QST

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Have you worked W5LFL lately?

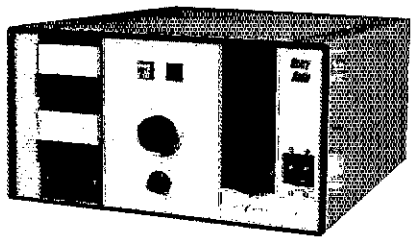
Henry has the amplifier you want!

Take your choice. The world famous 2K Desk Classic, 2K Console Classic and 3K Console Classic HF amplifiers speak for themselves. Now to complete your range of choice, the superb new 1002-A and 2002-A for 146 MHz and the 1004-A and 2004-A for 440 MHz.

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

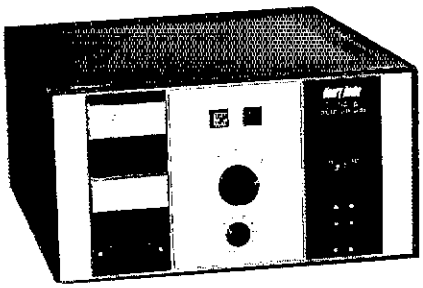
2K Classic...the culmination of more than fifteen years of developing the 2K series into the world famous line that sets the standards for top quality HF linears. A true "workhorse", built to loaf along at full legal power, trouble free, for years of hard service. Operates on all amateur bands, 80 through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

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



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

3K Classic...uses the superb Eimac 8877 tube. More than 13db gain. We believe the 3K to be the finest amateur linear available anywhere...the amplifier of every amateur's dreams.



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

2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier will use a ½ wave strip line and offer all of the same specifications as the 2002A. This will replace our limited production 2004.

1002-A A 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for ½ power specifications. Rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A.

1004-A...a half-power version of the 2004A. Will cover the 430 to 450 MHz band using a ½ wave strip line design.

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

We stock these plus many other fine names:
AEA • ARCO • ASTRON • B & K • BIRD • COLLINS • CONNECT-SYSTEMS • CUSHCRAFT • DRAKE • EIMAC • HAL • HUSTLER • HY-GRAIN • ICOM • KENWOOD • LARSEN • NYE • ROBOT • YAESU

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Expand and Protect Your RTTY Text

DSK 3100

DSK3100-DS3100ASR-ST6000 SYSTEM

The BEST RTTY system just got better! The DSK3100 may be added to any DS3100/MPT3100 terminal to give greatly expanded storage of text files. Best of all, files don't "go away" when power goes off! The DSK3100 builds on the already outstanding features of our super-terminal and adds even more versatility to text editing, mailbox, and traffic handling features. The two disk drives give text storage ten times that of the MSO3100 and MPT3100. Outstanding features:

- Save all your message and text on two 5.25″ diskettes
- Store up to 326,000 characters in 511 files
- Storage is equivalent to 4500 lines, 90 pages, 80 ft. of TTY paper, or 15 hours of text at 60 WPM!
- Save all TEN HERE IS messages on disk
- Save all DS3100 turn-on parameters on disk
- New clock includes power protection and autodate
- New printer output for parallel interface printers
- Access disks directly from your computer with USER I/O
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- Combine two files with new INSERT command
- New MSO directory is shorter and faster to send
- Cabinet matches ST6000 (3.5 × 17 × 9″; 12 lbs)
- One cable connection to MPT3100 terminal
- Operate from either 120 or 240V, 50/60 Hz power.

The DSK3100 adds non-volatile memory and extended storage features you, our customer, need. Rather than designing a new product to replace it, we have again up-dated the DS3100 to make it truly the most advanced and user-friendly RTTY system sold. With the addition of the DSK3100, the DS3100 remains the unchallenged leader in state of the art communications. Write for our latest RTTY catalog and see the DSK3100 at your favorite HAL dealer.

HAL

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ICOM IC-45A

Compact 440 — 449.995 MHz Mobile

IC-45A
440-449.995 MHz Mobile
10 Watts

10 watts / 5 memories /2 scanning systems in a 2"H x 5½"W x 7"D size /optional tone encoder / touchtone® microphone make the IC-45A the most popular 440-449.995 MHz mobile transceiver.

Dual VFO's. Dual VFO's give an extra stored frequency for scanning (memory scan scans 5 memories plus 2 VFO's) and each VFO has a different tuning rate for easy QSY.

Optional Encoder. Plug-in to allow easy access. Field programmable.

5 Memories. Instant access to most used frequencies. VFO A information is transferred to the selected memory by pushing the W/CK button.

Priority Channel. Any memory channel may be monitored for activity on a sample basis, every 5 seconds, without disruption of a QSO conducted on a VFO frequency.

LED Bar Meter. Shows strength of received signal as well as relative transmitter output from the fully protected final RF amplifier. APC (automatic power control) is used to detect SWR and adjust the power output to a safe level.

Simplex/Duplex Operation. Standard 600KHz offset initializes into radio at turn on. Offset may be changed by pressing the priority button while in VFO mode. Rotating the main tuning knob will now change the offset up or down and the offset will be displayed on the frequency readout.

Adjustable Power Levels. Pulling the squelch knob out places the unit into low power. Both the high and low power may be independently set to accommodate your simplex/repeater requirements or amplifier input characteristics.

Nor/Rev Capability. Use of the W/CK button in the duplex mode, allows one touch monitoring of the repeater input frequency. If simplex operation is possible you will know instantly.

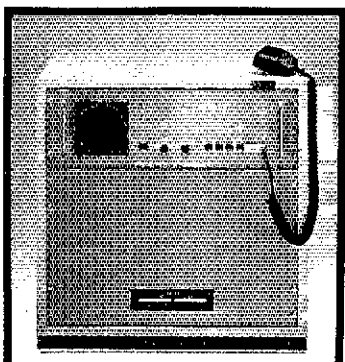
Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies.

With the mode switch in a VFO position, the unit will scan the band defined by memories 1 and 2. Full band scan or program band scan is selected internally.

The IC-45A has internally switched scanning choices of adjustable delay period after a carrier is received then resume scan, or resume on carrier drop.

A Compact FM Mobile. Fits in the smallest of places. Stacking, matching Mobile Mounts for UHF and VHF units make a complete mobile communications system for your car.

Memory Backup. When the optional IC-BU1 backup power unit is installed on the back of the IC-45A, memory will be maintained while transferring the unit from power source to power source. If the unit is not removed from power, it will maintain memory even when turned off with or without the IC-BU1.



IC-RP3010
FM Repeater

Now a 10 watt 440Mhz FM repeater from the leader in VHF communications. The IC-RP3010 features high stability crystal controlled channels, CTCSS system, ID'er, remote control through a DTMF decoder and microprocessor controlled circuitry.

ICOM
The World System

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February 1984 *Volume LXVIII Number 2*

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OUR COVER

Some of us have operated from exotic locations, but you'd have to go far (and high!) to top Owen Garriott's recent mission. His story, in his own words, begins on page 11. *(NASA photo)*

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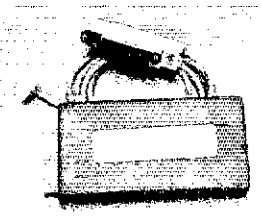
AEA Brings You The AMTOR Breakthrough

We are pleased to announce three new AMTOR products. Our new software package that will allow you to operate AMTOR with your CP-1 is called AMTORTEXT™. A complete hardware terminal unit and AMTORTEXT software plug-in cartridge for the Commodore 64 computer is called the MICROAMTOR PATCH™. We also have new applications software packages for the AMT-1 and Commodore 64 or VIC-20 computers.

NEW AMTORTEXT™

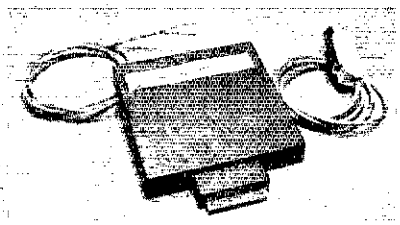


AMTORTEXT™ is a LOW COST software package that will allow the CP-1 and Commodore 64 computer to be used as a multi-mode AMTOR TERMINAL. Compare the outstanding FEATURES and PRICE of the AT-64 (AMTORTEXT for Commodore 64) to the competition: • KEYBOARD OVERLAY instructions (eliminates constant referral to manual) • STATUS INDICATORS on screen • Easy to follow MENU • ARQ, MODE A- MASTER OR SLAVE • FEC MODE B • MODE L (LISTEN TO MODE A) •SPLIT SCREEN with 2000 CHARACTER TYPE AHEAD transmit buffer • WORD MODE for error correcting with DEL KEY until space or CR is sent • REMOTE ECHO shows characters transmitted as they are validated by other station • easy entry of your SELCALL for automatic response to ARQ calls • BREAK-IN MODE to interrupt sending station • LTRS/FIGS REVERSE for assistance in MODE L sychronizing • TEN MESSAGE BUFFERS OF 256 CHARACTERS EACH • AMTOR timing synced to host computer internal CRYSTAL OSCILLATOR • PROGRAMMABLE TRANSMIT DELAY can be saved to tape • AUTOMATIC PTT • POWERED BY HOST COMPUTER • includes INTERFACE CABLE for AEA model CP-1 COMPUTER PATCH™.

The AMTOR software TIMING ROUTINES have been written by Peter Martinez, G3PLX (father of AMTOR) which means you can be sure of having NO SYNCHRONIZING problems with other AMTOR stations adhering to the established international AMTOR standard. PROPER SYNCHRONIZATION is an ABSOLUTE must for AMTOR!

$89.95 List $69.95* C-64 AMTORTEXT

NEW MICROAMTOR PATCH™



MICROAMTOR PATCH™ is a NEW LOW-COST, HIGH-PERFORMANCE AMTOR SOFTWARE/HARDWARE computer interface package. The MICROAMTOR PATCH (model MAP-64) INCORPORATES AMTORTEXT software (described above) for the Commodore 64 computer. All circuitry and software is incorporated on a single, plug-in cartridge module featuring the following: •TRUE DUAL CHANNEL MARK AND SPACE MULTI-STAGE 4 POLE, CHEBYSHEV ACTIVE FILTERS • AUTOMATIC THRESHOLD CORRECTION for good copy when one tone is obliterated by QRM or SELECTIVE FADING • EASY, POSITIVE TUNING with TRIPLE LED INDICATOR • NOT a low-cost, easily "pullable" phaselocked loop detector!!! • SWITCH SELECTED 170 Hz or WIDE SHIFT on receive • AUTOMATIC PTT • demodulator circuitry powered by your 12 VDC supply to AVOID OVERLOADING HOST COMPUTER and for maximum EMI ISOLATION • EXAR 2206 SINE GENERATOR for AFSK output • SHIELDED TRANSCEIVER AFSK/PTT INTERFACE CABLE PROVIDED • FSK keyed output.

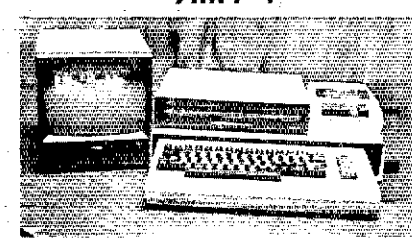
The MicroAmtor Patch is structured for easy upgrading to the AEA CP-1 Computer Patch™ advanced interface unit without having to buy a different software package! Simply unplug the external computer interface cable (supplied with the MicroAmtor Patch) from the MicroAmtor Patch and plug it into the Computer Patch.

$149.95 List $129* MAP64
$239.95 / $199.95* MAP-64/2

The Model MAP-64/2 incorporates the C-64 MBATEXT™ PROM on the same board with AMTORTEXT for low cost RTTY/CW/ASCII/AMTOR operation.

AMT-1

The **AMT-1** is the DEFINITIVE AMTOR TERMINAL UNIT which all future AMTOR units will be measured against. All you need for full AMTOR operation is a dumb ASCII terminal (or personal computer and emulation software) and a normal HF transceiver and antenna. With the AMT-1 you will receive the following features: •SENSITIVE FM DEMODULATOR • FOUR POLE ACTIVE RECEIVE FILTER • TOTAL CONTROL FROM KEYBOARD or by COMPUTER PROGRAM CONTROL • 16 LED PANADAPTOR TYPE TUNING INDICATOR • CRYSTAL CONTROLLED AFSK MODULATOR • RECEIVE/TRANSMIT standard RTTY • TRANSMIT MORSE CW • MORSE RECEIVE field installable option • AUTOMATIC PTT • 13 front panel LED STATUS INDICATORS • all METAL ENCLOSURE for maximum RFI immunity • operates from your 800 ma 12 VDC power source.



Shown with optional AMT-1 Console Stand, COMM-64 with CRT Monitor and cassette recorder (Not Included)

$589.95 List $499.95* AMT-1

Applications software for C-64 or VIC-20

AEA also offers an applications software package for the Commodore VIC-20 (model AMT-1/VIC20-1) or 64 computer that is resident on a plug-in PROM CARTRIDGE and includes the INTERFACE CABLE to go between the computer and the AMT-1. KEYBOARD OVERLAY instructions are also included for easy operation without the instruction manual. The COMM-64 program (model AMT-1/C64-1) offers SPLIT SCREEN OPERATION with ten MESSAGE BUFFERS. It also offers UNATTENDED OPERATION with automatic MESSAGE RECORDING and AUTOMATIC STATION INDENTIFICATION.

$89.95 List $69.95*

*SUGGESTED AMATEUR DISCOUNT PRICE THROUGH PARTICIPATING DEALERS ONLY

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OWN THE WORLD WITH THE R3 NO RADIAL VERTICAL 10, 15, 20 METERS

The R3 half wavelength design eliminates the ground radial system required by other verticals. Optimum current distribution gives more efficiency and low angle radiation for DX communications.

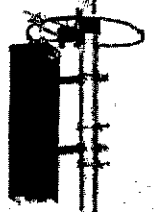
R3 brings high performance antenna features to those living in apartments, condominiums or on small city lots. Even if you have plenty of space, R3's combination of neat appearance and DX capability make it ideal for your station. The R3 includes an integral turner to give a perfect match across 10, 15, and 20 meters. The remote tuning feature allows easy fingertip control as you operate your station.

R3 is a complete antenna system ready to install in virtually any location from ground level to roof top.

FEATURES

- Gain, ref ¼λwhip
- No Radials
- 360° Coverage
- Integral Tuner with Remote Control Console and Indicator
- 24 Volts To Tuner
- 110 or 220 Volt Operation
- 75 ft (22.9m) Control Cable Included
- Only 22ft (6.7m) High
- 1 sq ft (.09 sq m) Space
- Self Supporting
- Stainless Steel Hardware
- Mount: Sleeve Type Fits Pipe Up To 1¾ in (4.5cm) dia
- Can Be Easily Stored and Set Up For Portable or Temporary Operation

Add up the features—you'll find that you can have ALL OF THIS PERFORMANCE without the need to buy tower, rotator and associated hardware. ***R3 IS ANOTHER PRODUCT CREATED FOR THE ENJOYMENT OF YOUR HOBBY BY THE WORLD RENOWNED CUSHCRAFT ENGINEERING DESIGN TEAM.***



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Manchester, NH 03108 USA
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Scan the World.

SSB, CW, AM, FM, digital VFO's, 10 memories, band and memory scan, optional 118-174 MHz coverage...

R-2000

The R-2000 is an innovative all-mode SSB, CW, AM, FM receiver that covers 150 kHz–30 MHz, with an optional VC-10 VHF converter unit to provide coverage of the 118-174 MHz frequency range. New microprocessor controlled operating features and an "UP" conversion PLL circuit assure maximum flexibility and ease of operation to enhance the excitement of listening to stations around the world.

R-2000 FEATURES:

- **Covers 150 kHz–30 MHz in 30 bands.** Uses innovative UP-conversion digitally controlled PLL circuit. UP/DOWN band switches (1-MHz step). VFO's continuously tuneable across the band and from band to band.
- **Optional 118-174 MHz coverage.** Through use of innovative microprocessor technology, frequency, band, and mode data of stations in the 118-174 MHz range may be tuned, displayed (full frequency, ie., 146.000.0), stored in memory, recalled, and scanned, using the R-2000 front panel controls and frequency display, allowing maximum convenience and ease of operation.
  The optional VC-10 VHF converter unit may be easily installed on the rear panel of the R-2000.
- **All mode: USB, LSB, CW, AM, FM.** Provides expanded flexibility in receiving various signal types. Front panel mode selector keys, with LED indicators.
- **Digital VFO's for best stability.** 50-Hz step, switchable to 500-Hz or 5-kHz. F. LOCK switch provided.
- **Ten memories store frequency, band, and mode data.** Complete information on frequency, band, and mode is stored in memory, assuring maximum ease of operation. Each memory may be tuned as a VFO. Original memory frequency may be recalled. AUTO. M switch for automatic storage of current operating data, or, when off, selective storage of data using M. IN switch.
- **Lithium battery memory back-up. (Est. 5 yr. life.)**
- **Programmable memory scan.** Scans all memories, or may be programmed to scan specific memories. HOLD switch interrupts scanning. Frequency, band, and mode are automatically selected in accordance with the memory channel being scanned. The scanning time is approximately 2 seconds per channel.
- **Programmable band scan.** Scans automatically within the programmed bandwidth. Memory channels 9 and 0 establish upper and lower scan limits. HOLD switch interrupts scanning. Frequency may be adjusted, using the tuning control, during scan HOLD.
- **Fluorescent tube digital display (100-Hz resolution).** Built-in 7 digit fluorescent tube digital display indicates frequency or time, plus memory channel number. DIM switch provided. The display may be switched to indicate CLOCK-2, FREQUENCY, CLOCK-1, and timer ON or OFF by the front panel FUNCTION switch.
- **Dual 24-hour quartz clocks, with timer.**
- **Three built-in IF filters with NARROW/WIDE selector switch. (CW filter opt.)** 6-kHz wide or 2.7-kHz narrow on AM. 2.7-kHz automatic on SSB. 2.7-kHz wide on CW, or, with optional YG-455C filter installed, 500-Hz narrow. 15-kHz automatic on FM.
- **Squelch circuit, all mode, built-in, with BUSY indicator.**
- **Noise blanker built-in.**
- **Large front mounted speaker.**
- **Tone control.**
- **RF step attenuator. (0-10-20-30 dB.)** Four step attenuator, plus antenna fuse.
- **AGC switch. (Slow-Fast.)**
- **"S" meter, with SINPO "S" scale.**
- **100/120/220/240 VAC, or 13.8 VDC operation** (with opt. DCK-1 cable kit).

