 12, KD8WH 11, WB8NHV 10, N8FNP 9, WB8MRL 9, W8HVK 8,NC8M 8, KA8YUM 8, W8ZM 7, WD8EKI 5, KD8WI 5, KD8ZE 5, WD8ADJ 4, WB8TRK 3, K8VOY 3, N8GIO 1, AD8I 1, K1LT 1, KA8MFG 1, KA8MFH 1, WD8NED 1.(Oct.) K8OZ 340, W8PMJ 281, W8JMD 159, N8XX 81, W8UPD 54, N8FAZ 33, (Sept.) K8OZ 378, W8PMJ 288, N8XX 102.

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 58/3 AETN 15/0 CDN 688/45 ESS 410/80 HVN 248/48 NYPON 703/465 NYSE 436/285 NYSL 279/110 NYSM 351/265 SDN 267/87 Ulster RACES 38/3. CLUB NEWS: Albany ARA will hear about radio controlled telescopes in the sky and elect new officers at their Dec. meeting—new members N2CKV W2YJR WB3HDG N2CQA KA2HRO KF2R. CCNR has election of officers and talk on net operation. Mt. Beacon ARC discussed packet bulletin boards at Dec. meeting. Rip Van Winkle ARS had holiday dinner instead of meeting. Schenectady ARA had shown on Glovers Reef and welcomes new members WB2OHI and N2BYT. Overlook Mtn. ARC has new officers K5NA-Pres. W2XL-VP. KA2TIP-Sec. KA2QYL-Treas. KU2Q-Dir. Congrats to all. Saratoga RACES had presentation by Dir. of Emergency Services. Westchester ARA had holiday dinner in lieu of meeting. West. ECA had holiday dinner at which N2BFG and AC2T received special awards for outstanding service during the past year. I wish everyone the best during the coming year—happy and healthy! Please note—if your traffic report does not appear in the column, WB2MCO did not receive it by the 5th. Please get your reports in prior to the 5th to appear in column. Let's all help out our local clubs by participating in the coming year. They are the backbone of amateur radio. See you on 145.01! NOV PSHR: WB2VUK WB2EAG KA2MYJ K2ZVI W2PKY WB2MCO KC2TF AK2E. Traffic: WB2MCO 264, W2PKY 199, KA2MYJ 151, KC2TF 150, WB2VUK 147, WB2EAG 129, K2ZVI 39, K2HNW 15, AK2E 12.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ—ASM/ACC: WB2IAP. SEC: KA2RGI. OOC: NB2T. TCC/RFI: W2JUP. STM: WA2ARC. PIO: W2IYX. The following are traffic nets in and around the section:

*NLI	3630 kHz	1900/2200	WB2EUF
NCVHF	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	1900/2000	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 N.Y. Inst. of Technology, Rt. 25A, Old Westbury in Salten Hall, Rm 2. Applicants are reminded to bring 2 forms of I.D., original and a copy of your F.C.C. license, check for $4.00 made payable to ARRL/VEC, 2 pens/pencils and a calculator for the math questions, for further info, contact Woody Gerstner, WB2IAP, 42 Mohawk Ave., East Atlantic Beach, NY 11561. Rich Tygar, AC2P, has stepped down as treasurer of the Suffolk County ARC, he has held that job for over 15 years, with a short term as Pres. thrown in for good measure, his replacement is KA2JMA. LIMARC will hold their winter flea market Feb. 16 at the Electricians Hall on Pinelawn Rd., Melville. Officers for LIMARC are: WA2KXE Pres., WB2ALW VP, WA2LUL Secy, WB2KWC Treas, K2ES, NK2J, WB2DIN, WA2BGE Directors. Vice Director of the Hudson Division WA2DHF, Steve Mendelsohn presented to LIMARC, on behalf of the ARRL, an ARRL Booster Certificate for getting 5 or more new members to join the ARRL. SEC KA2RGI was guest speaker at the Suffolk County ARC. Officers for Grumman ARC are: NN2C Pres, KC2DH VP, WB2QDT Sec, W2MFN Treas, WB2MPP, W2ZZE, W2DT, W2IVA, K2DOD as Board members, the club will also hold license exams Feb. 12, April 9 and June 11, at Bethpage H.S., call Dave Tanner at 391-6181 or Martin Miller at 575-0480 for more info. K2GCE spent the month of Aug. visiting his son in Germany, Bill also spent 2 weeks in the Hosp. in Sept. with a bad hip. Traffic: K2YQK 199, K2GCE 105.

NORTHERN NEW JERSEY: SM, Robert R. Anderson, K2BJG—ASM(VE liaison): N2XJ. SEC: KB2ZM. STM: KA2HNQ. OO/AAC: N2WM. ACC: K2BJG. PIO: WB2NQV. SGL: W2KB. TC: K2BLA. and BM: N2CXX. NOVEMBER 1985 appointments are: New: EC's W2BHM, W2KOG, W2NFF, WA2CWB, WA2IEK, WA2MIM, WA2PFU, W2UZT, and WA2VTV New OO W2DZ. Many more are still needed. Rember we must police ourselves and that does take some effort on our part. If you are interested in OO/AA or any other NNJ ARRL Field appointment, please contact the applicable leadership official listed above. Thanks to the expertise of WB2VUF (DEC Morris), N2FOZ, and W2QHI the ARRL in the NNJ section did well handling test messages during the National Communications System emergency communications test "Exercise Night Tango XII" held late November 1985. Jeff NJ2O attended a photo session with Governor Kean promoting the NJ QSL cards seen in Dec. QST. Congratulations to Stanley D Grossman, WB2PJL, who was awarded it's "Elmer-of the Year" award by the NNJ chapter of the QCWA. Donald Stantangelo, K2RLW, awarded the ARRL Hiram Percy Maxim award. The Cherryville Repeater Assn and the Bergen Amateur Radio Assn renewed as Special Service

Clubs. Northern Jersey DX Association now a 100% ARRL Club. The following who upgraded during November sessions at Sussex Conty ARC, State line RA, the NNJ VE Board, and Raritan Bay ARC: Novice:S Cohn, S Hoffman, D Ottara, and H Susman. Technician: KA2ZHL, KA2UTL, KA2TYG, N2CBQ, WN2SQC, KA2WYG, KA2WRS, KA2UVB, KA2RXZ, T Kvopka, J Kvopka, and H Umemura. General: N2FSM, WB2NEZ, KA2UPR, KA2YAT, KA3YFQ, KA2NYW, KA2WAV, KA2WFD, KA2YJT, Nakoto, Tanaka, K Jankovitz, J Colfin, and C Damm. Advanced: KA2YPV, KA2FFU, KA2NDN, WB2NTP, KA2OZA, N2FVP, WA2HHX, KA2YHI, KA2AYN, KA2AYO, WB2CGI, and KA2UOL. Extra: KD2JB, KC2XH, WA2KIR, KD2OW, WB2VEG, KC2EN, WA2SQQ, WB2ONA, W2TIN, and K2USV. November Data:

Net	Freq	Time	Sess	QNI	QSP
NJM	3695	1000 Dy	30	232	132
NJPN	3950	1800 Dy	Not	Available	
		0900 Su	as of	Deadline	
NJSN	3735	1830 Dy	0000Z	12/6/85.	
NJN/E	3695	1900 Dy	Net	Managers	
NJN/L	3695	2200 Dy	Please	note	
NJVN	49/49	2230 Dy	30	236	76
OBTTN	147.12	2000 Dy	30	339	185
TCETN	146.685	1930 Dy	Not	Available	
NJRTTY	147.51	Autostart	Not	Available	

UPLINK Amateur Radio News call 201-735-8550 PHSR: KA2SPH 138, N2XJ 103, WB2QMP 81, W2RRX 96, KA2IWS 84. Traffic: N2XJ 257, WB2QMP 181, KA2SPH 141, KA2IWS 119, W2RRX 73, N2DXP 21.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY—SEC: KDØBG, SGL: AKØQ, BM: KØIIR, PIO: NØENA, OOC: KDØRT, ACC: WBØQAM, TC: KØDAS. Hope all of you had a good holiday season. By the time you have read Iowa will have a new SM. I have resigned the position and Mr. Grauer will have appointed an interim SM. I wish to thank all for your support and activity during the last 5 years and hope that you will support the new SM. Send your Nominations for Iowa Ham of the Year before April 1, remember the Midwest '86 Convention will be held in South Sioux City again this year in April. The Iowa QSO party will be in March, participate. Thanks to all that have participated in the Regional IVOAD Meetings. The Iowa ARRL is a charter organization and should give full support. Sorry to see NCOR resigning as NM for ICN, still need activity. Davenport HAMFEST scheduled for February 23rd, Cedar Rapids Electronics Fair for August 8. Congratulations to all the new upgrades, too many to mention.

Net	Freq.	UTC	QNI	QTC	NM
TLCN	3560	0030-400	365	119	WØYLS
75 Meter	3970	1830-2330	2084	216	WBØXVW
ICN	3705	0100	68	19	NCØR
ITEN	3970	Sun	125	6	KDØBG

Good Luck for 1986. Keep the reports coming! Traffic: WAØAUX 364, WØSS 230, WDØFWB 143, KØGP 105, WØYLS 93, W4JL 62, WBØAVW 53, KAØGSA 52, KAØADF 50, KØBRE 32, WBØJFF 28, WØBW 29, WDHTP 23, KØCY 21, KDØBG 15, WØFQ 15.

KANSAS: SM, Robert M. Summers, KØBXF—Recent appointments include WAØHOZ becoming the NET MANAGER/EC for the Kansas Weather Network, replacing MIKE, WAØLBB. Mike says anyone who can sign 73 meaning that's my age as well as best regards deserves a rest. Besides that he just got new wheels or at least got an overhaul job on his wheelchair and wants to move on to other things before the new wheels do give out. The other appts is to Dan, WDØBRZ, who is going to coordinate the PACKET RADIO activity in KS for us. I understand there are several already using packet including NØDOT, NØFFM, NØFZT, WØFDJ, WØEQ and WDØBRZ. ARE there more of you out there???? NØDOT also has a mailbox, for those interested, in Junction City. Congratulations to the Pilot Knob ARC at Leavenworth and to the CKARC at Salina on renewing their applications to remain a SPECIAL SERVICE CLUB. Congrats also to CKRC on their 100% ARRL club affiliation. Recent requests have your SM now receiving a few more club bulletins each month. I know there are a few more though. Those I receive are: Shawnee Radio Am Comm Team—Johnson County; Procrastinator—Pittsburg area; Smoke Signal—Smokey Valley ARC; BEARS—Boeing ARC Wichita; QSP, Salina CKARC; CRZ, Leavenworth PKARC; Mine Creek AHC, Pleasanton; Douglas Co ARC; US Center ARC, Smith Center; Sand Hills ARC, Garden City; Grounded Grid, Wichita ARC; Transceiver, Topeka and Midwest Chirps, JARS, Wyandotte County. Tnx. Traffic: WØQBK 495, NØGCC 337, WØFIR 229, WØFRC 132, KSØU 95, WØHI 87, WØOYH 83, KØBXF 83, WAØHOZ 67, WØFDJ 58, WBØZEN 46, WØQMT 21, WØMYM 17, WØPB 13, WØRBO 7, NBØZ 5, NØAPJ 2.

MISSOURI: SM, Ben Smith, KØPCK—The Hannibal ARC officers for 1986 are: Pres. KAØQMV, VP, KAØRTV, Sec. KIØW, Tres. KØCG and Trustee KKØP. Silent Keys reported to me this month were: WØPXW and WBØPJK. Kansas City DX Club members WØJLC and KØRWL operated from Belize during the CQ Worldwide CW DX Contest. The St. Charles ARC Boy Scout 75th Anniversary Special Event Station operated in St. Charles Oct. 11-13 was awarded a blue ribbon for the best display at the camporee. They made 170 contacts during the three days and a lot of interest was shown by many of the 500 scouts at the camp. WAØITU received an ATC appointment. If any of the clubs in the Kansas City area holding Novices classes would like someone to help and advise their new Novices with antenna and other technical questions contact Dwight. Several ATCs have been appointed across the state and they are eager to be of assistance. If you do not know of an ATC in your area or would like to have an ATC appointment contact myself or K4CHS. The Western Jackson County ARES provided communications for the Divided-United Footrace on Nov. 10. KSØN, WBØYCD, KAØSXY and KAØSZY participated. The Kansas City ARC has received a "Booster" certificate for five or more ARRL memberships in the ARRL Club Challenge competition.

Nets reporting:

NET	Sess	QNI	QTC	Day	Time	Freq PM	Mgr MHz
MOSSB	30	743	148	Dly	6:00	3.963	KT5Y
MON	60	357	125	Dly	7:00/9:45	3.585	KØSI
MEOW	30	660	102	Dly	5:30	3.963	KØDSQ
HBN	21	328	22	Mon-Fri	12:05	7.290	KØDSQ
PHD	4	121	12	Mon	9:00	146.43	WAØKUH
MOFON	4	31	8	Wed	8:15	222.42/4.02	AIØO
MEMOE	11	99	5	TTSat	7:30	144.53/5.13	KAØFTS
ZAEN	6	70	5	Tue	8:00	147.84/.24	NOØE
RRABN	27	364	3	Dly	8:00	146.39/.79	KAØLLN
JCCCN	4	40	2	Wed	8:00	146.40/7.00	WBØDZX
CMEN	5	74	1	Wed	8:00	146.16/.76	KØPCK
MCARES	4	38	1	Thu	8:30	146.52	WBØELJ
LOZFM	5	105	0	Sun	9:00	146.13/.73	WØRTL
TCN	4	52	0	Thu	9:00	147.09/.69	KAØILO
IEN	3	27	0	Wed	7:30	147.84/.24	WBØSZI

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D-56	10/15/20/40/80	6	99	109.95

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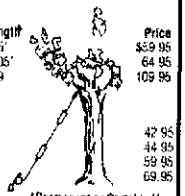
VS-41	10/15/20/40	1	27'	44.95
VS-52	10/15/20/40/80	2	52'	59.95
VS-53	10/15/20/40/80	3	49'	69.95

*Can be used without radials
*Feed line can be buried if desired



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COAX CABLE: (includes PL-259 connector on each end)

Type	Length	With antenna purchase	Separately
RG-58	50'	$8.00	$11.95
RG-58	90'	12.00	16.95

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- ★ NO jumper wires used
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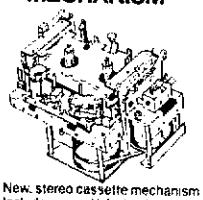

New, stereo cassette mechanism. Includes record/playback and erase heads, 2-12VDC motors, drive belts, pulleys, 3-12VDC solenoids, pinch wheels and other mechanical parts. These parts used on other current model decks, would cost several times our selling price if purchased separately. 5¾" x 3¼" x 3¼

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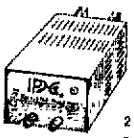

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D SIZE	1.2V 1200mAH	$3.50

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31,000 mfd. 15 VDC	1¾" DIA. x 4" HIGH	$2.50
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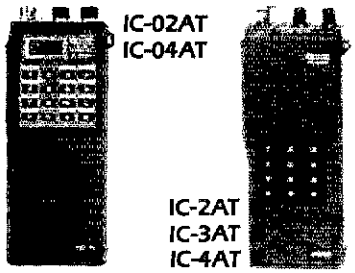

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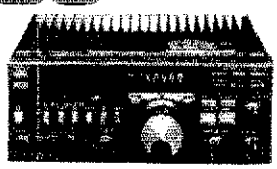

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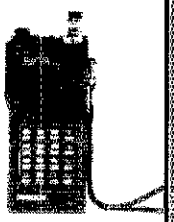

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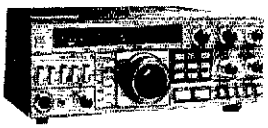

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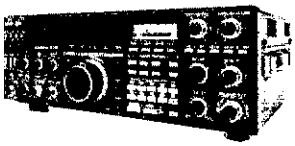

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BT-3	Battery Case for TR2600	11.95
PB-21	NI-CD Pack for TH-21/41	17.95
PB-21H	500 MAH NiCd Pack for TH-21/41	29.95
BT-2	Battery Case for TH-21/41	7.95
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SARN	4	38	0	Thu	9:00	146.43/7.03	WØENW
LARES	4	33	0	Wed	8:00	146.10/.70	WBØRHC
CVE	8	21	0	MWF	7:00	3.710	KAØFTS
CCAN	3	17	0	Qwa	8:30	146.46	WØNUB
LOZCW	4	16	0	Sat	9:00	3.707	WØRLT

Traffic: WØBMA 448, KØPCK 139, KØSI 130, KT5Y 96, KBØZL 92, AIØO 90, NDØN 87, WAØYJX 66, NØBKE 65, NØSS 60, NØEVC 58, NIØR 54, KGØL 51, KØOB 48, KØDSQ 35, WØOUD 32, KAØP 12, K9OCU 6.

NEBRASKA: SM, Vern Wirka, WBØGQM—STM: Jerry Kohn/WDØEGK. Some repeater owner/operators have expressed concern about stations that do not properly identify when they bring down the repeater phone patch. This includes when, for example, a phone patch is brought up but the originating station experiences a loss of control and cannot bring down the patch then another station just transmits the appropriate tone to bring down the patch but does not properly identify. Proper identification is always required. Assets of the Nebraska Amateur Packet Society have been donated to the Lincoln Amateur Radio Club. The Lincoln Club has purchased the equipment at the Beaver Crossing, Mead and UNL Abel Hall Digi-Peater sites. The Nebraska Amateur Packet Society is now a steering committee within the Lincoln Club. Grand Island area amateurs meet for Saturday morning coffee from 9:00 to 10:30 at the "Eatery" . . . located in the Gateway Plaza next to the Grand Island Mall. Two Grand Island amateurs, Carol Ihavenet/WBØMST and Glen May/KAØDJA . . . Both Grand Island Red Cross officials . . . assisted in the severe flood stricken areas of Louisiana during November. Jim Sanford/NØAIH tendered his resignation as Section Emergency Coordinator. The Blue Valley Radio Club Net meets on Wednesdays at 8:30 PM Central Standard time on the 146.87-.27 MHz repeater. The 146.87-.27 repeater is now on a 300 feet high tower located south of Gresham, Nebraska. Traffic: KØDKM 176, WBØTED 171, KAØBCB 113, WØKK 108, KØIXY 26, WAØBOK 15, WDØBOX 14, NØBA 11, WBØGMQ 8, WØNIK 2.

NEW ENGLAND DIVISION:

CONNECTICUT: SM, Robert J. Koczur, K1WGO— STM: K1EIC. SEC: KA1ECI. BM: K3ZJJ. ACC: KG1M. OO/RFI: NA1I. TC: W1HAD. PIO: KX1B. SGL: K1AH.

NET	FREQ	LOCAL TIME	QTC	QNI	NM
CN	3640	1990/2200	136	243	K1EIR
CPN	3965	1800 m-s	84	289	KA1BHT
NVTN	22/88	2130	26	164	WA1EMI
WCN	78/18	2030	204	437	WB1GXZ
RTN	13/73	2100	43	248	KA1JAN

Happy Valentines Day to all Connecticut Amateurs. GATEWAY is getting a new editor. Ed Raso, WA2FTC will be taking over the duties by the time you read this. Good luck, Ed, and congrats to departing editor Jeffrey W. Ward, K8KA, for a job well done. News form Al Jaras, NA1I, is that he is still looking for a few good hams to fill out the OO roster. This is an excellent opportunity for those of you would like to become more involved in the aspect of amateur radio that extends beyond rag chewing. For additional information regarding the OFFICIAL OBSERVER/AMATEUR AUXILIARY and an application contact: Al Jaras, NA1I, 122 Columbus Ave, Meriden, CT 06450-9998. Mary, WB1GXZ, shows she is continuing to work hard with results. Our section had 98% representation to FRN in November. Congrats to Fred, W1BXZ, who was honored by Tri City Radio Club for 54 years as a licensed amateur with a 1925 pristine porcelain insulator, unopened from the factory. WARC has graduated its second group of new hams. Connecticut now has six new amateurs thanks to the fine efforts for this club. Connecticut has a brand new amateur radio club. The Southern New England Association of Packeteers (SNAP) welcomes all interested folks to attend their meetings held the first Tuesday of each month at A.R.R.L. headquarters in Newington. Good luck, SNAP. Sarc held its first V.E. exam on Saturday, Dec. 7. 8 Hams advanced their tickets. Nice work. From what I can see, there is more activity than ever within Connecticut clubs. It makes me proud to be a part of it. 73s. Traffic: WB1GXZ 288, W1EFW 204, K1EIR 183, KA1KTH 152, KA1GWE 135, KA1KPS 115, N1BOW 80, W1YOL 70, W1BDN 42, K1AQE 36, KA1BHT 35, KA1EKC 25, W1DPR 20, NA1O 5, W1CUH 4, W1QV 4.

EASTERN MASSACHUSETTS: SM, Luck Hurder, KY1T—ASM: N1BBT & K9HI. OO/AA: KA1KE. SEC: KB1PA. STM: KW1U. ACC: K1AZE. TC: KA1IU. PIO: K1HLZ.

Net	Mgr	Freq.	Time(Loc)Dy
EMRI	N1AJJ	3658	1900/2200 Dy
EMRIPN	N1BGW	3880	1730 Dy
EM2MN	KA1AMR	145.23	2000 Dy
NEEPN	K1BZD	3945	0830 Sn
HHTN	WB1CMQ	04/64	2230 Dy
EMRISS	N1CVE	3715	1600/2030 Dy
CITN	N1BYS	745/045	1930 Dy

The FCC and EMASS Amateurs have joined forces! Yes it's true—early in December, the FCC's Field Operations Bureau and the recently formed Amateur Radio Auxiliary to the FOB met in Auburn to make further plans and discuss implementation of the Auxiliary in New England. NE Division Director K1KI, OO Coordinator KA1KF SM KY1T, Eastcars members, freq. coordinators and a large cadre of Official Observers were there with the FCC, discussing methods of assisting the FOB with monitoring, data collection and the solving of difficulties within the Amateur bands. Do you have the interest and "what it takes" to be an OO? Contact KA1KF for details. Barnstable Radio Club President K1MRO is scheming up ways to get his smiling face on ATV while Provincetown traffic handler KB1AF is trying to decipher the multitude of commands on her new packet board. W2KSV of Yarmouth has good reason to be smug this month after having won a hard-earned victory against the Kings Highway Historical commission. Many Cape amateurs have needlessly suffered for years under these harsh restrictions but with the passage of PRB-1, the tides may be changing. W1QLT, KZ1V, W1QFO and many others continue their much appreciated license exam sessions around EMASS, with large numbers of new licensees as well as numerous upgrades to show for their efforts. The Acton Boxboro ARC newsletter has some very interesting articles by KG1V about Soviet Union licensing and operating. EMASS appointees are once again reminded that all appointments require monthly reports to the appropriate Section League Official. Public Information Officer, K1HLZ is searching for Amateurs with media contacts or experience to assist as Public Information Assistants. Please contact him immediately if you are qualified for these important positions. Have you expressed your opinions to your Division Director or SM this month? Traffic: KW1U 995, N1BGW 377, KN1K 350, WA1TBY 290, KY1T 221, N1BHH 221, KB1AF 164, KA1AE 161, KA1AMR 160, N1CVE 142, WB1CMQ 138, K1GRP 136, W1CE 115, KB1PA 107, N1AJJ 90, KA1ON 83, N1DDC 80, N1DVI 53, KA1EID 52, K1ABO 52, WA1FNM 42, W1ZHC 41, WA1SNH 36, K1BZD 31,

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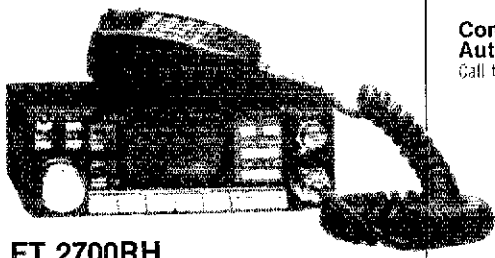

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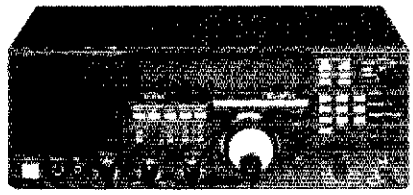

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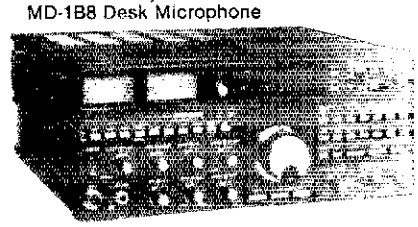

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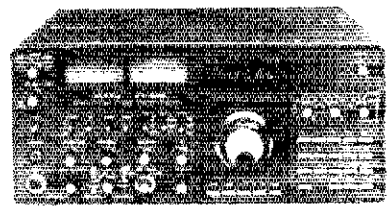

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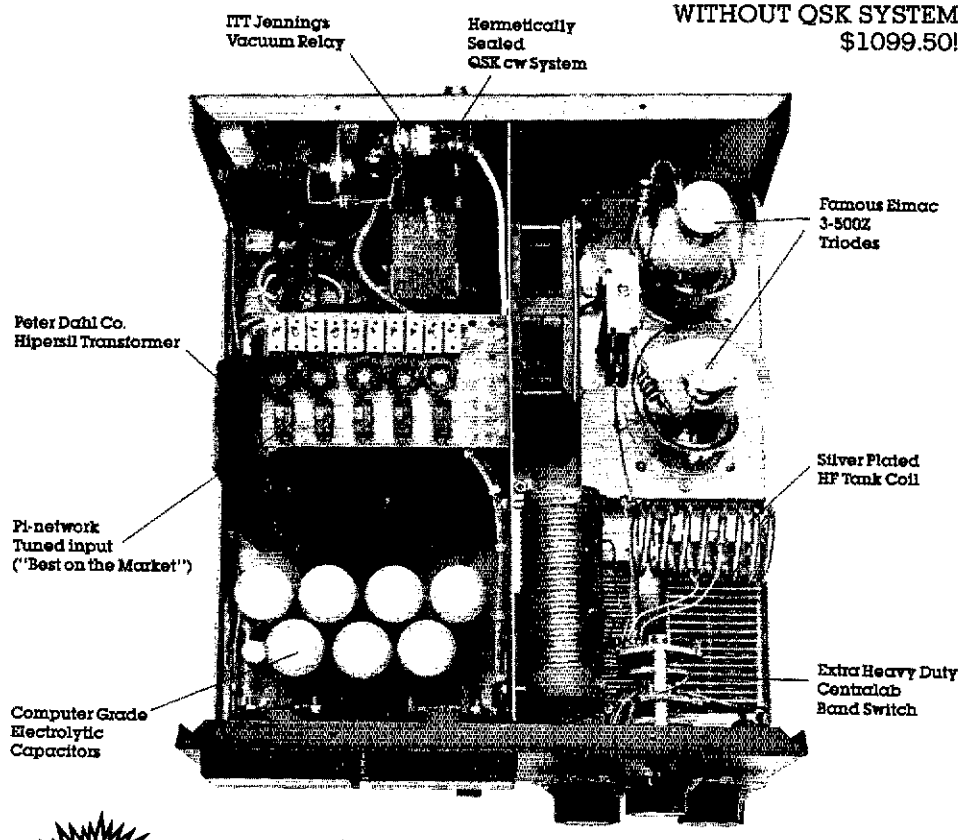

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MAINE: SM, Cliff Laverty, W1RWG—SEC: KL7IJG/1. STM: AK1W. ACC: KY1C. BM: W1JTH. OOC: W1KX. PIO: KY1E. SGL: K1NIT. TC: K1PV. PSHR: W1RWG 92, WA1YNZ 89, N1BJW 73. Blackstrap Rptr Assn reports following officers: Pres N1AKP, VP W1IDA, Secy N1AKR, Treas KA1KAR, Member at Large KD1UE, Activities Mgr N1DNY. The Augusta EARU announces Windsor Hamfest for September 6, 1986. From Belgrade Lakes the XE1HC/K1MAN Mexico City Emergency Net on 14.275 handled over 3000 pieces of traffic, and AP acknowledged K1MAN as its source of info on the disaster. Net Activities: sessions/checkins/tfc SGN 26, 1110, 186; PTN 30,217,90; LPTN 18,71,11; RACES 4/54/11; AEN 4/73/0. This was a slow traffic month. Let's all report our traffic. Also, let me know the dates of your club meetings. I'll try to visit each club. Traffic: AK1W 95, WB1CBP 87, N1BJW 60, W1RWG 52, N1BLZ 47, W1ISO 45, W1VEH 35, W1JTH 34, WA1YNZ 30, KA1JOJ 24, W1KX 15, W1GCB 15, W1OTQ 15, W1BMX 14, KA1ENL 12, KA1FTL 8.

NEW HAMPSHIRE: SM, Bill Burden, WB1BRE—TC: W1JY. SGL: N1AIX. November began with our state organization fall meeting. Most clubs attending reported activities in license classes or volunteer exams. WRONE (Women Radio Ops of N.E.) held their quarterly meeting in Nashua with many area Hams attending, including NA1Z, KA1LDS, WB1NX, KA9GHV, KA1KPM and WB1AOB. During this month I met with the Amherst Amateur Radio Club to discuss their efforts to stabilize the club. The Amherst club is a long time ARRL affiliate that has recently struggled through a series of setbacks including loss of a long-time meeting place, a change of meeting nights, and lagging participation in club activities. A core group consisting of KA1GAX, W1XC, K1IZM, WA1UVJ and new club president KBUNJ has been working to put together a plan for increased activity and growth. This will include programs and activities geared to attract area Hams and regular mailings to keep everyone informed. The meeting I attended at the local library turned out about 15 members who expressed concerns, ideas and a good level of enthusiasm! Some club members decided to work with local schools to stimulate interest among students. In my opinion, a club that has 15 members concerned enough to attend a "get-well" meeting and translate that concern into action to make the club succeed—will succeed! The Dec club function was a Christmas Party—which was sold out! the Kearsage club has opened a new club station in N. London. It will be used for emergency comm and net activities. Members of the Nashua club participated in a search for two teenagers lost in Hudson. 10 Hams assisted and provided comm in a four hour sweep of a heavily wooded area. The missing teens finally turned up in a neighboring town, cold but safe. We sadly report the passing of Mike Mattleman WA3BZM on Nov 23. Mike was EC for Rockingham Cty and a member of the Mt Moriah club and the Interstate Repeater Society. Nets: NHN 222, GSFM 213, GSPN 106, MSOVTP 30. Traffic: N1CPX 583, N1NH 532, W1PEX 476, W1FYR 237, K6UXO 157, W1TN 130, N1AKS 118, W1ALE 90, KK1E 87, WB1GXM 74, KI1M 74, K1TQY 60, KA1LBW 55, KH1OU 38, KA1GOZ 36, W1MHX 28, K1PQV 26, K1OIQ 26, K1ACL 26, KB1S 23, KA1HPO 21, WB1DSW 16, W1LQQ 9, KA1IIP 8, KB1KX 7, N1DQA 6, N1ALM 6, WA1YZN 3. (Sep.) N1CPX 330, W1QYY 226, N1NH 209, N1AKS 114, KK1E 110, W1TN 104, W1GUX 96, KI1M 89, K6UXO 88, KA1LBW 65, W1ALE 56, K1PQV 49, WB1GXM 42, W1FYR 32, KA1GOZ 24, K1TQY 24, K1OIQ 20, KA1HPO 16, N1ALM 15, KA1IIP 8, WA1PEL 5, W1LQQ 5, W1OKU 3.

RHODE ISLAND: SM, John Vota, WB1FDY—New officers of the B.V.A.R.C. Pres. N1CEF, V.P. W1LQA, Sec. KB1O, Tres. K1EHV. I enjoyed a delicious meal and some good conversation at the installation banquet with the B.V.A.R.C. Tnx for the invite. Soon to be Packet Radio at the Warwick WX office will keep you updated. Pse ck into the A.R.E.S. on 70 Tues. Even. We need a few traffic handlers. Pse give KA1KML a call. Tnx. VE Exams given by the E.B.A.W.A., O.S.A.R.G., P.R.A., Tnx to all the VE's for their time and labor. SM gaining weight to many club party's. Tnx to N.C.R.C. for a good meal and great conversation. Traffic: WA1CRY 59, KA1KML 183, Public Service Total 69, W1EOF 261, KA1JXH 190, Public Service 92.

VERMONT: SM, Ralph Stetson, KD1R—Seems strange trying to write something appropriate for February while deeply involved in the traditional holiday rush. As you know in last month's issue of QST, the position of Section Manager is open for re-election. I intend to run again. Hopefully I can do a better job in the next 2 years. So far have heard of one young ham in Vermont. He is eleven. You've til April 30 to find someone younger. Congrats to Ed, KT1Q, for earning his first BPL medallion. Ed invites all interested folks to join in the fun of message handling on VTN. If CW is not your thing, try VTSSB on 3909 at 6 PM Mon.—Sat. All are invited to use the KD1R-1 PBBS to enter and remove NTS messages as well. Good traffic handling skills are needed during emergencies to pass messages reliably and accurately. So get in and do your part often. These skills need frequent reinforcement. Nets: VTN 30/149/76; VSSN 12/32/5; VTRFD 4/43/27; CAR 26/700/39; VTPN 4/69/8; GMN 26/439/37; CVFM 4/60/10. NTS reps to 1RN cycle 2: 80%; 1RN cycle 3: 44%. Traffic: KT1Q 524, AE1T 122, W1KRV 65, N1COB 42, W1OAK 37.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T—SEC/SGL: WB1HIH. OO/RFI: N1CM. PIO/ACC: K1BE. STM: W1UD. TC: KA1JJM. Thanks to WB1DBN for fine job as EC Berkshire County for the past 4 years and welcome to W1SJV who has been appointed as his successor. NOBARC had a busy Thanksgiving Day with successful search for a downed plane. Several members provided comms for CAP and police and WA1ZFK found the plane with his DF equipment. New ARES net active on 145.31 every Sunday morn. Regret to advise that W1ACP is a Silent Key. HCRA starting a video tape library. Ten technical topics available so far. And new/upgraded hams are coming right along. HCRA license classes ended December 10 so expect to see some more new calls. And down in Worcester, new Novices KA1NMC and KA1NMD are active in Explorer Post 73. CMARA is really doing a great job with the Post. Over 15 club members helping in various capacities. If you have RTTY capability on 2 meters, check in Wednesday & PM net on Provin Mt. PSHR: WB1HIH, N1DMU. Traffic: N1DMU 233, W2SJV 221, W1UD 211, KA1T 111, WB1HIH 101, KA1EKQ 64, W1KK 43, W1ZPB 39, WB1FSV 32, W1JP 31, WA1OPN 19.

NORTHWESTERN DIVISION

IDAHO: SM, Lem Allen, W7JMH—CLUB NEWS: Twin Falls Club has a Breakfast get-together the first Saturday of

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each month—all Hams welcome talk-in on 146.16/76. ARRL MATTERS: N7BI has been appointed SEC—Congratulations. PEOPLE AND THINGS: W7TQG back from visit to AZ. W7FOF back from trip to warmer climes Stateside. W7MAI back from ARRL National Convention. W7IYG has new Kenwood TS 940 S and TS 711 All Mode 2M rig. W7AHS is looking for Fast-Scan TV Audience—he says he can change the TV Programs to suit the viewers. NET REPORTS:

Net	Fq-Time	Sess.	QNI	QTC
FARM	3937Lsb 7P Da	30	2177	34
ID CD	3990Lsb 810A Da	21	752	49
IMN	3635Cw 8P Da	21	213	69
NW TFC	146.38/98FM 730P Da	30	841	12

GENERAL: A screen door spring at a pulley and weight at the ends of your antenna will often prevent breakage during winter storms. Traffic: W7GHT 209, W7JMH 44, KA7KAI 56, N7BHL 44, KA7IHO 24, WB7CYO 14.

MONTANA: SM, Les Belyea, N7AIK—SEC: W7LR. PIO: W7JMX. ACC: WB7TWG. PIO: N7HAZ. BM: K7KGR. ASM/TC: K0PP. STM: KF7R. The Idaho-Montana Net mgr. WA7GQP adv IMN is now operating 7 days a week, freq. 3635 at 0300Z, and looking for more involvement from Mont. stns. Packet radio is growing very fast in our section, too many packet stns are now on the air to lost at this time. KC7AA (Glendive) gave a packet demo for the LYARS group a short time ago, so there will be still more before long. Call change, WB7AZJ is now KE7LH, Missoula upgrades- KA6QZK to adv, N7GUP to gen. DX note of interest, W7LR has worked 301 countries—on CW. PSHR: KF7R, W7TGU, WA7WZP.

NET	Sess.	QNI	QTC	MGR
MTN	30	1297	136	KF7R
IMN	21	213	69	WA7GQO
MSN	4	76	0	K0PP

Traffic: W7TGU 426, KF7R 114, N7AIK 18, WB7WVD 14, WA7TUW 8.

OREGON: SM, William R. Shrader, W7QMU—STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. STC: N7ENI. ACC: KB7CC. OO: N7SC. RFI: AK7T. Upgrades: NR7F, NR7M, KB7TB, KB7GN (Extra): KE7KH, N7HIM (Advanced): N7HRA, N7HQV, N7CFK, KA7SHO (General); KA7VZW, KA7WDJ (Tech). K7OYM and KA7PUH succeeded in becoming grandparents. Congratulations to all! We lost two old-timers this month, W7NJS and W7LJ. We'll miss them. OTVARC's "Good Neighbor Day" drew lots of attention especially youngsters. Lots doing on the bands during the event due to the Mexico City earthquake. JARS will be changing the Eight Dollar Mtn repeater in So. Oregon to 146.16/76 soon. N7ENI, ARRL Section Technical Coordinator, wants to thank all his ATCs for joining the team. They are AK7T, N7FIV, W6OFF, KZ7X, K7WWG, WA6KLA, W7LRB and N7HMV. The TC/ATC Northwestern Div. Net will meet at 2200 UTC on Sunday afternoons on 7.250 MHz SSB. N7ENI is net control at this time, with N7HMV as backup. If you are interested in the technical areas of Amateur Radio, why not join in with the group. N7HMV just got his Navy-M.C. Mars call, NNNOFGNT. W7VSE is OFF on a long deserved vacation to Oklahoma and Texas. I'll bet the traffic nets miss him. Traffic: W7VSE 575, K7OVK 257, N7FXJ 137, W7ZB 90, N7DRF 69, N7BGW 47, KA7AID 40.

WASHINGTON: SM, Gene Sprague, KD7G—ACC: KC7PH. OOC: N7IL. PIO/SGL: W7CKZ. STM: KD7ME. TC: W7BUN. SEC: N7DRT. ASM: KR7L. Refer to Jan *QST* for Net times and freq's. WARTS Net has moved up to 1700 PST, due to band conditions. Items to be entered in this column must be sent to me with enough lead time or it will be old news. This is being written the first part of DEC, so please send your info early. N7DRT replaces W6IIH as SEC, who resigned because of his work commitments. Tnx Earl for the time and effort you have given us. Very best wishes to you! Field appointments: OBS: KA7CSP, DEC: N7CFA, EC: WB7SOF & KA7JVW, OES: KA7AEF, ORS: WA7CTS, K7SUX & KA7AEF, ATC: K7UU, K7WA, W7UAT. W7GB & W7GNR, OO/AA: NJ7V, N7IL & KA7GYG. TNX to all! Do you want to serve with an appointment? Contact the Staff or me. It's fun and rewarding—Current Field Appointees, please report monthly to your coordinator or manager (list at top of column), so we know you are well and active. You can do this by mail or use the NTS and get a little practice on traffic handling at the same time. Your hard work benefits all of us and is appreciated. '86 Officers for clubs: Olympia ARS (OARS), Pres: KA7NRA, VP: WA7RDJ, Sec: N7HOE, Treas: N7GWV. Yakima ARC (W7AQ), Pres: WB7WAM, VP: KA7LMW, Sec: KA7IAY, Treas: KA7VIM, Trustee: NG7F. Radio Club of Tacoma (W7DK), Pres: WA7OII, VP: W7BUN, Sec: WB7QAH, Treas: N7DRT, Board: KA7CXU, KA7FIG, WB7BLQ, WA7FUS. Congrats to all and thanks for serving. Many clubs are offering classes and exams. Check to see if they can help you. Much can be accomplished as a group, you might like to visit or join your local club. Bulletin Station WA7ETH reports ARRL Bulletins are in the 146.70 RTTY Repeater mailbox. Contact him on 146.92 if you have items to be placed in the mailbox. (These reporters are on the West Side). When you have a news item for the general public concerning some good deed Amateurs have done, contact W7CKZ, the PIO, who can help you get it in the newspaper, TV or radio. Island Co. ARES was busy again with a simulated exercise. Congratulations to you who have your first license and those that have upgraded. I cannot list all of you who handled traffic during the Mexican Earthquake, however, you will certainly be remembered by those who helped for a long time. You have, again, demonstrated our ability to help those that need our service. Traffic: KD7ME 450, W7LG 228, WB7WOW 179, K7GXZ 130, K7SUX 128, KR7L 127, W7GB 97, KR7F 83, W7IEU 43, K7AJT 30, N7DDP 28, WA7BDD 28, KD7MW 23, WA7CTS 23, KD7G 23, KD7TJ 15, KA7AEF 12, N7GDW 11, KA7TCE 11, N7FXM 4, 73.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG—ASMs: W6ZF, N6DHN. SEC: W6LKE. STM: NI6A. OO/RFI Coord: NY6Z. Ex-EB resident N6IG is now in SV, and has accepted the job of State Govt. Liaison in Sacramento. I'm sure Jim will do a First-class job. BARC EC, KE6IA, was interviewed by the Benicia Herald, and the article was printed in the Sept. 22 issue. They are outfitting the city EOC on HF, VHF, UHF, RTTY and Packet with funds voted by their City Council. My hat is off to this active, "can do" group. EBARC digipeater, W6CUS-1, 145.090, now has an IC-735 300 baud HF link, all new antennas, and a 10 MB hard disk for the Mailbox, thanks to WD6CMU, KA6OLK, N6IIW, N6FQR, N6EEG, KF6PD and NI6A. Don, N6EEG and N6JNK are working on a RACES program for El Cerrito. 80-meter NCN conditions have been poor of late, but EB regulars WB6UZX, W6VOM, KB6DR, N6KM, WB6DOB, K6APW and K6AGD are keeping the section well

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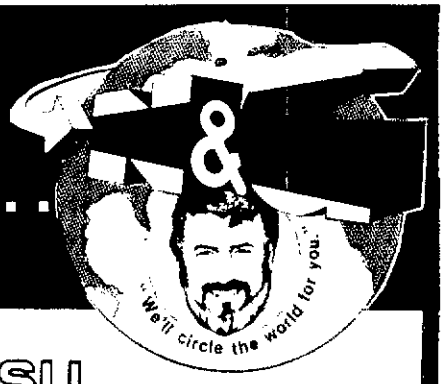

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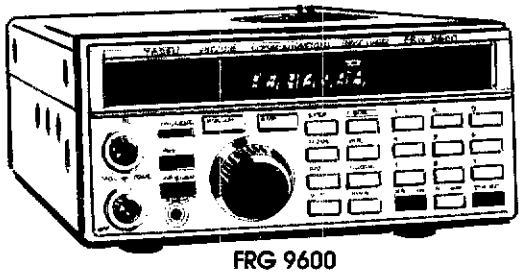

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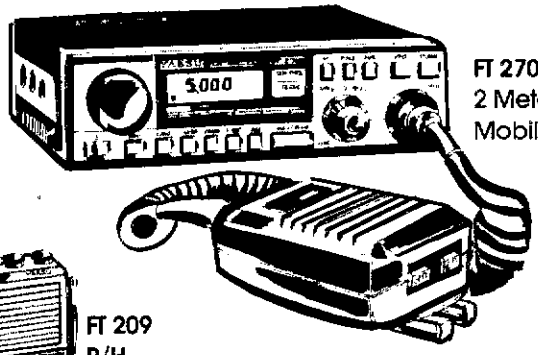

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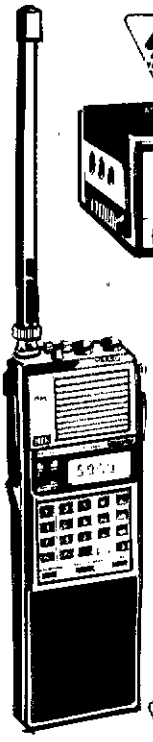
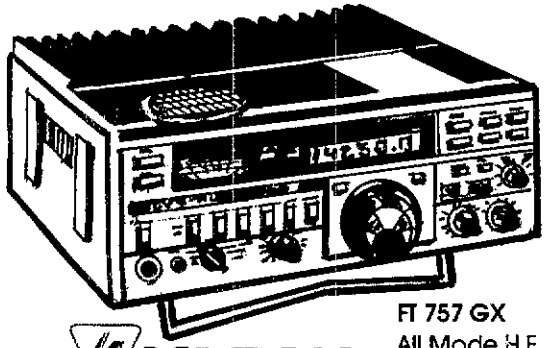
2 Meter 45 Watt
Mobile



FT 209
R/H
2 Meter
5 Watt
H.T.



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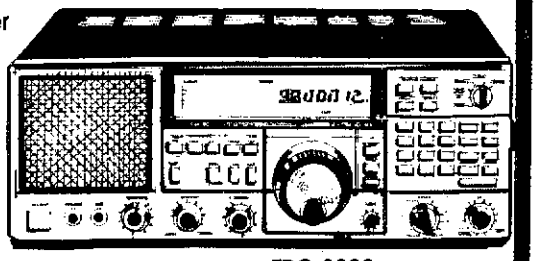
FT 757 GX
All Mode H.F
Transceiver



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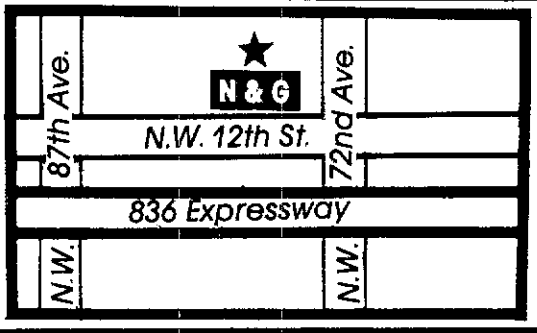

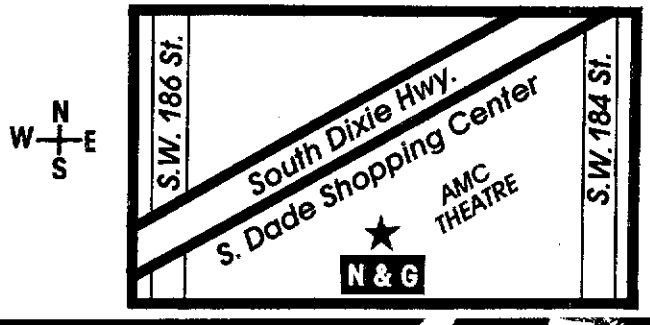

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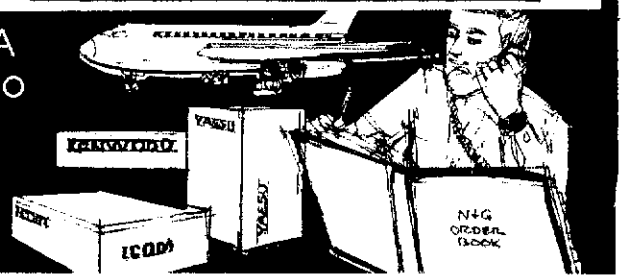

represented. The LARK Klutz of the month award was won by KB6HNH. Traffic: K6AGD 191, W6VOM 168, K6APW 151, WB6DOB 111, NI6A 66, WB6UZX 25. (Oct.) WB6UZX 36.

NEVADA: SM, Joe Lambert, W8IXD—SEC: K7HRW and W7BS have been appointed to the Steering Committee for Amateur Radio Station at the Vets Hospital. Other stations who have worked hard putting it all together are WA7ANA, W6JBB, WA7NLC & WA7VXZ. There were 347 check-ins to KA7EUA on the Nevada WX Net. Congrats to K7ICW for recruiting three ATCs—the most recently appointed being KE5ER. The Las Vegas Amateur Radio Club recently had an election with the following results: Pres, KG7ZA, VP N7CLK, Sec, KE7JX, Treas, WB7VUK and Board Members: K7WS, N9BCD and WB7EHN. TARA member WA6EWV reports the 145.6 Simplex repeater is installed at Angels Roost on a trial basis. W8IXD, SM has been invited to a Pacific Division Cabinet Mtg. on Jan. 11. NNARA's 1986 officers are: Pres KB7VU, VP KD7QJ, Sec/Treas, KD7SP, Sgt. at Arms KD7PD, Act. Mgr. W7GRY. SNARS reports a new ham radio store in Reno owned by KA7QYX.

PACIFIC: SM, James Wakefield, AH6CO—My term is nearly up and I will not run for SM. It has been a pleasure to serve you and hope you give my replacement the help you have offered me. Hawaii West's new officers are NH6M, prexy; NH6CH Veep; NH6DT, Sec'y; WH6AJC, Treas. Kauai reports new officers are KH6HU, prexy, KH6JIB, Veep, KH6AO, Sec'y; WH6AGU, Treas and KH6F, Activities Mgr. HARC elected KH6RQ, prexy, KH6NK, VP; KH6EEU, Treas. Directors are KH6KH, WH6AYM, AH6CK & WH6AWH. VEC tests produced another "no license" to extra for Norm Nelson on Maui. Also "NL" to Tech for John Bruce. WH6BFB and WH6ARS from Nov to Tech and KH6UU from Gen to Adv. In Kona, WH6AZI up'd from Gen to Adv; WH6BFT to Tech and Glenn and Jean Sakimura both obtained Extra. Congrats to all! Traffic is low!!! Traffic: KH6S 39, KH6H 32.

SACRAMENTO VALLEY: SM, Bob Watson, W6IEW—Trinity County cancelled their SET participation this year. After 15 hams spent 28 hours around the SET weekend in three different search and rescue emergencies, all successfully concluded, they didn't see the need for PRACTICE in a SIMULATED emergency. The Amador County ARC displayed their Emergency Van for the first time and included a treat for the kids. Set up in the major shopping center, they had a table where children could talk to "Santa" at the "North Pole" via 2M simplex. "Santa" (in a vehicle nearby where he could see without being seen) delighted nearly 50 kids the first day despite pouring rain. Thanks to Glenn Koropp, W6YFW, and Ed Anselmo, KW6N for participating for the Sacramento Valley Section in the "Exercise Night Tango XII." An expert at helping handicapped people, Helen Szucs, KB6BNC again assisted a VE team holding a special examination session for four blind hams trying to upgrade. Your help is much appreciated, Helen. Thanks for past services to ASM Hugh Nickles, WB6YKI and ECs Milt Smith, WD6EHF and Bill Jackson, W6OWQ who have resigned. We will miss your help. Traffic: WB6CLD 460, N6LUY 350, WA6WJZ 264, K6SRF 105, WD6BZQ 52. WA6ZUD 15, KB6CFX 4, WA6ERZ 4, WB6SRQ 10.

SAN FRANCISCO: SM, Bob Smith, NA6T—New Assistant Directors have been nominated from the SF Section. Asst. Directors from each club have been appointed. If you are interested in being an Asst. Director contact NA6T. SFRC 2nd Annual Computerfest is in January with working exhibits of ham applications at the club meeting. SF Section participated in "nite tango" NCS exercise with mild success, but work is needed in traffic handling and reliable communications. A digipeter is in the HARC-FWRA "xmas stocking" tnx for KE6LF, W6BME, WF5G, and others. KE6LF, the SEC for the Section, is looking for more active participation in Emergency Communications. Everyone has a nitch in RACES-ARES. Get out and support your local group. L CARS has been active in Search and Rescue with Lake Co. Sheriff's Dept. Also VE testing is alive in lake Co. with KB5AMP, Marilyn, as VE Coordinator. I hope 1986 will be great for Amateur Radio, best of Holiday greetings to all. Traffic: N6FWG 82, K6TP 56, K6TWJ 82, KK1A 78, NA6T 12.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD—SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. ACC: N6ECH. Asst. SMs: W6TRP and K6YK. N6DQE is a SILENT KEY. 1986 officers of the Fresno ARC are Pres WA6UOR, VP N6HEW, Sec KA6EME, and Treas WB6MCG. The club meets the second Friday in Fresno. 1986 officers of the Central Valley ARC are Pres W6TRP, 1st VP WA6CDB, 2nd VP WA6RXI, S/T W6VMB. The club meets the second Thursday in Bakersfield. 1986 officers of the Stockton-Delta ARC are Pres WA6KXR, VP KA7CJJ, S/T WA6WRP. The club meets the second Wednesday in Stockton. Congratulations to the following who recently upgraded: Extra N6JQT; Advanced KB6KKI, KB6IKD, and KB6GFD; General KB6JQK, KB6KEK, *and* KB6KKL; Technician KB6HAP, KB6JHE, KB6KGH. KB6ETA has a TW 4000. W6ZZB has a TR 2500. KE6DK has a TR 2500. Some valley Amateurs lost antennas in winds at the end of November. The 1986 International DX Convention is April 18-20 in Visalia. The 1986 Fresno Hamfest is set for the first weekend of May in Fresno. Traffic: N6AWH 86, K6PMG 18, W6DPD 14, WA6YAB 10.

SANTA CLARA VALLEY: SM, Glenn Thomas, WB6W—BM: W6BCY. PIO: N6BIS. TC: K6HLE. SEC: K6ITL. ACC: W6MKM. ASM: NS6N. STM: W6PHT. Hello to all. My goal as your SM is to enable the ARRL to serve the amateur radio community as well as possible. I need your help. If you have a question, a comment, or a problem I would like to hear about it. My address and phone number is in the front of *QST*, and I can often be found on the WB6ADZ repeater, 146.115 +600. New editor for the Foothills ARS Footprint is AA6PZ. Good luck, Paul. WB6AAJ has been busy organizing the Festival of Lights parade, not made any easier by its being postponed by rain. WN6I gave an excellent talk to the South Bay ARA on the local ARES organization. WA6LIJ is home after a long vacation. Congratulations to new EC WA6PUX (Mountain View) and new OO K6AYB. The SJSU club is in new digs while the old W6YL site is dug up. Checkins on the Monday (145.27-) and Tuesday (146.115+) night ARES nets has been running between 80 and 90. Why not join them and get involved in ARES? Also, remember the SM section net on Tuesday at 2100L, on WB6OQS/R 146.76. I plan to attend as many club meetings as I can in the months ahead, which will be much easier if I know when and where you meet. Traffic: (Nov.) W6YVB 235.

ROANOKE DIVISION

NORTH CAROLINA: SM, Rae Everhart, K4SWN—SEC: AB4W. STM: K4NLK. BM: K4IWW. ACC: WC4T. PIO: WA4OBR. TC: K4ITL. OOC: K1PLR. SGL: KE4ML.

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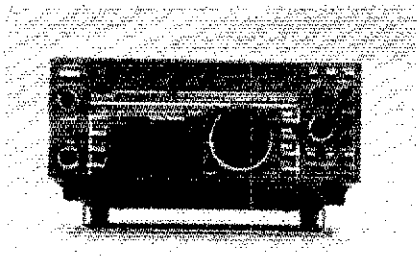

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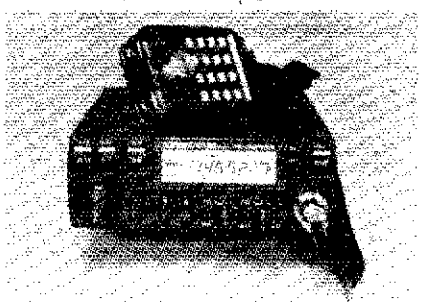

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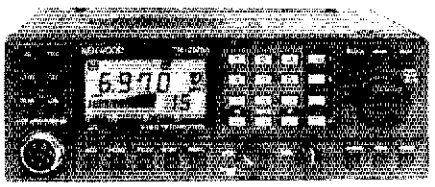

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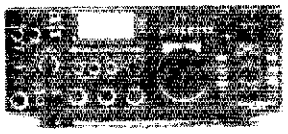

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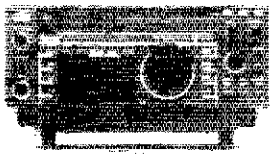

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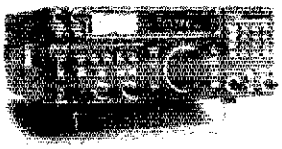

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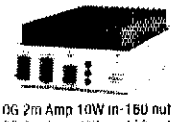

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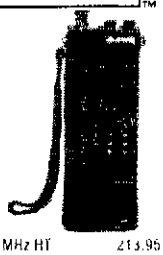

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FT-270RH 2m FM mobile	Call

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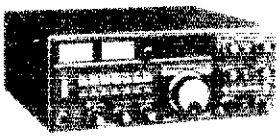

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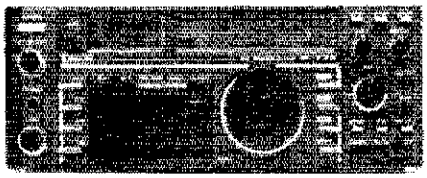

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EX-243 Electronic keyer unit	50.00	
IC-745 9-band xcvr w/.1-30 MHz rcvr	999.00	769.95
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EX-241 Marker unit	20.00	
EX-242 FM unit	39.00	
EX-243 Electronic keyer unit	50.00	
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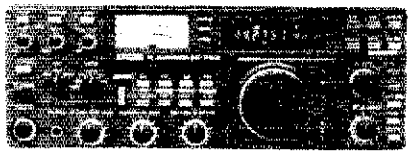
FL-54 270 Hz CW filter (1st IF)	47.50	
FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
FL-44A SSB filter (2nd IF)	159.00	144.95
HM-10 Scanning mobile microphone	39.50	
SM-6 Desk microphone	39.00	
HM-12 Extra hand microphone	39.50	
MB-12 Mobile mount	19.50	



IC-751 9-band xcvr/.1-30 MHz rcvr	1399.00	1089
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FL-32 500 Hz CW filter (1st IF)	59.50	
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RC-10 External frequency controller	35.00	
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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 (745/751)	56.00	
PP-1 Speaker/patch (specify radio)	139.00	129.95
SM-8 Desk mic - two cables, Scan	69.95	
SM-10 Compressor/graph EQ, 8 pin mic	119.00	
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

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Other Accessories cont.	Regular	SALE
AH-2 8-band tuner w/mount & whip	549.00	
GC-4 World clock • (CLOSEOUT) •	99.95	79.95
HF linear amplifier	Regular	SALE
IC-2KL 160-15m solid state amp w/ps	1795.00	1299
6-meter VHF Portable	Regular	SALE
IC-505 3/10W 6m SSB/CW portable	449.00	399.95
BP-10 Internal Nicad battery pack	79.50	
BP-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
VHF/UHF base multi-modes	Regular	SALE
IC-551D 80W 6-meter SSB/CW	699.00	599.95
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	

Limiter Offer! • Matching preamp* only $1.00 extra with purchase of IC-271A/H or IC-471A/H.

Accessories common to 271A/H and 471A/H	Regular	SALE
PS-25 Internal power supply for (A)	99.00	89.95
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
IC-27A Compact 25W 2m FM w/TTP mic	369.00	299.95
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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Hand-held Transceivers		
Deluxe models	Regular	SALE
IC-02AT for 2m	349.00	289.95
IC-04AT for 440 MHz	379.00	319.95
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
HH-SS Handheld shoulder strap	14.95
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
R-7000 25-2000 MHz, 117V AC	899.00	789.95
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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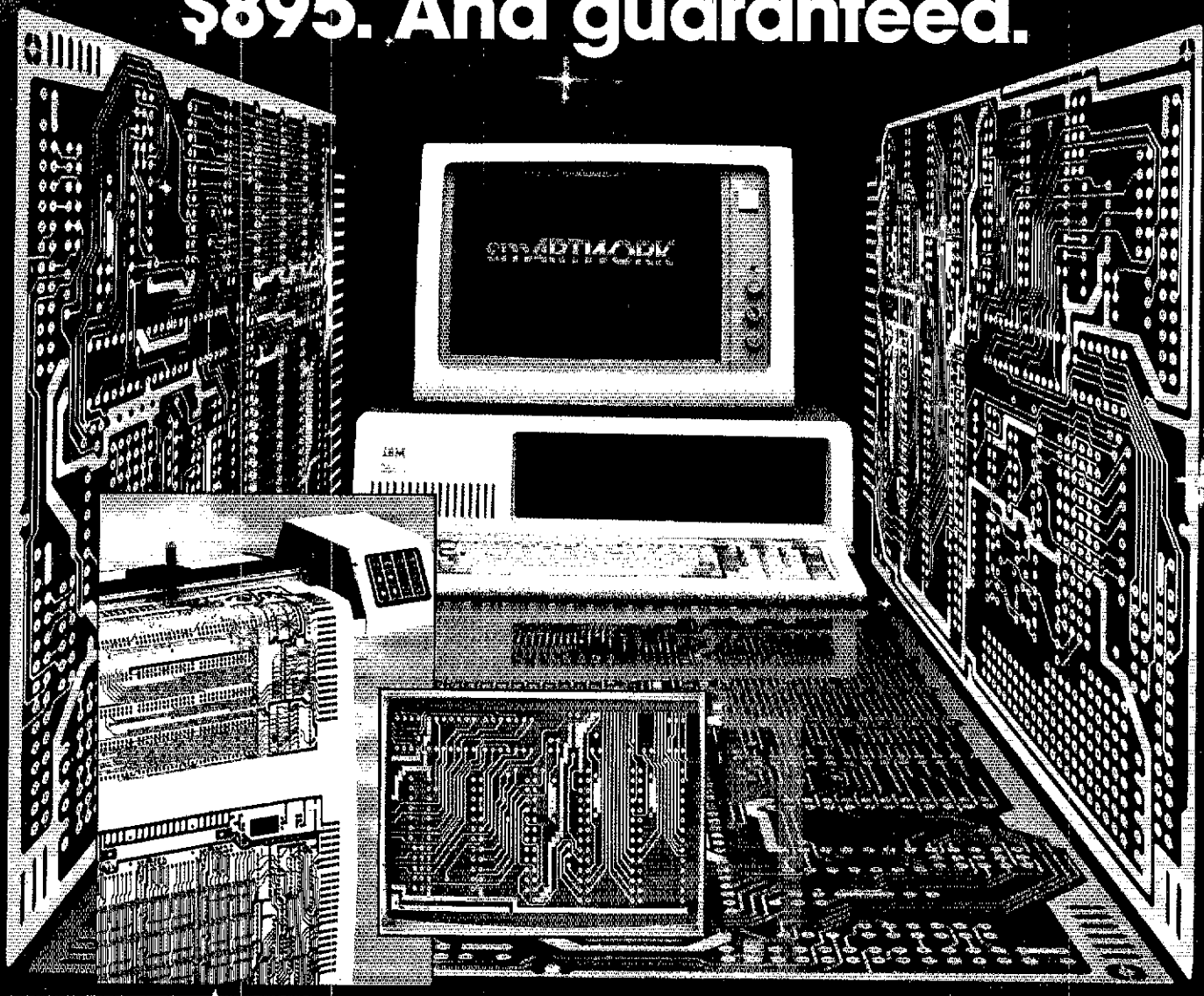

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Other features include CMOS circuitry for low power consumption, non-volatile memory to retain programming if power loss occurs, immunity to falsing, programmable security code and much more. The TP-38 is backed by our legendary 1 year warranty and 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.