Other features.

- RECORD output jack.
- Audible "beeper" (through speaker).
- Carrying handle.
- Headphone jack.
- External speaker jack.

Optional accessories:

- VC-10 118-174 MHz converter.
- HS-4, HS-5, HS-6, HS-7 headphones.
- DCK-1 DC cable kit.
- YG-455C 500-Hz CW filter.
- HC-10 World digital quartz clock.
- AL-2 Surge Shunt

More information on the R-2000 is available from all authorized dealers of Trio-Kenwood Communications
1111 West Walnut Street
Compton, California 90220.

KENWOOD

... pacesetter in amateur radio

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

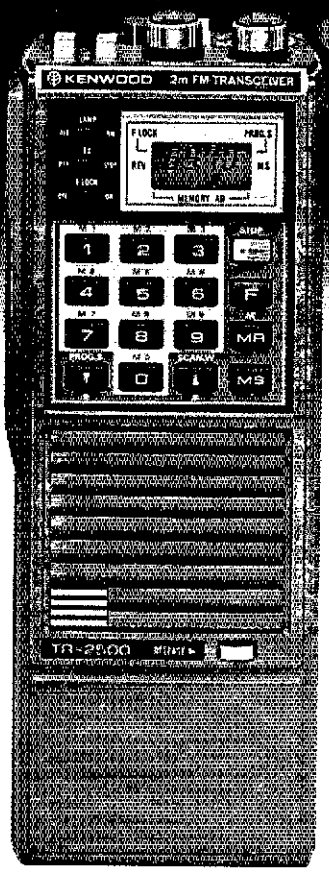
TR-2500

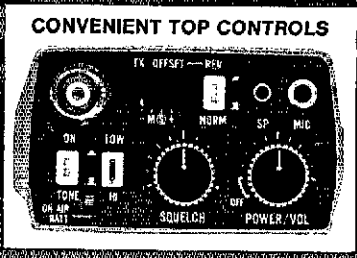
Small, Handy, Big!

The TR-2500 is a compact 2 meter FM handheld transceiver with every conceivable operating feature.

TR-2500 FEATURES:

- Weighs 540 g. (1.2 lbs). 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches).
- LCD digital frequency readout.
- Ten memories includes "MO" for non-standard split repeaters.
- Lithium battery memory back-up, built-in, (est. 5 year life).
- Memory scan.
- Programmable automatic band scan, and upper/lower scan limits; 5-kHz steps or larger.
- Repeater reverse operation.
- 2.5 W or 300 mW RF output. (HI/LOW power switch).
- Built-in tunable (with variable resistor) sub-tone encoder.
- Built-in 16-key autopatch encoder.
- Slide-lock battery pack.
- Keyboard frequency selection.
- Covers 143.900 to 148.995 MHz.





- Optional MS-1 mobile or ST-2 AC charger/supply for operation while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mAH Ni-Cd battery, and AC charger.

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply.
- VB-2530 2 M 25 W RF power amps., (TR-2500 only).
- TU-1 Programmable CTCSS encoder (TR-2500 only).
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only).
- PB-25H Heavy-duty 490 mAH Ni-Cd battery pack.
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for AA manganese/alkaline cells.
- SMC-25 Speaker microphone.
- LH-2 Deluxe leather case.

TR-3500

70 CM FM Handheld

- Covers 440-449.995 MHz in 5-kHz steps.
- Hi-1.5 W, Low-300 mW.
- TX OFFSET switch, ±5 kHz to ±9.995 MHz programmable.
- Auto/manual squelch control.
- Tone switch for opt. TU-35B
- Other outstanding features similar to TR-2500.

- BH-2A Belt hook.
- RA-3 2 m 3/8 λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap.
- EP-1 Earphone.

TR-7950/7930

Big LCD, Big 45 W, Big 21 memories, Compact.

Outstanding features providing maximum ease of operation include a large, easy-to-read LCD display, 21 multi-function memories, a choice of 45 watts (TR-7950) or 25 watts (TR-7930), and the use of microprocessor technology throughout.

TR-7950/TR-7930 FEATURES:

- New, large, easy-to-read LCD digital display. Easy to read in direct sunlight or dark (back-lighted). Displays TX/RX frequencies, memory channel, repeater offset, sub-tone number, scan, and memory scan lock-out.
- 21 new multi-function memory channels. Stores frequency, repeater offset, and optional sub-tone channels. Memory pairs for non-standard splits. "A" and "B" set band scan limits. Lighted memory selector knob. Audible "beep" indicates channel 1 position.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- 45 watts or 25 watts output. HI/LOW power switch for reduction to 5 watts.
- Automatic offset. Pre-programmed for simplex or ±600 kHz offset, in accordance with the 2 meter band plan. "OS" key for manual change in offset.
- Programmable priority alert. May be programmed in any memory.
- Programmable memory scan lock-out. Skips selected memory channels during scan.
- Programmable band scan width.
- Center stop circuit for band scan, with indicator.
- Scan resume selectable. Selectable automatic time resume-scan, or carrier operated resume-scan.
- Scan start/stop from up/down microphone.
- Programmable three sub-tone channels with optional TU-79 unit (encoder).
- Built-in 16-key autopatch encoder, with monitor (Audible tones).
- Front panel keyboard control.
- Covers 142.000-148.995 MHz in 5-kHz steps.
- Repeater reverse switch. (Locking)
- "Beeper" amplified through speaker.
- Compact lightweight design.

Optional accessories:

- TU-79 three frequency tone unit.
- KPS-12 fixed-station power supply for TR-7950.
- KPS-7A fixed-station power supply for TR-7930.
- SP-40 compact mobile speaker.

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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 U.S. 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: 643958 AMRAD NEWI.

"It Seems to Us..."

No-Code: Buried "Once and For All"

The Federal Communications Commission gave radio amateurs an early Christmas present on December 14, by agreeing unanimously to abandon its proposal for some form of no-code Amateur Radio license. The recommendation of the Commission's Private Radio Bureau, reflecting the tenor of the comments received, was to "bury the concept of no-code"; in adopting the recommendation the Commissioners, in the words of Chairman Mark Fowler, "put it to rest once and for all." Those were reassuring words to hear at the conclusion of what had been a long struggle, and it was a fine way to close out on an affirmative note what had been a most tumultuous year. The only regret was that the League's late President, Vic Clark, W4KFC, did not live to share in the celebration.

The ARRL Board had gone on record as opposing the concept of a no-code license at the earliest sign that such a proposal might see the light of day. In support of that position, Vic Clark penned "Some Thoughts on the Morse Code" for December 1982 *QST*, challenging the notion that the code was obsolete. The Commission approved the release of its no-code proposal (actually, two alternative proposals) some weeks later, on January 20, and it was not until the March 1983 issue of *QST* that we were able to share with the membership the complete text of the document. There followed a period of intensive study and discussion by League members on both sides of the issue, during which those subscribing to the minority viewpoint had an opportunity to make a case for their position. They didn't succeed; if anything, reaction to the specific FCC proposals was even more negative than had been reflected in earlier opinion surveys on the subject. Editorial support for no-code in the commercial magazines aimed at the Amateur Radio community did not change many minds, financially motivated opportunism generally being recognized for what it was. Thus, when the ARRL Board met in April, the Directors had a clear mandate to oppose any form of no-code amateur license.

It was after the Board Meeting that opposition to no-code went into high gear. Since the Commission already knew that the presently licensed amateur community was strongly opposed to a no-code license, filing comments could not simply be a numbers game; force of logic was even more important than weight of numbers. The amateur community, and League members and affiliated clubs especially, came through in fine style: By the Commission's own count, of the 5000 comments those opposing no-code outnumbered supporters by *20 to 1*. No-code support among responsible members of the public simply did not materialize to any significant degree. Even more impressive than the numbers was the quality of the filings. These weren't simple statements of opposition; for the most part they were well-reasoned arguments which looked at both sides of the issue, but came inexorably to the conclusion that a no-code license could imperil those very qualities in Amateur Radio which make it a public asset. Scores of Senators and Congressmen also heard from their constituents on the no-code issue, and several were sufficiently persuaded to register their own opposition. Certainly, our cause was given a tremendous boost when Senator Barry M. Goldwater, K7UGA, came out against a no-code license after carefully weighing its potential dangers and benefits.

The FCC was criticized for proposing no-code in the first place, but in fairness it should be said that from that point forward its handling of the issue was exemplary. A two-month extension of time for filing comments was granted, to permit the ARRL comments to be formulated after the April Board Meeting and to provide the greatest possible opportunity for public participation in the proceeding. The Commission staff tackled the mammoth task of digesting the volumes of comments with dispatch, which kept the period of uncertainty to a minimum. The Private Radio Bureau recommendation, and the Commissioners' action, was in accordance with the weight of public comment — thus demonstrating, in the words of ARRL President Carl Smith, WØBWJ, a "commendable responsiveness" to the people the Commissioners are appointed to serve. The December 14 consideration of the subject in an open Commission meeting, and the language of the Report and Order itself, could hardly have been more complimentary to the Amateur Radio Service. We especially liked these words, used to describe those who took the time to file comments with FCC: "These commenters are the people who have made the ARS what it is today — a service that is a model of public responsiveness in times of emergency and distress, and a service that is a model of self-enforcement and volunteerism. The strong sentiment they expressed in this docket about the nature of such a service is a critical factor in weighing the proposals."

With the no-code issue behind us, we can get down to the business of recruiting into Amateur Radio those very people the Commission wants to see attracted into our avocation. The only real difference between the Commission's original perception and ours is that of viewing "slow code" (five words per minute) as an unnecessary obstacle, rather than as an important part of the socialization process of a new amateur licensee. The desirability of growth was not seriously at issue; the question was whether the future development of the Service would be permitted to proceed on terms prescribed by its practicioners. It is gratifying that the FCC has entrusted us with the responsibility for seeing that Amateur Radio grows and develops on *our* terms, rather than theirs — and with the Commission's continued support, so we shall! — *David Sumner, K1ZZ*

League Lines...

No code is dead. See the complete story on pages 9 and 57.

Don't miss your chance to be a Charter Contributor to the ARRL Scholarship Endowment Fund Honoring Senator Barry Goldwater, K7UGA. Charter Contributors will have their name and calls listed in a commemorative book to be presented to the Senator. See page 58.

The FCC has commenced issuing 10-year amateur licenses. P.R. Docket No. 83-337 became effective on October 15, 1983, but actual implementation could not get underway because the Commission's computers needed to be re-programmed. (See December 1983 Happenings.) Licenses that specify the old 5-year terms will still expire on the date shown on the license. The new 10-year license term will begin only when a license is renewed or modified. Of course, new, first-time licenses will now bear a 10-year license term.

On December 8, President Reagan signed H.R. 2755, at which point it became Public Law 98-214. The bill's main purpose was to authorize funding of FCC for the next two years (fiscal 1984-85). Along the way, Senator Barry Goldwater's bill amending the Communications Act to allow recovery of costs in the Volunteer Examiner Program (see League Lines, December 1983) was added as an amendment.

The FCC will be addressing the issue of cost recoupment in a Notice of Proposed Rulemaking to be issued around March 1. Meanwhile, the ARRL is making preparations to become one national VEC covering all U.S. call districts and overseas U.S. amateurs. More details in QST next month.

ARRL-affiliated club newsletter editors and the following section level appointees are now eligible to receive the ARRL Letter at the reduced cost of $10 per year: Section Emergency Coordinator, Section Traffic Manager, OO/RFI Coordinator, State/Provincial Government Liaison, Technical Coordinator, Affiliated Club Coordinator, Public Information Officer and Bulletin Manager. Normal subscription rate is $19.50 per year.

The National Cable Television Association (NCTA) has indicated a willingness to communicate with cable operators involved in CATV/Amateur Radio interference disputes with the goal of effecting resolutions in individual cases around the country. If you would like to have your case reviewed by the newly appointed joint ARRL/NCTA committee for CATVI, please request a reporting form from the CATVI Desk, ARRL, 225 Main St., Newington, CT 06111.

W5LFL's taped log of his QSOs aboard the Space Shuttle Columbia has arrived at ARRL Hq. The log and four hours of tape have been reviewed and QSL cards will be sent out soon. (A listing of call signs in Owen's log appears on page 14.)

ARRL Headquarters is open from 8 A.M. to 5 P.M., Eastern Time, Monday through Friday. The receptionist will be available to welcome visitors and accept phone calls any time between these hours. If you are calling long distance and wish to speak to a specific member of the Hq. staff, however, there are certain "core hours" when it would be better to call. If you call between the hours of 9 A.M. and 4 P.M. (Eastern Time), Monday through Friday, you generally will be able to speak directly to the specific staff member you request. Staff absences from the office during these core hours shall be kept to a minimum. Only business travel and other special reasons will keep staff members out of the office during these times. This new schedule comes as a result of the Hq. staff going off the four-day work-week effective January 1. Half of the Hq. staff used to work 10 hours per day, Monday through Thursday, and the other half 10 hours per day, Tuesday through Friday. The new schedule means that all staff members will be available five days per week.

ARRL's Club and Training Department is looking for a Training Manager. Job Description: Oversee the ARRL Training Program; support corps of registered instructors; Instructor's Newsletter, In Training QST column, Tune in the World with Ham Radio, ARRL Code Kit; revise Instructor guides and audio/visual training aids; develop student materials; develop and test a program of instructor training and certification. Requirements: Degree and/or classroom experience in education, preferably in science or electronics; strong writing skills; broad experience in Amateur Radio; Amateur Extra Class license preferred.

Well Done, W5LFL!

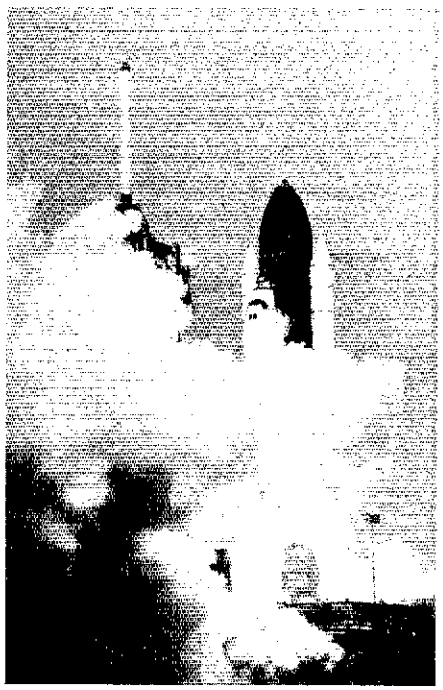
Was Owen Garriott pleased with his historic Amateur Radio operation from space? You betcha!

More than a decade ago, *CQ* Magazine published a cover photo of Dr. Owen Garriott, W5LFL, a newly selected Apollo astronaut trainee, with a question asking if he would be the first ham to operate from the surface of the moon. When Congress slashed NASA's budget, cutting short the Apollo program, Garriott and the dream of ham operation from space moved over to the Skylab program. Although Owen made it to Skylab, ham radio did not.

Now our dreams have become a reality — and a highly successful one, at that. On November 28, 1983, the Space Shuttle *Columbia* carried W5LFL and his radio into orbit. For 10 days *Columbia* streaked through the skies, and for the last seven of those days, hams around the world were sent emotionally into orbit when they heard Owen's voice break their squelches calling earth-bound stations. For those few lucky enough to hear their own call signs acknowledged, the thrill was doubly sweet.

Ten days, seven hours, 47 minutes and 23 seconds after launch, *Columbia* touched down, completing what could be the most thrilling chapter in the annals of ham radio. But it is not the end; just the beginning. Amateur Radio has moved into its newest frontier, and it is there to stay!

Ten days after touchdown, the STS-9 crew was back in Houston for the post-flight press conference. ARRL Public Information Coordinator Peter O'Dell, KB1N, caught up with Owen there and got his views on the history-making flight. ARRL Satellite Coordinator Bernie Glassmeyer, W9KDR, assisted with the preparation of this article.



Columbia clears the launch pad at 1600 UTC November 28 carrying W5LFL and the rest of the crew into orbit. STS-9 had the largest crew and most complex assignment of any Shuttle mission to date. *(NASA photo)*

QST: Owen, what was it like?

Garriott: Well, that can't be answered in just a couple of minutes. There's no way to answer that kind of a question. It's a very pleasant experience. The ham stuff in particular was a pleasant pastime. I managed to do it in my off-duty hours, and it was a pleasure to get involved in it and to talk with people who are as interested in space as the 100,000 hams on the ground seemed to be. So it was just a pleasant experience, the hamming in particular, all the way around.

QST: Can you tell us about your first contact?

Garriott: Before flight, of course we looked at all the possible orbits, and some of the best opportunities. There weren't too many good opportunities to begin with, crossing the U.S. We had to look rather carefully when my off-duty hours occurred to catch passes along the West Coast after work hours and along the West Coast and the East Coast before I went on duty. And so Rev [revolution] 40 was one of the first ones. We had a good opportunity to listen for U.S. hams, in particular, coming down the West Coast. So as soon as I put the antenna in the window and turned the transceiver on — I did so actually an orbit early just to make sure everything was working right — [I knew] clearly it was going to work fine. Then, on the designated orbit, why, it was just no time at all, as I approached the U.S. I began to hear stations that were trying to reach me. On my very first CQ, there were plenty of stations responding. So I managed to pick up the call from WA1JXN. He happened to be the first person to reach me after my CQ. And I am pleased that I had a chance to talk with him and a good many others, on that very first pass down the West Coast.

QST: Before the flight, you had mentioned a possibility of simply turning the tape recorder on and letting it run while you were busy with your activities. Did you have an opportunity to try this?