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The first is still the best! The original FM "Dual Bander." TW-4000A delivers 25 watts output on both VHF and UHF in a single compact package.

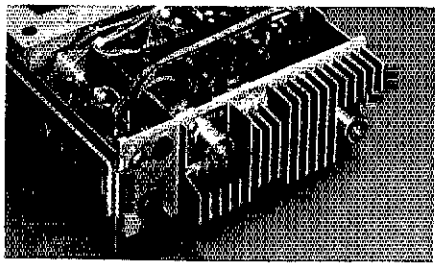
2 m and 70 cm FM in a compact package.
Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).

Single-function keys allow easy operation.

Large, easy-to-read LCD display.
A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.

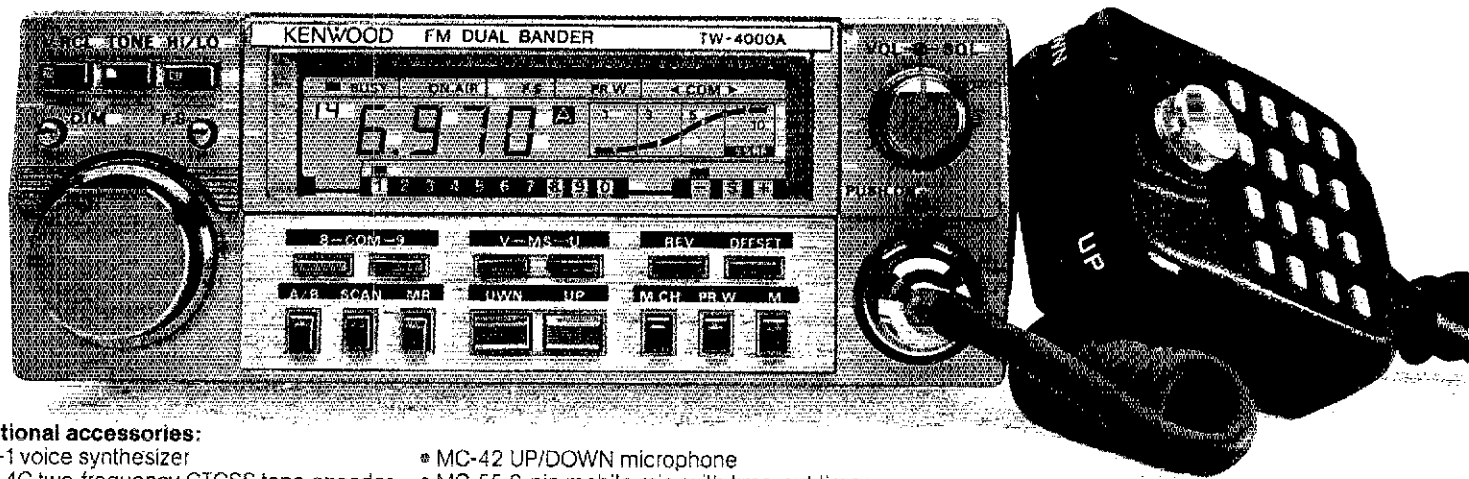
Front panel illumination.

10 memories with offset recall and lithium battery backup.
Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band (2 m/70 cm) operation.



- **Rugged die-cast chassis.**
- **Two separate antenna ports.**
  Use of separate antennas is recommended. This simplifies antenna matching and minimizes loss. However, mobile installations may require a single antenna. The optional MA-4000 dual band mobile antenna comes with an external duplexer.
- **Programmable memory scan with channel lock-out.**
  Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band scan in selected 1-MHz segments.**
  Scans within the chosen 1-MHz segment (i.e., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority watch function.**
  Unit switches to memory 1 for 1 second every 10 seconds, to monitor the activity on the priority channel.
- **Common channel scan.**
  Memories 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **High performance receiver/transmitter.**
  GaAs FET RF amplifiers on both 2 m and 70 cm, high performance monolithic crystal filters in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Optional "voice synthesizer unit."**
  Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Repeater reverse switch.**

More TW-4000A information is available from authorized Kenwood dealers.



Optional accessories:
VS-1 voice synthesizer
TU-4C two-frequency CTCSS tone encoder
PS-430 DC power supply
KPS-7A fixed station power supply
MA-4000 dual band mobile antenna with duplexer
SP-40 compact mobile speaker
SP-50 mobile speaker
- MC-42 UP/DOWN microphone
- MC-55 8-pin mobile mic. with time-out timer
- SW-100B SWR/power meter
- SW-200B SWR/power meter
- SWT-1/SWT-2 2 m/70 cm antenna tuners
- PG-3A noise filter
- MB-4000 extra mounting bracket

Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.
Antenna mag mount is not Kenwood supplied.

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Sweetness is here. HAPPY VALENTINES DAY to all. Congrats to: W4WJI, WA4MXZ, N4JRE, KF4WY, WC4T, WB2LEI, WD4RMQ, KB4IVV who received PUBLIC SERVICE AWARDS for participation in the N/T exercises and club public services above and beyond the call of duty. To upgrades in Nov. KB4OEX, KF4CL, WA4NRA, N4JVH, KB4QHV, W4JIS, K4IDD, WD8DQL, WB4SLF, N8EVJ, KB4GGH, N4JVD, KB4PUF, KB4FKF, KB4PNM, KB4JPU, KB4NYT, KB4NFO, N4MVZ, KB4MUC and all those who made the grade at Greensboro Hamfest. KU4W reports that exams given recently were a 95% pass rate. The League has the correct study material and the student is becoming better prepared. WD4BMG has 5 new Techs from his Novice class. KI4KM reports 2 new Novices from W4PAR. See you at Elkin Hamfest Feb. 16. K4EG club will sponsor NC QSO party contest Feb. 1 and 2. They also report that local cablevision company will loan them a video recorder for 86 Field Day to make a documentary of FD for viewing on local cable. Other clubs might be able to do this for added publicity. Extra points too. New Station Appointments ORS: AK1E, ATC: WA5DJJ. Silent Keys: W4QAF, WB4ZOZ. New packet repeater going up at W4BFB. CFARS may place first in fall 10-10 CW contest. New officers at W4NYR: N4FMH, KB4EOO, N4GOQ, WA4TTS, N4MRZ; at W4DW: WA9NEW, WB4USX, WB4ZSM, K4BWC, WB4MCU, WA4APK, WA1WXL, K4GOE, N4MCC; at CCARS: W4NTQ, K4HZR, WD4ECC; at CFARS: N4EWG, KE4HW, KD4XC, KB4FSI. Just another reminder that the SECTION conducts a net on the first, second, third, and fourth Thursdays at 8 PM on the 2M Link Repeater system. This is on the SECTION level and the NCS is usually a Section staff member. Everyone is invited to participate. This is a sincere way of bringing the league closer home to the section. N4JRE has received his PSHR certificate. Congrats. This month is best reporting of SARs to date. Thanks to all. Traffic: K4NLK 312, NJ4L 244, K4JHF 212, WB4HRR 148, KA4EYF 144, KB4FWL 98, WB4WII 88, KI4YV 78, WA4MNR 73, KB4IVV 60, AK1E 52, K4DDY 50, N4LST 49, WB4N 46, K4IWW 43, K4SWN 43, KA4YMY 38, NE4J 33, N4LUO 32, AA4MP 32, N4BYV 30, KU4W 28, N4JEO 25, WA4OBR 25, WD4EQK 23, K4GI 23, KB4OGR 20, WB4CYN 17, N4CJJ 16, K4YJB 16, N4JRE 13, K4FOY 12, WD4MRD 12, WD4HTE 10, N4MQU 10, N4UE 10, K4QXA 8, N4KYD 7, WD4RMQ 5, N4KOZ 4, K1PLR 3, KB4OKB 2. (Oct.) N4LST 56.

VIRGINIA: SM, Claude Feigley, W3ATQ—STM: KB4WT. SEC: WB4UHC. OOC: W4HO. ACC: NT4S. BM: AB4U. TC: WB4MAE. SGL: W4THV. For a listing of Section NTS NETS see last month's *QST*. Additional reports of ARES activities during the floods of early November indicate that WA4RTS, KB4IQT, W4OKM, N4ING, WD4RMK, K4YCR, and N4JMK were active supplying communications and performing damage assessments. In the Glasgow/Buena Vista area WD4RIE and members of the Lexington club supplied communications when Glasgow was completely cutoff from the outside world and was without electric power by the use of their communications van. The Winchester club had 20 of its members heavily involved in the Moorefield, WV, disaster area. They set up 6 stations in the Town Hall and 1 station at the local radio station where they were active from Nov. 5-12. They were constantly busy since there were only 2 telephones in service at the Town Hall which was the headquarters for the Red Cross, National Guard, Civil Defense, and the police and sheriff's departments. Stations active were: KD4TZ, WA8ALI, W3HQX, K4QAX, NC4B, W3THD, KE4KF, WA4HVU, KJ4EK, WB4FNW, K4LWG, N4MCS, WA4HBR, NT4S, WD4JSN, K4RMX, K4TIX, N8GFN, W4UGX, K4AC, KF4HP, WD8CNM. All parties involved in these emergencies report that their ability to perform a good job is the result of participation in their local 2-meter ARES nets and the NTS nets of the section. Does your local ARES group meet regularly on 2 meters? If not, start a net NOW. DEC N4EXQ has appointed the following new ECs: WB4VWR, Chesterfield; N4KDE, Hopewell-Prince George; KB4DCE, Henrico. WA4LTO, former chief-op at K4KDJ, have received his MBA and is working in Vienna. Jim will be missed on the NTS nets. The Lake Ridge ARA in Woodbridge is interested in ARRL affiliation. The Woodbridge Wireless Club has elected new officers with WA4MMN as prexy. Reminder to all Affiliated clubs: keep ARRL hdqs informed of any officer and mailing address changes. OOC, W4HU reports W4HU, W8IRT and AA4EL were active monitoring the bands as OOs. N4HSJ was heard on Packet radio as activity keeps growing in this mode of operation. Traffic handling activity: N4GHI and N4EXQ make BPL again. Both have made BPL for 10 consecutive months, an outstanding accomplishment. Fourteen stns make the PSHR Honor Roll led by N4GHI and N4EXQ and followed by KB4WT. See you at Winterfest in Vienna February 23. Traffic: N4GHI 818, N4EXQ 662, WB4PNY 363, AA4GL 346, AA4AT 328, W4JLS 169, WA4CCK 166, K4JST 164, KB4WT 162, W3ATO 120, WB4KIT 114, K4MTX 113, WD4ALY 106, N4KSO 88, WD4CCW 88, K4JUM 80, K4AXF 68, K4JM 56, K3RZR 56, NT4S 55, WD4MIS 51, W4WVP 50, WB4FLT 45, WA4LJI 43, WB4FDT 37, NN4I 37, WB4KSG 33, K4GR 31, N6ANQ 28, K4BGZ 26, N4DWO 26, KA4ERP 26, K4VWK 22, W4TZC 20, WA4TVS 19, WB4DQZ 16, NW4O 16, K4MLC 15, N4FNT 14, KC4HN 14, KB4OPR 10, WB4ZNB 10, KA4IUM 9, N3RC 9, W4YE 2.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT—SEC: K8QEW. STM: KD8G. SGL: K8BS. ACC: WA8CTO. TC: K8CG. All classes of exams will be given periodically in Chas. SASE to AC8K will bring details. For information on ham classes in Chas. area contact K8WMX. Spring Mtg of State Am. Radio Council will be at Jax. mtn on 3-8-86. This is an important mtg. plan to attend. KD8RD made BPL in Nov.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVFN	3865	6:00	1192	1200	30	W8YP
WVMD	7235	11:45	781	127	30	W8FZP
Hillbilly	14290	Noon Su	136	8	4	W8YP
WVNN	3730	7:30	36	8	18	WD8LDY
WVN	3567	7:00	246	87	30	KZ8Q
WVRN	3640	6:30	211	36	29	KD8RD

Traffic: KD8RD 531, WD8LDY 431, N8GJO 417, W8FZP 397, W8GK 279, KZ8Q 276, W8YP 242, K8UQY 206, WA3NUI 190, WD8EBH 158, K8QEW 101, N8FXH 131, K8KT 88, N8EMQ 79, KA8OGF 64, WA8KCJ 37, KD8G 34, W8JWX 31, KD8VT 31, NC8G 20, WA8YCA 14, WD8MJE 5.

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. As with most of the western states, winter came early with severe cold and lots of snow to Colo. This has put the State linking system behind, and it may be spring before any sites can be worked on. CCARC voted at their qtr meeting to retain the 15 kHz separation in Colorado. If your club or repeater group is not a member, please con-

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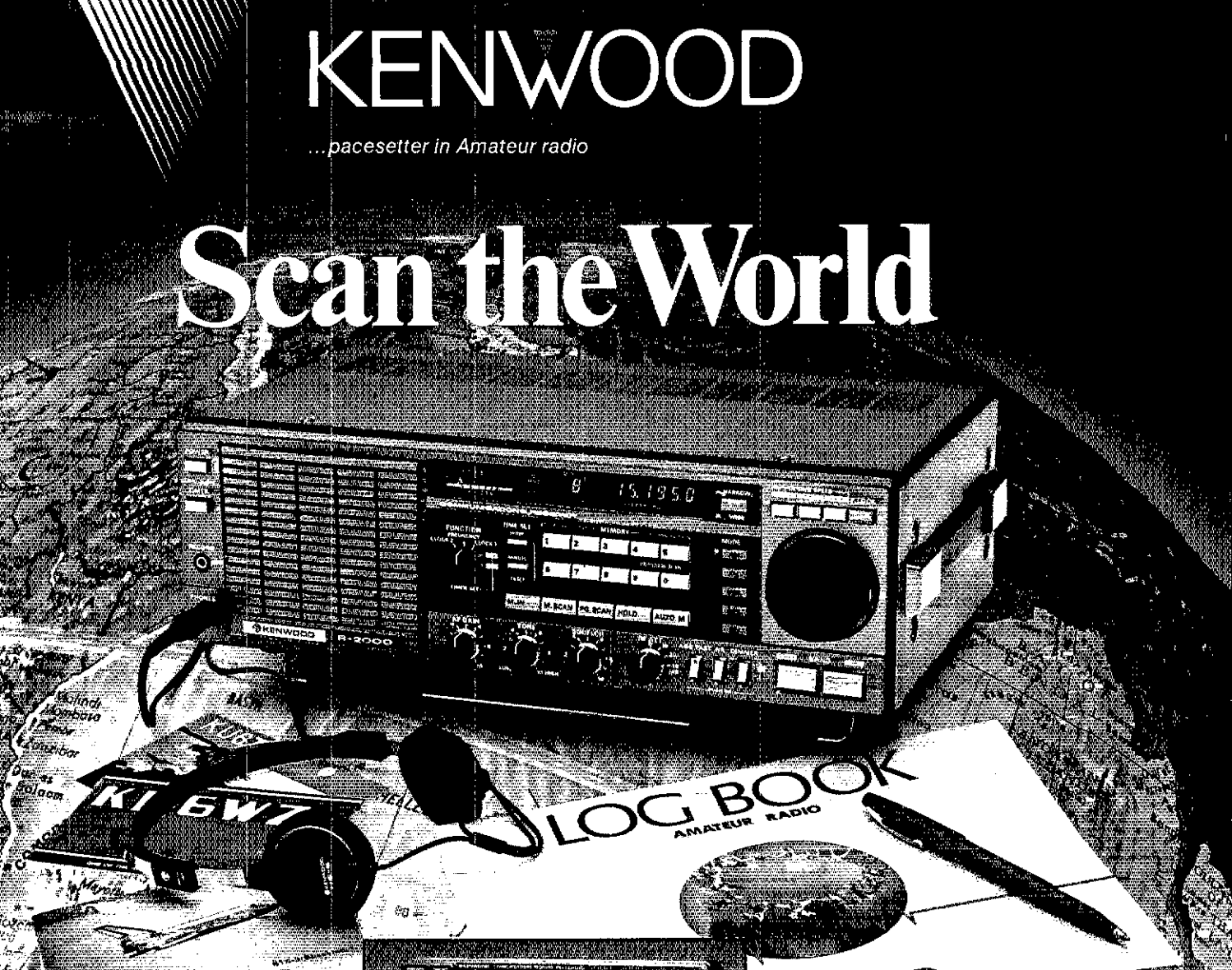

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All-mode receiver.

- Covers 150 kHz – 30 MHz in 30 bands.
- All mode: USB, LSB, CW, AM, FM.
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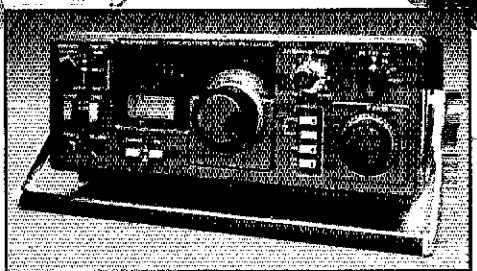
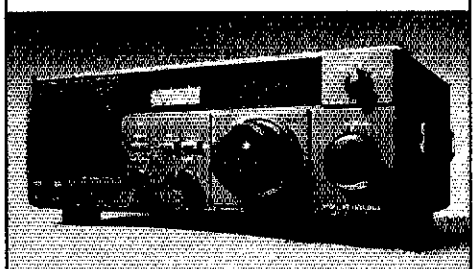
- Squelch circuit, all mode, built-in.
- Noise blanker built-in.
- Large front mounted speaker.
- RF step attenuator. (0-10-20-30 dB.)
- AGC switch. (Slow-Fast.)
- "S" meter, with SINPO scale.
- High and low impedance antenna terminals.
- 100/120/220/240 VAC operation.
- RECORD output jack.
- Timer REMOTE output (not for AC power).
- Muting terminals.



R-1000 High performance receiver • 200 kHz-30 MHz in 30 bands • AM, CW, SSB • 3 IF filters • noise blanker • RF attenuator • S-meter • 120-240 VAC • muting terminals • built-in speaker • digital display/clock/timer



R-600 General coverage receiver • 150 kHz-30 MHz in 30 bands • AM, CW, SSB • IF filters • noise blanker • RF attenuator • S-meter with SINPO scale • front mounted speaker • 3 antenna inputs • 100-240 VAC operation • record jack • muting terminals • digital display

Optional accessories:

- VC-10 VHF converter for R-2000 covers 118-174 MHz
- YG-455C 500 Hz CW filter for R-2000
- HS-4 Headphones
- HS-5 Deluxe headphones
- HS-6 Lightweight headphones
- HS-7 Micro headphones
- DCK-1 DC cable kit for 13.8 VDC operation
- AL-2 Lightning and static arrester

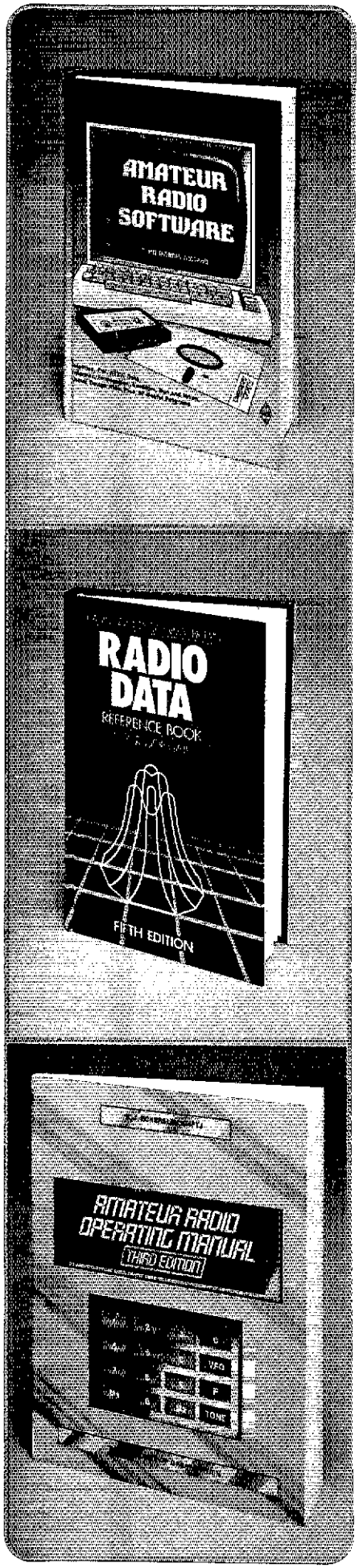
Additional information on Kenwood all-band receivers is available from authorized dealers.

25th Anniversary

KENWOOD

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

Service manuals are available for all receivers and most accessories.
Specifications and prices subject to change without notice or obligation.



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

KENWOOD

...pacesetter in Amateur radio

TR-9130

R-9130 2 meter all mode

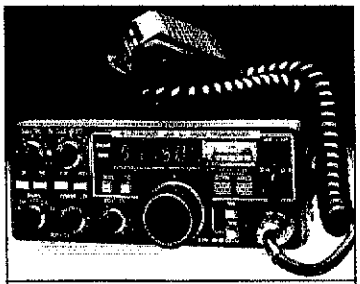
ne TR-9130 is a compact rig
iat gives you 25 watts of RF
ower on all modes!! You can
elect your tuning steps from
00-Hz, 1-kHz, 5-kHz or 10-kHz.
/ith six memories, you can
rogram your favorite frequen-
es! (FM 1-5 Simplex or
600-kHz offset, memory
non-standard offset, all six
r simplex, any mode!) Dual
gital VFO's, and transmit
equency tuning enhance
SCAR operations.

Internal battery back-up (9 V Ni-Cd not Kenwood supplied) retains memories for approximately 24 hours, in case you operate mobile and base!

Other convenient features such as automatic band scan, squelch circuit for FM/SSB/CW, tone switch, repeater reverse switch, CW semi break-in; sidetone, high performance noise blanker HI (25) LOW (5) power switch (FM/CW) RF gain control, and RIT circuit further enhance this expressive package!

Optional accessories:

- KPS-7A AC power supply.
- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
- SP-120 external speaker.
- TK-1 AC adapter for memory back-up.
- SP-40 mobile speaker.
- SP-50 mobile speaker.
- SW-100 A/B power meters.
- MC-55 Mobile Mic w/time-out timer.



TR-9500

70 CM SSB/CW/FM transceiver

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

TS-711A/TS-811A

Multi-function all-mode 2 m and 70 cm transceivers.

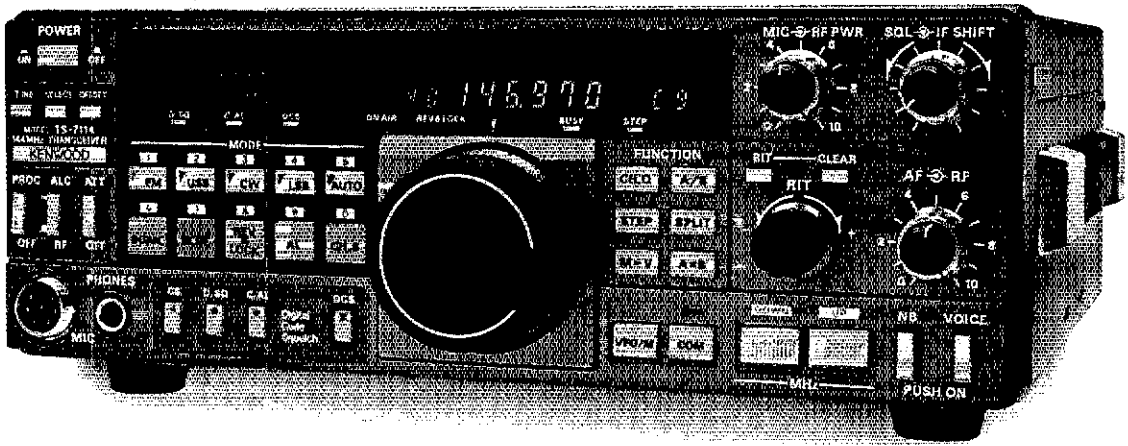
The TS-711A 2 m (142-149 MHz) and TS-811A 70 cm (430-450 MHz) all-mode transceivers are perfect base station units, designed to complement your present HF station. Both feature Kenwood's innovative D.C.S. circuitry. Built-in dual digital VFO's provide commercial-grade frequency stability through the use of a TCXO (Temperature Compensated Crystal Oscillator). The new fluorescent multi-function display shows frequency, RIT shift, VFO A/B, SPLIT, ALERT, repeater offset, digital code, call sign code, and memory channel. 40 multi-function memories store frequency, mode, repeater offset and tone. They have programmable scan, memory scan, and mode scan. The Auto-mode function automatically selects the correct mode for the frequency being used. When a mode key is depressed, an audible "beeper" announces mode identification in International Morse Code.

The TS-711A/TS-811A also feature all-mode squelch, noise blanker, speech processor (SSB, FM), IF shift, RF power control, alert, and a unique channel Quick-Step tuning that varies tuning characteristics from conventional VFO feel, to stepping action when CH.Q switch is depressed.

Combine all these features with built-in AC power supply and a hefty 25 watts RF output power and you have your ideal base station.

Optional accessories:

- CD-10 Call sign Display
- TU-5 CTCSS Tone Unit • VS-1 Voice Synthesizer • MC-60A Deluxe Desk Mic • MC-80 Desk Mic • MC-85 Desk Mic
- SP-430 External Speakers
- MB-430 Mobile Mount
- PG-2J DC Cable



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Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation

tact me for further info as the dues have been changed to be much more fair and equal for groups no matter what size of membership. CCARC is a needed organization in this section, help to support it with your input. RMRL is the latest repeater organization to vote to put up a digipeater for packet if it is installed on Squaw, it will have great coverage on the eastern slope. Congrats to the W. Slope ARC for setting up station capabilities with the Veteran's Hospital in Grand Junction this is a first for the section, and will be a great asset. 73, KQ0J. NETS: Col; QNI 919, QTC 42-Inf 92, Time 858, 26 sess. CWN: QNI 124, QTC 55, Time 473, 30 sess. CWXN: QNI 2831, QTC 2321, Time 2700, 30 sess. HNN: QNI 1946, QTC 130-Inf 473, Time 15552, 30 sess. SCTN: QNI 78, QTC 8, Time 181, 19 sess. Traffic: N0BQP 2085, WA0HJZ 1282, K0RXK 532, W0ACH 512, K0JAN 499, WA0OYI 328, KB0Z 192, W0LAE 88, WD0AIT 79, WB0FFV 70, WD0BSG 70, N0DZA 51, AI0W 12.

NEW MEXICO: SM, Joe T. Knight, W5PDY—ASM: W5HD. DEC: KB5XD. STM: ND5T. NMs: WA5UNO K6LL W5VFQ. TC: W8GY. ACC: W5HD. Southwest Net (SWN) meets daily on 3583/7083 at 0230 UTC and handled 213 msgs with 210 stations in. New Mexico Roadrunner Net meets daily on 3939 at 0100 UTC and handled 75 msgs with 1157 stations in. New Mexico Breakfast Club meets daily on 3939 at 1330 UTC and handled 102 msgs with 801 stations in. Yucca 2-mtr Net 78/18 handled 16 msgs with 360 checkins. Caravan Club 2-mtr Net 66/06 handled 8 msgs with 181 checkins. SCAT 2-mtr Net 66/06 handled 21 msgs with 630 checkins. Sorry to report the passing of KD5CC, John of Roswell. He will certainly be missed. K5ECQ, Whitey is holding his own. Approx. 15 Hams took part in the SAR for a downed Acft near Gallup, NM. Good job fellows. Traffic: W5DAD 178, W6SX 21.

UTAH: SM, Jim Brown, NA7G—SEC: Rich Fisher, WA7JJL. STM: John Sampson, W7OCX. WA7MEL reports he is claiming WAS on 160, as of Dec. 4. VE Testing is continuing on a regular basis—thanks to all concerned for a successful program! WA7MXZ in Logan is now able to work packet into Salt Lake Valley on 2 meters simplex. 73 de NA7G. Traffic: K7HLR 209, WA7KHE 187, N7ASY 128, WA7JJL 54, WA7MEL 53, NA7G 22, W7OCX 4.

WYOMING: SM, Dick Wunder, WA7WFC—ASM: KA7AWS. SEC: W7TVK. STM: KA0X. Numerous locations hosting their first VEC Exams and I would like to thank everyone for their effort. Upgrades at Rawlins exam—KA7SGR & KA7VMA to TECH, KA7VMR to GEN & WB7BGT to ADV. Upgrades at Green River exam—KA7QFS to TECH & KA7FLE to EXTRA. New Novice include; Laramie—KA7WIV & Cheyenne—KA7WJT, KA7WKH, KA7WKI, KA7WKJ, KA7WKK & KA7WKL. Congratulations to all. Wilson Sellner, WB7RRZ, has been recognized by the National Weather Assn. for his outstanding contributions during the Aug. flood in Cheyenne as net control for the Severe WX Net. Congratulations Wil, from all of us. Wyo Cowboy Net—22 Sessions, 839 QNI & 21 QTC. Traffic: NN7H 215, W7HLA 26, NQ7Q 25.

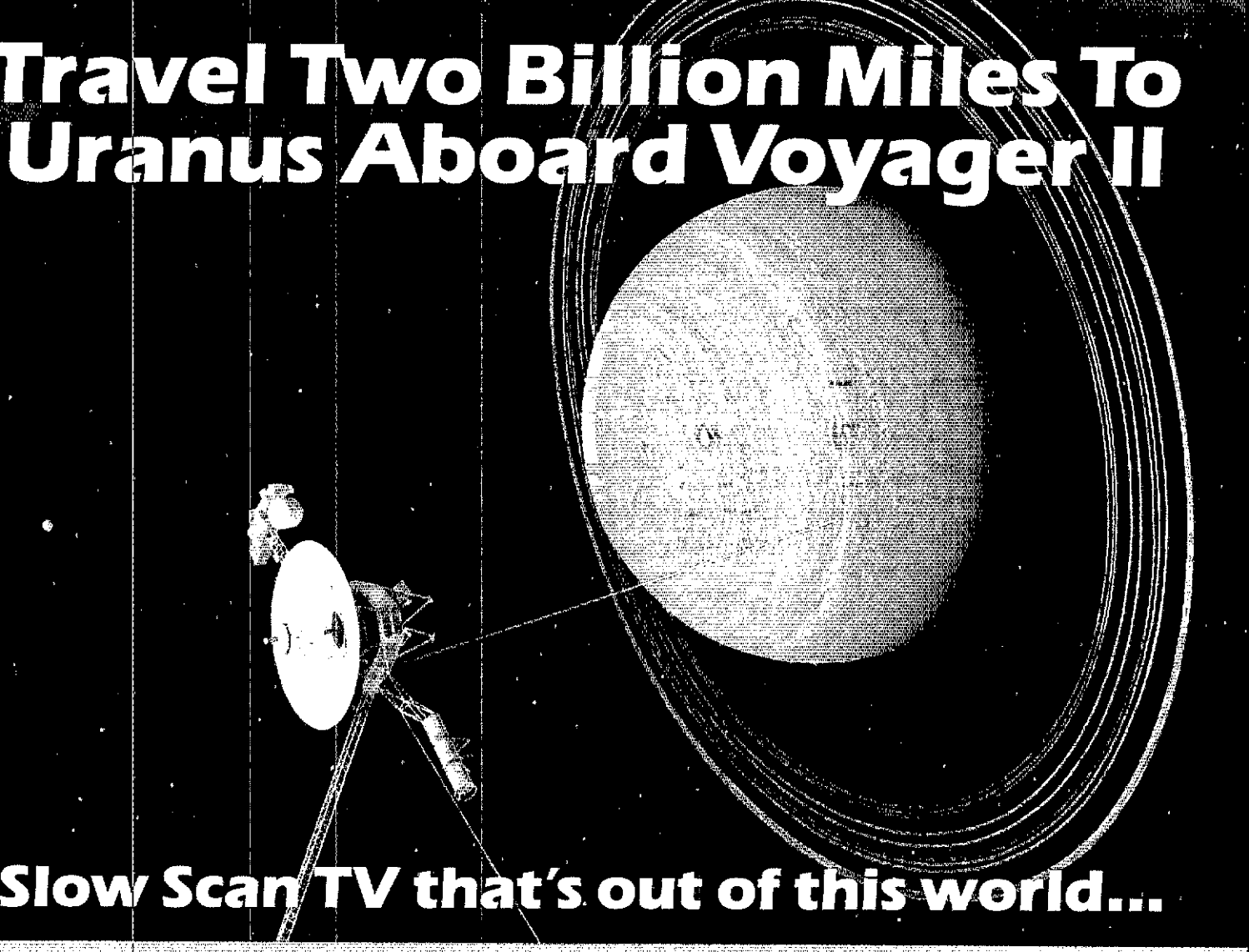
SOUTHEASTERN DIVISION

Administrator's Note: The October Section News report from Alabama did not appear in January QST because of an administrative oversight. We regret the omission. The October report is presented this month, followed by November's report.

ALABAMA: Joseph Smith, Jr., WA4RNP—STM: N4JAW. SGL: KA4WVU. BM: KF4VV. OO/A AUX: AA4BL. TC: N4AU. ATC: WB4BYQ. ACC: WA4RNP. Another year has gone by and we have seen many changes in our hobby. We have new modes and bands to explore and some new laws to ease the way for effective antennas. It was a good year and as we "did more in 84" and "came alive in 85" so may we "do more tricks in 86." Let's experiment with the new modes and adapt to the future. The Huntsville Area Young Ladies Amateur Radio Club (HAYLARC) has become our newest Special Service Club. I know they will be an asset to our fraternity. By now you know that WA4FAT, Bill Levey is our new "B" Net Manager and that Mac, KJ4MG (ex N4JTX) is now the "M" Net Mgr. It is sad to note the passing of these "hams": N4ESG, James N. Duncan of Mobile; W4EF, Ralph A. Owen of Tuscombia; and W4EKL, Jerome J. Weaver of Huntsville. They will be missed by many. Reports for October: BPL: WA4JDH. PSHR: WA4JDH, W4CKS, WD4NYL, W4ZJY, and WA4RNP. CAND reports 671 messages passed in 31 sessions with these DRN5 reps present: NW4X and W4CKS. DRN5 reports 575 messages passed in 60 sessions with AL rep by WA4JDH, W4CKS, W4WJF, NW4X, and KC4GS. Traffic: WA4JDH 851, W4ZJY 141, NW4X 122, W4CKS 97, K4AOZ 80, WD4NYL 61, WA4RNP 49, AA4KE 46, WB4IXA 33, KC4GS 19, WB4TVY 12, W4DGH 8, W4WJF 6. My thanks to all of you who voted in the Sec. Mgr. election. It shows concern for our fraternity. Thanks for the show of confidence in electing me for another two years. Here are the new officers of EARS (Enterprise ARS): President N4JAG, Rick; Vice President WA4AKG, Cliff; Secretary K4PDK, Bob; and Treasurer W4FOS, C.W. and from the Cullman ARS: President KB4ACR, Al; Vice Pres WA4SYI, John; and Sec/Treasurer KD4ZO, Joe. The new SCARC (Shelby Co. ARC) officers are: Pres KJ4GH, Gary; Vice Pres K4EYM, Luther; Sec/Treasurer KB4KHG, Cheryl. This month the B'ham club will sponsor the Ala. QSO Party from 1600Z Saturday Feb. 22nd until 2300Z Sunday Feb. 23rd. Work sta once per band and mode. Work mobiles again if they change counties. Count: 2 pts phone 3 points CW each contact. See details elsewhere. Lots of trophys. CAND reports 832 messages in 30 sessions with DRN5 rep 100% by W4CKS and NW4X. DRN5 reports 806 messages in 60 sessions with AL rep 95% by WA4JDH, W4CKS, W4WJF, NW4X, KC4GS, and KB4GGQ. RN5 reports 242 messages in 27 sessions with AL represented 85%. BPL: WA4JDH. PSHR: WA4JDH W4CKS W4ZJY and WA4RNP. Traffic: WA4JDH 1093, W4CKS 139, W4ZJY 84, K4AOZ 56, KC4GS 50, WD4NYL 28, WA4RNP 27, W4DGH 10, W4WJF 8, WB4TVY 4.

GEORGIA: SM, Eddy Kosobucki, K4JNL—ASM & BM: K4VHC. SEC: NC4E. STM: W4PIM. ACC: WA4ABY. OOC: NA4I. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. Remember after 1 Jan 86 no FCC form prior to June 84 will be acceptable. Due to resignations on job transfers Atlanta ARC elected KC4MJ Pres & NM4T VP. GA-AL AMSAT net meets on 3857 at 8PM EST on Weds. All interested are invited to check in. For further info on AMSAT contact W4BIW. The Dalton ARC is a small club but they sure are active. Won't be long before the Hamfest season is agn upon us, Columbus kicks it off on March 22 & 23. If you want yours published in *QST* it must be n to HQ at least two months prior. Remind ur publicity chrm of this. Remember the daily Georgia secton nets. GCN at 0700 daily 0800 on Sun on 3995, GN daily at 1300 on 3987.5, GSSBN at 1830 daily on 3975, GSN at 1900 & 2000 daily On 3593. Albany reports 35 area hands involved in annual Pecan Festival Parade. They looked sharp in the orange vests provided by the parade committee. WB4JHS of Thomasville has a 10 meter beacon on 28.253 MHz CW for propagation study; he's

Travel Two Billion Miles To Uranus Aboard Voyager II



Slow Scan TV that's out of this world...

By adding SSTV to your station, you and thousands of amateur radio operators can view live pictures of URANUS from the cameras on NASA's voyager II spacecraft almost 2 billion miles away.

And for those stations equipped with ROBOT® Slow Scan, the JPL Amateur Radio Club will be maintaining a specific operating schedule (see box) during the encounter to enable you to receive pictures of URANUS within minutes of their arrival on earth.

So if you missed the lights of Mars, Jupiter's moons, or the rings of Saturn, here's your chance to see URANUS, one of only two planets tipped on its axis.

JPL's Amateur Radio Club's Voyager II/Uranus Encounter Operating Period

Call Sign: W6VIO (Voyager in Outer Space)
Dates: Jan. 18 - Jan. 28, 1986
SSTV Frequencies and Modes:
3845 kHz 14235 kHz 28680 kHz
7220 kHz 21340 kHz
Operating Times: (universal coordinated time)
0400-0700 UTC 0900-1400 UTC

With your ROBOT SSTV in your station, not only can you view the planet's pictures in your own home, but you can record them, too. Order your model 1200 TODAY!

Call (619) 279-9430 for further information. Visa or Mastercard accepted.

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Please send me the following Robot equipment. I understand that I can test Robot for any reason, for any length of time, and receive a full refund within 60 days from date of purchase.

☐ 1200C high resolution video II w/receiver $1295
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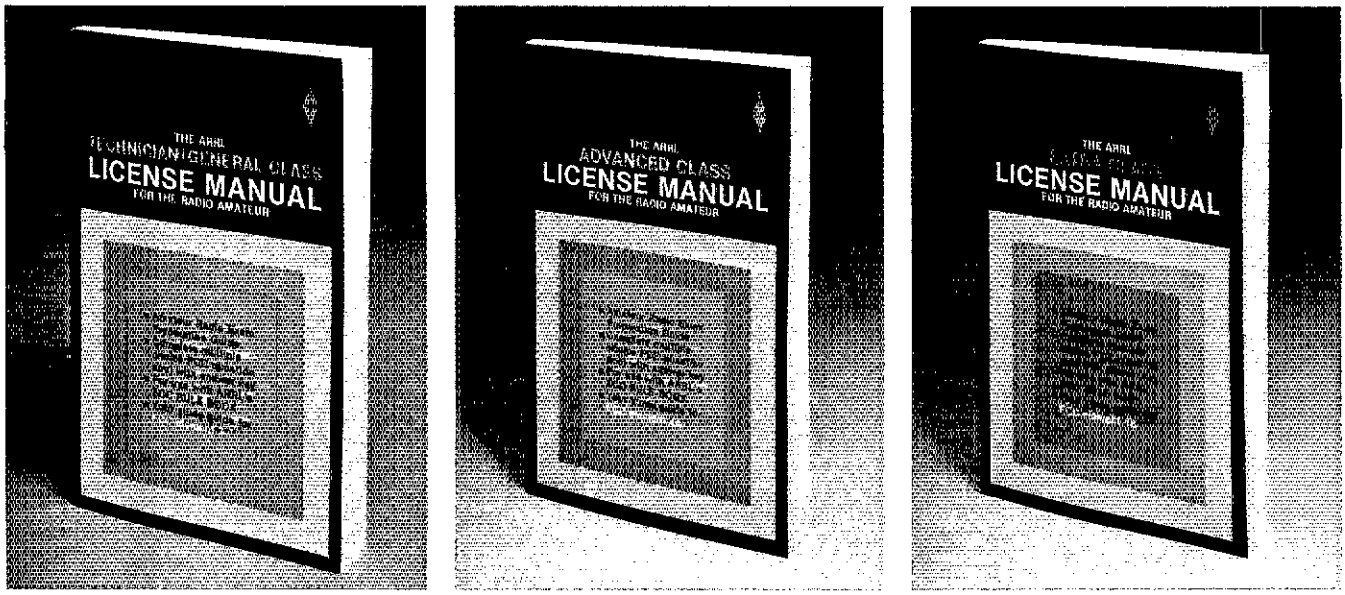
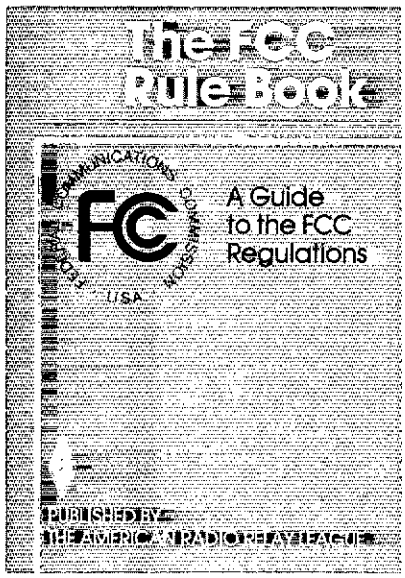
Name _____
Address _____
City _____ State _____ Zip _____
_____ Exp. Date _____
☐ MC ☐ VISA
☐ COD ☐ Enclosed check or money order $ _____



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

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The American Radio Relay League, Inc.
225 Main Street
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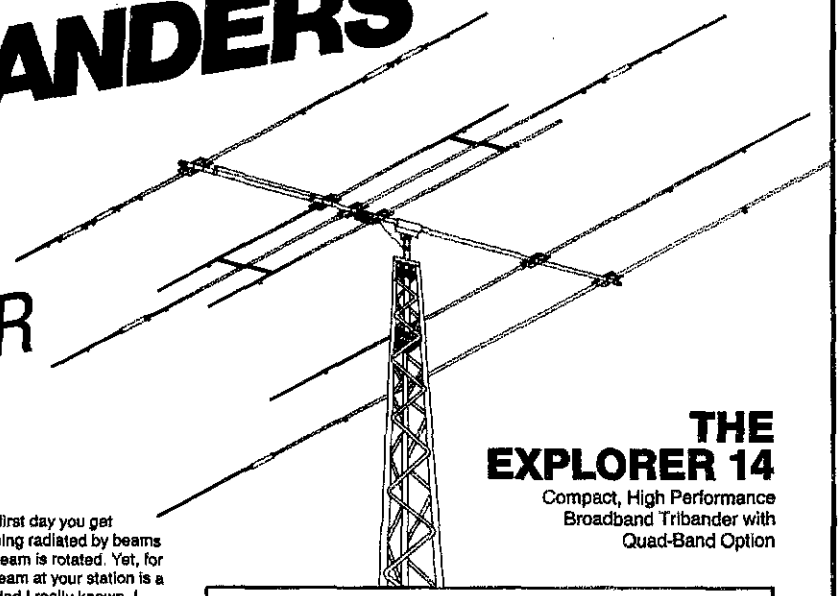
hy-gain®

BROADBANDERS

MAXIMIZE THE POTENTIAL OF YOUR HAM GEAR



There is nothing like a beam!

You hear about the importance of the antenna system from the first day you get involved in amateur radio. You hear the big signals on the air being radiated by beams and you hear those same signals virtually disappear when the beam is rotated. Yet, for whatever the reason, getting on the air for the first time with a beam at your station is a down-right exhilarating experience. The universal reaction is "Had I really known, I *would have installed a beam years ago*".

The gain of a beam multiplies the effective radiated power of your transmitter just like an amplifier. More importantly, it amplifies the signal from the station being beamed. Off the sides and back of the antenna, the effective radiated power of those kilowatts on/near your frequency are reduced to manageable QRP levels.

A well-designed beam is by far the best performance buy you can make and it doesn't use any electricity. Further, if you buy a good one, it will last longer than some of the electronics gear in your shack. In terms of cost per hour of enjoyment, a beam antenna is among the least expensive major station components.

As sunspot cycle 21 winds down over the next few years the priority for a good beam shifts from "great to have" to "essential!" To maximize your station capability on the high bands choose one of these super broadband arrays.

THE EXPLORER 14

The same compact size as the well-known TH3Mk3 it replaces. The driven element uses an open sleeve dipole which is a concept that we call PARA-SLEEVE (Patent Pending). The para-sleeve design achieves the broadband performance objective. The forward gain and front to back ratio is very impressive, especially when compared with other antenna designs in the same size class. 43 lbs. (19.5 kg) of superb performance on a 14 ft. (4.3 m) boom. Turning radius 17 ft. (5.3 m) and 7.5 sq. ft. (.69 m²) of surface area. The EX 14 is the ideal choice where space is limited. Great for roof mount or on smaller towers. Optional QK7-10 kit adds your choice of either 30 or 40 meters to the driven element.

FIVE ELEMENT THUNDERBIRD TH5Mk2

Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. 72 lbs. (32 kg) of rugged antenna with 7.4 sq. ft. (.68 m²) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).

SEVEN ELEMENT THUNDERBIRD TH7DX

This is a broadband successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribander's or stacked monobander's. 76 lbs. (35 kg) with a surface area of 9.4 sq. ft. (.87 m), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). If you own a TH6DXX, a conversion kit is available which includes the second driven element, the completely new matching system, a full set of stainless steel hardware, and of course, step by step instructions. After conversion, your TH6DXX is a TH7DX, exactly.

FEATURES COMMON TO EX 14, TH5Mk2, and TH7DX:

- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
- Handles maximum legal power with a respectable margin of safety.
- Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground.
- BN 86 balun supplied as standard.
- Top quality stainless steel hardware supplied at no added cost.
- Super strong, taper swaged 6063-T832 thick-wall aluminum tubing used throughout.
- Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (63 mm).
- Twist and slip proof die formed heavy gauge aluminum element to boom brackets.
- All tubing deburred and cleaned for ease of assembly.
- *Only one set of dimensions for complete coverage of all three bands below 2:1 SWR.*
- Designed to survive winds of 100 mph (160 km/hr).

THE EXPLORER 14

Compact, High Performance
Broadband Tribander with
Quad-Band Option

The value of a Directional Antenna was one of my early "discoveries". Over the years, I have built or bought numerous Quads and Yagis. I have never been so impressed as I am with my TH7DX. I enjoy QRP but now have a problem convincing folks that I am only running 5 watts! The TH7DX is a superb antenna, both from a performance and a structural point of view.

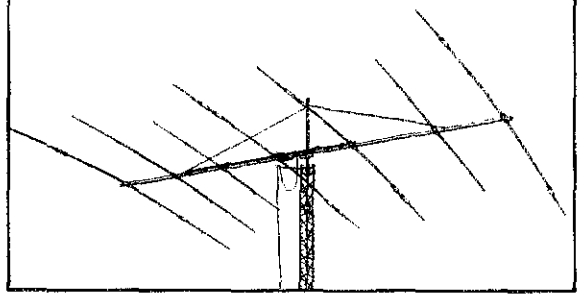
Congratulations!

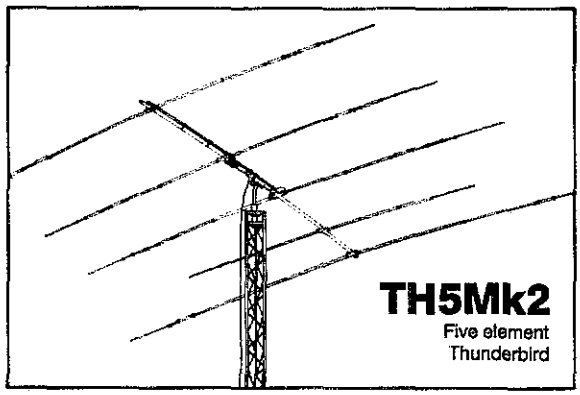
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element
Thunderbird





TH5Mk2

Five element
Thunderbird

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.

looking for some reprots. With all the computers in the section & the ease of getting on RTTY we're looking for an individual in the section to get a first class RTTY net going. Do I have a volunteer? Many, many tnx to all who gave their time & efforts to the Mexican earthquake & the disaster in Colombia. To all of u FB GA hams tnx fer all the season greetings that I received during the past holidays. Traffic: W4PIM 191, W4BKK 164, WB4WQL 119, K4EV 40, W4FIZ 40, K4MOG 31, WB4DVZ 30, W9NXC 25, N4UZ 21, KC4WL 20, KF4FG 20, W4HON 17, W4BIA 16, WB4SPB 13, K4BAI 12, K4NM 12, WB4DBO 6.

NORTHERN FLORIDA: SM, Phil O'Dwyer, WF4X—ASM, ACC: N4ADI. STM: WB4GHU. SEC: WA4PUP. PIO: WA4PUO. SGL: KC4N. BM: KB4LB. OO: K4JJE. TC: N4KF. It seems like it has been longer than three months since I saw so many of you at Jacksonville. Hurricanes Elena, Juan and Kate have been un-welcome visitors and gave us some practice in Emergency operations. All of you, as well as our Section Level nets and local area VHF nets performed in your usual outstanding manner so please accept my thanks. Elena got all of my antennae, and we got them put back up just three days before Kate arrived, and I'm happy to report they are all up and OK. Please join me in saying thanks and a hearty well done to Roy, N4ADI, for picking up the reins while I let them carve on me. Our SEC, Rudy, WA4PUP, and I send our heartfelt thanks to all of our fine DECs, ECs and AECs for the long hours and dedicated efforts that you gave so unselfishly during these storms-well done, gentlemen. Traffic: WD4IIO 1266, WX4H 883, N4PL 730, WB4ADL 554, WA4QXT 503, KB9LT 372, KC4VK 229, WB4GHU 169, WD4IUI 160, WA4EYU 145, WF4X 142, KD4KK 116, KF4U 116, AA4HT 113, N4DY 112, AA4FG 105, KF4TM 101, W4KIX 92, KB4LB 79, W4GUJ 75, KB4MHH 73, NF4O 71, W4NGO 5, N4ADI 53, WB4TZR 51, N4JAQ 48, W4LDY 32, WA4PUP 31, N4GMU 30, NQ4P 26, WA4SXW 24, W8IM 19, WC4D 16, WD4EQB 16, NS4C 13, N4ENL 12, KF4GY 11, WB4FJY 8, KA4KAH 8, WB4AWG 8, NA4F 5, WA4PUO 4, N4JHI 3.

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 134 bulletins received and transmitted this month. OBS stations reporting were: AA4BN 14, W4ESH 5, WT4F 1, KA4GUS 12, K4IEK 24, WD4KBW 32, WA4EIC 32 and AA4MI 14. WB4WDK reported that in October the Highlands County ARC provided communications for the Precision Aerobatic Contest as well as sailboat races. The Highlands County group was busy again in November assisting with the Lake June Invitational Sailboat Regatta. K4SCL sent radiograms saying he has installed version 1.6 software in the Kantronics packet, Oscar 10, FM voice 2 meters, 220 MHz and 440 MHz, HF CW and SSB, traffic nets, emergency nets and weather watch.. N2WX sent a message stating that the TAPRS TNC2 unit runs software developed entirely within the state of Florida. KW1K has now begun RTTY operation. K4ZK received a certificate of appreciation from Governor Graham for his work during Hurricane Elena. Congrats, Bill. W4ESH provided communication between the US Coast Guard and TG9HH who was on a 34 foot Cigarette— The Cigarette was located off the northern tip of Cuba and was taking on water. A helicopter was dispatched and I guess all ended well. N4KB took over a TCC sked starting December 3rd. N4KB also said his brother, George W1NJM should be in Florida starting December 7th. 73 de WA4PFK. Traffic: W3CUL 3046, W3VR 1137, WA4PFK 397, W4NFK 352, KF4JA 296, K4ZK 289, K4SCL 282, K4EUK 272, WA4EIC 234, N4KFU 201, KA4FZI 186, WB4WYG 173, KA4GUS 160, K4IA 144, KY8T 96, KA4NXF 93, KB4MON 92, WA4RUE 92, KB4KB 91, N4JOA 81, N4KB 81, WD4KBW 74, KA4AMC 66, KA4YHS 64, WD4MCC 63, WD4CHO 63, N2WX 63, W4DL 59, W4ESH 57, W4DVO 52, W4PKP 51, KI4ZW 48, W4SME 46, W3TLV 42, KF4RL 42, KB4LPL 41, N4ET 41, WT4F 41, N4MML 40, W4SS 33, AA4BN 32, WA4HXU 31, K4JI 31, WB4GCK 29, WA4NBE 25, K4FQU 25, KY8Y 25, WA4HDH 24, KA4SIH 21, KA4KAW 20, WB4BKC 17, WA9VND 16, KB4LKT 1, W4WYR 16, AA4MI 16, KB4EWO 15, KA9AKY 11, K4OVC 10, K4IRT 10, W4MFD 10, W4IJR 10, N4ILN 7, KD4GR 7, KA4GDU 6, KW1K 5, N4IXO 5, WB4AID 5, WK4F 5, W4MPV 5, WA4GIE 5, KA4KDD 4, AA4IF 3. (Oct.) W4DVO 76, KW1T 2.

WEST INDIES: SM, Carlos Flores, WP4J—WINC Net Daily on 146.940-600 at 22:30 Z and WINS Net on 3.710 kHz at 22:00 Z. Hello Amigos, welcome back to the West Indies Section and Merry Christmas to you all. SM Carlos, WP4J gave Mr. Juanito, KP4AET, from Arecibo a certificate of merit for his outstanding performance as net controller for the weather net everyday at 23:05 Zulu on 3.930 MHz. It was time that his efforts were finally recognized. On the other hand, the WINC net on 146.940-600 MHz has been finally very active in these past months and WP4J has been giving out participation certificates for that ham that does not miss one with the help from the STM, the NM and also NCs from that net, St. Thomas and St. Croiz are very eager to start the ARES program and Carlos, WP4J, has sent them all the necessary information. We congratulate Ivan Belvis, KP4FI, for breaking the world's record in the CQ WW contest, CW on 40 Meters. Also on that weekend, we had a visitor from Florida, WC4E (NP4Z, Felipe's QSL Mgr.). They were both operating from KP4BZ and NP4CC contest station on the east side of PR (Ceiba). Jeff, WC4E, was surprised of the huge pile-up that he stirred up on the radio, and was so scarred that he froze on the head mic and did not know if to leave or stay. Well Amigos, hasta la vista chao.

SOUTHWESTERN DIVISION

ARIZONA: SM, Jim Swafford, W7FF—STM: W7EP. NMs: K6LL, KA7HEV, WB6CAG. Hope everyone enjoyed the holidays. KA7RHD is appointed PIA for Tucson, and still need a volunteer for PIO. NJ7E our new OOC is looking for an OO vol. in Tucson area. SET reports received from KQ7T for Coconino-Yavapi counties; W7KAX for Mohave; and K7KYW for Pima. All are to be congratulated on running very successful simulated emergency tests utilizing their ARES members. We will need to stimulate more activity so that all of AZ will be ready should a major catastrophe occur. N7CEE, EC in Flagstaff reported an actual emergency operation there involving the Alpine Rescue Team assisting the Sheriff's Dept. in finding two lost hunters. WB7NFX, KA7PZL, KD7XF and N7CEE provided the communications when regular service failed. Great work, guys! W7YS reports many antennas down in Flagstaff due to recent heavy snow. New packet repeater, WB7BNI in Phoenix on 145.110/144.510. Accepts digital signals only, no voice. Contact W1FJE for details. ARCA again planning the summer hamfest at Ft. Tuthill. Dates not firm yet, but should know next month. Also mark your calendar for the big SW Div. convention in San Diego next

The DX is better out here. Ask anyone who owns an FT-726R.

It's true. Linking up to OSCAR 10 is *the one sure way to bring the world* into your ham shack. No matter where your shack is.

FT-726R owners know. You'll find them working the world from their apartments. Attics. And from their antenna-restricted neighborhoods.

They'll even boast of a signal quality and DX potential that would make any 20-meter operator envious. Regardless of where we are in the sunspot cycle.

In fact, the FT-726R is the world's most popular link to OSCAR 10.

And for good reason. This 2-meter, 10-watt rig gives you full cross-band duplex capability. Simply plug in two optional modules, one for 435-MHz operation, another for cross-band duplex.

You can set up your earth station just about anywhere. All you need is the 726 and two Yagi antennas: 435-MHz for transmit and 2-meters for receive.

Even as a conventional base station, the FT-726R is a real standout.

You can choose from three operating modes: SSB, FM or CW. Expand to three-band operation with your choice of optional modules for 10 meters, 6 meters, 430-440 MHz and 440-450 MHz.

Then store your preferred frequencies and modes into the eleven memories for instant recall. With pushbutton transfer capability to either of two VFO registers. And versatile scanning functions you'd expect from a Yaesu radio.

Plus you get a lot more extras, including a built-in speech processor, all-mode squelch and a noise blanker.

So no matter where your shack is, let Yaesu's FT-726R introduce you to OSCAR 10. The world is waiting.

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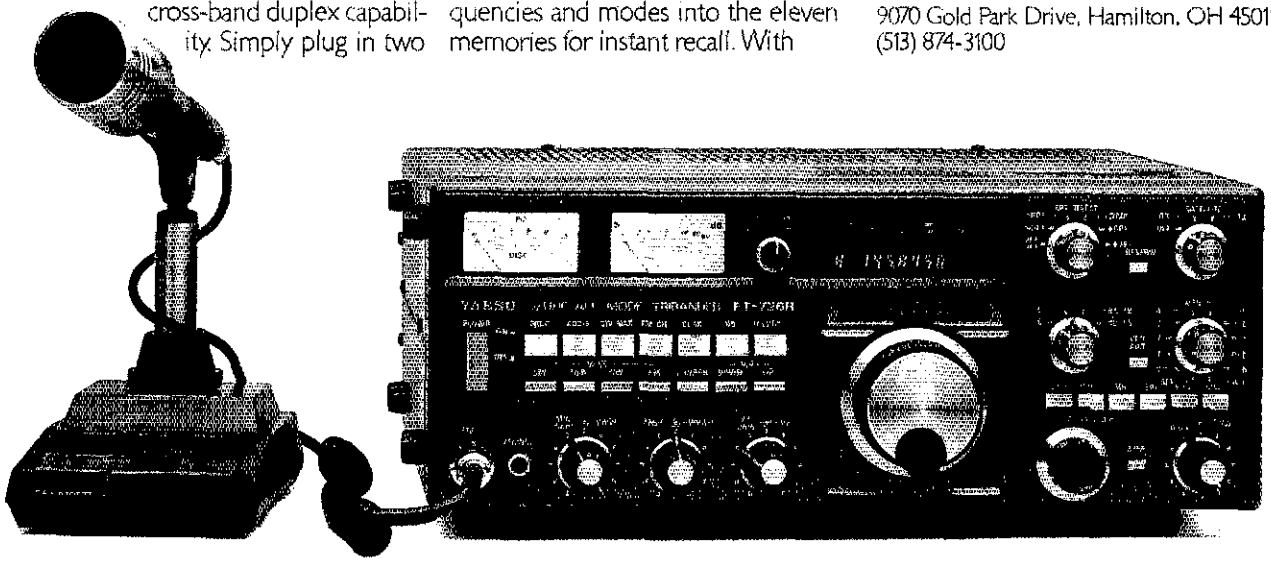

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Why buy a low-power thumbwheel HT when Yaesu's high-power handhelds are available for virtually the same price?