Garriott: I tried it, but it really was not a satisfactory mode. I was the one who thought it might work well, and I was mistaken about that. For one thing, it takes up the window in the spacecraft. The crew normally likes to use that to take photographs out of, and to leave that antenna in the window when I'm not around to attend it and be using it is sort of an infringement on some of the things they like to do. And on top of that I'd have to leave it sitting on one frequency instead of tuning across the band on the 10 possible channels that I was expecting to use. So all in all, it was not a very practical, worthwhile way to pick up additional calls. It really requires some attendance there. We could be automated, of course, if we did things differently, so the transceiver were cycling on its own, say, 15 seconds on each channel, or something like that — then it maybe could have been worked a bit differently, or better. But in the mode we had, it was really not very practical.

QST: How about the method of tuning the radio: Did you find that satisfactory, where it was much like a crystal-type tuning mechanism as opposed to the synthesized

Kennedy Space Center, Florida, November 28, 1983: Mission specialist Owen Garriott and payload specialist Byron Lichtenberg prepare to enter the astronaut van for the ride to Pad 39A and the launch of STS-9. Dr. Garriott, W5LFL, is waving in response to greetings of "73, Owen!" from photographer Patty Winter, N6BIS. *(photo by Patty Winter)*

"73, Owen!"

Even an astronaut on his way to the launch pad has time for a friendly wave to a fellow ham, as Owen Garriott proves in the photo. I was at Kennedy Space Center last November to cover the launch of STS-9 for a computer magazine. (An Apple® II controlled one of the Spacelab experiments.) As part of my work, I photographed the six crew members as they left the Operations and Checkout Building on the morning of November 28, and got into their special van for transport to Launch Pad 39A.

The walkout takes only about half a minute, so photography time is at a premium, but I couldn't resist putting down my camera long enough to wish Owen a good trip in "hamese." At least I had enough professional sense to set the camera back up in time to catch his reaction!

Later, while Owen was in *Columbia* waiting for the launch, Launch Director Al O'Hara, K4KOL, exchanged similar greetings with him. — *Patty Winter, N6BIS*

type with thumb-wheel switches that most hams use?

Garriott: It was quite satisfactory. Because I held the transceiver in one hand, I could key it with one finger, and with the thumb and index finger switch frequencies at the same time and with just one hand. And so it worked out quite satisfactorily to change the little knob to the 1 through 10 position.

QST: How about the mode of operation — FM as opposed to sideband, or some exotic mode — do you think FM was the appropriate mode to use?

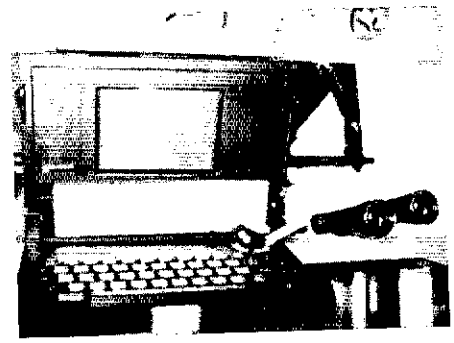
Garriott: Indeed, FM was the best. It had several advantages, by taking out the Doppler shift — it's the first principal advantage, because you've got a lot of things to think about, up there — you've got a lot of background noise. You simply don't have any time or opportunity to worry about taking out Doppler shift, which is a substantial shift at a wavelength of 2 meters. And the people on the ground, many of them not experienced with vehicles traveling this fast and producing such large Doppler shifts, they'd have the same kind of a problem. FM also has the advantage of tending to select those strongest or loudest signals and suppressing the rest. And if you put them all on an equal basis with 100 signals trying to come through at the same time, I think it would even further complicate the problem of readibility. So the FM had several advantages, and I'm convinced it was indeed the correct mode of operation.

QST: Tell us about the advance planning you did for the mission.

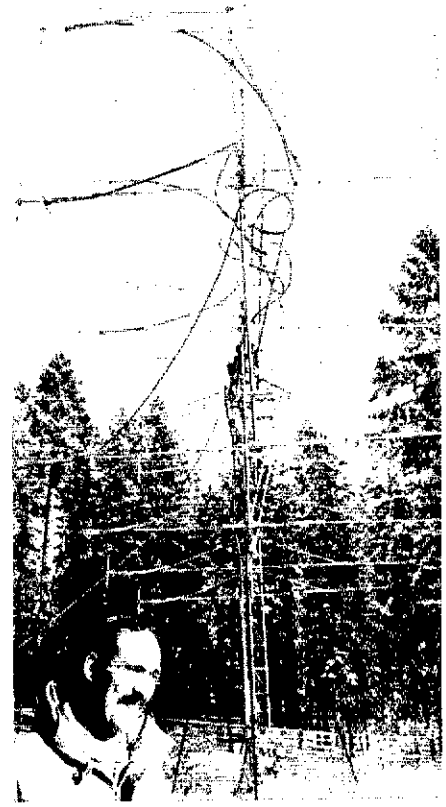
Garriott: It certainly was an extremely important matter to have done all the planning possible before flight, so you can get up there, and not have to take a guess as to whether it was going to be a good pass, whether you were going to be on duty, or off duty, what the spacecraft attitude is going to be. You really need to know whether you'll be looking at the stars or looking at the ground. We did all that planning, we had people here at JSC [Johnson Space Center] helping with the spacecraft attitude computations, we were talking to people about what their schedules would be, and whether there would be time to work it in, and what we should be able to do. We did have a few planned contacts, like with my hometown (I had a chance to talk to my mother and my sons), and all of those things needed to be laid out ahead of time. So that kind of preplanning is essential if you're going to have a successful tour.

QST: I understand you had a very thorough checklist with you to facilitate your operating. Can you tell us a little bit about that?

Garriott: As we were going through the planning stages, I just put together the sort of notes that I would prefer to put on a sheet of paper rather than try to tuck into the recesses of my memory somewhere.



While on his 10-day mission exploring space and going where no ham had gone before, W5LFL was aided by SPOC — Shuttle Portable Onboard Computer. *(NASA photo)*



Lance Collister, WA1JXN, of Frenchtown, Montana, stands before the antenna that helped him become the first amateur to work an astronaut-ham orbiting the world.

W5LFL Carries Amateur Radio to Classrooms

Sally O'Dell, KB1O and ARRL Club Program Manager, approached her daughter's first grade teacher and asked if the class would like to hear some of the ham radio transmissions from space. The school leaped at the chance. Word got to the press, and the attempt was widely covered by the local, regional and national media, including *The New York Times* and even the *Weekly Reader*.

But the publicity was merely icing on the cake. The real story and benefit to ham radio in the long run was what happened at the school. Avery Street's room 8 became "Mission Control." Mrs. Jarsen, the teacher, used the opportunity to teach concepts of exploration and communications. But the whole school was seized by the spirit. The hallways were covered with decorations and projects featuring space travel and ARRL publications. W5LFL and KB1O in 8-inch-high letters appeared on construction paper plaques in the hallway.

How did the kids feel about it? Mrs. Jarsen reported that for several days before the mission, the kids invented and played a new game that might be called "Owen Garriott talks to Sally Ride on the ham radio." After the actual attempted contact, the kids added another element to the game. One boy would push his way through the other children until he found "Owen" or "Sally" and push a microphone in front of their faces — he was the reporter.

Was this an isolated case? We have reports from all across the country of school children becoming involved in ham radio and space during the STS-9 mission. Those are the hams of the future, the ones who will keep the Service healthy and vital — the new blood. Now it's in your hands; now is the time to approach your school and talk to them about starting a Novice class. Do it today!

First-grade students at Avery Street School in South Windsor, Connecticut, prepared for W5LFL's flight and their hoped-for contact with him by making model Shuttles from construction paper, decorating the walls with space and ham radio symbols, and pretending to be astronauts talking to each other over ham radio.

Sally O'Dell, KB1O, explains to first-grade students why they did not hear W5LFL on Orbit 49. They persisted and were able to hear him on a later orbit.

Starting out with the pages here, for example, I'm holding in my hand all the lists of the frequencies and the channels I had available to me on my transmitter, and a number of the names and call signs that I'm going to be looking for. One thing that's of interest you wouldn't probably know about is that we had a little computer up there which allowed us to place any spot around the world we want, and when our orbit passes near it, it'll tell us how long it is before we arrive at that location. And so I've got myself about 20 of the principal geographical locations around the world where I know I'm going to be interested in talking to people, like my home in Enid along with Washington, and Connecticut and San Francisco and a few other places scattered around the world, and I can use that little computer to tell me how long it's going to be before I arrive over that location. And it's located where I can see it from my ham operating station. And so I was using that continuously to tell how long it was going to be before I passed over Washington, or how long it would be before my next opportunity to come down and see the West Coast and San Francisco.

I also had a list of ground tracks for the spacecraft showing what the spacecraft attitude was and what part of the ground my antenna would be seeing on that particular path. And so if I'm looking straight down, of course, it's just a little circle. But if a spacecraft is, say, looking to the north or the southwest, these little charts showed me just what the spacecraft attitude was during those passages.

I also had a printout of all the revs I have planned as possible communications opportunities. And so it starts right up here with 40 and 49, 56, etc., many more than I was actually able to use, but all of the ones that were possible or potential. So that's the kind of preplanning that I did prior to this flight, and it really was a help in making sure you didn't waste a lot of time in orbit figuring out what you wanted to do next.

QST: What was the most exciting thing relating to ham radio that happened during the mission?

Garriott: That's hard to say. There were a number of firsts, and a number of really exciting things. I enjoyed the first contact, I enjoyed the first CW contact. It's fascinating to talk to Orroroo Valley [site of a tracking station in Australia — Ed.], to meet your friends and fellow astronauts out there and get patched into the Capcom, to demonstrate the utility of the ham system operating as a backup to some of our Spacelab communication systems. It's always a pleasure to talk with people like Senator Goldwater, he's been such an enthusiastic ham for these many decades and I had a chance to talk with Senator Garn and American ambassadors here and there. And King Hussein. So all of those things are interesting. I enjoyed for example even last night, as I was sitting at my home, reviewing and editing my tapes to keep finding new contacts that I was unable to read during the flight. As a matter of fact, I properly interpreted only, well, less than half of all the contacts that are on the tape, and I find that I've made contact with some of my friends in Europe — right at the integration center, where we spend a lot of our training time. All of those things are exciting, so it's hard to pick out a single item.

QST: Did you accomplish everything you set out to do?

Garriott: It's hard to think of anything that was not. At this point I think every objective we set out to achieve preflight has been accomplished.

QST: As I understand, the next astronaut who is a ham scheduled to fly is Tony England, sometime around March of 1985. Assuming he is permitted to take a ham radio along, what advice would you give him?

Garriott: Well, plan to use it in the same way I did. Start thinking about it ahead of time to make sure it's not going to interfere with the other work tasks that you'll be assigned on the flight that you have to accomplish primarily. And let's think about some flight modifications to the transceiver design — something to prevent overloading on the front end when there's 100 stations calling on the same frequency, and a few other things like that; a pair of headphones, for example, instead of a simple little earpiece in the ear. So I think there are some things that we can do to make the task even better, and the accomplishments even more extensive.

QST: When you worked your sons Robert and Richard at W5RRR, they mentioned a joke that had been perpetrated on you about Richard perhaps being a stowaway. Do you care to relate that incident to us?

Garriott: What the story related to is the fact that Richard in particular is a very creative young man, who would like very much to have had the opportunity to fly. Actually, of all the people in the world, he's about the only one I can think of that I might have changed places with, had I had the chance to let him have this opportunity, and since it was my second flight I just might have been coerced into giving my son

Did You Work W5LFL?

This is the first draft of the W5LFL log, which we've put together after carefully transcribing about 4 hours' worth of tape. Background noise made it difficult for Dr. Garriott to write down or respond to each call received. The entire W5LFL log was recorded on tape; therefore, the tape becomes the official log. If your call isn't there, check the list of incomplete calls that follows the first list. If you attempted to contact W5LFL and are not on the first list, please do the following:

Look for a call sign resembling yours in the list of "incomplete" calls. If you find one, send us as much information about your transmission as you can, including date and time in UTC. We'll compare it to the time on the tape, and decide if your call qualifies as a contact. All determinations will be made by W5LFL and ARRL. Address your QSO information to ARRL Hq., ATT: W9KDR, 225 Main St., Newington, CT 06111. — *Bernie Glassmeyer, W9KDR*

AA6S
AB7C
AE7Q
AJ6L
AL7W
CE3CKE
CE3AHD
DC6SN
DC6AH
DC8AM
DF6UQ
DG6NAA
DJ1IJ
DK6RX
DLØDAA
DL1YCA
DL9GAK
DL9MH
EA3AWD
EIØRTS
EI3FI
F1FVX
F5AD
F6AVG
G4UYL
G6DEF
G6EGY
GM8NXC
GW6OJK
HH2CX
I1NRF
I5FBP
JY1
KØLIR
KØRI
KØRZ
K1IKN
K1PAD
K1PXE
K2IBP
K2OVS
K2RIW
K2TTI
K3DI
K3NV
K3PGP
K3TC
K4GFG
K4JT
K5ADQ
K5CAY
K5IH
K5OKG
K5OXE
K5QHF
K6DYD
K6GSS
K6LY
K6MYC
K6TDR
K7GIJ
K7ND
K7SMV
K7UGA
K8CS*
K8KNT
K9BI
K9HMB
KAØPGN
KAØY
KA2BTD
KA4WJA
KA5FPV
KA6DQZ
KA7GHR
KB4CRT
KB4WM
KB5AMN
KB6TN
KB6V
KC4P
KC7EM
KC8KE
KD5JH
KD6LQ
KD7IY
KD7RF
KE5C
KE6VK
KE6XJ
KFØM
KF4SX
KF6Z
KI7L*
KNØL
KN2D
KQ5D
KQ5W
KS1S
KT1U
KXØO
KX6C
KY4Z
KY7B
NØCOX
NØCXC
NØIS
NØLL*
N2EK
N4GAN
N4HY
N4JBK
N5BLZ
N5DDT
N5EZM
N6AVR
N6DD
N6ECL
N6JM
N6NB
N6QP
N6RJ
N7ARE*
N7BHC*
N7DOF
N7WS
N8DEJ
N9GA
NG5P
NM5I
NN6E
NR4P
NT6G
OE6WIG
OE7FRH
OF2XN
OH3XA
OK1DFG
OK1DIG
OK1KRA
OK2BDS
OK3CGX
OZ1DPR
OZ1ELF
SM2KT
SM4CLU
TI3DJT
VE1AFU
VE1BB
VE1CAW
VE1CGY
VE1OC
VE1UT
VE3BNA
VE3BNO
VE3KLW
VE3KRP
VE4OO
VE7BOQ
VE7CYB
VK1BX
VK1DF
VK1ORR
VK1RR
VK1ZAH
VK1ZIF
VK1ZQR
VK2KPG
VK2PMN
VO1BK
VO1DI
VO1FP
VO1FR
VO1GG
WØPHD*
WØPN
W1AW
W1PSG
W2EFL
W2GDV
W2JNO*
W2NQ
W2PAU
W3CWG
W4AQL
W4BE
W4KYL
W4MOP
W4ODW
W4ROA
W4WJ
W5FF
W5GEL
W5HTK
W5HUQ
W5LFG
W5LUU
W5PNY
W5RRR
W5UN
W6KH
W6LEV
W6YBL
W6YX
W7AVD
W7BGH
W7ID
W7KMF
W7RV
W7SW
W7YKN
W8AC
W8FQK
W8GUS
W8WN
W9KDR
WAØVJF
WA1BAR
WA1FCK
WA1JXN
WA1PSI
WA2BSH
WA2CHY
WA2SEF
WA2VMS
WA2WVL
WA4BEV
WA4BZJ
WA4EWA
WA4GIJ
WA4KXY
WA4LZR
WA4MMD
WA4PLR
WA4SBC*
WA4TNV/KL7
WA5AFO
WA5DBY
WA5DXR
WA5NOM
WA6CFM
WA6IUM
WA6KNR
WA6PEV
WA6RLV
WA6SGK
WA6YBT
WA7BJU
WA7DPM
WA7JUO
WA7RQS
WA7UIB
WA8KEM
WA8MTI
WA8TXT*
WBØSWD
WBØTTW
WB2ONA
WB4EMI
WB4YJC
WB4YUD
WB5AZI
WB5DSH
WB5PDW
WB5RRR
WB5VZL
WB6DEO
WB6DTR
WB6GYE
WB6IDK
WB6NOA
WB8NWY
WB8PAT
WB9MSV
WDØFOY
WD4FAB
WD4IYS
WD4KSN
WD4RJI
WD4VCS
WD5BPB
WD5IFB
WD5KBZ
WD6AUS
XE1ALQ
XE1FV
XE1TU
XE2RCP
YU7KN
YU7MAU

*Heard on CW

Incomplete Calls

Orbit 40
W5V__
KA__
__AJW

Orbit 56
WA7RV__
W7Q__

Orbit 71
W5U__Z
WA7__V

WB5__B__
__5RN
WD5CG__
WA4DN__

Orbit 97
K5A__

Orbit 111
OE7U__
DL9__
HG8__N

DHØAA__

Orbit 113
WA4N__
K2U__

Orbit 130
WA6G__
K5__V
WA6__
WA2VW__

Orbit 134
KA7__
KR8__
N8C__
W4__

Orbit 135
WB5L__J
__6E
K5D__
__IIX

Orbit 144
__XC
WD4__
KA1__
__OG
__A__A
__1DCR

Orbit 145
__ZPR

WB2JS__
__YW

Orbit 146
W7__
VE3J__

Orbit 149
VE3__
WB9C__

Orbit 150
WA7__
AD1__

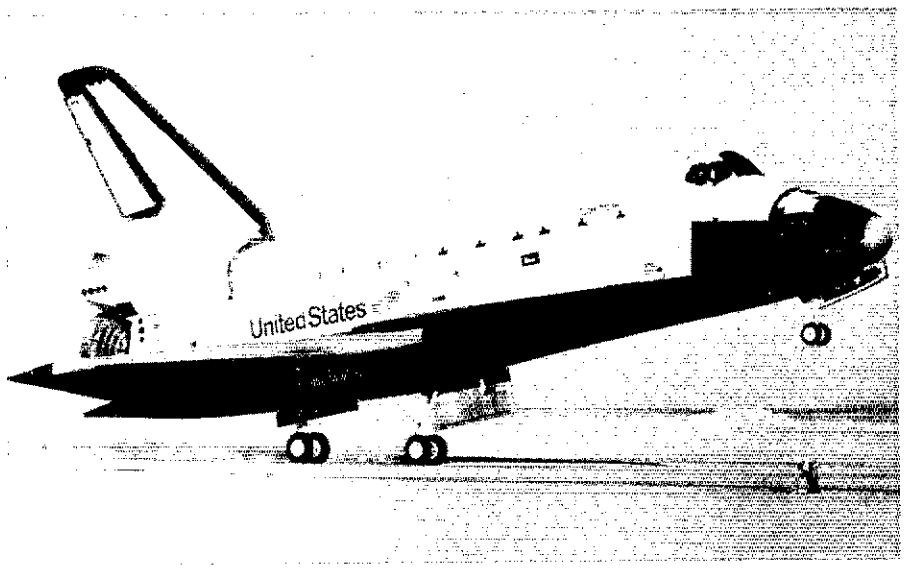
At the Johnson Space Center in Houston, the W5RRR OSCAR station, located in the visitor's auditorium along with most press tables, plays host to hams and media alike during one of the early passes. W5DID is at the mike, and the expression on the face of NBC Science Correspondent Roy Neal, K6DUE (far left) mirrors the frustration of that particular pass. *(NASA photo)*

Richard that chance. And so he very much wanted to do that, and he's kidded me for a long time about touring the spacecraft a few days ahead, and suddenly disappearing from the tour. And, I did take a check on my bunk when I got there to make sure there was nobody there.

QST: Can we expect to hear W5LFL on the air in the near future from a somewhat less lofty altitude?

Garriott: I would think so. I still have that backup transceiver at my home right now. I expect to be right back on some of those same 2-meter frequencies in the next few weeks. But then I'll have to get on another rig to get on the other bands as well, and I expect it's a fair guess that I will.

QST: We'll be looking for you! QST



Touchdown! *Columbia* brings home her precious cargo. Among the many records set by STS-9 is the first ham operation from space — the one hams will remember forever. *(NASA photo)*

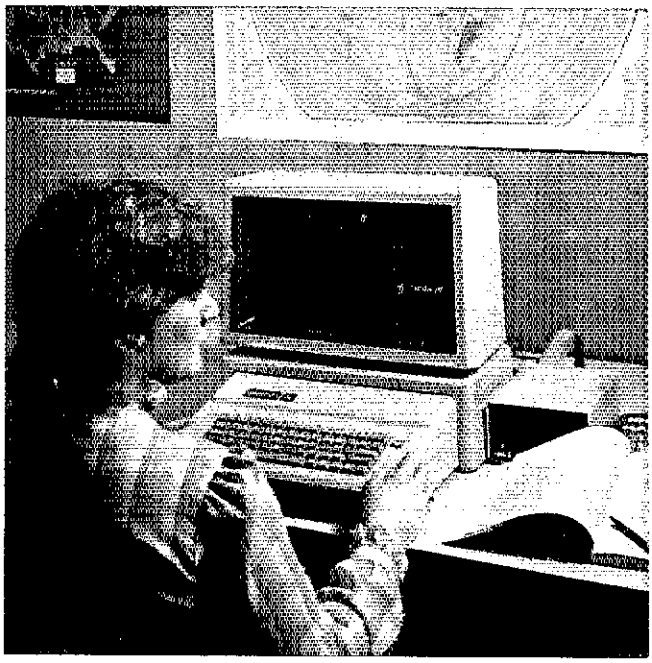
Next Month in QST

Ever wonder if you need — really need — a preamp? An article in March *QST* will give you a good idea of whether it would help or hinder your receiving. Another March technical article explores switched capacitor filter ICs, newly developed devices that have many Amateur Radio applications. Other items to look forward to next month include:

- an article describing how to get your Amateur Radio news into the newspaper or on the 6 o'clock news;
- a provocative look at the state of FM repeaters;
- an examination of Mode L, the AMSAT-OSCAR 10 1269- to 436-MHz transponder; and
- your responses to two of the biggest Amateur Radio stories of the past year: death of the FCC's no-code-license proposal, and W5LFL's highly successful operation from space.

The Effect of Real Ground on Antennas

Part 1:† You've seen free-space antenna patterns, and even pattern calculations that include the effect of a theoretical, perfect ground. But what is *your* antenna really doing?



By James C. Rautio,* AJ3K

Ground reflections can actually improve the performance of your antenna. For example, the power radiated from an antenna in free space is dispersed throughout an entire sphere. When the antenna is moved closer to earth, half the power is radiated directly into the sky, the other half is reflected by the ground before going skyward (Fig. 1). If you have a perfect ground, half of the total power is reflected back into the half sphere above ground. This means that the total power is distributed over half as much surface area, yielding a 3 dB increase in average effective power. All of your signal is now packed into a half sphere. However, it is not uniformly distributed throughout that space.

Radiation patterns may be expressed in terms of decibels (dB). Pattern values can be calculated either from the power of the radiated signal

$$dB = 10 \log \frac{P}{P_o}$$

or from the field strength or field intensity, which are related to the radiated-signal voltage

$$dB = 20 \log \frac{V}{V_o}$$

Doubling the field strength at a given point represents a 6 dB increase in signal strength. This means the effective radiated power at that point has increased four times.

For our example, the reflected wave will be in phase with the direct wave in certain directions. The antenna radiation will be 6 dB stronger than the radiation from the same antenna in free space for those directions. However, we don't get something for nothing. In other directions the reflected wave will be 180° out of phase, and the waves will cancel completely (assuming no losses in the ground reflection). At most points the two signals will be anywhere from 0 to 180° out of phase, producing a whole range of signal-strength variations.

Real ground makes the situation a little more complex. Because real ground is not a perfect conductor, it will reflect some of the RF and absorb the rest. How much is reflected depends on ground conductivity, dielectric constant, frequency, angle of incidence and polarization. In addition, there may be a phase shift when the wave is reflected. Things get complicated.

Annie to the Rescue

As you can see, in order to find a *real* antenna pattern, the number of calculations and the number of variables start to add up. This sounds like a problem for a computer. Well, if we are going to write a program, it should be as general as possible. So let's include things like dipoles of any length (not just ½ wave) and any orientation (vertical, horizontal or sloping). While we're at it, how about including inverted Vs, and ¼-λ verticals? If we can study one antenna, how about an entire array of antennas?

Of course, we'll want some way to plot the results. I decided to use the ARRL standard antenna pattern grid.[1] A good plot-

†Notes appear on page 18.

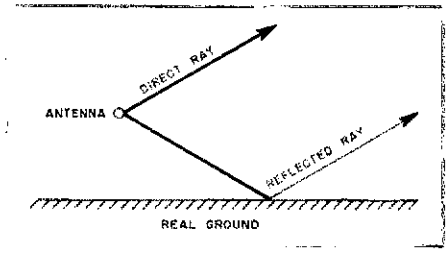


Fig. 1 — The field strength at any distant point will be the sum of the direct ray and the reflected ray. When the ray is reflected, there may be a phase shift, and some of the signal may be absorbed by the ground.

*4397 Luna Course, Liverpool, NY 13088

†The author will examine other types of antennas in subsequent installments. They will appear from time to time during 1984.

ting package will allow the user to specify the chart size. This allows the pattern to be traced directly onto the ARRL paper. Of course, the software should be user friendly and be menu driven.

All this is asking a lot of a personal computer. I decided to use machine language, so the program would be as efficient as possible and fit in limited memory.

My analysis is taken from a book by Jordan and Balmain.[2] For those who may be interested in the calculations involved in this procedure, the appendix contains a brief description of the equations I used. You may also want to refer to the February 1981 issue of *QST*, which contains three articles relating to computer-calculated antenna pattern plots.

The program was only a gleam in my eye in January 1983. The software was completed seven months later, and I call it Annie. Annie is available commercially for the Apple® II+ or //e computers.[3,4] The rest of this article describes the results produced by Annie in my study of ½-λ dipoles.

The Horizontal Dipole

I moved to Syracuse, New York, in the fall of 1982. I had just enough time to put up an 80-m dipole at the awesome height of 20 feet before winter stopped all serious antenna work.[5] The dipole worked reasonably well for local contacts but, not surprisingly, I couldn't even *hear* DX stations on the low end of the band. Will Annie tell why?

Fig. 2 is a plot of two different dipole patterns. This chart is a computer printout done by Annie. The bottom of the graph is below ground, and wouldn't show anything. The plot is of a vertical cross section (also called a "theta cut") of the dipole patterns. Zero degrees is overhead, while ±90° marks the horizon broadside to the dipole. You are looking at the end of the dipole to view this pattern.

The solid outer circle is the Ø dB reference. The numbers on the right side represent the levels of the dashed circles inside the plot. The first dashed circle is 3 dB down. Recall that a dipole above a perfect ground is up to 6 dB better than a dipole in free space. This fact is noted at the right side of the plot, "ADD 6.000 DB TO VALUES."

Of the two patterns plotted in Fig. 2, one is smooth and dismally small. You might guess that that is my dipole at 20 feet (0.071 λ). The other pattern, just for comparison, is the same dipole above the same average ground, this time 1.2 wavelengths high. Note that my antenna has difficulty even making it up to the nulls in the higher dipole pattern. As for any low-angle radiation, I might have better luck with a dummy load!

Just what is an average ground? This is very subjective, but I am using a conductivity of 5 millisiemens/meter (mS/m) and

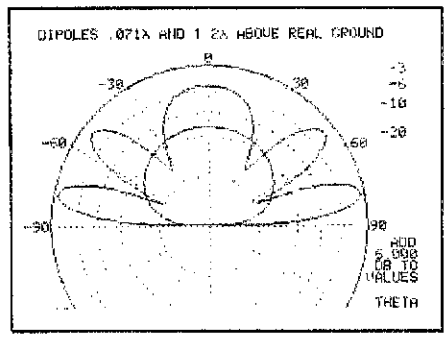


Fig. 2 — Computer printout from Annie, showing the difference between a low antenna and a high antenna over real ground.

a dielectric constant of 15.[6] [Siemens (abbreviated S) is the unit being used at the present time to represent conductance. Most hams will be more familiar with the mho(℧), but the two terms are equivalent. — Ed.] If you are in the middle of a desert, 1 and 7, respectively, might be more likely numbers. If you are very fortunate, 25 and 30 would be a jackpot. The current edition of *The ARRL Antenna Book* has a ground conductivity map of the United States that you may find useful. Keep in mind that ground conductivity depends on moisture content and temperature of the soil. Warm, moist conditions are best.

Fig. 3 contains a series of antenna-pattern plots for dipoles at different heights and three different ground conditions. These plots were traced directly from computer printouts onto ARRL antenna paper. Each curve is for a different value of X, where X is the ground conductivity (in mS/m) divided by frequency (in MHz). This trick takes into account the frequency dependence of the ground. The larger X is, the more RF is reflected by the ground rather than being absorbed.

The graphs in Fig. 3 are modeled after those for a perfect ground in *The ARRL Antenna Book* on page 2-18. Like Fig. 2, these plots are all broadside theta cuts, with zero degrees directly overhead. The horizon is at ±90°. These charts can be used to predict the effect of changing your antenna height.

Another use for these charts is to measure the characteristics of your ground. Using a test dipole and some means of measuring the vertical plane antenna pattern just match the sidelobe positions of your dipole with the ones in Fig. 3 to determine the effective height of your antenna.[7-9] The effective height is not always the same as the physical height. If you measure one or more null depths, you can match the null depths with the appropriate curve to determine the effective ground conductivity. To actually measure the vertical plane pattern may require a good deal of ingenuity. Hot air or helium balloons, or radio-controlled model airplanes, may be solutions.

Off the End

All of the plots so far have been theta cuts of the broadside pattern of a dipole. What happens if we do a theta cut (keep zero degrees equal to directly overhead) but look at the antenna from a different angle? Fig. 4 shows what happens when the dipole is one wavelength high. The outer curve is the usual broadside theta cut. The next curve is a theta cut half way between broadside and off the end of the dipole, and the inner curve is the pattern right off the end of the dipole. In all cases, zero degrees is directly overhead. As you might expect, it's difficult to work DX (low radiation angle) off the end of a dipole.

Fig. 5 shows the effect of lowering the dipole from 1-3/4 λ high to 3/8 λ high. While the 1-3/4-λ high dipole has a large lobe straight up, the smooth curve of the 3/8-λ-high dipole is greater or equal to the higher dipole everywhere else. This suggests that if you want more general coverage off the ends, lower might be better.

Horizontal is ... Vertical?

One would expect that a horizontal dipole would have horizontally polarized radiation. What does Annie say? There is a problem right on the horizon. Annie's analysis does not include the ground wave, so it predicts that there is no signal right at the horizon. If you analyze the pattern just a few degrees above the horizon, you will find horizontal polarization — most of the time.

When Annie analyzed the broadside theta-cut patterns of Fig. 3, the polarization was always horizontal. However, the situation changes when we look at any other cut. Not only can part of the polarization be vertical, you might even have elliptical (or circular) polarization!

Fig. 6 shows a horizontal dipole ½-λ high. The outer curve is total antenna gain (vertical and horizontal). The smallest curve is the total horizontal-polarization gain and the middle curve is the total vertical gain. In most places, the vertical polarization is stronger than the horizontal polarization!

How did this happen? Fig. 6 is not a broadside theta cut; in fact, it is 70° from broadside, almost off the end of the dipole. (Note that to compensate for the reduced gain off the end, the 6 dB offset was changed to Ø dB.)

Fig. 7 shows a view of the dipole from 70° off broadside and about 40° up from the horizon. The Z axis is straight up and the X-Y plane represents ground. The dipole runs parallel to and some distance above the X axis. The Y axis runs perpendicular to the antenna.

Real ground complicates things even more. Since the ground adds some phase shift upon reflection, the vertical and horizontal polarizations are not in phase.

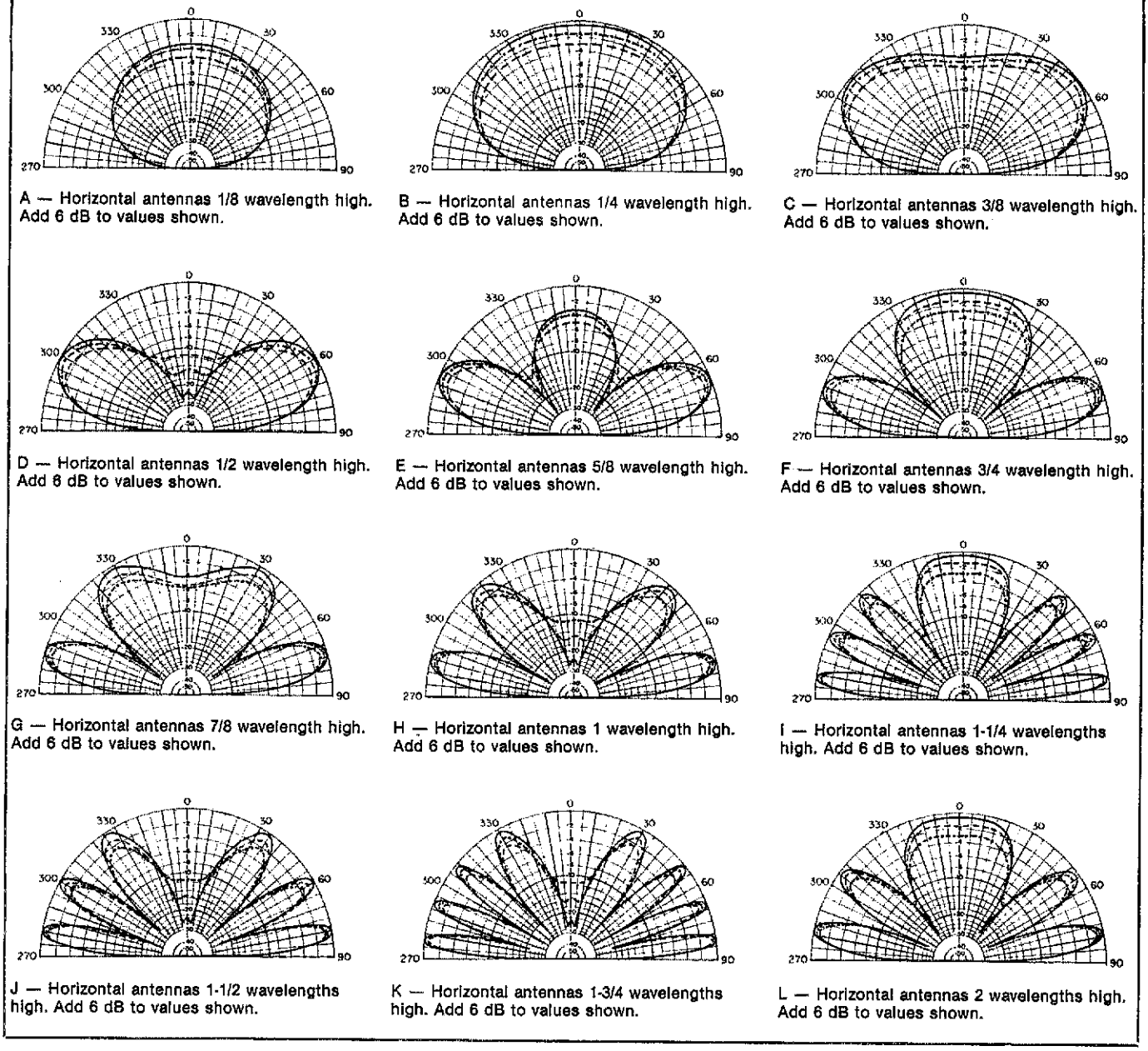


Fig. 3 — The effect of real ground on dipole patterns. The solid line represents a good ground (X = 10, ϵ = 30), the dashed line represents a medium ground (X = 1, ϵ = 15) and the dot-dashed line represents a poor ground (X = 0.1, ϵ = 7). X is the ground conductivity (in mS/meter) divided by the frequency in MHz, and ϵ is the dielectric constant of the ground. Add 6 dB to all values.