Ours give you 2.5 watts RF output right off the shelf. Or 3.7 watts with the optional FNB-4 battery pack.

Ours come with a hi/low power switch. A relative signal strength/PO meter with nightlight. And built-in VOX capability. (Optional headset required.)

Plus ours offer options like a DTMF keypad. And a plug-in subaudible tone board with both encode *and* decode capability.

And thanks to our unique robotic assembly of surface mount components, it's all enclosed in a lightweight and compact case, measuring just 2.6 x 1.4 x 6.1 inches.

Choose from three models: the FT-203R for 2 meters, the FT-703R for 440 MHz, and the FT-103R for 220 MHz.

As standard equipment you get a rechargeable battery, AC wall charger, rubber duck, earphone, belt clip and soft case.

Plus a wealth of optional accessories. Including a fast charger, VOX headset with boom mic. Mobile radio hanger. Speaker/microphone. DC car adapter. And much more.

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Celebrate your buying decision with the money you've saved.

When it comes to getting maximum HF performance for your dollar, the choice is clear. Yaesu's FT-757GX.

Nowhere else will you find so many HF features packed into one compact, mobile-ready package. At a price that's got the competition baffled.

For starters, each 757 includes an electronic keyer, 600-Hz CW filter, AM and FM modes, AF speech processor. And a 25-kHz marker generator. All at no extra charge.

And working the DX has never been easier with dual VFOs, single-button VFO/memory swap for split-frequency operation, eight memories, and push-button quick memory and band scan.

The 757 also lets you listen from 500 kHz to 30 MHz with its high-performance general coverage receiver. The transmitter covers 160 through 10 meters, including the new WARC bands, with 100 watts output on sideband, FM and CW.

CW buffs will enjoy the delights of full QSK operation. Plus the massive heatsink and duct-flow cooling system allow continuous RTTY operation for up to 30 minutes. Use the FP-757HD heavy-duty power supply option for continuous-duty applications.

And of course, there's the 757's highly attractive price. It's the perfect way to get all the HF performance you desire, with money left over to apply toward other ham gear. Perhaps a power supply for base station use. An antenna or antenna tuner. Or whatever else makes your operation complete.

So ask your dealer today about Yaesu's FT-757GX. The most celebrated HF price/performer on the air.

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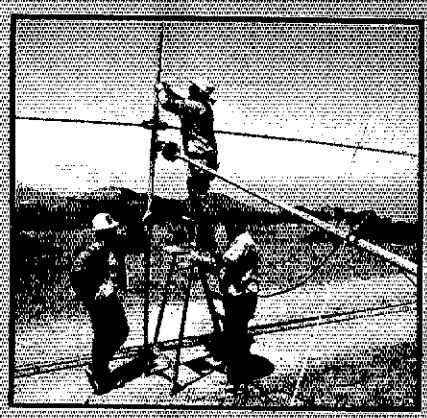
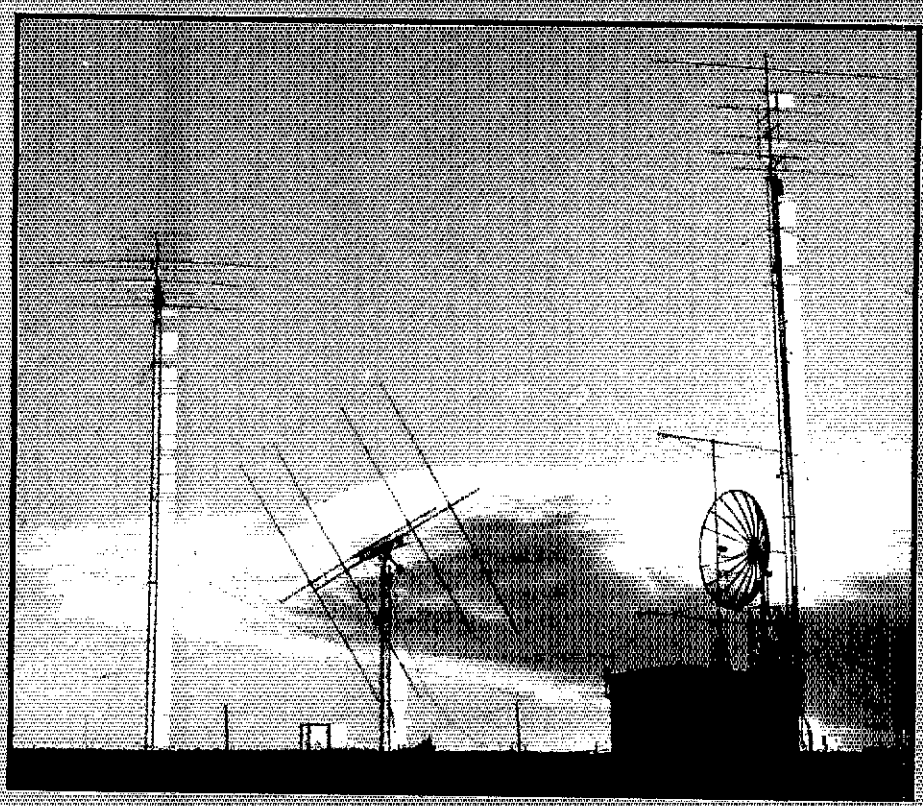
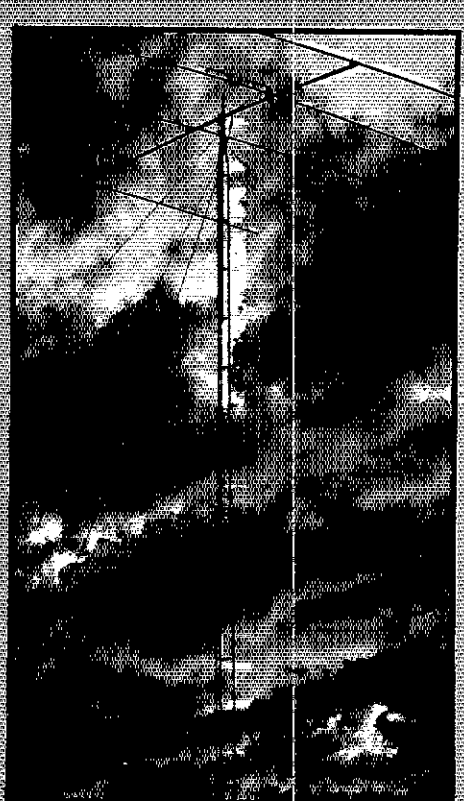
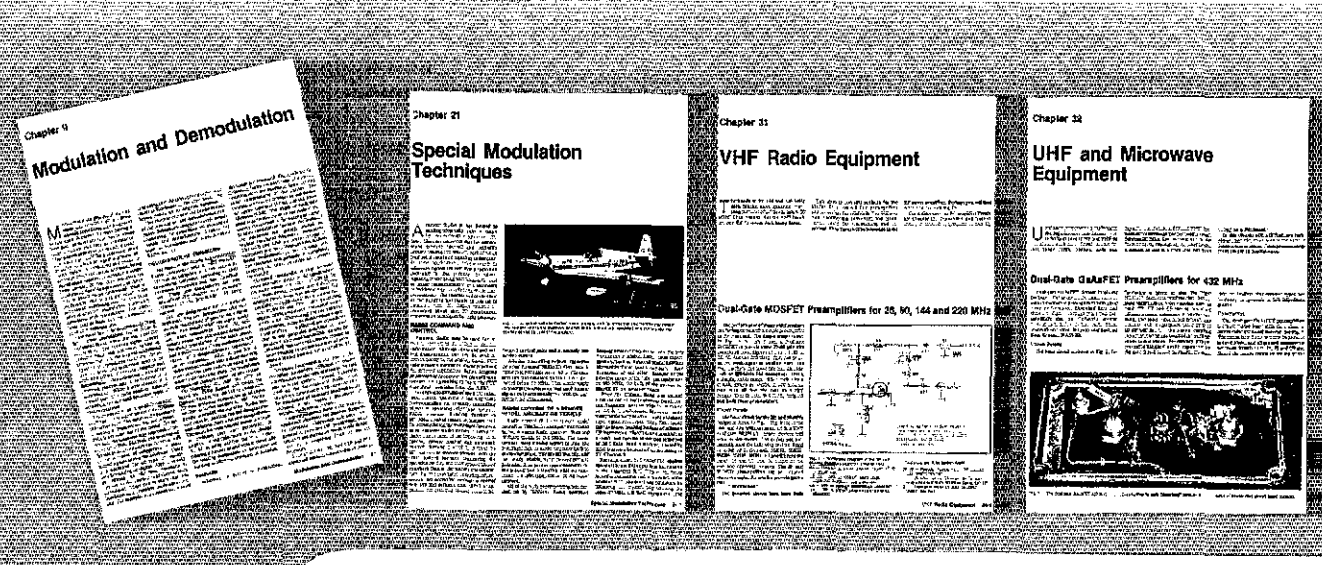


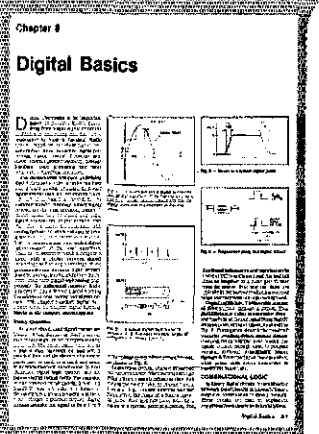
THE ARRL 1986 HANDBOOK

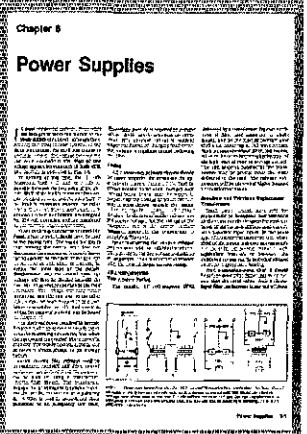
FOR THE RADIO AMATEUR

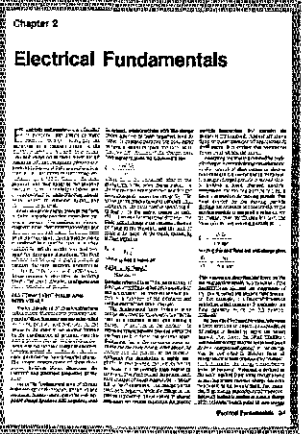












THE PLOT THICKENS!

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.

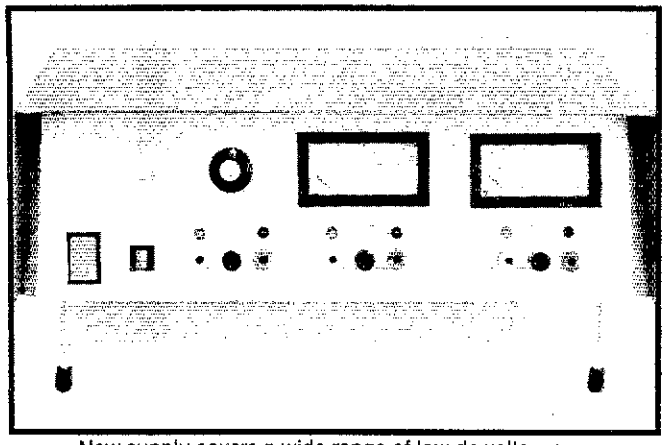
An understanding of digital electronics is a must these days since such circuitry has so many practical applications in station control, frequency synthesis, telemetry, word processing and other information-handling systems. The Digital Basics chapter will help you to understand what is going on in everything 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.

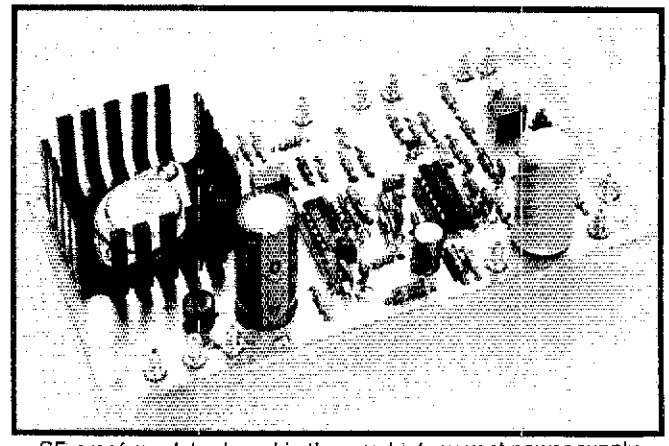
On the practical side, you will find many of the 27 new projects described on the next page. There are new power amplifiers for 1.8, 50, 144 and 1296 MHz, plus preamplifiers and transverters for the VHF/UHF enthusiast. The new digital PEP Wattmeter - SWR Calculator will be one of the most popular projects.

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!

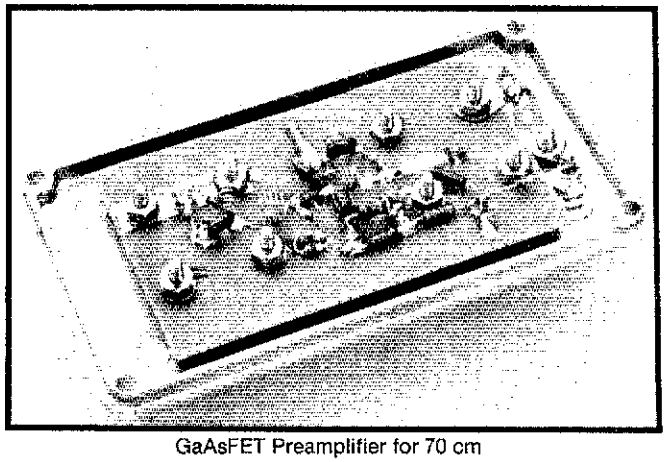
Paperbound prices are $18.00 in the U.S., $19.00 in Canada and elsewhere. Cloth prices are $27.00 in the U.S. and $29.00 elsewhere. Prices in U.S. funds. Foreign remittance should be in the form of an international money order or a check drawn on a bank account in the U.S.



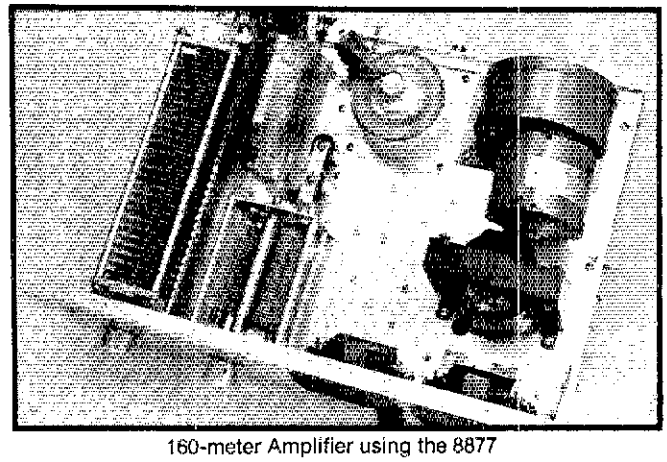
New supply covers a wide range of low dc voltages



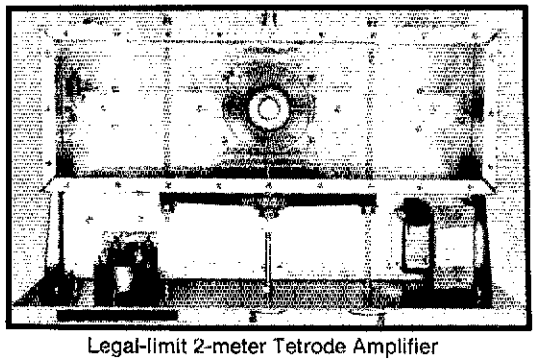
RF-proof regulator board in the new high current power supply



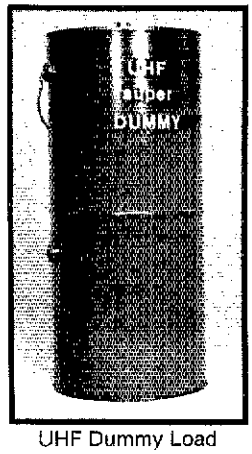
GaAsFET Preamplifier for 70 cm



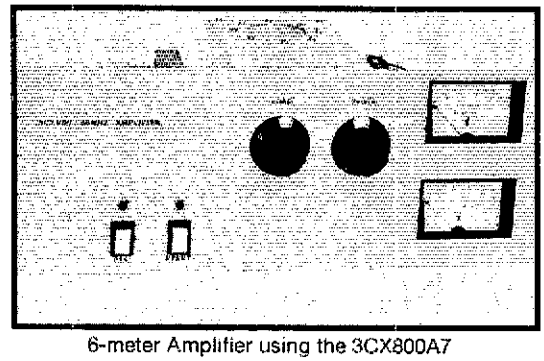
160-meter Amplifier using the 8877



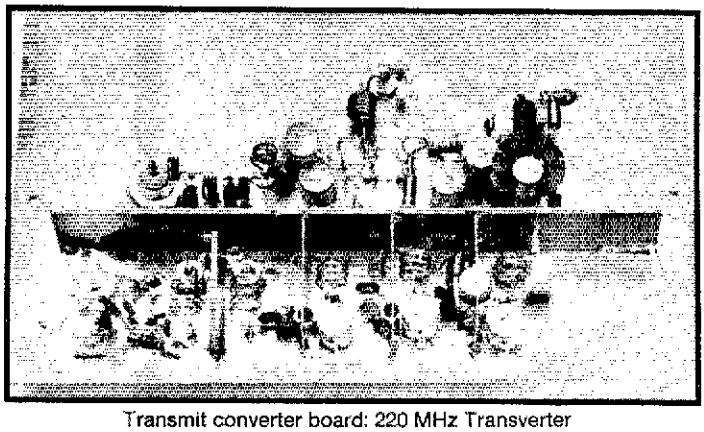
Legal-limit 2-meter Tetrode Amplifier



UHF Dummy Load

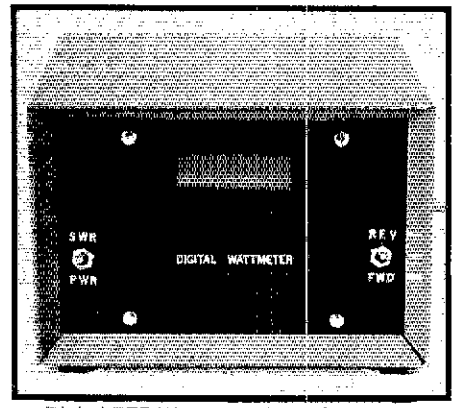


6-meter Amplifier using the 3CX800A7

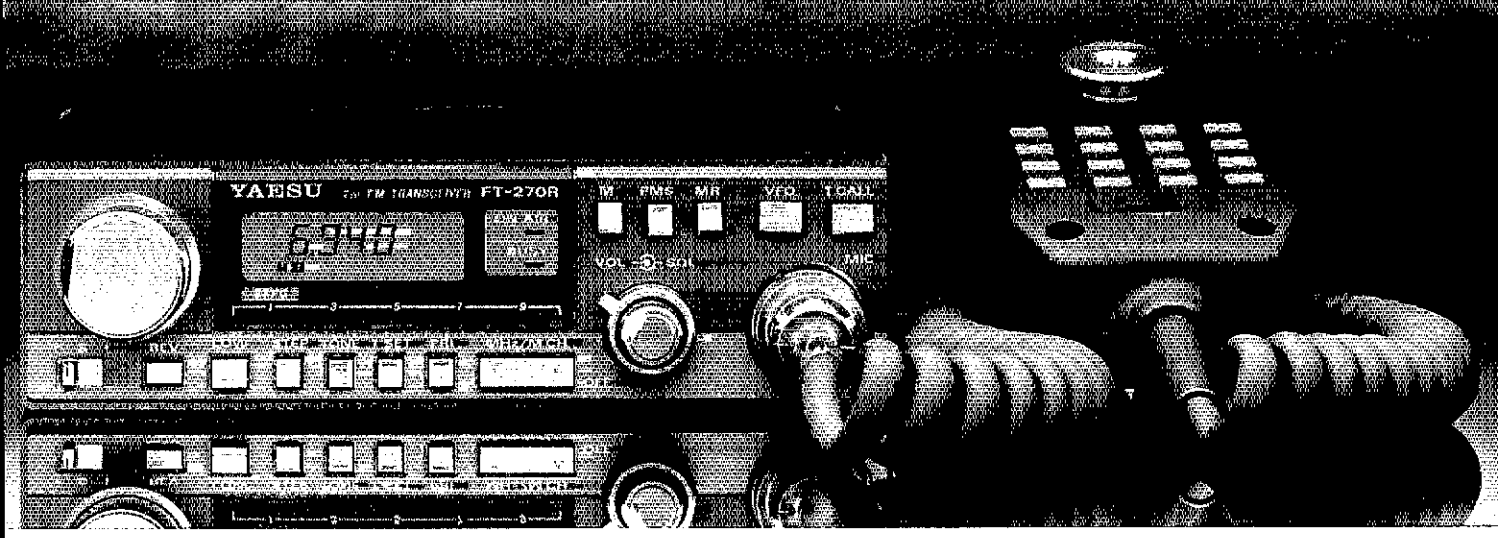


Transmit converter board: 220 MHz Transverter

New for '86



Digital PEP Wattmeter-SWR Calculator



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.

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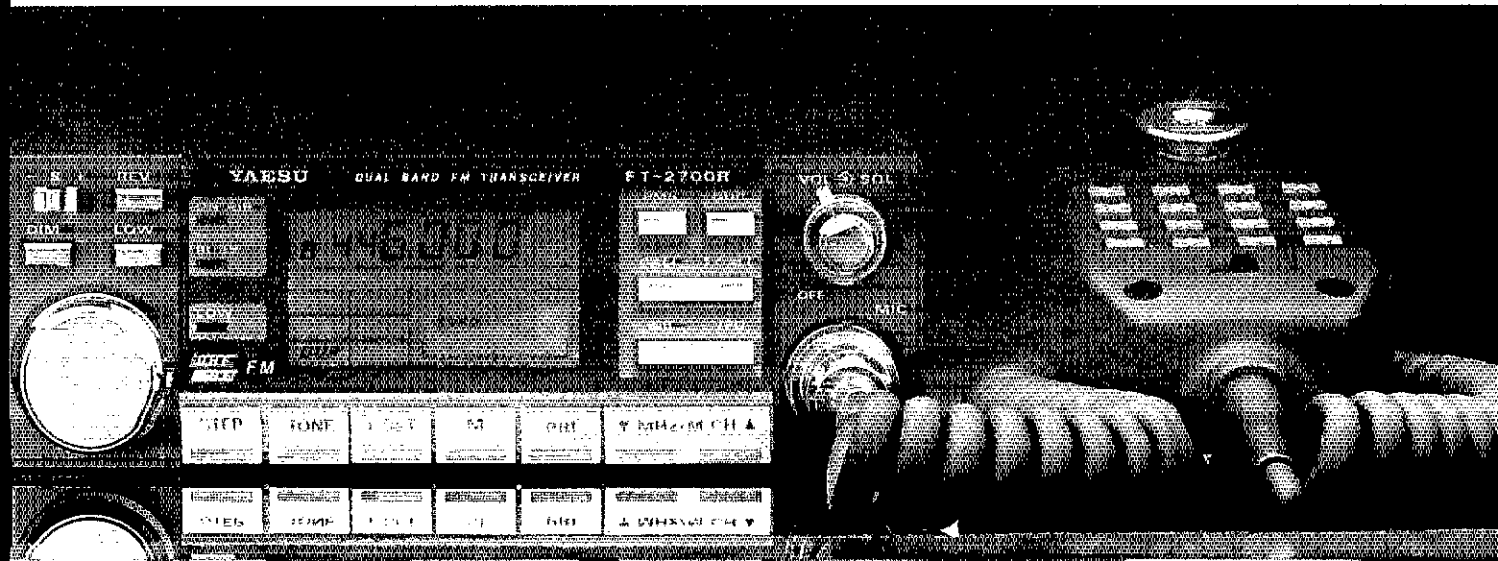

Sept. 5-7. As a result of the Mexican earthquake experience, the Volunteer Resources Comm. of the ARRL Board of Directors has recommended that a Blue Ribbon Committee be appointed to review the NTS with a view to enhancing its ability to provide effective emergency communications under crisis conditions. Your SM endorses this action. Green Valley ARC holds classes for Novice and other wishing to upgrade. Contact KA7NBM. They also provided communications for recent County Fair parade and Nogales-Tucson arm of the Am. Cancer Soc. Bike-athon. Sun City ARC reports twenty-five members participated in November Palo Verde Siren tests. 73, JIM. ATEN QNI 862, Ttc 130. Two Meter Apache Junction Radiogram Net QNI 225 QTC 87. Cactus Net QNI 588 QTC 148. Cactus 2 Meter Net QNI 322 QTC 88. SWN QNI 210 QTC 213. Australian/American Traffic Net cleared 43 messages in November with KB1FE, K7OVK and VE2BVS. Traffic: W7AMM 228, W7EP 185, K6LL 182, KB7FE 179, W7KCM 163, W7LVB 80, W7GAQ 74, KA7HEV 66, WB7CAG 47, WA7KQE 28, K7POF 26, K7JKM 22, N7ETP 19, W7KXE 6. (Oct.) N7ETP 19.

LOS ANGELES: SM, Bob Poole, AJ6F—ASM: Jim, K6IYK. SEC: Ron, AK6Y. STM: Gene, W6INH. ACC: Royce, KX7O. OOC: Russ, K6BMG. Our new SEC, Ron Boan, AK6Y, is doing a great job in refining the ARES structure here. Early in December, the Long Beach Red Cross Chapter activated ARES through EC K6PQZ. Alan called out (at 1:30 AM) W6PGM, KA6BUY and W6PCI to provide vital shelter communications after a fire rendered 50 homeless and 4 dead. These dedicated men saw to the communications and other needs of the victims at the shelter. About 28 were fed and bedded down in the aftermath of the tragedy. Our thanks to these selfless amateurs in their fine performance. Congratulations to the Downey Amateur Radio Club upon their recent SSC confirmation. The men and women of Downey have a good thing going there. Plans are in the works to support two major marathon races in the section; the Long Beach Marathon in February and the gigantic Los Angeles Marathon in March are to be supported by Amateur Radio. Contact local ARRL leadership on how you may become involved. For those who did such a splendid job on the Hollywood Christmas and Rose Parades and didn't get enough, come on out for one of these races and apply that great talent and experience (it's a lot of fun, too). Attention Packeteers: Scott, N6BGW, has a special net category on his BBS (through N6GPP duplex packet repeater, 146.745) that is dedicated to the ARRL activity in this area. Feel free to post and retrieve messages of interest to ARRL members or leadership. In addition to monitoring 145.01 most of the time, I regularly check into the following BBS/Hosyt systems in the area: W6IXU, KD6SQ (Gateway), WB6YMH-2, N6CXB-1, WB6AIE and (of course) N6BGW. Drop a line sometime. It's not too early to begin plans to attend or participate in the 1986 ARRL National Convention. SANDARC will be the host club in San Diego September 5-7. See you there. Traffickers please send your reports before 6th of month or else they won't make it, thanks. We made the Thanksgiving month with poor band conditions. However the message totals were down this year, probably due to conditions. OCWA chapter 7 had their fall dinner at the picwick in Burbank and 70 attended. K6PG out of the hospital and doing fine. A meeting was held December 9th in Downey to reorganize the OOTC Chapter 2, which has been inactive for several years; hopefully under the watchful eye of Stewart J. Wolfe, W6FYV, a nice crowd attended the meeting. Traffic: K6UYK 783, W6INH 406, WB6VPY 85, W6LHE 80, W6ORF 10, K6CL 15. WD6FWG 13.

SAN DIEGO: SM, Arthur Smith, W6INI—Plan to attend the 1986 National Convention, Sep 5-7 in San Diego. For out-of-towners: Make this convention an opportunity to spend your 1986 vacation in "America's Finest City". Something to see and do for everyone. Palomar ARC Officers for 1986: W9FQN Pres. KB6DNR VP, KB6DNR VP, WF6L Sec, WI6B Treas. The club has new digipeter on 145.05 MHz. Communications for the Super Frog Triathalon were provided by KF6BB, WD6CSS, N6HEA, N6IGP, N6LKC, KG6MB, KA6OMK, K6SJA, KE6VB, KA6WFB, W6YVY. New call sign: KB6IUX now KG6ZL. New ARES mbrs: KA6FPS, W9FQN, NC6J, K6VMI. Upgrades: to Extra N6KGI, KG6XR: to Advanced N6JUA: to General N6MSC, to Tech KA6JAN. New Eastern Dist ARES net each Saturday at 1900 on 147.57 MHz. Net controls for the ARES 160 meter net are WA6BVN, N6FBZ, KS6L,W6TET. This net meets each Sunday at 1100 on 1.945 MHz and covers the ARRL SW Div. Ham Radio/Computer swap meet monthly on first Saturday at San Diego-Jack Murphy Stadium. Opens 0700. NCTN met 29 times and handled 172 msgs. ORS are reminded to submit ttc report monthly by, 5th, to STM N6GW. Traffic: KU6D 252, N6GW 42.

SANTA BARBARA: SM, Byron Looney, K6FI—Season's fires resulted in 278 ECCs to operators in the section. CDF entertained ARES ops from Las Politas fire. Good work, gang! Many stations appearing on packet . . . even some dyed-in-the-wool CW types. W6IXU mailbox very popular. Simi Valley celebrating new Zoning Ordinance that gets 75-foot limitation on amateur antennas and higher with Special Use Permit. Santa Barbara ordinance still a problem. Hope it's history by the time this is published. If your club is not receiving "SBAR Section News," let me know. Please pass it around at the club meetings. Latest members of Santa Luisa Radio Club are KF6OY and N6JNS. You, too, can become a member of SLRC by operating at one of the CSTI Earthquake classes. It's a great experience. Contact the SM for info. Traffic: N6HYM 69, K6YD 67.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC—ASM/ACC: NI5V. STM: AE5I. PIO: K5HGL. RFI: WB5JBP. TC: W5LNL. BM: W5OXK. SGL: W5UXP. Your new Net Mgr for the Texas Ttc Net is Dale Jobson, KD5RC. Congrats, Dale! Our Technical Coordinator and his staff of assistants stand ready to help you, and will, I am sure, be glad to speak at your club meeting. All are experienced technical oriented folks who enjoy helping others with rig problems, or solving an RFI complaint. Leading this program here in our Section is our Technical Coordinator, Don Divinia, W5LNL, in Greenville. He is aided by Asst. Technical Coordinators K5UPN, in Longview, KA5QYV in Whitney, KE5ZW in Snyder, WB5KTD in Ft. Worth, WA5KZA in Paris, WB5KYK in Pampa, N5FXX in Lubbock, KA5RGC in Sweetwater, W5RIY in Commerce, and KO5D in Sundown. If you need addresses or tel. numbers for these gentlemen, just let me know. I want to thank all these fine gentlemen for volunteering their time and expertise in getting this worthwhile program into operation in our Section. It is not too soon to be preparing for the upcoming tornado season. HF conditions are not reliable, so we must bring all of our resources together; i.e. packet, linking, and VHF relay etc. in order to get the job in planning for a large disaster in outlying areas. PSHR for Nov. KA5SPT AE5I WD5EEH N5IGR K5UPN KB5UL W5VMP and KA5OYV. Traffic: K5UPN 363, KD5RC 354, KA5SPT 186, AE5I 182, W5TNT 151, N5BT 136, W9OYL 132, KB5UL 113, KA5AZK 103, WB4HML 96, N5IGR 49, WA5EZT 36, KA5KQF 35, W5VMP 34, KA5QYV 20, WD5EEH 18, KB5UQ 5, K5PC 3.