Old hands with antennas will know that this means elliptical polarization. A special case of elliptical polarization is called circular polarization.

For the antenna of Fig. 6, the polarization is right-hand elliptical below 54°. It is left-hand elliptical above 54° and it is linear at 54° up from horizontal.

Conclusion

A computer program provides the means to study antenna-pattern plots for a variety of ground-conductivity conditions. We have seen the effects of changing the height of a dipole antenna over real ground, and have looked at radiation patterns from several angles. There are many other antenna configurations of interest to amateurs. Annie has the capability to analyze other types of antennas, such as sloping dipoles, inverted Vs, verticals and even some types of beam antennas. Future articles will present a computer analysis of these antennas at various heights and over different ground conditions. It should help you predict what the radiation pattern from your antenna looks like.

APPENDIX

My computer program calculates horizontal

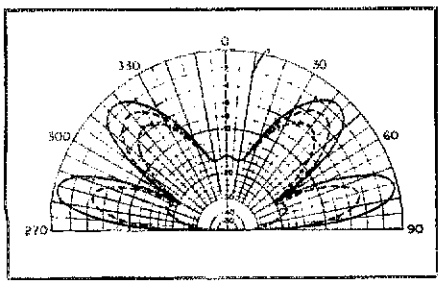


Fig. 4 — The solid line represents the pattern of a dipole one wavelength above average ground. You are looking at the end of the antenna for a broadside radiation plot as in Fig. 3. The dashed line is the pattern for the same antenna, viewed 45° from the end. The dot-dashed line is the pattern viewed broadside to the dipole (the radiation is off the ends). Zero degrees is directly overhead. Add 6 dB to all values.

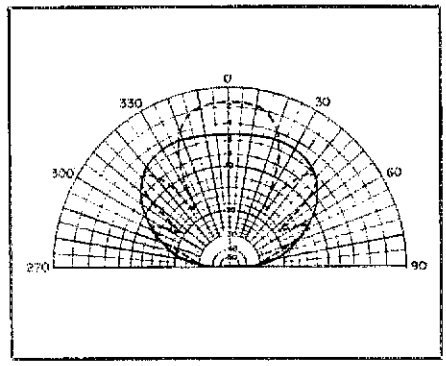


Fig. 5 — Except directly overhead, an antenna 3/8-λ high has equal or better performance off the end than an antenna 1-3/4 λ high. Lower is better for more signal off the end, but higher is better if you want a null off the end. Add 6 dB to all values.

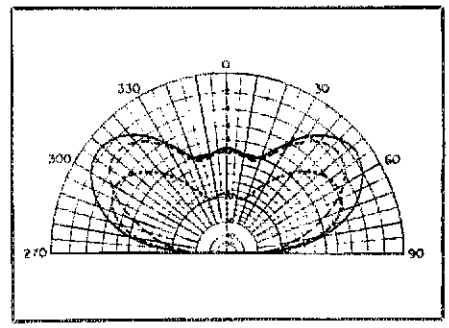


Fig. 6 — Radiation for a horizontal dipole is not always horizontally polarized. The solid line represents the total gain of the dipole, the dashed line is the vertical component and the dot-dashed line is the horizontal component of the gain. This plot is taken at an angle of 70° from broadside. Add 0 dB to the values on this graph.

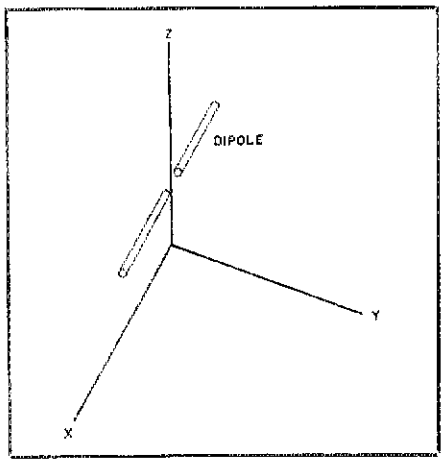


Fig. 7 — When viewed from different angles, it can be seen that a horizontal dipole no longer "looks" horizontal so its radiation is no longer purely horizontal either.

and vertical reflection coefficients using Eqs. 1 and 2.

$$R_H = \frac{\sin\psi - \sqrt{(\epsilon_r - jY) - \cos^2\psi}}{\sin\psi + \sqrt{(\epsilon_r - jY) - \cos^2\psi}} \quad \text{(Eq. 1)}$$

$$R_V = \frac{\sin\psi\,(\epsilon_r - jY) - \sqrt{(\epsilon_r - jY) - \cos^2\psi}}{\sin\psi\,(\epsilon_r - jY) + \sqrt{(\epsilon_r - jY) - \cos^2\psi}} \quad \text{(Eq. 2)}$$

where

ψ = angle of the reflected wave, measured from horizontal

ϵ_r = relative dielectric constant of real ground,

f = frequency in MHz

$$X = \frac{\sigma}{f}$$

$Y = 18 \cdot X$, and

σ = conductivity of the ground in mS/m.

For a given direction, θ, multiply the reflected wave by R_H or R_V. Add

$$\frac{4\pi Z}{\lambda}\cos\theta$$

radians to the phase of the wave, and then add it to the direct wave. Z is the height of the dipole in wavelength. Determining how much of the reflected wave is horizontally or vertically polarized requires a rotation of coordinates and some spherical trigonometry, which I will not go into here.

Calculation of the E-field for a dipole pattern is done by Eq. 3.

$$E = I_o \frac{\cos(\beta_H \cos\theta) - \cos\beta_H}{\sin\theta} \quad \text{(Eq. 3)}$$

where

I_o = dipole current,

β_H = ½ the dipole length (in wavelengths) × π

θ = the angle measured from the dipole axis.

The pattern values (PV) are then calculated by means of Eq. 4.

$$PV = 20 \log\left(\frac{E}{E_o}\right) dB \quad \text{(Eq. 4)}$$

Annie's calculations assume a sinusoidal current distribution, with the current going to zero at the ends. The dipole impedance is not calculated.

Notes

[1]J. Hall, "The New Look for QST's Antenna Patterns," *QST*, July 1980, p. 26.

[2]Jordan and Balmain, *Electromagnetic Waves and Radiation Systems*, 2nd Ed. (Englewood Cliffs, NJ: Prentice Hall, 1968), pp. 630-644.

[3]Annie is available for $49.95 plus $2 postage (NY residents add sales tax) from Sonnet Software, Dept. Q, 4397 Luna Course, Liverpool, NY 13088. Alternatively, you may send a description of your antenna for analysis. Please write for details. Be sure to include your full name and call sign. The ARRL and *QST* in no way warrant this offer.

[4]TRS-80® microcomputer owners may want to reference "Antenna Modeling Program for the TRS-80," *QST*, February 1981, p. 15.

[5]m = ft × 0.3048, mm = in × 25.4.

[6]J. Sevick, "Measuring Soil Conductivity," *QST*, March 1981, p. 38.

[7]G. Schrick, "Let's Measure Beam-Antenna Gain with a Reference Dipole," *QST*, August 1981, p. 16.

[8]F. Brown, "Antenna Gain Measurements — Part I," *QST*, November 1982, p. 35.

[9]F. Brown, "Antenna Gain Measurements — Part II," *QST*, December 1982, p. 27.

James C. Rautio was first licensed in 1968 as WN2LQW (later WB2LQW). He received an Extra Class license, AJ3K, in 1979. In 1978 he received a BSEE from Cornell University and in 1981 received a Master's in Systems Engineering from the University of Pennsylvania. He is currently enrolled in a PhD program at Syracuse University. Jim has worked for General Electric since 1978. He has developed extensive RF circuit design software and is currently engaged in the design of monolithic microwave integrated circuits at frequencies ranging up to 20 GHz. Jim is a life member of ARRL and a member of IEEE, and has published several technical papers.

Strays

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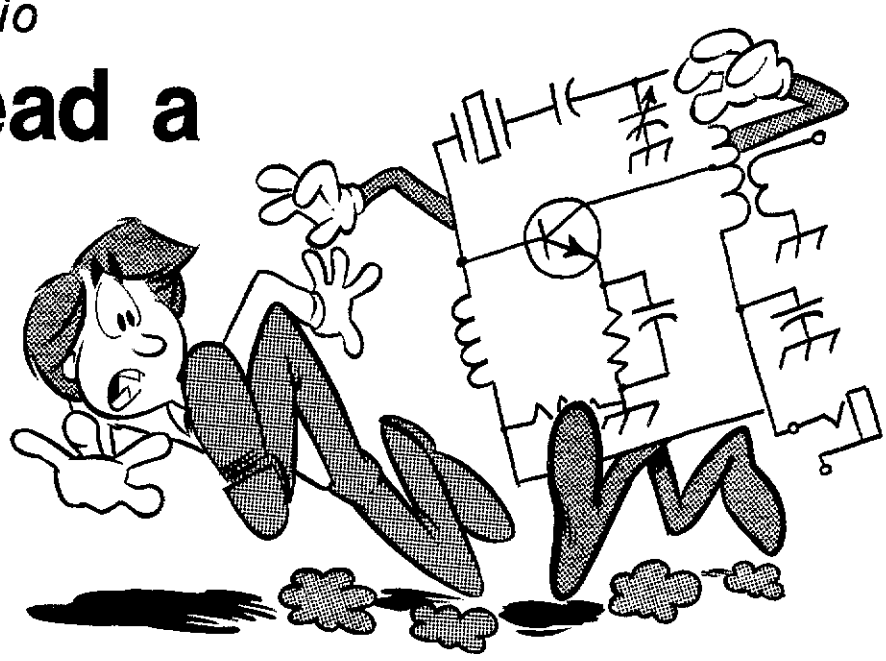
• *First Steps in Radio*

How to Read a Schematic Diagram



Part 2: The first step toward learning the basic theory of this series is to understand circuit diagrams — the "road maps" that allow us to build or repair equipment.

By Doug DeMaw,* W1FB

"Sure, I can handle the electronics — up to a point. I start having problems when I try to figure out what's going on in schematic diagrams." Many newcomers to radio electronics have this problem. Perhaps you're one of them.

In this installment, we'll learn what the various electronics symbols stand for, and we'll get a feel for how the diagram relates to the actual circuit-board layout.

Learning the Symbols

We must first accept the fact that very few electronics symbols look like the physical item they represent. Only a *pictorial* diagram can satisfy that requirement. Most electronic parts are encased or encapsulated in some manner, which prevents us from peering inside to see what is there. Semiconductors (diodes, transistors and integrated circuits) are the worst in this regard, for if we did saw one open for a look-see, we might be hard-pressed to recognize the various elements (drain, base, emitter, collector, source, gate, or whatever) unless we understood the philosophy of semiconductor design and fabrication. So, our best approach is to ignore for now the contents of the enclosed components and think mainly about how the leads relate to the inner elements, as defined by the assigned symbol. In the days of vacuum tubes we could dismantle a tube and easily identify the grid, plate, cathode and filaments, but things have changed!

Unfortunately, each publisher of amateur and commercial electronics magazines or journals follows his or her own symbology. For this reason, diagrams found around the world can conflict. The ARRL has adopted and used the IEEE (Institute of Electrical and Electronic Engineers) standard symbols for many years. Only a few exceptions exist, and that is done to simplify (or unclutter) the drawings in *QST* and other League publications. We will focus on the *QST* symbology here, and despite differences found in other publications, you should be able to determine what a symbol stands for, because there will be ample similarity. Some magazine publishers, in order to establish a distinctive "style," have more or less ignored the recommended standards for electrical symbols. It is unfortunate, but we must accept it.

An abbreviated presentation of electrical symbols is provided in Fig. 1. You will see that some symbols do, indeed, resemble what they stand for, such as the headset, speaker and hand key. Conversely, the symbols for ICs (integrated circuits) would in some instances fill one or two *QST* pages if we were to see all of what was inside the IC. So for these complex circuits we accept the practical solution — to use just a box, a triangle or similar representation. In a real-life situation we think only about where each external lead connects, according to the numbers assigned to the pins by the manufacturer. This was for many years known as the "black box" approach. In other words, don't worry about what's within the box; just concentrate on what the box will do for us.

You will note that for some symbols we have more than one format. This means that we may use any of the illustrations given, and we may find one or all of them in a single issue of *QST*. The wiring junctions at the lower right of Fig. 1 are an example of what we are discussing.

The best advice I can offer at this time is to spend a few evenings studying and memorizing the symbols in Fig. 1. When you feel that you have the data implanted

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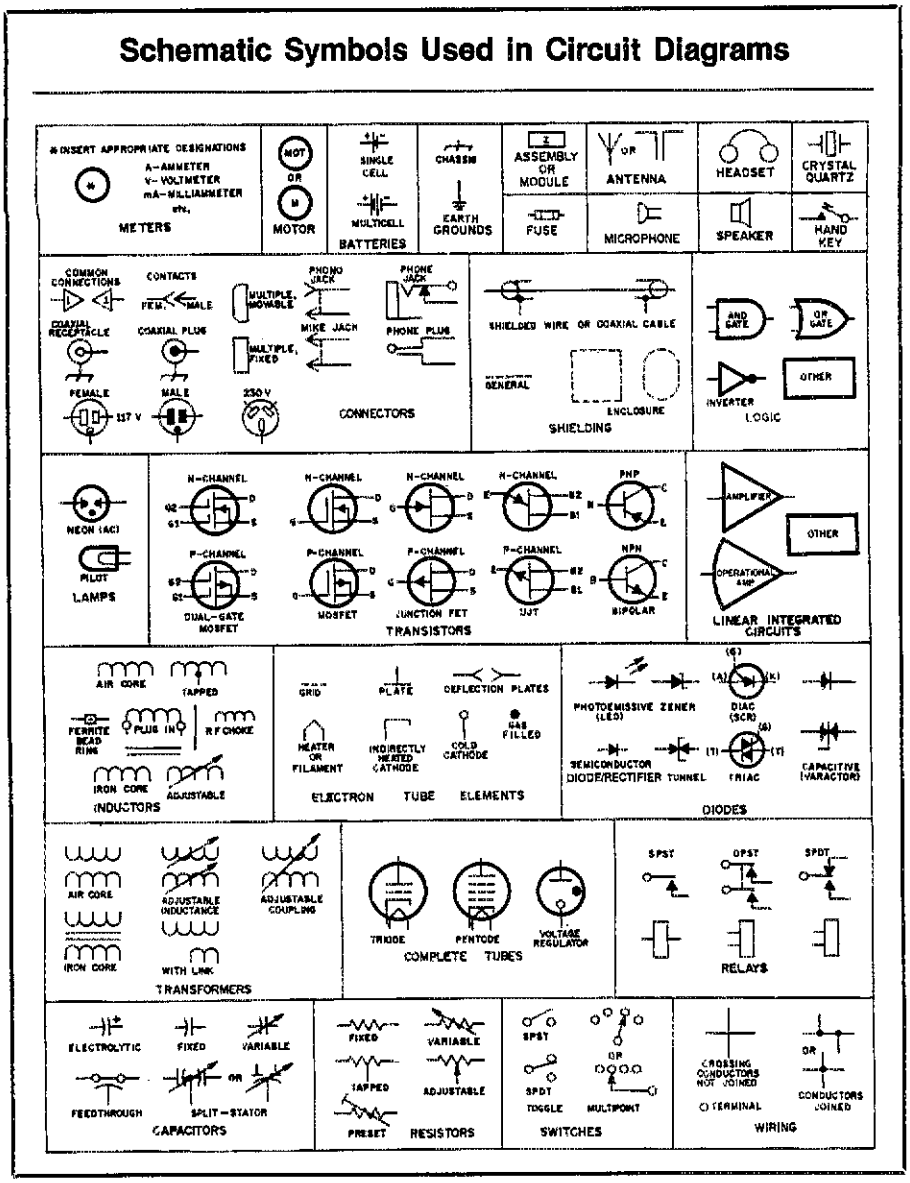


Fig. 1 — Collection of standard symbols used by the ARRL for circuit diagrams. Most of these symbols were adopted from the IEEE standards.

firmly in your mind, put away the symbols page and try to draw each symbol by memory, writing its name next to it. Continue with the exercise until you make no mistakes. This knowledge will prove invaluable to you as you pursue that ham license. It will be helpful to know the symbols after you pass the exam, also. You will need to have this knowledge in order to repair your equipment, to duplicate home-construction projects in the magazines, or to do your own circuit designs. If you are a person without sight, have a friend provide you with word pictures of the symbols and learn them that way. I know at least two blind amateurs who repair their own equipment by having someone give them word pictures of the diagram section that applies to the problem.

A Simple Circuit Example

Let's try our luck at relating a simple circuit to a pictorial diagram. This will enable you to see how things hook together when assembling a circuit from a schematic diagram. Fig. 2 shows two schematic diagrams of a two-stage audio amplifier, such as we might find in the early stages of a receiver. Although the two drawings look quite different at first perusal, you will observe that they represent the same circuit in complete detail. The difference is only in the manner of illustrating the circuit schematically. Fig. 2A shows the ground connections separately. Likewise with the two +12-volt connections. Fig. 2B shows the ground and +12-volt lines joined together, respectively. The net result is the same in either case: In a practical circuit the ground or +voltage lines would eventually be joined at a common point when example A is followed. It merely illustrates that you may find more than one style of presenting a circuit. You will note also that the resistors which connect to the +12-volt source (Fig. 2B) are routed upward rather than downward, as in Fig. 2A. You may find a mixture of the two methods in a given drawing, so don't let that confuse you. The main objective is to make sure that all of the parts are connected to the appropriate circuit points. A pictorial representation of these circuits is provided in Fig. 2C.

A Few Subtleties

You are probably wondering why the capacitors (sometimes wrongly called "condensers") have a curved line at one end and a straight one at the other end. The curved line indicates the end of the capacitor that goes to the terminal of lowest impedance or potential, such as circuit ground or the least positive of the two circuit points between which the part is installed. This applies mainly to polarized capacitors. Most of these parts are marked with a + symbol or may have a black band at the opposite end to indicate the negative terminal of the capacitor. This concept does not apply to disc-ceramic, mica and other nonpolarized capacitors, but the curve is always used in the symbol to show which end represents the low-impedance side of the circuit. Always pay close attention to the + symbols of capacitors: Hooking them up backward can cause them to short out or even explode!

Notice also that within the circular borders of Q1 and Q2 are arrows on the emitter line. When the arrowhead points toward the outer circle, the device is an NPN type, which requires a positive voltage on the collector terminal. If the arrows point inward toward the junction of the three lines, it signifies a PNP transistor, which needs a negative collector voltage. If you use the wrong transistor you may destroy it when voltage of the improper polarity is applied to it.

The arrowhead on R6 — the audio-gain control (sometimes called a "pot" for potentiometer) — tells us that the resistor value is variable by means of mechanical adjustment. In this case we would have the control mounted on the front panel of our equipment. Its shaft would be fitted with a knob to permit us to adjust the value of R6 when we wished to. If the adjustment were to be made only one time, then left in a preset position, we might install a trimmer pot at R6 (screwdriver adjust), and it could be installed right on the circuit board or chassis. Some hams call these controls "trimpots," but Trimpot® is a trade name, not a generic term.

J1 and J2 are jacks into which we may plug our outboard circuits or accessories, such as a microphone at J1. This electrical symbol is representative of a number of styles of jack. So just think of it as a connector of your choice — one that has a "hot" (center) terminal and a ground point (outer ring). It could be a phono jack, or one that a standard audio plug mates with. It could even be a coaxial-cable jack, if you wanted to use something that unusual for

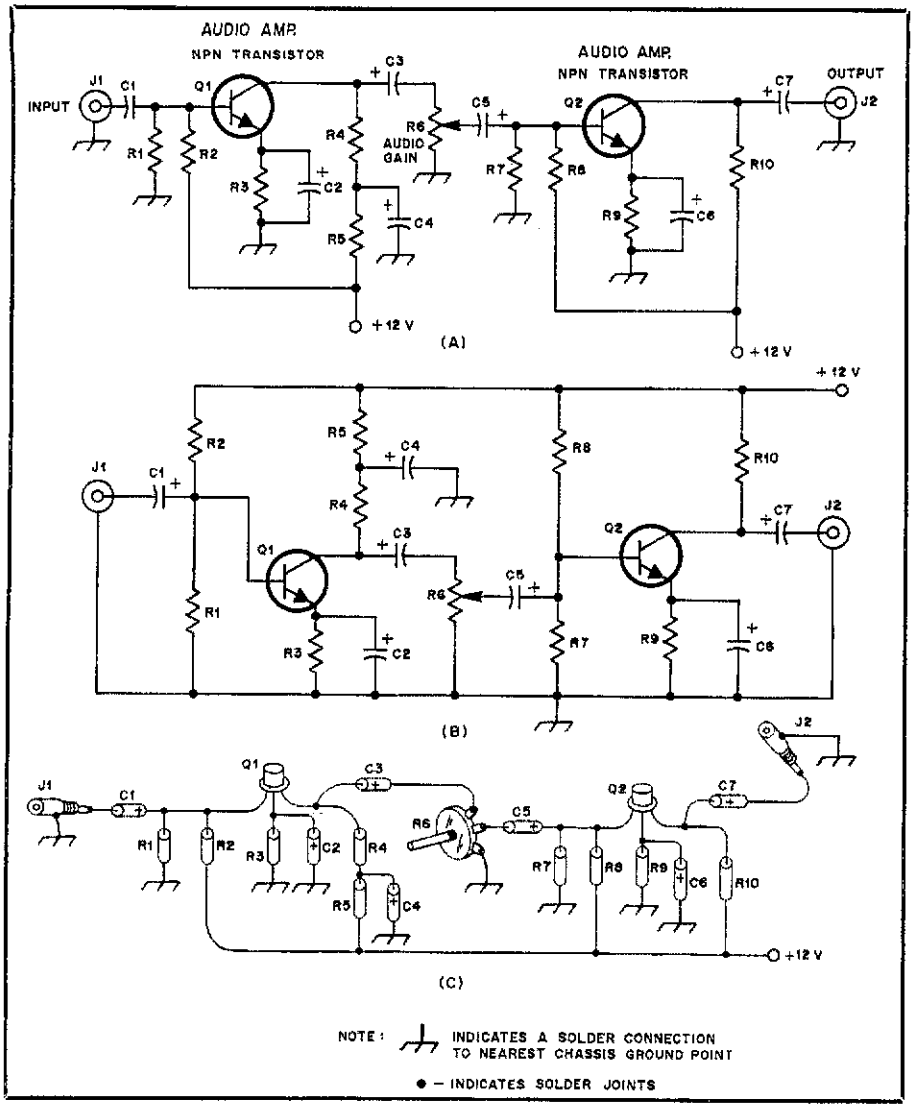


Fig. 2 — Examples of an identical circuit (A and B), drawn in different ways (see text). The pictorial representation at C is for the circuits shown in illustrations A and B. This shows how we can relate the drawing to the assembled circuit, which would normally be mounted on a circuit board or a metal chassis.

audio work! Examination of Fig. 1 will show that jacks with additional electrical contacts have a more complex symbol.

Notice that the symbol for ground in Fig. 2 looks like a rake. This is the proper symbol for *chassis ground* in a circuit. The earth-ground symbol of Fig. 1 is frequently misused by publishers for indicating chassis ground. Try not to be confused if you encounter disparity of this type: There is a significant difference between an earth ground and a chassis ground!

Voltage- and Ground-Bus Lines

I've noticed that one of the points of greatest confusion among beginners is how to configure the chassis-ground connections and the voltage-line network. In bygone days, when hams used wooden chassis, it was standard practice to run a ground-bus wire across the chassis. Each ground point in the circuit was then tied to this line by means of the shortest connecting lead possible. Other builders would return all ground connections for a single-circuit stage to a nearby common terminal, then route a lead from that point to the ground-bus wire. Although these techniques could still be applied, it is easier for us (and often better in terms of circuit performance) to bring each ground return to the metal chassis or circuit-board ground in the immediate area of the stage being wired. Not only does this impart a neater end product, it aids circuit performance (stability and reduced losses) when the ground leads are kept short and direct. The chassis or circuit board ground foil serves as the old-style ground bus when we do this. The "bottom line" here is to not worry about the maze of ground lines in the diagram. Simply make your ground connections short and direct near the related circuit elements.

Voltage-bus lines are treated like the old-time ground-bus conductors. That is, they are "floated" above ground on insulating terminals (or along specific voltage-bus foils on circuit boards). The various circuit points that connect to the voltage lines are connected by means of short jumper wires, or by the related components themselves (resistors, for example).

Circuit Direction

Another question that is asked frequently is, "Which way does a circuit run on a diagram?" The confused person means, does the first stage of a circuit start at the left or right of a drawing? Frankly, it makes no difference. Traditionally, for reasons I don't comprehend, a circuit has commenced at the left of the page and proceeded to the right. For example, considering a transmitter, the VFO or crystal oscillator would begin at the left of the sheet, followed by the intermediate stages, with the PA (power amplifier, or last stage) at the far right. Hams have developed the habit, as a consequence, of laying out the assembled unit from left to right also. I always did! But, it matters not how you lay out your project, provided you isolate one stage from another by reasonable physical separation, or by means of individual shield compartments. The last stage should never be placed alongside the input stages, lest unwanted feedback occur. The straight-line layout is the best method to adopt when in doubt.

Although it may not be apparent when examining a schematic diagram, we should always try to physically isolate the input and output components of a circuit stage from one another. Grouping them together will often cause feedback (output energy being fed back to the input circuit), which can cause a stage to self-oscillate, which renders the circuit useless. Some diagrams show a particular stage or stages enclosed in dashed lines. This indicates that that part of the circuit is contained in a shielded compartment to isolate it from the remainder of the circuit. A solid line around a circuit normally indicates that it is a separate module of a composite unit.

Potentiometers and Meters

We can't tell from the electrical symbol which end of a potentiometer (volume, tone, drive control, etc.) should be connected to ground. Many beginners have a problem with this: After wiring in the control, it operates backwards! For example, maximum volume occurs when the control is set fully *counterclockwise*. I understand this annoyance, for it used to happen to me!

Also, the circuit symbol for meters shows that one terminal is plus and the other is minus. But, which is which? Some meters have the polarity marked on the cases: Others bear no identification. Fig. 3 shows which end of a control should go to ground, and the meter drawing indicates which terminal is the positive one. The positive meter lug always connects to the circuit point of *highest* potential, as shown by the examples in Fig. 3. Incorrect

Glossary

base — the internal part of a bipolar transistor that controls the flow of current.
bus — a conductor of electrical current that carries a potential from one point in a circuit to another, such as positive or negative voltage, or ground.
capacitor — a device that stores dc energy but prevents its flow; permits the passage of ac energy, however.
cathode — negative electrode from which electrons flow in a stream inside a vacuum tube.
collector — in a bipolar transistor, the region through which the primary flow of charge carriers leaves the base. Generally, the output terminal of the transistor.
diode — a device having an anode and cathode, and which allows current to flow only one way.
disc-ceramic — a type of capacitor containing a ceramic dielectric (nonconducting material).
drain — a field-effect transistor electrode that supplies the amplified output signal in a grounded-source or grounded-gate hookup.
emitter — the element in a bipolar transistor that injects electrons into the base, which can be modulated by the base input signal.
encapsulated — a component that is embedded in a hard protective substance, or in a metal case.
feedback — ac energy that follows a path from one part of a circuit to another, intentionally or otherwise.
filament (heater) — in a vacuum tube, metallic wire heated by electric current; may serve also as the cathode in some tubes.
gate — part of an electronic device such as a field-effect transistor that controls the passage of current.
grid — in a vacuum tube an electrode that controls current flow.
hand key — a device used for sending Morse code.
impedance, low — minimal resistance to ac.
integrated circuit — an electronics component that contains many individual transistors, diodes, capacitors and resistors and is sealed permanently in a single block or unit (unrepairable); usually referred to as an "IC" or "chip"; the various internal components are connected together or "integrated."
mica — an insulating (or dielectric) material found in nature; a mineral silicate.
oscillator — a circuit that generates a particular frequency.
plate — in a vacuum tube, the anode (positive element; in capacitors, the internal metal conductors.
polarized — a component that has positive and negative terminals marked on the case; the polarity is sometimes indicated by the shape of the part — each end being slightly different.
potentiometer — a variable resistor, such as a volume control.
resistor — a component that opposes the flow of current; available in a wide range of ohmic values and power ratings.
schematic — a diagram using electrical symbols that illustrates a circuit plan or "scheme."
semiconductor — an electrical component that is made from solid crystal materials, such as silicon or germanium; modern diodes, transistors and ICs are semiconductors; conductivity is intentionally poor compared to metal conductors.
source — the element in a field-effect transistor that supplies electrons; similar to the emitter in a bipolar transistor or the cathode in a vacuum tube.
transistor — a triode or tetrode semiconductor device that is capable of performing amplification, oscillation and control functions.
trimmer — an adjustable component, such as a capacitor or resistor; generally used for fine adjustment and left in a preset position.
vacuum tube — a device used to generate or amplify signals; can also be used as a rectifier or to perform control functions.
VFO (variable-frequency oscillator) — an oscillator whose frequency can be varied over a wide range by mechanical or electrical means; normally adjustable from the front panel of the equipment.

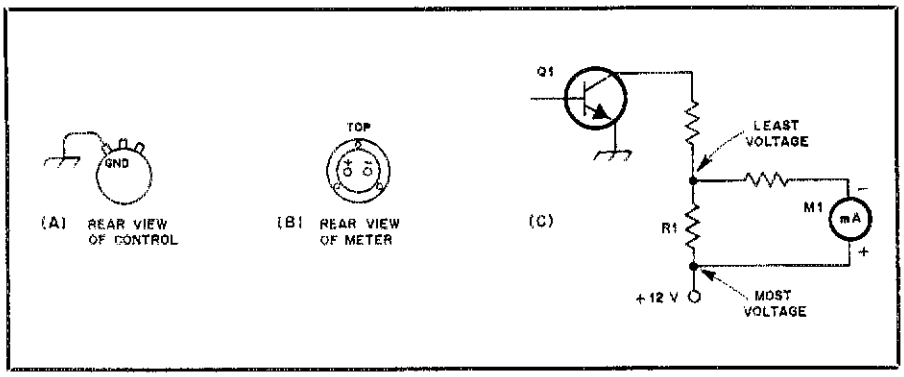


Fig. 3 — When wiring audio or tone controls, the ground end of the control is at the far left when viewing the control from the rear (A). Similarly, when viewing a meter from the back side (B), the positive terminal is at the left. The circuit at C shows that the negative terminal of a dc meter must be connected to the circuit point that has the lower of the two available potentials. The voltage drop across R1 in this example, caused by the current taken by Q1, makes the dc voltage lower at the top of R1 than it is at the low end of the resistor. This type of circuit can be used to monitor the current that Q1 draws.

polarization can destroy a meter at once. No one likes a meter with an S-shaped needle, jammed all the way to the left of the meter face! Ouch!

Some Final Words

The intent of this article is to help prepare you for the installments that follow in First Steps in Radio. How adept you become at following a schematic diagram easily and accurately will depend entirely on your tenacity in learning the symbology. Now is the proper time to apply yourself. This will make the lessons that follow a lot less difficult to digest. Practice drawing some simple circuits from memory. But, don't worry about the quality of your artwork. We aren't trying to follow in the footsteps of Rembrandt when drawing our diagrams; clarity is all that is required!

Strays

CALL FOR *QST* TECHNICAL ARTICLES

☐ The ARRL is always in need of quality technical articles for *QST*. Construction projects and tutorial material about new advances in technology are in highest demand. We depend on article contributions from members to cover these topics. Many good suggestions for articles come in, but we look to those who are considered experts in a particular area to write most of our articles.

Direction-finding techniques are becoming more and more important as amateurs are entrusted with an increasing responsibility to police our own frequencies. Many groups hold "fox hunts" or other events to practice VHF-DF methods. But the problem is a bit more complex when it comes to HF direction finding. What can hams do to DF below 30 MHz?

If you are an expert in this field, please consider sharing some of your knowledge with *QST* readers. Prepare a short summary, or outline, of your proposed article and submit it to Paul Rinaldo, W4RI, Manager, Technical Department, ARRL, 225 Main St., Newington, CT 06111. — *Larry Wolfgang, WA3VIL, Assistant Technical Editor*

Sporadic E on 144 MHz — 1983

How was your E_S summer of '83? After reading this, you might agree that at least *some* clouds have a silver lining!

By Jim Stewart,* WA4MVI

During the evening of July 25, 1983 (UTC dates and times are used in this article), many surprised radio amateurs were rewarded with remarkable long-haul DX on 144 MHz. Many old-timers commented that this event was perhaps the best skip they had ever observed, and many VHF novices were bitten by the bug and introduced to the elusive DX mode known as sporadic E or E_s.

The E region of the ionosphere sometimes becomes charged in a small area, becoming a reflector at VHF, and returning very strong signals from stations hundreds and sometimes thousands of miles away (see Fig. 1). The mechanism responsible for this is still not understood clearly, but many theorize that wind shear (Fig. 2) and severe thunderstorm activity can precipitate an E_s event. After many studies, I conclude there is strong evidence that the two are indeed closely associated.

Many 144-MHz QSOs took place on July 25, 1983 between the hours of 0200-0330Z. Those stations on the air were rewarded with new states and new grid squares. Amateurs in Colorado worked amateurs in South Carolina, and signals from New Mexico were "20 over" in Pennsylvania. Signal paths drawn from station to station all intersect over eastern Missouri, a definite indication of an E_s cloud and its location. Reports were also received of QSOs between stations in New England and Florida. Perhaps a second elusive cloud was present!

Those of us who hurriedly made excited contacts couldn't imagine that the band would stay open for several hours with such fine signal levels, although we had seen like openings earlier in the year. The evening of June 26, the Sunday of Field Day weekend, was remarkably similar, with many Field Day stations using small arrays and operated by first-time VHF operators enjoying rare DX for several hours from around 0100-0300Z.

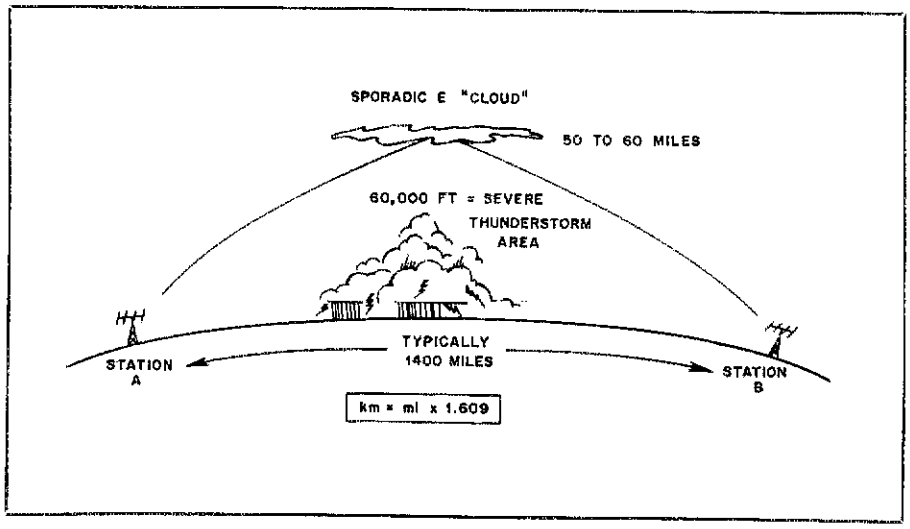


Fig. 1 — The sporadic E cloud is a small, charged area of the ionospheric E layer.