OKLAHOMA: SM, Dave Cox, NB5N—ASM: K5WG, SEC: W5ZTN. STM: KV5X. ACC: NJ5Y. BM: W5AS. PIO: WD5IFB. OOC: K5WG. SGL: W5NZS. TC: W5QMJ. Hamfest season is not too far away. Plans should be underway for most '86 events. All sponsors of a hamfest, or other ham gathering please forward details to NB5N. If you desire ARRL participation at your event please specify. It's a brand new year; time for renewed commitments by the many clubs throughout the Section. Contact the club coordinator, NJ5Y, for help with activities, programs, and more. Attention all appointees, don't forget to report your activity to the appropriate leadership official (listed above) periodically. Your active status will be jeopardized by inactivity. In related news, I've seen a couple of articles from Okla. in the "Field Forum" and "Section Leader," but not as many as I'd like. That's your forum; so let's share some of our section with the rest of the country. Edmond ARC has affiliated with the Metroplex Network, a nationwide system for amateur radio related news, and will sponsor a program to relay the latest amateur radio happenings once a week on the 147.030 repeater. Traffic: W5AS 209, WB5OHK 201, W5RB 156, KV5X 151, KB5EK 122, W5VXU 116, K5CXP 109, W5REC 108, WD5IFB 91, NX5I 82, WA5OUV 78, NG5O 62, KC5OU 56, NQ5W 55, NB5N 49, N5IKN 48, WA5ZOO 36, K5GBN 34, W5VLW 25, NR5L 25, WA5OGC 25, W5VOR 22, K5ENA 20, K5CAY 18, KA5WGS 16, W5SUG 14, KA5TTH 13, N5EO 12, KX5W 6, N5GVK 6, N5DWN 5, NQ5Y 5, ND5S 5, WD5DKC 5.

SOUTHERN TEXAS: SM, Art Ross, W5KR—STM: K5QEW. SEC: KA5KRI. ASM: N5TC. PIO: WA4UZB. KA5OAP reports West Houston RACES members provided communication for the 8th annual Memorial-Spring Branch Rotary "Village 5-mile Run," with over 1300 runners turned out. N5HXU has started a new ARC at TSTI in Harlingen. WBAYL is editor of HAMBONES, a new club bulletin of the Golden Crescent ARC in El Campo; she reports that the club has recommended KA5JTM for a Public Service award for his 3-day handling of over 100 messages following the Mexico City earthquake; also reported several club members provided communications for C.R.O.P. walk. WD5JCX teaches at two high schools in McAllen; he is also conducting Novice classes at each school. Brazos Valley ARC reports WA5G, WB5IGG, WA5F and N5FNA provided communications for Juvenile Diabetes Foundation's Diamond Walk; KA5GYG running RTTY bulletin board; N5FNA teaching a Novice class. ORS NZ5J (ex-KA5PEX) reports WD5DOM upgraded to Advanced; N5INS is newly licensed Technician; W5UPS, NZ5J and K5IG are newly accredited VEs along with K8GCU and K5RF. Hill Country ARC reports N5FGR is now KF5GA. KA5CSX is now KF5FU and KA5SHK is now KF5GF. 7290 Net elected new officers: W5TUK, Net Mgr; KA5AZK, Asst Net Mgr; K5BNH, Secretary; W5TYS, Treasurer. CAND Mgr W5KLV reports 832 messages in 30 sessions; DRN5 represented 100% with help of WB5YDD, W5KLV, N5DFO, NZ5U, WB5EPA, NX5V, WA5ZJY, KD5KQ, WB5FQU, DRN5 Mgr WB5YDD reports 806 messages in 60 sessions; STX represented 100% by W5KLV, WB5EPA, WB5FQU, W5CTZ, KD5ZV, NX5V, KD5KQ, N5GKM, N5DFO, NZ5U, WA5ZJY and WB5YDD. OBS W5KLV reports 5 bulletins, 29 satellite bulletins, 4 propagation fcsts, 4 DX bulletins and 4 CRRL Bulletins given 147 readings. Traffic: W5KLV 344, WB5YDD 327, KS5V 276, W5CTZ 197, N5DFO 185, WB5EPA 170, WB5FQU 122, WD5GKH 65, N5GKM 65, W5AC 62, AC5Z 47, AJ5K 47, KC5T 22, K5HZR 21, K5QEW 18, NZ5J 13. (Oct.) W5KR 80, WA5UZB 4.

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FM-240 2 Meters
FM-740 70 cm

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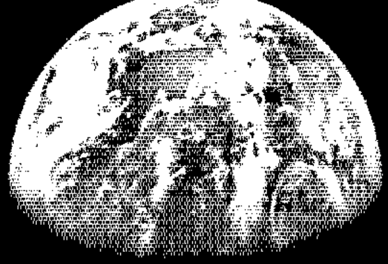

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- Memory Scan — Programmable modes: SKIP, CARRIER, AUTO & DELAY.

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Specifications KDK FM-240 (and FM-740)	
General	
Supply Voltage	13.8v ± 15%, negative ground.
Consumption	Transmit: 1.5A @ 5w, 5.5A @ 25w Receive: .4A @ 0 sig., .6A @ max volume.
Temp. Range	− 10 deg. C to 60 deg. C.
Dimensions	40H × 140W × 170D mm (Body only)
Weight	1.0Kg (Body only)
Transmitter	
Freq. Range	FM-240 142.000 - 150.00 MHz (FM-740 440.00 - 449.975 MHz)
Output	High = 25 watts, Low = 5 watts (High = low, (Low = 1W) (FM-740 High = Low)
Modulation	Variable reactance frequency modulation
Max. Deviation	± 5KHz
Spur. Emmis	More than 60dB down from carrier
Duplex Offset	Programmable ± .1 to 12.7MHz (set at ± .6KHz ex-factory)
Tone	Programmable 74-250.3 (34 EIA tones) Encode and Decode
Receiver	
Int. Freq	1st = 10.7MHz, 2nd = 455KHz (1st-21.4MHz 2nd-455KHz)
Sensitivity	Better than 12dB SINAD @ .2uV
Squelch Sens	Better than .15uV
Bandwidth	+ 6KHz @ − 6dB
Selectivity	+ 12.5KHz @ − 60dB
Image Ratio	Better than 70dB
Audio Output	More than 2w, 8 ohms load, 10% THD
Standard Accessories	
Speaker Microphone	Speaker = 8 ohms, Mike = Condenser type. SM-34A: UP/DOWN plus tone encoder.
Power Cable	2 meters, with 7A fuse.

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One of the most exciting features of modern transceivers is their ability to adapt to a constantly changing world and provide coverage of both present and future amateur bands or frequency allocations. This flexibility to sidestep "operating range obsolescence" is achieved by using broadband RF circuits and full microprocessor-controlled tuning systems...a vast improvement over fixed coil setups and mechanically bandswitched transceivers of previous times.

Today ICOM utilizes this "high tech" frequency coverage concept in its equipment's design. And to complement ICOM's recent advances in broadband RF circuit design and solid state technology, the ICOM engineering team has developed "one step beyond" circuitry in its phase-locked loop/VFO technology.

ICOM is a world leader in PLL design — designing circuits which are praised by users for their extreme accuracy, stability, and flexibility. By clever utilization of the memory capacity inside of a transceiver's CPU, and adding to it the memory of an external RAM (Random Access Memory) unit, ICOM offers 32 **tunable** memories, plus two VFO's in each of its "top of the line" transceivers. This provides the ultimate in frequency agility. No one else has this on-board, standard feature...and, not only is it possible to store frequencies in memory (VFO to memo), but memo to VFO is possible, allowing storage of each side of a split frequency.

ICOM's frequency-controlling RAM is contained on a **single plug-in PC board** mounted near the CPU, which also houses the lithium cell for keeping the memory alive during times of non-use. Frequency reprogramming ham band range updates can be accomplished by sending **only** that RAM PC back to ICOM America for program updating. This can be done in a padded postal mailer...fast, easy, and convenient. It is not necessary to return the whole transceiver. RAM board factory programming service for initial factory program is available on a 24-hour turnaround basis (when requested). This is only one example of ICOM's commitment to providing the best customer service in amateur radio. ICOM's commited to amateur radio, and we're dedicated to keeping you communicating without delays or excuses!

Additionally, for the experimenter, the programming information for initial factory programming is available from ICOM. With this information and a home computer, you can customize your own radio system if you wish.

An interesting technical point about the ICOM system is the life expectancy of the ICOM RAM board's lithium cell. Since these cells have only been manufactured during the last ten years, we must extrapolate the following values. Our unit's lithium cell is rated at 165 milliamphours capacity. Under normal conditions, the cell's capacity will be 91 percent of 165mAh **after ten years.**

During manufacturing, a special test jig is used to check the RAM boards. All RAM boards are checked for total current drain before they are installed in the transceiver. Measured current demands must be less than the design criterion of 100 nanoamps (.0001 milliamps), yielding an estimated lithium cell life of 180 years. Actual current values for the RAM memory typically **measure only 10 to 30 nanoamps,** yielding a calculated 600 years of battery life.

ICOM units utilizing the lithium cell-backed RAM concept include the IC-751 and IC-745 HF transceiver, IC-271A 2-meter base, IC-471A UHF base, IC-1271A 1.2GHz base and IC-R71A general coverage HF receiver.

ICOM's CPU/RAM concept might easily be considered as providing a "forever capable" radio.... and change is the only thing constant in our modern age.

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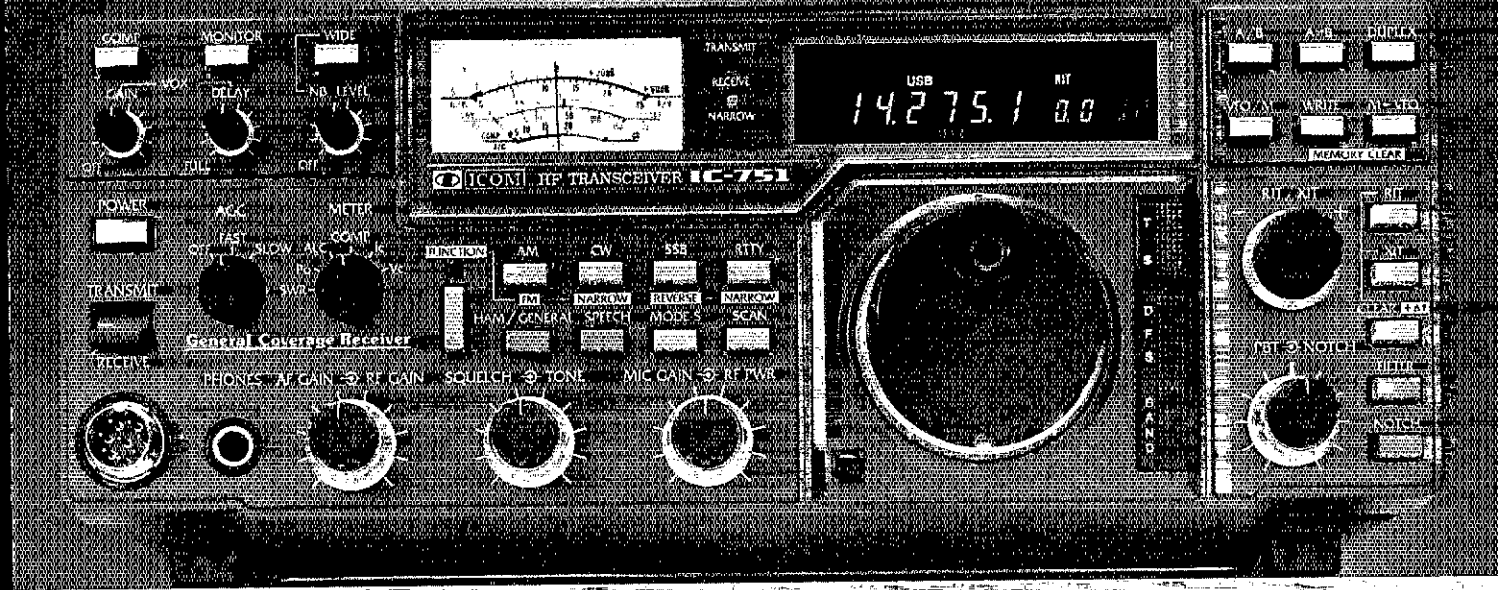
ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234

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:

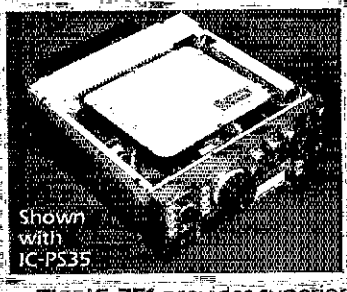
- 100KHz – 30MHz Receiver
- 105dB dynamic range
- QSK — full break-in CW (nominal speed 20WPM)
- FM Mode Standard
- High-grade FL-44A 455KHz SSB filter
- 32 tunable Memories with lithium battery backup
- 100% Duty Cycle Transmitter
- Passband Tuning
- 12V DC operation
- Adjustable AGC
- Adjustable Noise 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

Ref. No.	Filter	Model No.	Center Freq. (KHz)	6dB (KHz) Width
	STANDARD FILTERS			
	AM Ceramic	CFW-455 II	455	6.0
	SSB (PBT) XTAL	FL-30	9011.5	2.3
	FM Filter	FM455	9011.5	15 (-3dB)
	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	3.8
	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.

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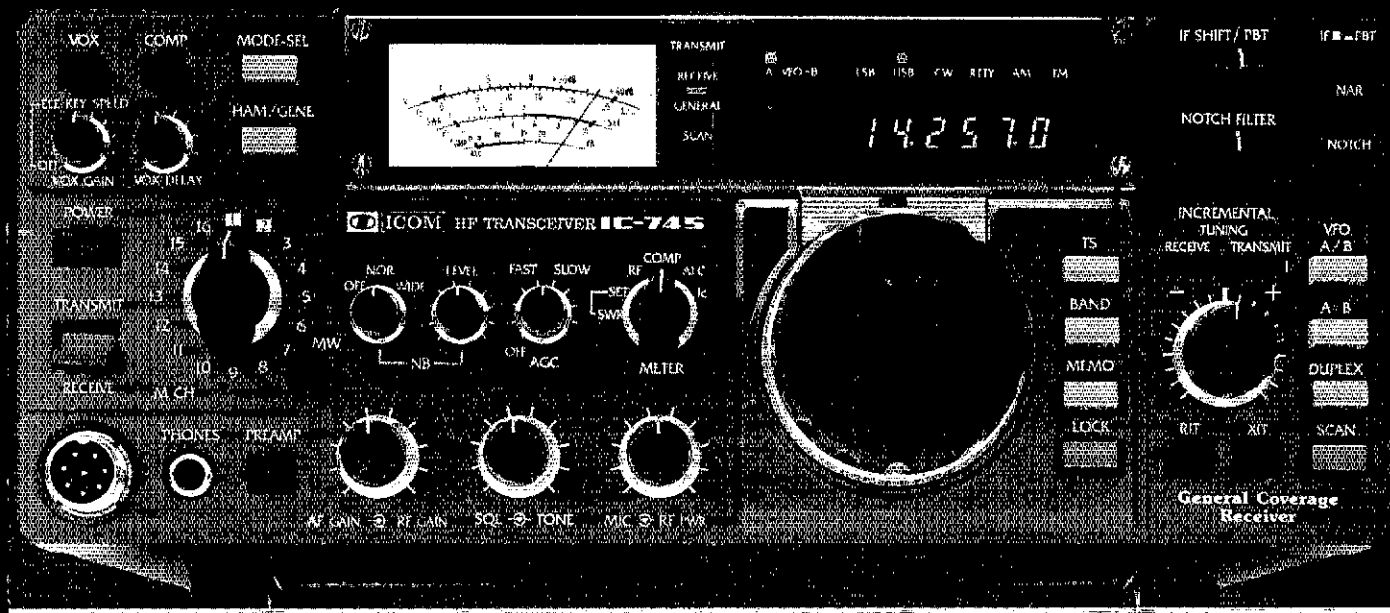
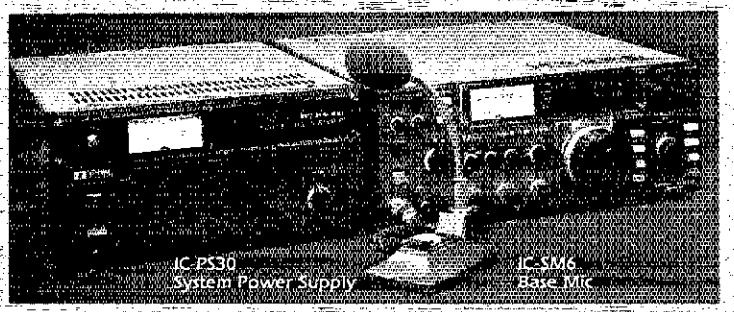


High Performance Maximum Flexibility

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. 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

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6th Annual

CINCINNATI ARRL'86

- Great Lakes Division Convention -

February 22-23

Sharonville (Cincinnati), Ohio

ALL INDOORS: Vendors • Flea Market • FCC Exams • Forums • Awards • ARRL Reps. • Women's Program • Banquet • Hospitality suite • Wouff Hong • Meetings

REGISTRATION - $5. Flea Market $5; $10 Choice/Reserved.

FOR INFORMATION: P.O.B. 11300, Cincinnati, Ohio 45211 or Telephone (513) 891-6018.

SPECIAL RATES ON REQUEST: La Quinta Motor Inn (Sharonville), Tel. 1-800-531-5900; (513) 772-3140
1 or 2 beds $32 & $38

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IC-02AT

ICOM 2-Meter Handhelds

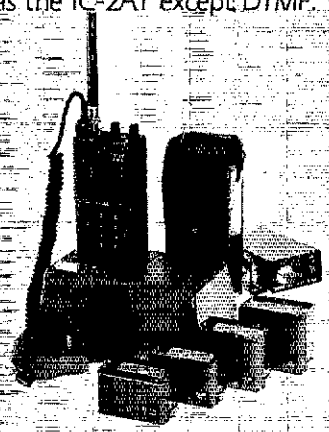
If you want a 2-meter handheld with exceptional features, quality built to last and a wide variety of interchangeable accessories, take a look at the ICOM IC-02AT and IC-2AT handhelds.

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.

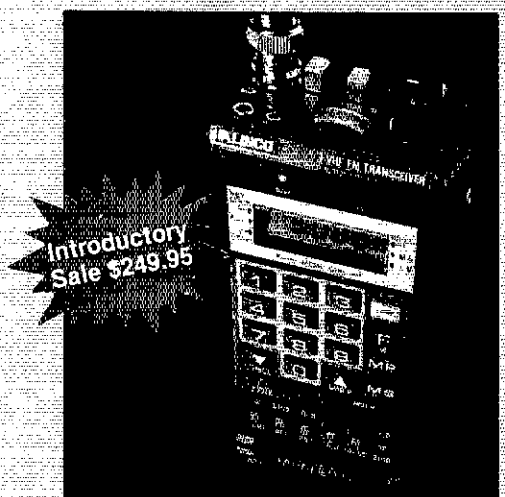
The IC-02AT and IC-2AT come standard with an IC-BP3 NiCd battery pack, flexible antenna, AC wall charger, belt clip, wrist strap and ear plug.* See the IC-02AT and IC-2AT 2-meter handhelds at your local ICOM dealer.

Often imitated, never duplicated.

ICOM

First in Communications

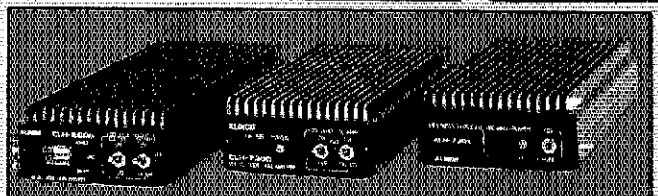
ICOM America, Inc., 2380-116th Ave NE, Bellevue, WA 98004 / 3331 Towerwood Drive, Suite 307, Dallas, TX-75234



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 9.6V-Low Power = .4 watt
at 9.6V-High Power = 3. watt
at 13.8 V-Low Power = .5 watt
at 13.8 V-High Power = 5. watt

ALR-206T - List $345.00

- Unique Control Knob
- Completely Programmable From Microphone
- 25 Watt High - 5 Watt Low
- 10 Channel Memory
- Built in Lithium Back Up Battery
- Up/Down Control On Microphone
- Built in Sub Audible Control
- Many Features, See Your Dealer

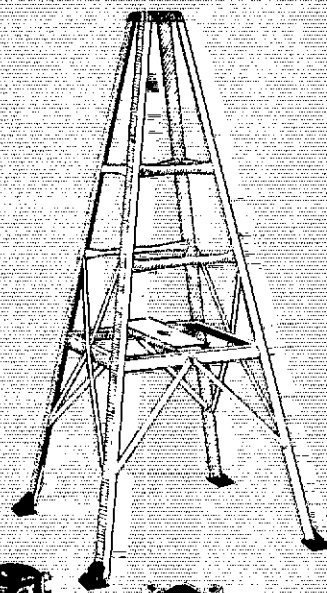


Linear Amps
2m and 70cm Micro Linear Amplifiers. Each of these amps include a heavy duty heat sink, a protection circuit and low pass filter for a clean signal. On one you get a GaAsFET RX preamp and even an RF meter on one. List Prices From $69.95 to $156.00.

Power Supplies
Affordable performance is the final output of these work-horses. 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.

ALINCO ANNOUNCES THE PERFECT MATCH FOR MEDIUM SIZE ANTENNA SYSTEMS.
THE NEW ALINCO TOWERS ARE IDEAL FOR MOUNTING:

- Light-Weight Beams
- VHF UHF Antennas
- Oscar Antenna Systems
- Guy points when added support is required
- No rivets - all steel bolts
- All towers have *four* legs for easy mounting. Along with ALINCO's unique dual wall construction for unparalled strength
- Rotor mounts inside the ALINCO Tower with provisions for top mounted thrust bearing
- Light-weight aluminum construction for easy installation and durability



ALINCO MODEL AAZ-7
ROTATOR

ROTATOR
MODEL AAZ-7 $121.00

THRUST BEARING
MODEL AAZ-7A
$36.00

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See your favorite dealer for all Alinco Products or contact us for a dealer near you. Remember, Alinco has a 30 day replacement for all products that do not meet our quality control.

Everett L. Gracey, President

Contact your nearest dealer or Call Alinco for the location closest to you.

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44 Glen Carran Circle • Sparks, Nev. 89431 Facsimile (702) 359-1424

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. This includes firms or individuals offering products or services for sale. A special rate of 25 cents per word applies to individuals seeking to dispose of or acquire personal station equipment, and to hamfest and convention announcements.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 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 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.

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.

GREAT LAKES DIVISION ARRL Convention. February 22-23, 1986, Great Oaks Vocational Campus, Sharonville (Cincinnati), Ohio. Just off I-75 & I-275. Hospitality Room Saturday. Forums. Vendors. Indoor Flea Market. FCC Exam, Meetings, Food, Women's Activities, Banquet & Wouff Hong, Admission ($5) includes all convention awards. Flea Market space $10/reserved, or $5 as available. Special motel rates. For information telephone 513-851-1056 (vendor & flea market), other 513-921-3844 or 513-421-4775 or POB 11300, Cincinnati, OH 45211.

New *New*

THE STANDARD OF EXCELLENCE

Definitely Superior!

AZDEN PCS-5000

COMMERCIAL — GRADE

UNPRECEDENTED WIDE FREQUENCY RANGE: Covers 140.000-153.000 MHz in steps that can be set to *any* multiple of 5 kHz up to 50 kHz.

CAP/MARS/NAVY MARS, BUILT IN: *The wide frequency range* facilitates use of CAP and ALL MARS FREQUENCIES including NAVY MARS. ***COMPARE!***

TINY SIZE: Only 2 inches high, 5¼ inches wide and 7¼ inches *deep!*

MICROCOMPUTER CONTROL: Gives you the most advanced operating features available.

UP TO 11 NONSTANDARD SPLITS: ***COMPARE*** this with other units!

20 CHANNELS OF MEMORY IN TWO SEPARATE BANKS: Retains frequency, offset information, PL tone frequency.

DUAL MEMORY SCAN: Scan memory banks separately or together. ***ALL*** memory channels are tunable independently. ***COMPARE!***

MEMORY SCAN LOCKOUT: Allows you to skip over channels you don't want to scan.

TWO RANGES OF PROGRAMMABLE BAND SCANNING: Limits are quickly reset. Scan ranges separately or together with independently selective steps in each range. ***COMPARE!***

BUSY SCAN AND DELAY SCAN: Busy scan stops on an occupied channel. Delay scan provides automatic auto-resume.

DISCRIMINATOR CENTERING (AZDEN EXCLUSIVE PATENT): Always stops on frequency desired when scanning.

PRIORITY MEMORY AND ALERT: Unit constantly monitors one memory channel for signals, alerting you when channel is occupied.

LITHIUM BATTERY BACKUP: Memory information can be stored for up to 5 years even if power is removed.

FREQUENCY REVERSE: Allows you to listen to repeater input *frequency.*

ILLUMINATED KEYBOARD WITH ACQUISITION TONE: Keys are easily seen in the dark, and actuation is positively verified audibly.

CRISP, BACKLIGHTED LCD DISPLAY: Easily read no matter what *the lighting conditions!*

DIGITAL S/RF METER: Shows incoming signal strength and relative transmitter power.

MULTI-FUNCTION INDICATOR: Shows a variety of operating parameters on the display.

FULL 16-KEY TOUCHTONE PAD: Keyboard functions as autopatch when transmitting.

MICROPHONE CONTROLS: Up/down frequency control and priority channel recall.

PL TONE GENERATOR BUILT IN: Instantly program any of the standard PL frequencies into the microcomputer. ***COMPARE!***

TRUE FM, NOT PHASE MODULATION: Unsurpassed intelligibility and audio fidelity. ***COMPARE!***

HIGH/LOW POWER: Select 25 watts or 5 watts output — fully adjustable.

SUPERIOR RECEIVER: Sensitivity is better than 0.15 microvolt for 20-db quieting. Commercial-grade design assures optimum dynamic range and noise suppression. ***COMPARE!***

DIRECT FREQUENCY ENTRY: Streamlines channel selection and programming.

OTHER FEATURES: Rugged dynamic microphone, built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses and hardware are included.

EXCLUSIVE DISTRIBUTOR. DEALER INQUIRIES INVITED FOR YOUR NEAREST DEALER OR TO ORDER.

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MANUFACTURER.

JAPAN PIEZO CO., LTD.

1-12-17 Kamirenjaku, Mitaka, Tokyo, 181 Japan Telex: 781-2822452

THE DELAWARE VALLEY Radio Association will hold its 14th annual Flea Market of Amateur Radio and Computer *Equipment on Sunday, March 23, 1986*, from 8 A.M. to 2 P.M. at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton, New Jersey. Advance registration $3 (March 10th deadline) or $4 at the door. Indoor and outdoor Flea Market area ($5 per space or $7 for wall spaces with seller set-up at 6 A.M.), awards, commercial dealers, and refreshments. Sellers must provide their own tables. Talk-in on 146.07-.67 repeater. For advanced registration and/or spaces write: KB2ZY, Box 441B, R.D. #1, Stockton, NJ 08559. (SASE please).

QSL Cards/Rubber Stamps/Engraving

POST CARD QSL Kit - Converts Post Cards, Photos, to QSLs! Stamp brings circular. Labelcraft, P.O. Box 412, West Sand Lake, NY 12196.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: 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.

QSLs — 1) Famous KØAAB custom collection. 2) Railroad employees and railfan's specials. 3) Front report styles. 4) Multiple callsigns. 5) Ham "business cards." State your sample wants. 39c self addressed business size envelope required. Marv Mahre, WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109-3621.

QSLs Samples 40¢ (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

BE SURPRISED - get a variety of cards - 100 for $8 or 200 for $13. Samples $1 refundable. All three colors, fast service, satisfaction guaranteed. Constantine, 1219 Ellington, Myrtle Beach, SC 29577.

FINEST CUSTOM QSLs AND RUBBER STAMPS: 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.

FIRST CLASS, Full Color QSL from your prints or slides. Confirming report and address printed on back, $199/2,500. Smith Printing, 20420 Calhaven Dr., Saugus, CA 91350. 805-251-7211.

QSL samples—25¢Samcards—48 Monte Carlo Dr., Pittsburg, PA 15239.

QSL's 100 $17.95. Gold ink, Black Stock. Jim's Printing Service, 2155 Young, Memphis, TN 38104 SASE WA4PRE.

ANTIQUE-VINTAGE-CLASSIC

WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, 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: 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.

WANTED: MCINTOSH and Marantz tube-tupe audio equipment, parts, accessories and literature, for personal collection. 100% reply. Marcus Frisch, WA9IXP, Box 385, Elm Grove, WI 53122-0385, 414-475-5356.

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.

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 Bellbrook Way, Atherton, CA 94025.

SCHEMATICS: Radio receivers 1920's/60's. Send Brand-name, Model No., SASE. Scaramella, Box 1, Woonsocket, R.I. 02895-0001.

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.

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.

QST ISSUES 1923 to 1975, HR 1960 to 1975; 73 1960 to 1975; CQ 1946 to 1975. Offers: VE3BVX, 58 Albert, Lindsay, Ontario K9V4J8.

TELEGRAPH KEYS wanted. Collector seeking pre-1940 bugs. Vibroplex, Martin, Thomas, Lippencott, MacDonald, etc. Also need spark keys and pre-1915 telegraph (keys, sounders, pocket sets, peg boards, etc.) Visitors welcome. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081, tel. 214-234-1653.

WANTED: HAMMARLUND HX-50/50A Exciter, condition unimportant, must have 160-m option installed. Or, 160-m field kit only, P/N-PL26860-G2. Will pick up if local. John, WB2EQG, Box 1872, Wayne, NJ 07470, 201-694-2392.

WANTED: BC-610, Globe King, Collins or Johnson A-M Transmitters. K4KGT, Virgil L. Wyrick, Rt. 4, Sweetwater, TN 37874, phone 1-615-337-6484.

TOP DOLLAR paid for Viking Navigator or Ranger I. Must be very clean, undamaged, unmodified, fully operational. K4MSG, 703-435-2994.

CONELRAD MONITOR, $25. RME Speech Clipper, $18. Miller-595 AM Tuner, $15. Winged S-Line, $545. Paul, W0UC, 612-842-1559.

WANTED: 1930s EQUIPMENT operating above 30 MHz by National, RME, REL, Lafayette, Gross, RCA, Meissner, Peak, Haigis, Barr, Abbott, Hallicrafters, Radio Transceiver Laboratories, Harvey, others or homemade from ARRL/Radio Handbooks. Nagle, 12330 Lawyers, Herndon, VA 22071, 703-620-3066.

WANTED FOR COLLECTION: Complete in good condition ARRL Handbooks—1926 Ed 1 1928 Ed 4, 1929 Ed 5. Steve Smith, 4104 Anita Lane, Greenfield, IN 46140.

HALLICRAFTERS HT-33A Linear with spare tubes, Antenna Relay, $300. Nye Phone Patch, $20. Ameco Preamp, $20. EICO 460 Scope, $25. Pilot Razor Pens (black), $7/dozen; Alan Burg, W2MV, 3320 Bainbridge Avenue, Bronx, NY 10467, 212-655-4977.

VIBROPLEXES, BUGS wanted. Hensley, 5054 Holloway, Baton Rouge, LA 70808.

HIGHEST PRICES Paid for Harvey FT-30 Xmtr and Skyrider 7-tube Rcvr. W1EC, Box 1607, Duxbury, MA 02331, 617-934-5043.

NATIONAL RADIO COMPANY equipment manuals. Also NCL-2000 factory parts. SASE for price lists. Maximilian Associates, 11 Plymouth Lane, Swampscott, MA 01907.

QST FOR SALE: Back issues 1924 thru early 1970's. Have 756 issues, mostly complete years, some duplicates as a Lot $350 postpaid. Or will sell by the year at $15 to $20 per year postpaid. All Very Good to Fine Condition. Send SASE for complete list. Ken R. Stewart, HCR-32, Box 87, Fort Pierre, SD 57532-9402, phone 605-223-2623 evenings.

SELLING: Viking Challenger Transmitter, Lafayette HA-800B Receiver, Heathkit HM-102 Pwr-SWR Meter, Turner Plus 3 Microphone, 100 watt dummy load and books. All equipment operational and comes with manuals. Asking $150, you ship. Contact Carl Scarpa, 201-754-6905.

General

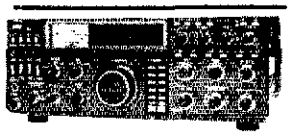
DRAKE DC-4 MOBILE power supply, Swan TB-2 beam new in box, Doug Wismer, 18 Sheldon Ave., Kitchener, Ontario N2H 3M2.

HEWLETT-PACKARD 606B Signal Generator. Excellent condition. w/manual. $290. VE3EAA, Box 2980, Ottawa "D," CANADA K1P 5W9.

WANTED VHF Communications Magazines from Winter 1976 issue to date. VE3BVX, 58 Albert, Lindsay, Ontario K9V4J8.

KENWOOD

TS-940S LIST $1999
NEW Top-of-the-Line
HF Transceiver
• 100% Duty Cycle
• 40 Memory Channels
CALL FOR SPECIAL PRICES!!



TS-930S LIST PRICE $1649
CALL FOR SPECIAL SALE PRICE!

TS-430S LIST PRICE $899.95
CALL FOR SPECIAL SALE PRICE!

TS-711A LIST $799.95
TS-811A LIST $899.95
CALL FOR SPECIAL PRICE!

TW-4000A LIST $599.95
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TR2600A · 2mtr
TR3600A · 70cm
High Tech
HT XCVRS

NEW
Ultra-
Compact
HT XCVRS
TH21AT 2mtr
TH31AT 220 MHz
TH41AT 440 MHz
CALL FOR SPECIAL PRICES—
SAVE $$$!!

MIRAGE AMPLIFIER SALE!

B3016
ONLY $199!

Model	Band	Pre-amp	Input	Output	Sale Price
A1015	6M	Yes	10W	150W	$249
B23	2M	No	2W	30W	$ 79
B215	2M	Yes	2W	150W	$259
B108	2M	Yes	10W	80W	$159
B1016	2M	Yes	10W	160W	$249
B3016	2M	Yes	30W	160W	$199
C22	220	No	2W	20W	$ 79
C108	220	Yes	10W	60W	$179
C1012	220	Yes	10W	120W	$259
D24	440	No	2W	40W	$179
D1010N	440	No	10W	100W	$289

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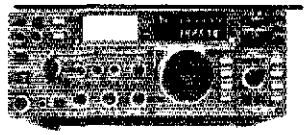

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RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

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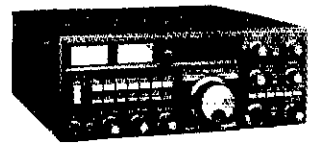

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TRS80C Hamsoft	$59.95	TI994A Hamsoft $99.95
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Amtorsoft (C64/VIC20)		$89.95
Amtorsoft (Apple)		$139.95

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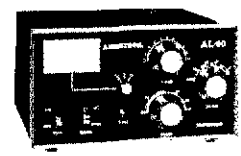

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AI-84 600W PEP Output (4-6MJ6 Tubes)	$379
AL-1200 1500W Output (3CX-1200 Tube)	$1399
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ATR-15 1500W Antenna Tuner	$289

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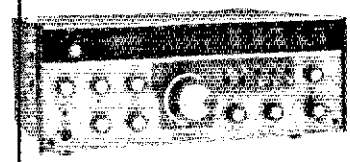

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MFJ TUNERS

This may be the world's most popular 3 KW roller inductor tuner because it's small, compact, reliable, matches virtually everything and gives you SWR/Wattmeter, antenna switch, dummy load and balun — all at a great price!

Meet "Versa Tuner V". It has all the features you asked for, including the new smaller size to match new smaller rigs-only 10¾"Wx4½"Hx14 7/8"D.

Matches coax, balanced lines, random wires—1.8 to 30 MHz. 3 KW PEP —the power rating you won't outgrow (250pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

MFJ-989 **$329.95**

Accurate meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter, MFJ-1312 is available for $9.95.

6 position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ's Fastest Selling TUNER

MFJ-941D **$99.95**

MFJ's fastest selling tuner packs in plenty of new features. New styling! Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/balanced line or tuner bypass for dummy load.

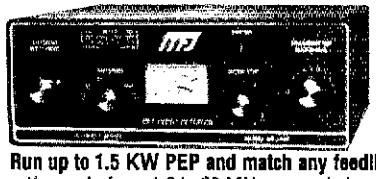
New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 RF power output.

Matches everything from 2.8 to 30 MHz! dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

Built-in 4:2 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ's 1.5 KW VERSA TUNER III

MFJ-962 **$229.95**



Run up to 1.5 KW PEP and match any feedline continuously from 1.8 to 30 MHz: coax, balanced line or random wire.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. 6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 in.

MFJ's Best VERSA TUNER

MFJ-949C **$149.95**

MFJ's best 300 watt tuner is now even better! The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale on easy-to-read 2 color lighted meter (needs 12 V).

A handsome new black brushed aluminum cabinet matches all the new rigs. Its compact size (10 x 3 x 7 inches) takes only a little room.

You can run full transceiver power output—up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Use it to tune out SWR on dipoles, vees, long wires, verticals, whips, beams and quads.

A 300 watt 50 ohm dummy load gives you quick tune ups and a versatile six position antenna switch lets you select 2 coax lines (direct or thru tuner), random wire or balanced line and dummy load.

A large efficient airwound inductor—3 inches in diameter—gives you plenty of matching range and less losses for more watts out. 100 volt tuning capacitors and heavy duty switches gives you safe arc-free operation. A 4:1 balun is built-in to match balanced lines.

Order your convenience package now and enjoy.

2 KW COAX SWITCHES

MFJ-1702 **$19.95**

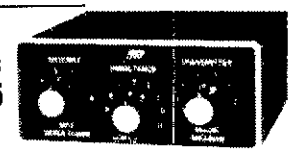
MFJ-1702, $19.95. 2 positions. 60 dB isolation at 450 MHz. Less than .2 dB loss. SWR below 1:1.2.

$29.95 MFJ-1701

MFJ- 1701, $29.95. 6 positions. White markable surface for antenna positions.

MFJ's Smallest VERSA TUNER

MFJ-901B **$59.95**



MFJ's smallest 200 watt Versa Tuner matches coax, random wires and balanced lines continuously from 1.8 thru 30 MHz. Works with all solid state and tube rigs. Very popular for use between transceiver and final amplifier for proper matching. Efficient airwound inductor gives more watts out. 4:1 balun for balanced lines. 5 x 2 x 6 inches. Rugged black all aluminum cabinet.

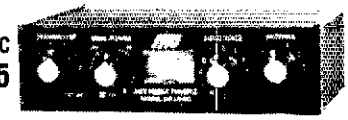
MFJ's Random Wire TUNER

MFJ-16010 **$39.95**

MFJ's ultra compact 200 watt random wire tuner lets you operate all bands anywhere with any transceiver using a random wire. Great for apartment, motel, camping operation. Tunes 1.8-30 MHz. 2 x 3 x 4 inches.

MFJ's Mobile TUNER

MFJ-945C **$79.95**



Designed for mobile operation! Small, compact. Takes just a tiny bit of room in your car. SWR/dual range wattmeter makes tuning fast and easy. Careful placement of controls and meter makes antenna tuning safer while in motion.

Extends your antenna bandwidth so you can operate anywhere in a band with low SWR. **No need to go outside and readjust your mobile whip.** Low SWR also gives you maximum power out of your solid state rig—runs cooler for longer life.

Handles up to 300 watts PEP RF output. Has efficient airwound inductor, 1000 volt capacitor spacing and rugged aluminum cabinet. 8x2x6 inches. Mobile mounting bracket available for $5.00.

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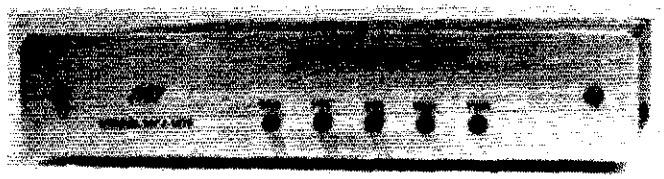
An identical TAPR TNC 2 clone with a new cabinet and added features ... for an incredible $129.95!



MFJ-1270
$129.95

Join the exciting packet radio revolution and enjoy error-free communications ... for an incredible $129.95!

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.

All you need is your rig, home computer with a RS-232 serial port and a terminal program. If you have a Commodore 64, 128 or VIC-20 you can use MFJ's optional Starter Pack to get on the air immediately. You get interfacing cable, terminal software on tape or disk and complete instructions ... everything you need to get on packet radio. Order MFJ-1282 (disk) or MFJ-1283 (tape), $19.95 each.

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.

Here are MFJ's latest and hottest products for improving your station's performance.

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.

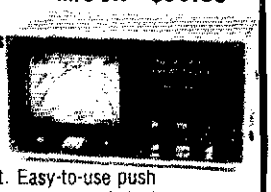
You get the convenience of a dedicated keyboard —no program to load—no interface to connect—just turn it on and it's ready to use.

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

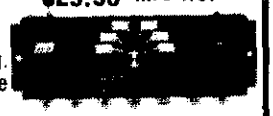


MFJ's cross-needle SWR/Wattmeter gives you SWR, forward and reflected power —all at a single glance! SWR is automatically computed —no controls to adjust. Easy-to-use push buttons select three power ranges that give you QRP to full legal limit power readings. Reads 20/200/2000 W forward, 5/50/500 W reflected 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

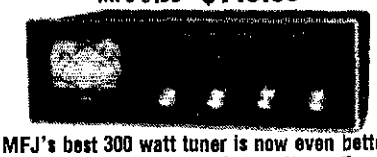
This new breakthru MFJ Antenna Current Probe lets you monitor RF antenna currents—no connections needed! Determine current distribution, RF radiation pattern and polarization of antennas, transmission lines, ground leads, building wiring, guy wires and enclosures.

- **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.
- **Pinpoint RF leakage** in shielded enclosures.
- **Locate the best place** for your mobile antenna.
- **Use** as tuned field strenght meter.

Monitors RF current by sensing magnetic field. Uses an electrostatically shielded ferrite core, FET RF amplifier, op-amp meter circuit for excellent sensitivity, selectivity. 1.8-30 MHz. Has sensitivity, bandswitch, tune controls, telescoping antenna for field strenght meter. 4 x 2 x 2 inches.

MFJ's Best VERSA TUNER

MFJ-949C $149.95



MFJ's best 300 watt tuner is now even better!

The MFJ-949C all-in-one Deluxe Versa Tuner II gives you a tuner, cross-needle SWR/Wattmeter, dummy load, antenna switch and balun in a new compact cabinet. You get quality conveniences and a clutter-free shack at a super price.

A new cross-needle SWR/Wattmeter gives you SWR, forward and reflected power—all at a single glance. SWR is automatically computed with no controls to set. Has 30 and 300 watt scale.

Run up to 300 watts RF output—and match coax, balanced lines or random wires from 1.8 thru 30 MHz. Tune out SWR on dipoles, vees, long wires, verticals, whips, beams/quads. 10x3x7 in.

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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IC-471A 10w 430-450 SSB/CW/FM Xcvr $799.00 Call

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IC-04AT Call
IC-2AT Call
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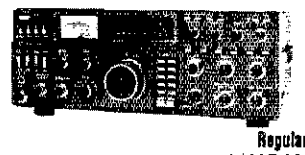
IC-4AT Call

IC-R71A GENERAL COVER RCVR



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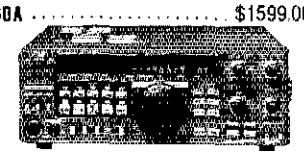
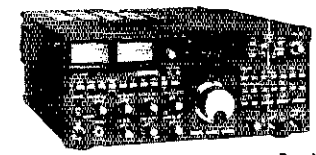
TS-930S/AT	$1799.00	Call
TS-930A	$1599.00	Call



TS-711A TS-811A ..... Call

TR-2600A Call
TH-21A Call
TH-21AT Call
TH-41A Call
TH-41AT Call

R-2000 GENERAL COVER



	Regular	SALE
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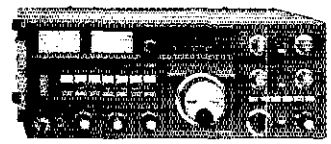
FT-1		Call



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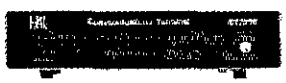
FT-203RH Call
FT-103R Call
FT-703R Call

FRG-8800 GENERAL COVER RCVR

SALE!! NEW RTTY/CW COMPUTER INTERFACES



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YAESU FT 2700 RH
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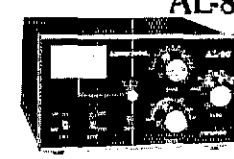

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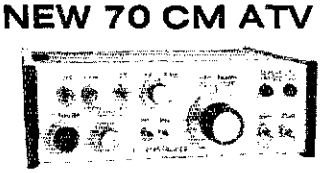

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* **FEATURES:** small 7x7x2.5". Push to look (PTL) T/R switching. GaAsfet downconverter tunes whole 420-450 mHz band. Two switch selected video & audio inputs . . . 10 pin color camera jack & RCA phone jacks. Xmit video monitor output. Over 1 watt 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.

COMMERCIAL 10 kW Transmitter, Racal Model TA184C linear with frequency synthesized exciter Model MA228F covering 2-30 MHz, manual or servo tuned, all modes SSB/AFSK/AM/CW. Uses 4CX10000D in final. Complete with spares including 4CX10000D tubes, sockets, transformers, servemeters, etc. Will crate for shipping but pickup preferred. Price $3800 U.S. VE3KHB phone 613-283-0637 (approximately 60 miles NW Ogdensburg, NY).

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HAM TRADER Yellow Sheets, in our 23rd year. Buy, Swap, Sell ham radio gear. Published twice a month. Ads quickly circulate — no long wait for results! SASE for sample copy. $10 for one year (24 issues). P.O. Box 2057. Glen Ellyn, IL 60138-2057.

TEFLON, s.a.s.e. W9TFY, Alpha IL 61413.

ARCOS VHF/UHF amplifier parts and kits. Harold "Connie" Bramstedt, 6104 Egg Lake Rd., Hugo, MN 55038, 612-429-9397.

COLLINS Repair and Alignment, former Collins engineer. Research and Consulting, Glenn A. Baxter, P.E., Registered Professional Engineer. K1MAN 207-495-2215.

HOSS-TRADER, Ed Says, Shop Around for the best price then telephone the Hoss last, for the best deal.
New Display Kenwood TS-830-S transceiver $745. New Display ICOM IC-2AT $169. New Display Azden PCS-5000 $259. New Display ICOM-735 Transceiver regular $849, cash $649. New Display ICOM-751 Transceiver regular $1379, cash $1049. New Display ICOM-745 Transceiver regular $999, cash $679. New ICOM 02-AT $279. New MB-VA 3kW Antenna Tuner regular $585, cash $469. New LK-500ZB 2500 Watt Amp Supply Linear with tubes/Hypersil Transformer regular $1159, cash $949. Like new Drake B-line complete $399. New Display 940-S Kenwood $1599. VISA/MasterCard Accepted !!! Moory Electronics Company, P.O. Box 506, DeWitt, ARK 72042, 501-946-2820.

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EIMAC-3-500Z's. New-very limited quantity! $85 each, cash, COD, MO. Add $3.50 per tube for shipping and handling. I pay cash or trade for all types of transmitting or special purpose tubes - Mike Forman, 3740 Randolph, Oakland, CA 94602 415-530-8840.

AMRAD (Amateur Radio Research and Development Corporation) is a nonprofit organization of experimenters in packet radio, spread spectrum and digital communications. Monthly newsletter. Mail $15 to AMRAD, 5829 Parakeet Drive, Burke, VA 22015. Add $2 for Canada, Mexico; $8 overseas air, $2.30 surface.

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FREE RECORDINGS of exciting Mexico City and Columbia emergency nets. Send two C-90 cassettes and return postage to K1MAN, Belgrade Lakes, Maine 04918. Join International Amateur Radio Net on odd Saturdays of month: SSB 14.160 at 14:30Z, RTTY 14.090 at 15:30Z.

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1986 CALLBOOKS, Either, $18; any two more, $16 each. Postpaid U.S.; Century Print, 6059 Essex, Riverside, CA 92504. 714-687-5910.

SPY RADIOS And "Bugging" Equipment Wanted! Buying radios beginning with letters "SS" or "SRR" (Example, SSR-5, SRR-5, etc.), military radios in civilian suitcases, "bugging devices! MUSEUM, Box 18521, Wichita, KS 67218, call 316-684-6254.

CLIMBING BELTS & Accessories. Illustrated brochure. W9JVF, 1147 N. Emerson, Indianapolis, IND 46219.

DXPEDITION to MONTSERRAT only $250/week. Details: VP2ML, Box 4861, Santa Rosa, CA 95402.

120' GUYED STEEL TOWER. Extremely strong, $700. WA8MLV, 216-834-1737.

COLLINS WANTED: 55G-1 Preselector with manual, good condition. Need KWM-380 accessories - mics MM-280/281, SM-280/281, AC-2821 DC Cable, AC-3802 Speech Processor. Need filters - F455B60 and F455B05. Need 270G-2 Speaker (75A-2/3 era). Need Spinner Knob for 75A-4 (already have 4:1 reduction gear). Need Tuning Knob for S-Line (NO finger indent). Want to locate 75S-2 and 32S-2 with Power Supply in good condition and manuals. All replies answered. AC1Y 203-667-2494.

APPLE COMPUTER program "Hamlog," 15 modules; logs, auto-sorts 7-band WAS/DXCC. Full feature editing. Much more. $14.95. KA1AWH, PB 2015, Peabody, MA 09160.

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TELL THE WORLD what you would really rather be doing! "I'd rather be DX'ing" Bumper Sticker with "Amateur Radio" written down the sides. Send $2 & 50 postage to Dan Jordan, P.O. Box 6349, Evansville, IN 47712.

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WANTED: CV-89A Plug Set, AN/URA-17 Plug Set and URA-17A. Support Brackets for C. T. Huth, 229 Melmore St., Tiffin, OH 44883.

NICAD BATTERY PACKS - Exact replacement FNB-2 NiCad packs for Yaesu FT-207/FT208 with case, $24 + $2 shipping. Other packs and cells available, send SASE for list. Peripherex, 149 Palmer Road, Southbury, CT 06488, 203-264-3985.

COLLINS 32S-1 and 516F-2 AC Supply. Mint. $275. W8OBI, 419-882-2142.

AN/GRA-71, Coder Burst Transmission Sets. Two new and all components from third. E/C. With schematics. Jim Meaker, 518-235-2892, Albany area.

WANTED: KING KMC-95, accessories. Condition unimportant. Frank White Box 2012, Olathe, KS 66061.

COLLINS "S" Line, mint, KB6GWS, 818-990-2988.

APPLE IIC Software RTTY, ASCII, CW, Logbook, Text Editor, etc. $19.95. SASE for information. K5HI, 2215 Goldsmith, Houston, TX 77030. 713-661-5859.

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.

FREE STANDING Towers manufactured by Trylon Manufacturing of Canada, we have the height and wind load to suit your needs. Up to 96', also guyed towers complete with guys and anchors up to 160'. Write to BJX Supply Co., P.O. Box 388, Corfu, NY 14036 or call 716-599-3791 after 6 PM east. FOB Buffalo NY.

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COLLINS KWM-2, 312B5VFO, 516F2, DXEng. Processor, $245. 30 S-1 2kW Linear, $990. Put me on DXCC Honor Roll, 4CX1000 $95. Kenwood TH21AT, soft case, 2 spare batteries, $245. K6IR, 16904 George Washington, Rockville, MD 20853, 301-774-7709.

FOR SALE: VHF Engineering 2-meter Repeater with crystals for 147.135-147.735. Asking $225 or best offer. Buyer to ship. Contact WA2NAN, 315-848-3653.

TRS-80 MODELS III/4 RTTY, CW Software Package. Free Information. KCQ Software, 6319 Bouef Trace, Alexandria, LA 71301.

INTELLEC SERIES II Microcomputer Development System double density Diskette Subsystem; ICE49 Emulator; Intel Programmer UPP8751, UPP849 - make offer. Greg Smith, Ohaus Scale, #201-377-9000.

SELL: KENWOOD 930S/AT, SP930, MC-60, $1,350. Alpha 76A, 3-tube, $1,300. Wilson MT-61 w/raising base, Teterex TB5-ES, Ham III pkg $800, Yaesu FT-221, $200. Yaesu FT207R HT, DC powerpack, mike, $150. Clegg FM DX, $125. C-64, 1541, 1702, 901, AEA CP-1, $600. ICOM 25A, $195. Lyn, K4VBU, 703-632-3805, 1124 Plantation Road, Martinsville, VA.

REPEATER controller: Rockwell AIM-65 microcomputer, great for controlling a repeater. BASIC, assembler, 4k RAM, printer, case, power supply and manuals. $250. Bob, WBØUBL, 319-848-4857.

BEAM HEADINGS to over 320 DX locations plus major U.S. cities from your exact QTH. Send SASE and $3 to Steve Wirth, 530 Notre Dame Dr., Altamonte Springs, FL 32714.

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WANTED TO BUY: Late Military & Commercial Electronics. Collins Receivers & Packradios, Watkins-Johnson and all late Receivers and Transceivers. Also parts and late HP-GR etc. Test Equipment. Cash paid no questions. Please call or write now. D&R Electronics, Rt. #1 Box 449, Milton, PA 17847. Phone 717-742-4604.

COMPAQ DESKPRO 3 with dual speed processor, 8 MHz. 8087, 640K RAM, 360K floppy drive, 10M hard disk, AC line conditioner. Princeton HX-12 color monitor. Compaq DOS 3.0 with BASIC interpreter. Mint, 1 year old. $2400 or offer. Mike, KC7WG. 503-664-2472 days.

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SELL: SWAN 350B Transceiver $275. Robot RTTY/CW Keyboard $275. W6XM, 619-459-5527.

ESTATE SALE: Johnson Viking 500 (super condition) Johnson kW Matchbox, D-104 mike, Vibroplex Deluxe Original Keys, TR-4, Rohn-Spaulding HA-48 Tower, 18-HT High Gain, both dismantled, Spare 4-400 A Eimac tube, plus more. Write: Dr. David A. Osborne, 5 Vare Woods Rd., Saddle River, NJ 07458.

CLIMBING BELTS. Padded nylon web belt with adjustable length lanyard. Meets OSHA and ANSI specs. $54.95 plus $3 UPS. John Limbach, K8NN, Box 2263, Englewood, CO 80150.

WANTED: NCX-1000 for parts, 8122 tube. For Sale: 3CX2500A3, new in sealed shipping enclosure. J. H. Mills, WV4U, 1490 Dewitt St., Port Charlotte, FL 33952, 813-627-3672.

BE OUR VALENTINE! Your unwanted equipment would be greatly appreciated by the Cupids learning English Through Amateur Radio at Junior High School 22 on Manhattan's Lower East Side. Send it today via WB2JKJ and remember not only are we luvable but also deductible.

COLLINS 32S-3 with 516F-2 AC Supply, 32S3 with 200 Hz CW filter, all cables. $665. W8OBI, 419-382-2142.

HAMTRONICS 220 MHz Repeater, Phone Patch, Decoder, Ider, all factory wired, $650. OBO WB4BBS, 904-432-1876.

DIRECT PLUG-IN REPLACEMENTS for 866's, 3B28's $18 per pair postpaid. Also 4B32 replacements $22 per pair. Supply limited. CRT's: 3AP1, 3BP1, 3FP7, 3HP7, 3ACP7, 5FP7, 5JP1, 7BP7, K1206P7. Write for CRT prices: Galbraith, W9RDJ, 1214 South Alvord, Evansville, IN 47714.

WANTED: NEED URGENTLY Schematic, operations manual for Honeywell 6869 VLF Receiver. H. Weber, 2605 W. 82nd Place, Chicago, IL 60652.

DRAKE CW75 Electronic Keyer, Nye SSK-1 Squeeze Key, P75 Phone Patch, 703-788-9529 AA4HB.

WANTED: AMECO Preamp 160 thru 10. Steve Carr, 612-439-6697, 12288 Jody Ave., N. Hugo, MN 55038.

WANTED: ICOM IC-2KL linear amplifier and IC-2KLPS. K6DL, 2612 Valencia Ave., Santa Ana, CA 92706.

SELL: NEW Cushcraft A-3 w/SS hardware, $150. Autek QF-1A, $45. Pick-up only. WØMHK/1, 203-666-8109.

SELL: DRAKE 2B Receiver, mint condition, $160. 612-429-0595, Charles R. Berens, 2295 Sierra Drive, White Bear Lake, MN 55110.

WANTED: ARGONAUT 515. AA4CO, 919-756-5862.

WANTED: 2 METER Converter with 10 Meter IF & Power Supply. Write KA3JHU, 320 Walker Rd., Dover, DE 19901.

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SELL-COMMODORE VIC-20, Data Cassette, Kantronics Interface, Hamsoft with manuals, best offer. E. Fullmer, WB6MKA, 615 E. Walnut, Glendora, CA 91740, 818-963-1380.

70 FT VESTO self supporting tower, Johnson Rotator, 6-20, 3-15 4-10 Telrex beams. $500/firm pickup. Mike Samarco, 111 Glen Avenue, Upton, MA 01568 (W1JZ) 617-529-4427.

WANTED: FL1500, FL6000 Filters 4NB Blanker for Drake R4C. Harvey Johnson, 726 Parkview Drive, Milton, WI 53563. 608-868-3503.

FOR SALE: Heath: SB101 Xcvr: HP23A Pwr Supply; HM15 SWR Bridge; $190. Misc. Dale Fourtner, 1727 Denkinger Rd., Concord, CA 94521, 415-687-7703.

440 HT-KENWOOD TR-3500, brand new, perfect condition, minimal use. Call Jon, N3DKC, 413-542-3001.

WANTED MANUALS and schematics for: GE Progress Line two meter FM, Transmitter, 4ET21A2 Rev. T, Receiver HER 25B2, Rev. F and Pwr. 4EP2B1 Rev. S. Also Sony Video Camera, AVC-4200A, serial number 10354, K4QOP, 7726 S.W. 53rd Pl., Gainesville, FL 32608.

COLLINS ALL R/E 32S-3 w/DX Engineering Processor 516F-2, 75S3-B w/500-300 filters, 312B-3, complete set spare tubes $750. N2DL, after 7:00, 914-634-4778.

ESTATE SALE of W4BQC. TEMPO I XCVR and power supply, GSB 201 Linear Amplifier, lap oscilloscope, Accu-Keyer, mike, headphone. Realistic TRC450 with lake 12V Power Supply. Phone No. 615-484-8802, Mrs. Marie Armstrong.

YAESU FT-101E, mint, loaded, filters, with matching spkr, $425. Jim Roberts, 410 Hawthorne Place, Auburn, IN 46706, 219-925-3219.

WANTED: 8877 new/used. W9ZR.

WANTED: MAINT. manuals for Defense Electronics TR711 Receiver and manuals for related plug-in units. Also needed manuals for 1368GR and SR202 Receivers. Call collect 214-986-8164, K5MVE.

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WANTED: CONSTRUCTION-Operation Manual for Knight-Kit Model T-175 linear amplifier. W8JKB, 2359 Woodford Street, Toledo, OH 43605.

YAESU 757-GX, Power Supply, Antenna, $500 for all. Don Thornton, 1800 N. Western Ave. #406, San Bernardino, CA 92411, 714-887-8088.

SELL ICOM IC-255A 2-meter mobile including 5/8-wave mobile antenna, both mint, $265 postpaid. (Have gone to 220 MHz). *Don Miller, W2MQB, 516-324-2546.*

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KENWOOD TS-530S Transceiver with YK-88C and YK88CN CW Filters and external speaker SP-230 all for $390. Call 206-362-2933 N7FTS.

WANTED: MFJ cartridge "Telekey" for VIC-20, Yaesu FC-700, SFC D. H. Farwell, 535-46-9326, HHO-KMC, Box 617, APO NY 09164.

FOR SALE: Collins 75A2, $135; 75A1, $135; 32V3 In DX100 cabinet, $125; *DX100, $75;* DX60, $40; HT18, $40; *HQ129X,* $50; Mint CE100V, $150; Murch Transmatch, $85; mint TR4CW, AC4, MS-4, $400; 70 foot angle iron guyed tower, $350; SX43, $75; CE600L, needs work HV, 40M, $95; Meissner Signal Shifter, 160-10, $45; S58 AM-FM, $45; Cliff-Dweller 80-40M dipole, remote adjustable, $95; 100 foot pneumatic mast on trailer, generator, compressor, $2500; 1983 Milspec 1030, 200W CW Filters, Extended Book, Mike, mint, $4955; 1927 Atwater-Kent B.C. set, $75; Want to buy: Telrex 636, 845, 646, 1044 beams; HyGain LP1007, KLM 10-30 Log Periodics, K8CCV, 216-427-2303, 6-9 P.M. E.S.T. *weeknights.*

SALE: SIGNAL-ONE CX7-B Transceiver, 200 watts output 10-160. Works perfectly. $750. WB2BNH, 914-963-0689 days.