The cause of E_s is still one of the mysteries confronting those who watch and study them, although we do know more today than we did only a few years ago. By carefully studying weather data from various National Weather Service (NWS) charts and records, and noting the times of these and other openings, certain patterns begin to emerge. For many years, I have been fortunate to have had daily access to data available from NWS, and am thankful to those persons at the National Weather Records Center at Asheville, North Carolina who aided various studies.

Perhaps the best single weather chart for a study is the Radar Summary chart designed to aid pilots in avoiding severe thunderstorm or Weather Watch areas. These charts show storm heights over the

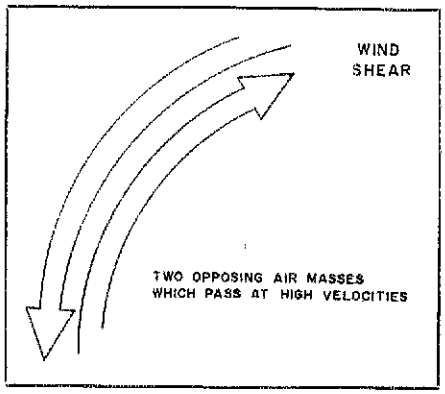


Fig. 2 — Two opposing air masses passing each other at high velocity can produce wind shear.

U.S. Studies have shown that very high storms, especially those that penetrate a region known to meteorologists as the

*20 Country Club Dr., Greer, SC 29651

tropopause, often influence events in the lower ionosphere.[1] During some years, severe summer storms grow to altitudes near 75,000 ft, and some evidence suggests that storm severity and height varies with the solar cycle.[2] It may be that E_s occurrences vary with the solar cycle, although they follow it less closely than do F-layer openings.

Once a storm develops to the stage at which it punches through the lower atmosphere, it may achieve the rare status of a severe storm area and tower above average storms around it. A severe storm usually causes the National Weather Service to issue a Weather Watch for a particular area. Watchful VHF operators should be alert to the possibility that E_s may be associated with, or close to, such an area.

A severe thunderstorm produces heavy precipitation, hail, tornadoes, and severe lightning, but even more important for our purposes, wind shear. It is now suspected that the wind-shear phenomenon occasionally encountered by aircraft is also responsible for E_s events. High ionization potentials are possible when two air masses pass each other with high velocities. Winter jet-stream events may also explain winter E_s openings as wind shears of 500 knots relative speed are observed.[3]

The Radar Summary Chart of 0335Z, July 25, clearly shows a close relationship between midpath points and co-located severe storm areas. See Fig. 3. The area with the highest weather disturbances in the country (with storm tops near 60,000 ft) was located in eastern Missouri, near the point where the paths of reported 144-MHz openings cross! Another area, although smaller and with storm tops of only 50,000 ft in altitude, was located over west Texas, almost over some of the stations in the QSOs. This area probably enhanced the opening. Also, a severe-storm area with a 50,000 ft top was located over coastal North Carolina, the approximate midpoint of QSOs between stations in New England and Florida.

It is interesting to note that data shows the entire country relatively clear except for these areas. After plotting hundreds of QSOs via E_s in past years, the connection seems always to reappear. The June 26 event was no exception. See Fig. 4. The Field Day opening also had a few severe-weather areas located at the point where all paths appeared to cross over southern Missouri, extending into northern Kansas. Severe thunderstorm areas always seem to appear near the midpath point during summer E_s openings and sometimes almost over the station at one end of the QSO. I have been fortunate to catch several of these somewhat rare events, and when the E_s cloud was suspected to be overhead, signals seemed to come from many directions and elevations. This evaluation was done using an EME array with elevation control.

Those of us who participated in the E_s events of the summer of 1983 may remember them as perhaps the best openings for many years. Possibly this summer's E_s season, from May through August, will again reward us with more fantastic E_s DX!

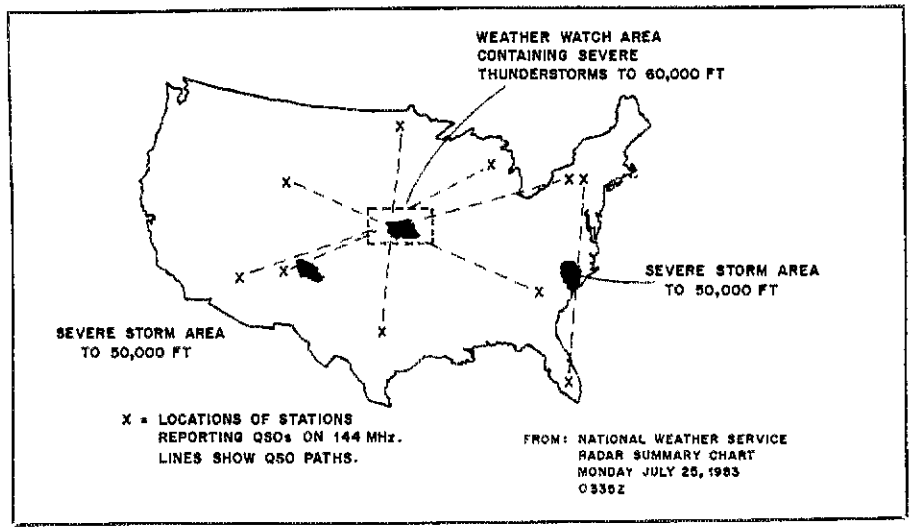


Fig. 3 — The NWS Radar Summary Chart for July 25, 1983 at 0335Z indicated the severe storm areas shown. The dashed lines are QSO paths of stations (represented by Xs) reporting activity on 144 MHz.

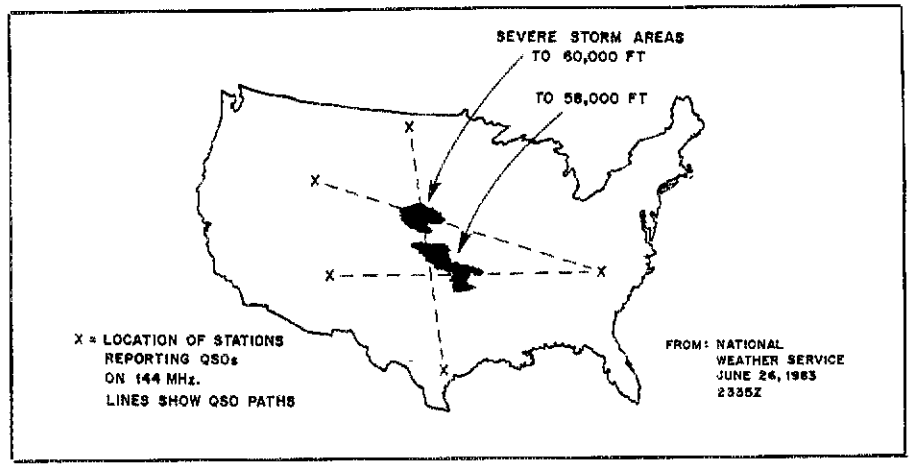


Fig. 4 — This plot is made from information gathered for Field Day, June 26, 1983.

Notes

[1]Tropopause — the boundary between the upper and lower atmospheres, which varies in height from 5 to 11 miles, with daily variances according to geographic location.
[2]m = ft × 0.3048.
[3]km/h = knots × 1.852.

Strays

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

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

- A look at "Series Line Matching Sections for Impedance Matching," by R. E. Prack, K5RP
- A new view on direction finding in the Data Communications column by Dave Borden, K8MMO
- "The Theory of Diode Wattmeters and Some Applications," by A. E. Weller, WD8KBW

QEX is edited by Paul Rinaldo, W4RI, 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 U.S.; write to Headquarters for details.

Z-AMTOR: An Advanced AMTOR Code Converter

AMTOR is an exciting new mode of radio teletype (RTTY) operation for HF Amateur Radio. It offers all the utility and enjoyment of conventional RTTY plus one large advantage: AMTOR removes virtually all errors.

By Paul Newland,* AD7I

This article describes how to build and operate an AMTOR controller that I have designed and programmed. I call this system Z-AMTOR, because it uses a Z80 microprocessor in the control circuitry. Z-AMTOR is the combination of a simple microcomputer system and the program that controls it. The features that it provides are many, and, hopefully, of great use to radio amateurs who use radioteletype communications on HF. It is important to differentiate between AMTOR and Z-AMTOR. AMTOR is the name of the internationally sanctioned teleprinter protocol that describes a method by which two stations can communicate with each other, correcting any errors that occur.[1] Z-AMTOR is the name of the particular system I am describing here.

The major advantages of the AMTOR protocol over conventional RTTY are error reduction and built-in selective calling. For a more complete introduction to, and explanation of, AMTOR, refer to the *QST* articles by Martinez and Newland.[2,3]

It is important to clarify a bit of terminology. Some confusion exists regarding different labels for various AMTOR components and modes. For the purposes of clarity, I will use terminology that comes closest to that used in the International Radio Consultative Committee (CCIR) 476-2 or 476-3 standard, where appropriate. In the past, Mode-A (ARQ) has also been known as ARQ, Mode-A, AMTOR or MASTER/SLAVE. Throughout the remainder of this article I will refer to Mode-A (ARQ) as Mode-A. Mode-B (FEC) collective has also been known as FEC, broadcast or Mode-B. Again, throughout the remainder of this article I will refer to Mode-B (FEC) collective as Mode-Bc. Mode-B (FEC) selective has been known as: SELFEC, Mode-S and group broadcast. From now on I will refer to Mode-B (FEC) selective as Mode-Bs. Mode-L is not defined in CCIR 476-3 but it has been previously defined by Peter Martinez, G3PLX, as a mode used to monitor Mode-A communications. It has also been known as listen, ARQ-monitor or watch. I will refer to this Mode-A monitor capability as Mode-L. Finally, the CCIR 476-3 document refers to both a "call" signal for Mode-A and a call sign for Mode-Bs. I will continue to use the "loose" term SELCALL for these two character sequences. It should be obvious from the context what proper term I am referring to.

Z-AMTOR is a full-featured AMTOR controller. Some of the highlights of this system include:

Mode-A — With Mode-A you can have an error-free QSO with another station. The other operator need not be present, but you are assured that the station is receiving your data without error. [FCC rules require a control operator to be present during all transmissions. — Ed.] You can ask the station to send an answer-back message automatically to ensure the teleprinter is connected to the remote system. This answer-back message is used as an automatic QSL for commercial stations. There is no reason amateurs cannot do the same. Selective calling is used with Mode-A.

Mode-Bc — You can transmit to and receive transmissions from other stations, with error correction. Selective calling is not used with Mode-Bc.

Mode-Bs — You can transmit to and receive transmissions from other stations using personal and group selective calls with error correction.

Mode-L — This one is of the most interesting modes. It is used to monitor Mode-A communications. This mode allows amateurs to continue self-policing of their frequencies.

Microcomputer System

The microcomputer provides the decision-making capability for Z-AMTOR. A microprocessor controlled by a program stored in read only memory (ROM), which is called firmware, provides all the process-control functions that make Z-AMTOR such a powerful tool for short-wave radioteletype communication.

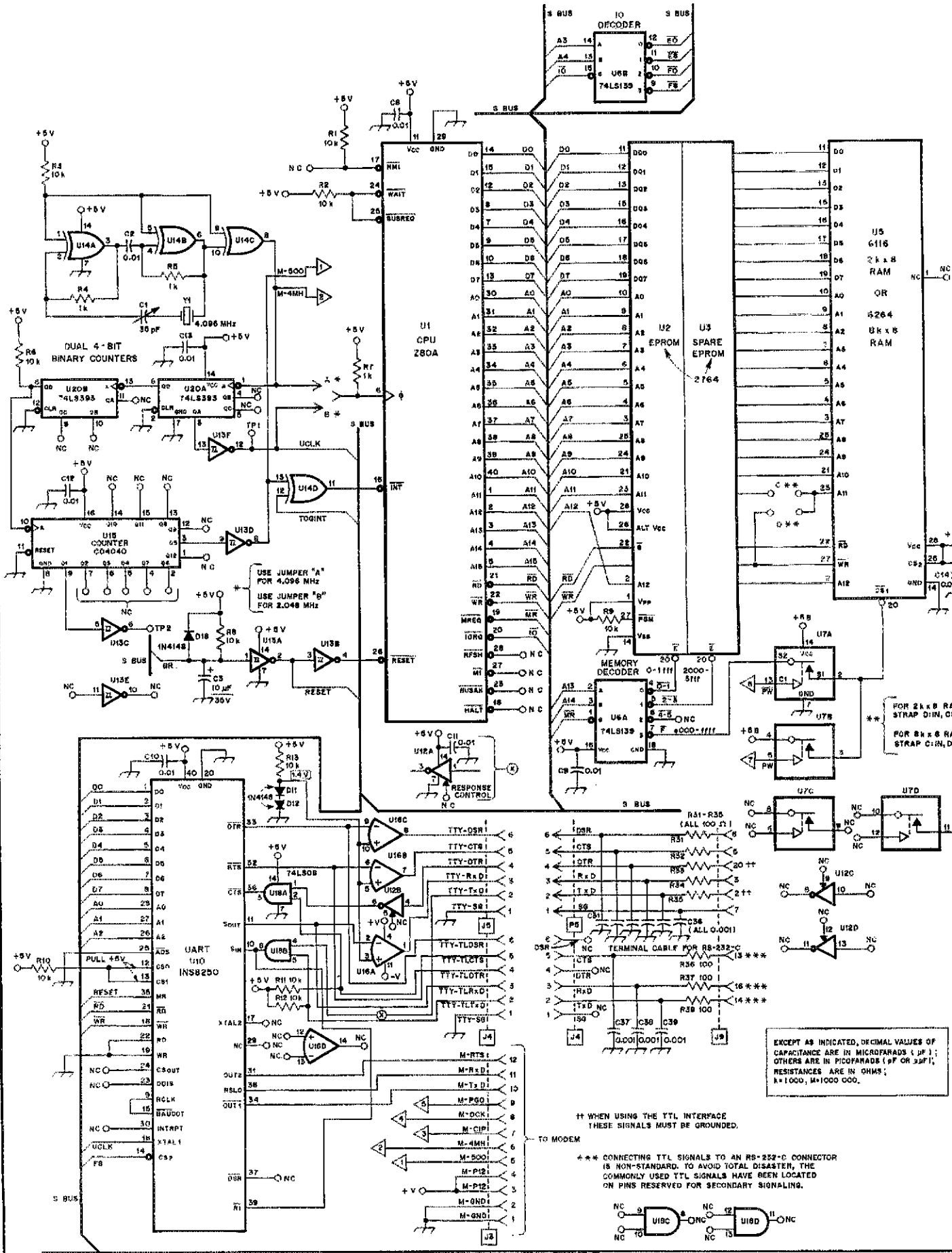
The operation of a microprocessor is not complex or hard to understand. I won't attempt to provide a tutorial here, but I do encourage readers unfamiliar with microprocessors to visit libraries or bookstores for information. They are far easier to understand than modern SSB radios!

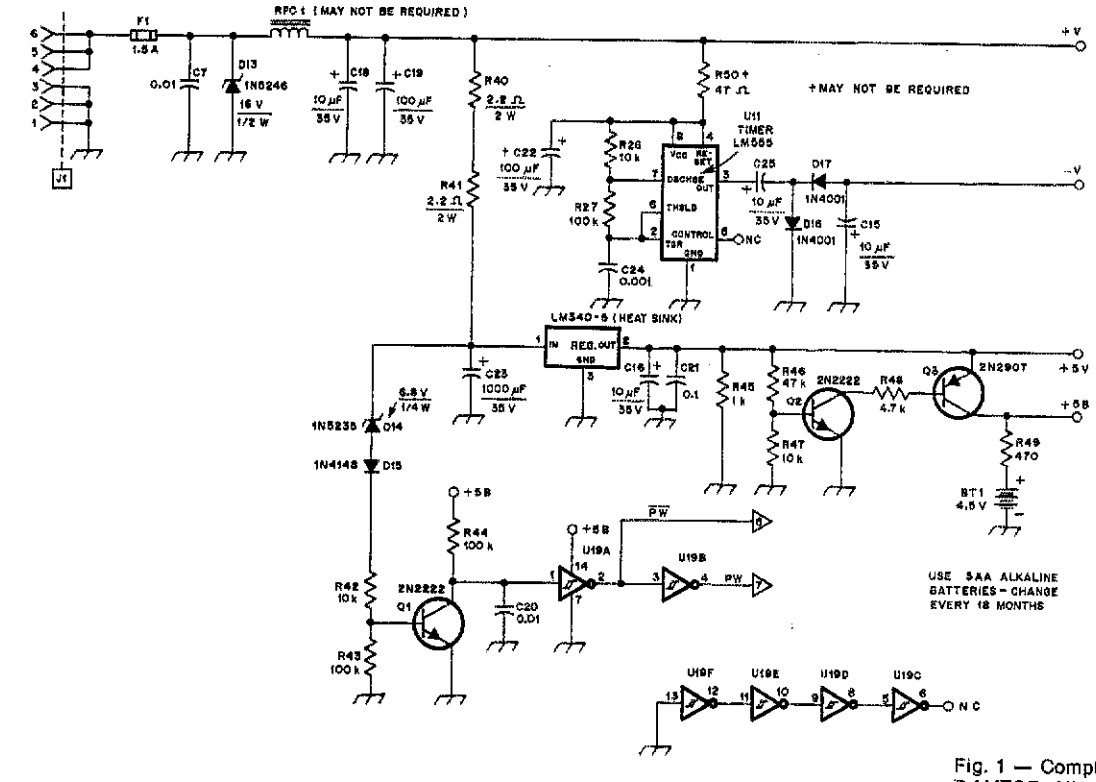
Circuit Description

A complete schematic diagram of the Z-AMTOR code converter is given in Fig. 1. The unit requires an external 12- to 15-V power source, which can be provided

[1]Notes appear on page 34.