FOR SALE: Yaesu FT-902 DM new in carton $950. Kenwood R-2000 receiver with 500 Hz filter, mint cond. In carton $425. Regency MX-7000 Scanner new in box $360. Heath 6 MHz O'Scope with probe, good cond. $150. 313-772-2844 or write. Fred Kaluza, 22629 Clairwood, St. Clair Shores, MI 48080.

INFO TECH M-600. Rolls Royce of Receiver Terminals $450. KA2JIZ, 83-86 Callbooks. 518-842-8847.

"NOVICE RADIO OUTLET" New and used equipment dealer! Attention beginners! "February Special!" Used Kenwood 520-S transceiver, w/manual $420. (NEW) Azden PCS-5000 2M Mobile $295. Free shipping U.S.A. 919-286-7927. 1604 Delaware Ave., Durham, NC 27705.

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RS-232 Tri-State Breakout Box. Never used, still under warranty. Cost $250, sell for $125. Bill Johnston, N5KR, 1808 Pomona, Las Cruces, NM 88001.

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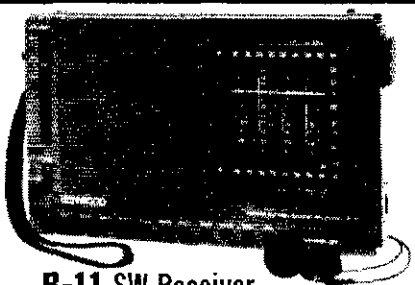

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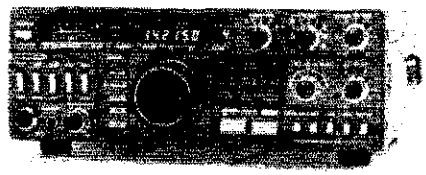

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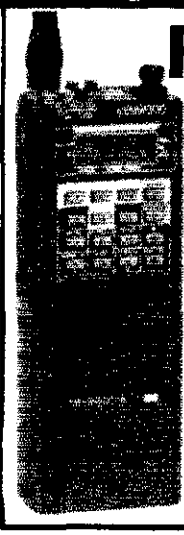

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TH3JRS	3 element "Junior Thunderbird	$190.00
TH5MK2S	5 element "Thunderbird"	$398.00
TH2MKS	2 element "Thunderbird"	$174.00
TH7DXS	7 element "Thunderbird"	$461.00
TH6DXX	conversion kit to TH7DXS	$153.00
EXP 14	Explorer 14 triband beam	$315.00
QK710	30/40 M conv Exp 14	$76.00
	Monoband	
105BAS	"Long John" 5 element 10 mtr	$135.00
155BAS	"long John" 5 element 15 mtr	$207.00
205BAS	"Long John" 5 element 20 mtr	$352.00
204BAS	4 element 20 meter	$259.00
7 1S	Discoverer" rotary dipole 30/40mtr	$145.00
7-2S	Discoverer" 2 elem. 40 meter beam	$327.00
7-3S	converts 7-2S to 3 elem. beam	$205.00
	Multiband Verticals	
18HTS	"Hy-Tower" 10 thru 80 meters	$433.00
14RMQ	tool mt kit for 12 AVQ,14AVQ and 18ATV/WB	$36.00
18VS	base loaded 10 thru 80 meters	$30.00
12AVQ	trap vertical 10 thru 20 meters	$48.00
14AVQ/WBS	trap vertical 10 thru 40 meters	$65.00
18AVT/WBS	trap vertical 10 thru 80 meters	$106.00
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18TD	portable tape dipole 10-80 meters	$121.00
2BDQ	trap doublet 40 and 80 meters	$98.00
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5BS	2 meter 5 element beam	$25.00
8BS	2 meter 8 element beam	$36.00
214BS	2 meter 14 element beam	$43.00
6BS	4 element 6 meter beam	$66.00
V-2S	colinear gain vertical 138-174 MHz	$44.00
V-3	colinear gain vertical 220 MHz	$44.00
V-4	colinear gain vertical 430-470 MHz	$52.00
GP62A	base, 2 mtr. ground plane 3 dB	$24.00
	VHF & UHF Mobiles	
HR144GRI	fiberglass 2 mtr. 6dB gain 3/8-24 mt	$62.00
HB144GRI	HyBander 2mtr 6dB gain 3/8-24 mt	$56.00
HB144MAG	HyBander 2 meter	$19.00
BN86	ferrite balun for 10-80 meters	$22.00
CUSHCRAFT ANTENNAS		
A3	2 element triband beam	$204.00
A743	7 & 10 MHz add on kit for A3	$69.00
A744	7 & 10 MHz add on kit for A4	$69.00
A4218	18 element 2 mtr. 28.8 boomer	$94.00
A4	4 element triband beam	$269.00
AV4	40-10 mtr vertical	$88.00
AV5	80-10 mtr vertical	$95.00
ARX2B	2 mtr. "Ringo Ranger"	$34.00
ARX450B	450 MHz "Ringo Ranger"	$34.00
A144-11	144 MHz 11 ele VHF/UHF	$44.00
A147-11	11 element 146-148 MHz beam	$44.00
A147-22	22 element "Power Packer"	$122.00
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214FB	14 element 2 mtr FM "Boomer"	$74.00
220B	17 element FM "Boomer"	$88.00
228FB	28 element 2 mtr. Boomer	$204.00
12-19	19 element 2 mtr "Boomer"	$88.00
424B	24 element "Boomer"	$75.00
B3	20-15-10 mtr vertical	$254.00
10-4CD	4 element 10 mtr "Skywalker"	$101.00
15-4CD	4 element 15 mtr "Skywalker"	$115.00
20-4CD	4 element 14 mhz "Skywalker"	$257.00
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4BTV	40-10 mtr vertical	$79.00
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6BTV	6 band trap vertical	$124.00
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Alliance	HD73 [10.7 sq.ft.]	$98.00
Alliance	U110	$47.00
CDE	5045-II [8.5 sq.ft.]	$145.00
CDE	HAM IV [15 sq. ft.]	$220.00
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[2-18 & 6-22]	4080" per foot	$0.18
[2-16 & 6-20]	4090 per foot	$0.35
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	500' roll	$79.00
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25G	10' section	$49.00
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55G	10' section	$133.50
HB3	thrust bearing	$56.25
M200	10' mast 2" o.d.	$99.00
BX-40	40'self supporting [6 sq.ft.]	$170.00
BX-48	48'self supporting [6 sq.ft.]	$216.00
BX-56	56' self supporting [6 sq.ft.]	$290.00
BX-64	64 self supporting [6 sq.ft.]	$375.00
HBX-48	48 self supporting [10 sq.ft.]	$265.00
HBX-56	56' self supporting [10 sq.ft.]	$339.00
HDBX-40	40 self supporting [18 sq.ft.]	$249.00
HDBX-48	48 self supporting [18 sq.ft.]	$319.00
5/16	EHS guy wire [3990 lbs]-1,000	$148.50
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ALL OF OUR ACCESSORIES ARE MANUFACTURED BY 'ROHN'

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BC210XL.....$159.00

18 channel 6 band, dual scan speed, auto squelch, direct chan access limit, search, programmable, auto lockout, AC/DC.

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BC100XL	16 chan 8 band programmable hand held	$179.00
BC145XL	16 chan 10 band, weather AC/DC	$99.00
BC175XL	16 ch 11 band aircraft	$169.00
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BC210XW	20 chan 8 band(2 bank) programmable	$179.00
BC800XLT	40 chan 12 band, aircraft & 800 MHz.	$299.00
DX1000	10 KHz to 39 MHz Direct Access Shortwave	$329.00

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45 chan 8 band hand held aircraft, programmable, search or scan, priority control, chan. lockout, scan delay, w/wall charger, carry case, earphone, & nicad battery.

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R1060	10 chan 6 band weather AC only	$99.90
D403	4 chan 3 band, crystal, AC only	$67.90
R106	10 chan 6 band, crystal, AC/DC	$96.90
Hx650	6 chan., crystal hand held	$79.00
Hx750	6 chan. aircraft hand held	$89.00
MX3000	30 chan 6 band AC/DC	$199.00
MX4000	multi band, 20 ch AC/DC	$289.00
MX5000	20 Ch 25-550 MHz, aircraft	$329.00

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SX400-scanner/radio.....**$399.00**

Multi band programmable synthesized scanner/radio 20 channels with 12 block chan. spare switches 25-520 MHz. frequency range, AM/FM change mode, momentary memory recall, birdie tree seek, DC or optional AC power, priority, muting circuit, dual squelch control, auto noise limiter/FM IF filter

RF CONVERTERS FOR SX400 RADIO

RF1030 - 100 KHz to 30 MHz	$179.00
RF8014-800 MHz to 1.4 GHz	$149.00
RS5080 - 900 MHz to 800 MHz	$149.00

SX200-scanner/radio.....**$159.00**

Covers aircraft, military, FBI, satellites, police, fire, defense, aero navigation, amateur radio plus AM/FM radio on 16 channels, seek and scan, digital readout, AC/DC

BMP10/60

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PROGRAMMABLE SCANNER-no crystals. 10 channels to store frequencies you choose, 60 pre-programed "hot" frequencies, touch keyboard with audio response, skip, pause and action. Base-mobile or portable capabilities.

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Fox Vixen II	Superhet dash/visor	$154.90
Fox Super Remote	Superhet detector	$184.90
BEL 861	dash/visor, audio & LED's	$89.90
BEL 860	small dash/visor,	$119.00
BEL 834	sensitive dash/visor, LED & audio	$149.00
BEL 837	smallest remote, audio for X & K band	$159.00
BEL 870	super small with GaAs diodes	$124.90
Whistler SPECTRUM	superhet dash/visor	$189.90

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49 MHz, FM 2-WAY RADIO
hands free operation, voice activated transmit up to ½ mile, batteries optional

model 49B.....**$34.95**
same as 49S except uses "AAA" nicad batteries and comes with battery charger

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Fully regulated, 7 amp constant,10 amp surge capacity.

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Fully regulated 20 amp surge capacity 13.8 VDC, 17 amp constant

WANTED: HEATHKIT SB-401, mint condition with manual. KAØRRX, 303-530-0338.

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COMPUTER PRINTOUT of Beam Headings and Distances from your exact location to all Call Sign prefix's world wide including over 200 U.S. and Canadian cities. Send your location and $11.95 to: G. Miller, K7GFL, 3715 Brittlewood, Las Vegas, NV 89120.

KENWOOD TS-930S Transceiver serial 5050221 with AM filter and MC-60A microphone $950. TS-922A amplifier serial 4120058 $900. These units are one year old in new condition with all manuals and original packing. Two Eimac 3-500Z tubes, new $70 each. Bird elements 10C, 25D $25 each. Bird Line Section 4230-006-1 $25. Bird 72R coaxial switch $25. MicroModule Filter PS-432 $15. Johnson 1 kW Low-Pass Filter $12. Albert Weiss, K6VU, 1700 Forest Lakes Blvd., Naples, FL 33942. Tel 813-262-6866.

ANNUAL SALE of new and fully warranted display and demonstrator equipment by authorized dealer. Limited quantities so phone your order for best chance at these bargains. TH-21AT $189, TH-41AT $199, AT-930 tuner for TS-930 $149, TS-930S/wAT $1099, TR-7930 $299, TM-211A $289, TM-411A $339, R-600 $289. Prices include UPS shipment continental US. Douglas Electronics, 1118 South Staples, Corpus Christi, TX 78404. VISA-MC 512-883-5103.

MMT 1296/144 GaAsFET Transverter, $235; FTV-650 6M Transverter, $95; Johanson 0.8-10 pF Pistons, $2.50. CTCSS Encoder (IC-2AT), $20. Postpaid. Paul, W6UC, 612-642-1559.

SANYO MBC-555 Computer, two SS Drives, 128k RAM. Mono, RGB, Parallel Printer Outputs. Graphics. Manuals, MS-DOS, WordStar, SpellStar, MailMerge, EasyWriter, CalStar, InfoStar. Only lightly used. $550. Howie Ball, WB2PUI, 177 White Plains Rd., #31A, Tarrytown, NY 10591, 914-631-5460.

ROHN TOWERS-Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributor for Heliax antenna cable. Hill Radio, 2503 G E Road, P.O. Box 1405, Bloomington, IL 61701-1405, 309-663-2141.

R.F. POWER METER Narda 8440 10 Mc-12.4 Gc $95. Radio Specialty F.M. Deviation Scope 25-175 Mc $250. K6KZT, 2255 Alexander, Los Osos, CA 93402.

REPLACE RUSTED Antenna Bolts with Stainless Steel. Small quantities, free catalog. Elwick, Dept. 575, 230 Woods Lane, Somerdale, NJ 08083.

TR-7950, $285. IC-27H, $275. Azden 4000, $210. TR-2600A, $200. HMC-1, $25. BP-26, $20. SMC-30, $20. DC-26, $10. F.O.B. K1LEC, 802-886-8121.

CIRCUIT BOARDS, guaranteed lowest quotes and Free twelve hour prototypes. Single and double sided boards. Small through large production quantities. Mail specifications. Hobbyists, any schematic, 6" × 9" maximum, etched on a 3" × 4" board $1.50 (larger boards $2.50). Send remittance and schematic or artwork, or, print your own circuit boards. Kits of all sizes. Guaranteed lowest prices. Basic kit $2.75. Materials for two 3" × 4" boards (included), or S.A.S.E. for catalog - T.O.R.C.C.C. Electronics, Box 47148, Chicago, IL 60647, 312-342-9171.

DRAKE C4 Station Console: Contains: Watt Meter, Remote Antenna Switch, Phone Patch, Antenna Rotor Control, Digital Clock Station Power-Up Control & Switch and Station Timer. $325. ICOM IC-02AT - 3 watt walkie $225. Vernon Chapin, K3VC, 301-252-6111.

COMPLETE HEATH STATION: SB-303 solid state Receiver, SB-401 Transmitter SB-600 Speaker, Mike, Cables, Manuals mint $325. Collins KWM-2A WE. PM-2 Power Supply, speaker $450. John, W6MQK, 1049 N. Holliston Ave., Pasadena, CA 91104, 1-818-798-9345.

LOOP YAGIS: 902, 1296, 2304 MHz. Power Dividers, complete arrays, kits. Write: Down East Microwave, Bill Olson, W3HQT, Box 1655A RFD #1, Burnham, ME 04922, 207-948-3741.

RESISTORS - ANY VALUE/quantity, ¼ watt @$.01, ½ watt @$.015 ($1 minimum). Quantity discounts, 1,000+. Send wattage(s), value(s), quantity(s), and remittance - T.O.R.C.C.C. Electronics, Box 47148, Chicago, IL 60647, 312-342-9171.

SELL SEVENTY-FOOT Rohn twenty five G Tower. Henry Anderson, Box 384, Pelican Rapids, MN 56572.

BUY, SELL, SWAP your equipment in the Amateur Radio Mailbag. A neat, easily readable publication. Published twice monthly. SASE for sample. P.O. Box 3718, Edinburg, TX 78540.

HARRIS RF-230 Commercial Channelized, Synthesized, Programmable Transceiver. SSB/CW/AM 2-30 MHz (125-watt output, Simplex/Duplex operator with 1 PPM Stability. Can be computer controlled. Useable for Maritime, Commercial or Amateur Service. Original cost $7500. Best offer over $1700 with Astron 35 Amp/12 Volt Supply. WA1TUT. 203-937-5074.

HICKOK 140B Oscilloscope, with Heavy Duty Case. $85. WD6CPN, 213-425-0359.

CRYSTALS BUILD SOMETHING: QRP, quick and easy with inexpensive FT-243 crystals. All bands FT-243's 160M—2M made to order. See January classified advertisement. Crystals Since 1933. Stamp or long SASE for 1700-60,000 kilocycles. listings, circuits. W6LPS, C-W Crystals, Marshfield, MO 65706.

KENWOOD TS 520S in mint condition. Includes DC/DC Power Supply, all manuals, $400. KQ3H, 215-596-1134 day, 215-355-3073 evenings.

HAM STATION—KDK 2015R 15W, 2M synth., w/mike, $150; AMCOMM S2-25, 25W, 2M synth., w/mike, Touch-Tone, AC-PS/Spkr., $180; Alda 103 80-20M, SSB-CW, 250W, w/Calib., N.B., $175; Ten-Tec KR-50A keyer, $50; 206A Calib., $17; W2AU Baluns, $12; W2VS Traps, $18. Everything Unused. Ten-Tec 405 Linear (used EC) w/AC-PS (new), $175; Coils, spokes for 3 el. Mini-Beam GC $25. WB2TEX, 11 Berkley Road, Scotia, NY 12302.

TEST EQUIPMENT lab calibrated Signal Generators: HP 8640B 500 kHz thru 1024 MHz, AM/FM with options 002, 003 and 323 portable field carrying case $5,500, Marconi TF 1066B/6, 10 MHz thru 470 MHz, AM/FM $550, HP 606A, 50 kHz thru 65 MHz $375, Military TS-510A, 10 MHz thru 420 MHz $295, Military URM-25D kHz thru 50 MHz $245, URM-26B-4 MHz thru 405 MHz $245, HP/Boonton 202H, 54 MHz thru 216 MHz AM/FM $275, HP 614A, 900 to 2100 MHz $345, HP 608E 10 MHz thru 480 MHz $495, HP628A 15 GHz thru 21 GHz $650, Frequency Counter HP5245L with HP 5253B Plug-in, range 0-500 MHz $375. We accept VISA, M/C, Check. Satisfaction guaranteed, phone Bill Slep, 704-524-7519, Slep Electronics, Highway 441, Otto, NC 28763.

QST 10 year cumulative technical index, covers every technical article, construction technique, modification to commercial and kit equipment, computer program and application, product review and all related "Feedback" and technical correspondence from the January 1976 issue (when QST was re-formatted) up through December 1985, arranged alphabetically within over 30 logically and conveniently organized chapters listing page, month and year, put your or the libraries collection to maximum use before building or buying equipment or assembling your station by bringing yourself up to date first, just $9.95 postpaid. Desert Data, 56089 29 Palms Hwy, Suite 131, Yucca Valley, California 92284.

PC/MS-DOS Ham Software. Send $6.50 for sample disk and catalogue. Rockford Systems, 7474 Hessler, Rockford, MI 49341.

WANTED: H.P. 8558A/8558B Spectrum Analyzer plug in for Type H.P. 181AR Scope. K2RG, 201-366-8225, 10 Rose Court, Dover, NJ 07801.

TEN-TEC MODEL 4229 Antenna Tuner $110. KF3C, 412-537-7693.

FOR SALE: Ameritron AL-80 Linear Amplifier 1 kW, QSK, 160-10 Meters, 3-500Z Final. Complete with manuals. $450 or best offer. Frank, K1FJ, 219-485-2634.

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.

YAESU FT-7, Factory Overhaul $250 plus shipping. W5BVF, 409-684-3349.

KENWOOD AMATEUR REPAIR, experienced professional service. Visa/MC accepted. Mon-Fri 10:00 to 4:00 PM. Pacific Rim Communications, 23332 58th Ave West, Mountlake Terrace, WA 98043, 206-776-8993.

HAM RADIO PROJECT: Please send unwanted Ham Gear. Contact Bro. Bob KD2PB at St. Johns Home, 144 Beach 111 St., Rockaway Park, NY 11694, 718-945-2800.

FOR SALE: Complete Yaesu Station, FT-707, FP-707, FC-707 and YM-36 microphone. RCA WO-33A Oscilloscope. Kenwood VFO-820. Yaesu VFO FV dx 400. Sure model 330 broadcast microphone. Western Electric 72A, 0 to 4000 Hz audio frequency meter using Lissajous patterns on a 2-inch scope. Meters, Tubes, Used 4-1000A, Books. Bill, N0ZX, 11608 Davenport Plz #23, Omaha, NE 68154. 402-330-6562.

KENWOOD TS-120S xcvr 5 band 200W, PS-30 AC Supply, MC-35S mic. Mint $399. K2SQZ, Frank, 716-297-6990.

WANTED: 20-inch K&E Log Log Duplex Vector Sliderule. W4UEB, Box 573, Edenton, NC 27932.

SELL: CP-1 TU with MARSTEXT-C64 and AMTORTEXT-C64 Program Cartridges. Like New. Cost $310 sacrifice for $160. W0MZC, 303-776-1249.

ATV 1200 MHz Loop Yagi and Down Converter, $95, Novax Simplex Phone Patch, $150, Astron 20A Power Supply, $60. N4DAF, 704-541-3166.

DRAKE T-4XB Transmitter, AC-4 PS $100; HA-10 1500W Linear 80-10 meters $95; R-390 Receiver 500 kHz-32 MHz $95; HW-12 75-meter SSB Transceiver with PS $55; Drake TR-72 2-meter transceiver, AC-10 PS $45; ARC5 CW Transmitters, 80 & 40 meters, common PS, all for $30; Heathkit IG-5282 audio signal generator kit, never opened $40. K4URX, 3209 Tudor Drive, Lexington, KY 40503, 606-223-8412.

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.

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.

COUNSELOR - Ham Radio; H.S. Grad., College Student, Adult. Children's camp; varied activities; professional atmosphere; 6/24/-8/22 or any part thereof. Northeastern Pennsylvania 2½ hours. NYC. Apply Camp Wayne, 570 Broadway, Lynbrook, NY 11563 516-599-4562.

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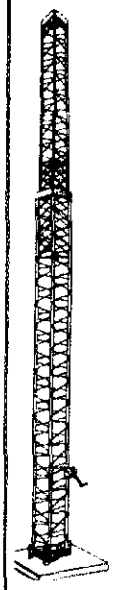

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Check these features:
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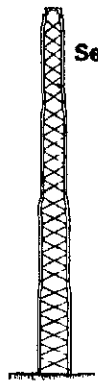
- Totally self-supporting—no guys needed

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!

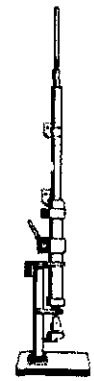
To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

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-213/U

$.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
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

½" Alum. w/poly Jacket $.79/ft
½" LDF4-50 Andrew Heliax™ $1.79/ft
⅞" LDF5-50 Andrew Heliax™ $3.99/ft
select connectors below.

HARDLINE & HELIAX™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax™	$25	$25	$25	$25
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 $1.25
UG21B N Male $2.95 UG23D N Female $2.95

Antenna Wire & Accessories

Solid Copperweld 12 ga $.12/ft 14 ga. $.10/ft
Stranded Copper 14 ga $.10/ft 16 ga $.09/ft
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	
2BDQ 80/40 mtr Trap Dipole	
5BDQ 80-10 mtr Trap Dipole	
BN86 80-10 mtr KW Balun W/Coax Seal	

Limited Quantities purchased at old prices. Call for current prices.

HUSTLER

6BTV 80-10 mtr Vert $129 5BTV 80-10 mtr Vert $109
4BTV 40-10 mtr Vert $89 G7-144 2-mtr Base $119
G6-144B 2-mtr Base $89

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$16	$17	$19	$22	$26
2KW Super	$20	$22	$25	$29	$39

Bumper Mounts - Springs - Folding Masts in Stock!

BUTTERNUT ELECTRONICS CO

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
3/8EJ (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
6" Diam - 4 ft Long Earth Screw Anchor	$14.95
500 D Guy Insulator (5/32" or 3/16" Cable)	$1.69
502 Guy Insulator (1/4" Cable)	$2.99
5/8" Diam - 8 ft Copper Clad Ground Rod	$12.95

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating)	$.29/ft
HPTG4000 Guy Cable (4000 lb rating)	$.49/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$7.95
9902LD Cable End (for 6700 cable)	$8.95
Socketfast Potting Compound (does 5-8 ends)	$14.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
12 in Wall	$29	$49	$59	$79
.18 in Wall	$39	$69	$99	$129
.25 in Wall	$69	$129	$189	$249

VISA MasterCard

ORDER TOLL FREE 1-800-272-3467

Texas, Alaska & for information 1 (214) 422-7306

Mon-Fri: 9am - 5 pm
Sat: 9am - 1 pm

TEXAS TOWERS

Div. of Texas RF Distributors Inc. 1108 Summit Ave., Suite 4 • Plano, Texas 75074

(Prices & Availability Subject To Change Without Notice) *(Antenna/tower product prices do not include shipping unless noted otherwise)*

209RH shown actual size.

FT-709R transceiver

High power to get you out. Battery saver to keep you there.

Where other HTs don't make it, Yaesu's 2-meter FT-209RH and 440-MHz FT-709R keep going strong. Here's why:

Our 2-meter model offers you 5 watts output. And our 440-MHz model offers 4½ watts.

Yet there's no excessive battery drain, thanks to a unique user-programmable Power Saver. When activated, it puts the rig "to sleep" while monitoring, and "wakes it up" when the squelch breaks. Thus, you can listen for hours while keeping plenty of power in reserve.

And despite the wealth of advanced features, operation is actually simple and intuitive. That's why our radios are so much easier to "learn" than any other advanced HT.

At the push of a button, you can recall the information you've independently stored in each of the ten memories: receive frequency, standard or non-standard offset, even tone encode/decode.

Monitoring your favorite repeaters or simplex frequencies is just as easy. Just touch a button to scan all memory channels, selected ones, or all frequencies between adjacent memories. And use the priority feature to return automatically to a special frequency.

Bring up controlled-access machines with the optional plug-in subaudible tone encoder/decoder, independently programmed from the keyboard for each channel. Then use the decode function to listen for tone-encoded signals on selected channels — without a lot of chatter.

Finally, both HTs cover 10 MHz, and come complete with a 500-mAh battery, charger and soft case. Options include a VOX headset and hard leather case.

So next time you visit your dealer, pick up Yaesu's 2-meter FT-209RH or 440-MHz FT-709R. Because they not only get you out, they keep you there too.

YAESU

Our 30th Anniversary.

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.

KENWOOD

...pacesetter in Amateur radio

NEW! Computer-interface

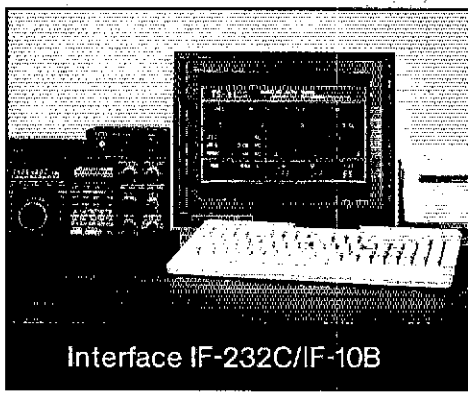
"DX-cellence!"

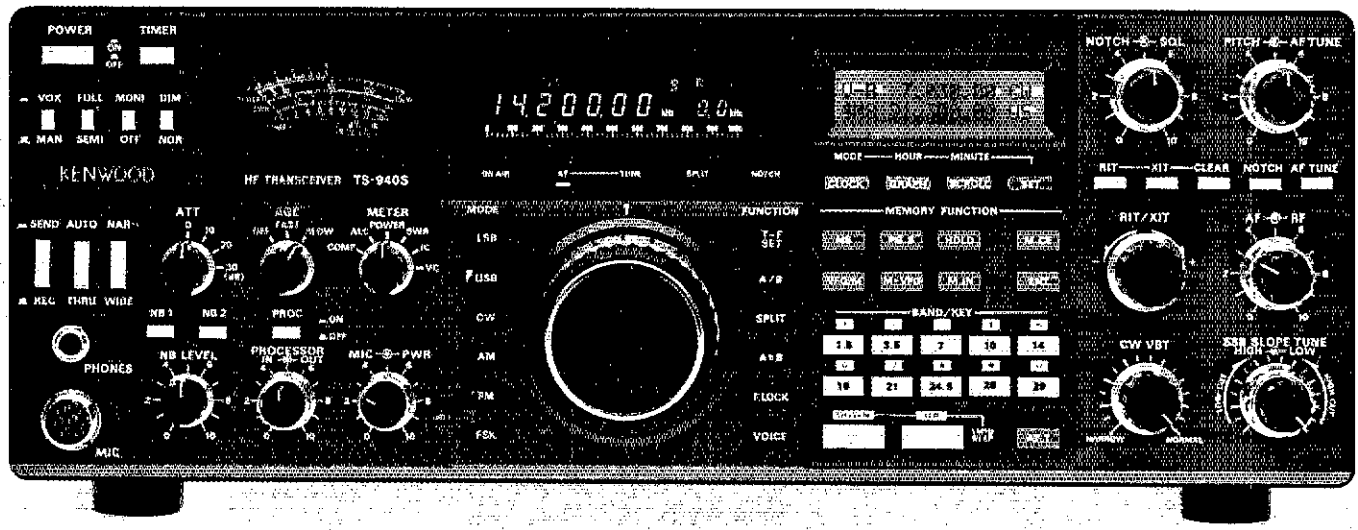
TS-940S

The new TS-940S is a serious radio for the serious operator. Superb interference reduction circuits and high dynamic range receiver combine with superior transmitter design to give you no-nonsense, no compromise performance that gets your signals through! The exclusive multi-function LCD sub display graphically illustrates VBT, SSB slope, and other features.

- **100% duty cycle transmitter.** Super efficient cooling system using special air ducting works with the internal heavy-duty power supply to allow continuous transmission at full power output for periods exceeding one hour.
- **High stability, dual digital VFOs.** An optical encoder and the flywheel VFO knob give the TS-940S a positive tuning "feel."
- **Graphic display of operating features.** Exclusive multi-function LCD sub-display panel shows CW VBT, SSB slope tuning, as well as frequency, time, and AT-940 antenna tuner status.
- **Low distortion transmitter.** Kenwood's unique transmitter design delivers top "quality Kenwood" sound.
- **Keyboard entry frequency selection.** Operating frequencies may be directly entered into the TS-940S without using the VFO knob.
- **QRM-fighting features.** Remove "rotten QRM" with the SSB slope tuning, CW VBT, notch filter, AF tune, and CW pitch controls.
- **Built-in FM, plus SSB, CW, AM, FSK.**
- **Semi or full break-in (QSK) CW.**
- **40 memory channels.** Mode and frequency may be stored in 4 groups of 10 channels each.
- **Programmable scanning.**
- **General coverage receiver.** Tunes from 150 kHz to 30 MHz.
- **1 yr. limited warranty.** Another Kenwood First!

Optional accessories:
• AT-940 full range (160-10m) automatic antenna tuner • SP-940 external speaker with audio filtering • YG-455C-1 (500 Hz), YG-455CN-1 (250 Hz), YK-88C-1 (500 Hz) CW filters; YK-88A-1 (6 kHz) AM filter • VS-1 voice synthesizer • SO-1 temperature compensated crystal oscillator • MC-42S UP/DOWN hand mic. • MC-60A, MC-80, MC-85 deluxe base station mics. • PC-1A phone patch • TL-922A linear amplifier • SM-220 station monitor • BS-8 pan display • SW-200A and SW-2000 SWR and power meters.





Complete service manuals are available for all Trio-Kenwood transceivers and most accessories.
Specifications and prices are subject to change without notice or obligation.

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

KENWOOD

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