*P.O. Box 205, Holmdel, NJ 07733-0205


S BUS
I/O DECODER
U6B 74LS139
U1 CPU Z80A
U2 EPROM
U3 SPARE EPROM 2764
U5 6116 2k x 8 RAM OR 6264 8k x 8 RAM
DUAL 4-BIT BINARY COUNTERS
U20B 74LS393
U20A 74LS393
4.096 MHz
30 pF
U15 COUNTER CD4040
USE JUMPER "A" FOR 4.096 MHz
USE JUMPER "B" FOR 2.048 MHz
UCLK
TOGINT
RESET
MEMORY DECODER 0-1fff 2000-5fff
U6A 74LS139
UART U10 INS8250
PULL +5V
TTY-DSR
TTY-CTS
TTY-DTR
TTY-RxD
TTY-TxD
TTY-SG
TTY-TLDSR
TTY-TLCTS
TTY-TLDTR
TTY-TLRxD
TTY-TLTxD
TTY-SG
M-RTS
M-RxD
M-TxD
M-PSO
M-DCK
M-CIP
M-4MH
M-500
M-P12
M-P12
M-GND
M-GND
TO MODEM
RESPONSE CONTROL
TERMINAL CABLE FOR RS-232-C
R31-R35 (ALL 100 Ω)
R36 100
R37 100
R38 100
C36 (ALL 0.001)
C37 C38 C39
0.001 0.001 0.001
U7A
U7B
U7C
U7D
U12C
U12D
U16C
U16B
U16A
U16D
U18A
U18B
U13A
U13B
U13C
U13D
U13E
U13F
U14A
U14B
U14C
U14D
U12A
FOR 2k x 8 RA STRAP D:IN, C
FOR 8k x 8 RA STRAP C:IN, D
EXCEPT AS INDICATED, DECIMAL VALUES OF CAPACITANCE ARE IN MICROFARADS (μF); OTHERS ARE IN PICOFARADS (pF OR μμF). RESISTANCES ARE IN OHMS; k=1000, M=1 000 000.
†† WHEN USING THE TTL INTERFACE THESE SIGNALS MUST BE GROUNDED.
††† CONNECTING TTL SIGNALS TO AN RS-232-C CONNECTOR IS NON-STANDARD. TO AVOID TOTAL DISASTER, THE COMMONLY USED TTL SIGNALS HAVE BEEN LOCATED ON PINS RESERVED FOR SECONDARY SIGNALING.



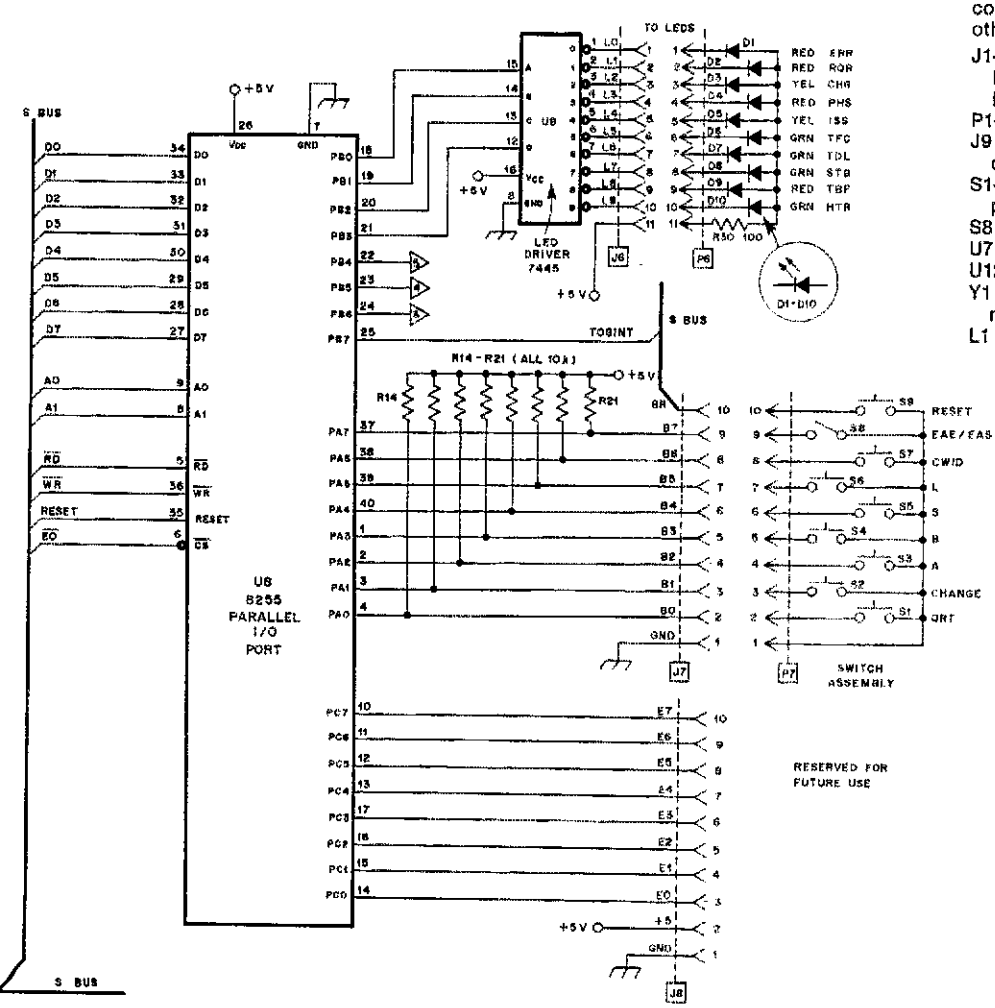


Fig. 1 — Complete schematic diagram of Z-AMTOR. All resistors are ¼-W, carbon-composition, 20%-tolerance types unless otherwise noted.

J1-J8 — In-line, multipin connectors. Number of pins for each are as indicated.

P1-P8 — Mating connectors for J1-J8.

J9 — DB25 female RS-232-C DCE connector.

S1-S7, S9 — Momentary-contact, push-button switches.

S8 — SPST switch.

U7 — CD4066 quad analog switch.

U12 — 1489A quad RS-232-C receiver.

Y1 — 4.096-MHz crystal, JAN Crystals part no. 813-936-2397.

L1 — 10-µH, 1.5-A RFC.

by an ac-operated power supply or a 12-V battery. This makes the unit useful for both base-station and portable operation.

Power is connected to the board via J1, a six-pin connector. F1 and D13 provide current and voltage protection while RFC1, C18 and C19 provide high- and low-frequency filtering. R40 and R41 drop some of the voltage to the 5-V regulator input. U17 provides precise regulation and protection for the +5-V converter supply.

U11 and associated components form a voltage inverter for the RS-232-C drivers. The 555 timer oscillates at 10 kHz. C25 and C15, along with D16 and D17, invert the +12-V supply to about −8 V. C15 helps filter the oscillator output.

U19 and Q1, act as a power warning indicator for the battery backed-up RAM (BBRAM). When the voltage at the U17 input falls below 7.5 V, Q1 will turn off and C20 will charge to +5 V. The output of U19A will go low, indicating a "power warning" ($\overline{PW}$) and the output of U19B will go high (PW). When $\overline{PW}$ is low and PW is high, the RAM chip will be disabled and put in the low-power state.

As long as the output of U17 is +5 V, Q2 and Q3 are on, sending about 1 mA of charging current into the RAM battery and providing +5 V for U5, U7 and U19. When the output of U17 falls to zero, Q2 and Q3 are off, isolating the +5-V supply from the +5 B supply. Power for U5, U7, and U19 is now drawn from the battery. With a high-impedance voltmeter set to 1-V full scale, you shouldn't see *any* voltage across R49 when the power is off. (If you do there is current flowing through it.) If so, something is wrong! Check to see that the +5 B supply is isolated from +5 V and that the unused inputs to U19 are connected as shown in the schematic.

The major timing element on the Z-AMTOR board, the digital clock, is formed by U14A, U14B, U14C, and associated components. The buffered output of U14C provides the 4.096-MHz clock signal to U2OA, U2OB and U15; TTL and CMOS ripple-counter ICs, respectively. These ICs divide the master clock frequency by powers of 2, many times.

The 2.048-MHz output on pin 3 of U20 provides a clock signal to the UART (universal asynchronous receiver transmitter), U10, for its baud-rate generator. U13F buffers this signal. The CCIR 476-3 standard requires that the timing oscillator be within 30 parts per million, therefore C1 should be adjusted to provide a signal of 2.048 MHz plus or minus 60 Hz at Test Point 1 (TP1). Try to get exactly 2.048 MHz.

By inserting either STRAP A or STRAP B, the processor, U1, can run at 4.096 MHz or 2.048 MHz. For normal use, Z-AMTOR will have STRAP A installed and STRAP B removed. The 500-Hz output of U15 pin 3 is connected to U14D pin 13. The other input of U14D, pin 12, is connected to TOGINT, a bit output of the parallel interface, U8. The output of U14D drives the interrupt line of the processor. Under firmware control, whenever an interrupt is detected by the processor, the TOGINT lead will change state, removing the interrupt signal from the processor. Using this method, interrupts are received by the processor every millisecond. This forms the basis of the real-time clock.

U13A and U13B provide the reset circuitry for Z-AMTOR. U13C does a special service for debugging malfunctioning Z-AMTOR units. This will be discussed in the DEBUGGING section.

U6B provides an I/O decoder for the I/O chips while U6A provides a memory decoder for the memory chips. U2 and U3 are ROM chips that contain the preprogrammed firmware. Normally, U3 is not required. U5 is the CMOS random access memory (RAM) for Z-AMTOR. This is the read/write memory for storing the user's parameters, type-ahead buffer data, etc. U7A and U7B provide a method of disabling the RAM during power loss.

U10 provides the parallel-to-serial conversion for interfacing a terminal and modem to Z-AMTOR. U18A, U18B and U18C provide TTL inputs to the UART from the terminal. U12C and U12B provide RS-232-C inputs for TTY-TXD and TTY-RTS, respectively. U12A provides RS-232-C input from the modem for RF-RXD. U16A, U16B and U16C are drivers that send data from Z-AMTOR to the terminal.

U8 is the parallel-interface device for Z-AMTOR. Output lines PBØ through PB3 provide signals for the LED decoder/driver, U9. The appearance of more than one LED active at a time is achieved by multiplexing the LEDs under firmware control. Actually, U9 can only light one LED at a time. All switches, except RESET, connect to PAØ through PA7, with R14 to R21 pulling the leads to +5 V when the switches are open. PCØ through PC7 are reserved for future use. Nothing should be connected to these signals.

Interrupts

An interrupt signal is generated once each millisecond and forms the basis for all clock timing within Z-AMTOR. At each interrupt, the current processing of the Z80 is stopped, the registers are stored on the stack and the interrupt processing is begun. This processing adjusts the phase-locked loop (PLL) for received-data recovery, sends and receives all bit I/O, and increments clocks used for the CW identification and time-out timers.

During standby, at each interrupt, the data received from the radio is analyzed to see if a Mode-A, Mode-Bc or Mode-Bs signal is present. If so, flags are set internally that inform non-interrupt routines that an AMTOR call has been found.

Bit I/O

Bit I/O is used to interface Z-AMTOR with the front-panel buttons, the LED decoder and the radio modem. The panel buttons are sampled once every 20 ms and compared to the previous sample. If there is no difference between the old and new samples, no action is taken. If the old sample shows that a button was not pressed at that time, and the new sample shows that it now is pressed, a flag in memory is set to mark the button closure. Other routines can then test and clear that button flag as required.

The hardware provided with Z-AMTOR can light only one LED at a time. However, firmware provides a multiplexing feature that allows 4 of the 10 LEDs to appear to be lit at once. This allows use of only 4 I/O lines to drive 10 LEDs.

The radio is controlled with bit I/O from the UART port. This I/O could have been provided through unused bits on the parallel port (U8) but I thought it best to use the UART for all serial communications.

Terminal Control

The terminal is interfaced to Z-AMTOR with an 8250 UART. Some of the features of the 8250 are an internal baud-rate generator, loop back for self test and selectable character length. Thus, the same hardware device can be used to interface a 300-bit/s ASCII terminal or a 45-bit/s ITA No. 2 (International Telegraph Alphabet No. 2) terminal; the firmware programs the UART to provide the required operations.

When characters are typed at the keyboard, Z-AMTOR takes them from the UART, converts them to AMTOR codes and places them in an internal FIFO (first-in, first-out) buffer. When needed, the characters are pulled from the buffer and sent to the modem. A similar process is used for moving characters from the modem to the terminal. Because these FIFO buffers provide an elastic storage, Z-AMTOR allows terminals with different speeds to communicate with each other (if the terminals do not overrun the buffers).

Framing

Z-AMTOR provides the fastest method of establishing data framing and synchronization with which I am familiar. In memory, the firmware constructs 10 shift registers (labeled 0 through 9) with each register containing 21 bits (three AMTOR characters). When each millisecond interrupt occurs, the firmware increments a counter that goes from 0 to 9 and back to 0 again. This is analogous to a hardware divide-by-10 counter.

During each interrupt, a sample of the data from the radio is placed into the shift register whose label is the same as that of the current state of the millisecond counter. Then the contents of that register are compared with the register that received the last bit. If the contents of these registers are the same, the program waits for the next in-

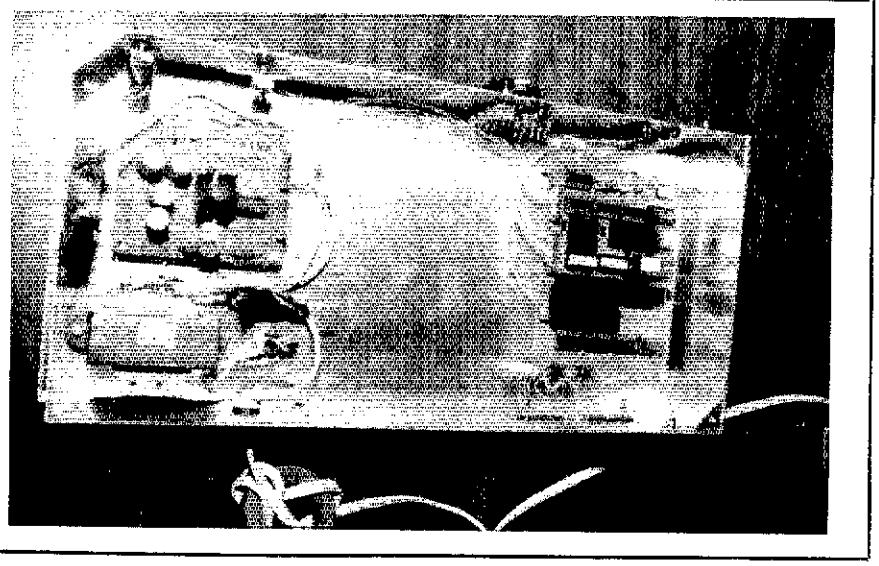


Fig. 2 — Photo showing the layout of a Z-AMTOR unit using wire-wrap techniques. The power supply is on the left and the Z-AMTOR board is on the right. The space in the center is reserved for the addition of a modem.

terrupt. If the contents are different, the program determines how many of the previous registers have the same data. If the number of registers that have the same data is less than some threshold (currently 7) or if the any of the three characters contained in the shift registers fails the 4/3 mark-space ratio test, the program waits for the next interrupt. If all these requirements are met, some calculations are made to set the PLL to the optimum state for clock recovery and the system is flagged as being framed.

Finally, the program determines the mode that the system is in. If the operator has selected Mode-L and if there isn't an RQ character at the second position in the shift register, the system is allowed to pass data to the terminal.[4] If not in Mode-L, Z-AMTOR checks the shift register to see if the selective call of the station is present; if so the Mode-A flag is set and Mode-A processing begins. If it is neither Mode-L nor Mode-A, the shift registers are compared with the Mode-Bc idle signal. If this is present the Mode-Bc flag is set and Mode-Bc processing is started. Internally, Mode-Bc is capable of switching to Mode-Bs as required.

Construction

Construction of Z-AMTOR is best handled by one of two methods. If you can make or get a PC board, this is probably the best way to go. If a PC board is not available, however, then wire-wrap techniques should be used. Regardless of construction method, be sure to include all power supply capacitors shown on the schematic. It is important that the 0.01-μF bypass capacitors be distributed evenly throughout the board. For those opting for wire-wrap, a suggested physical placement is shown in Fig. 2. Be sure that all connections are of good quality with four to eight wraps per lead and no gaps or over-wraps. Be sure to use sockets for all chips, even though some of the chips are less expensive than the sockets that hold them. It may be worth the extra money for the sockets during the debugging phase of the project.

As with any electronic equipment operated in an electromagnetic field, it is extremely important that the equipment be contained in an RFI-proof enclosure. The case must be grounded to the radio equipment using a low-impedance ground strap. Additionally, each signal lead from the enclosure to the outside world must be decoupled. I use 100-Ω resistors in series with each signal lead and a 0.001-μF capacitor from each resistor to ground. The cap should be on the side of the resistor closest to the protected equipment. If you get strange results when operating this or other electronic equipment when a transmitter is active, reduce the power and see if the problem goes away. If it does, local RFI is probably fouling up your electronic gear.

Debugging

Now that you have completed the board and are ready to begin testing, what do you do? First, check all connections. With all chips removed from the board, apply voltage and check the power-supply connections on each chip socket to ensure that the proper voltage is going to the right place on each chip.

Next, remove voltage and install all chips, then reapply voltage. C1 should be adjusted to provide a signal at Test Point 1 (TP1) of 2.048 MHz (± 10 Hz). Press and release the RESET button. The HTB lamp should be on and will be interrupted once every 4 seconds. All of the other LEDs should be out. If you have this much operating correctly, congratulations are in order. The system is now 95% operational.

If you did not get the HTB lamp operating correctly, then you have a small problem. You have probably heard the story that most problems with newly constructed boards are caused by wiring errors. Well, after several years of seeing bunches of newly constructed boards that don't work, take my word for it: It's true! Most microcomputer problems are caused by shorts, opens, wires in the wrong place or incorrect supply voltages. Chips themselves are rarely at fault.

After you have checked the board for the umpteenth time and have not located the problem, you are ready to begin detailed debugging. The next trick to try, if you have the parts, is to replace all the chips on the board. Chances are that this will not fix the problem, however. To proceed further, you need either a 100-MHz scope with delay capability, a microprocessor emulator or a signature analyzer. I won't explain how to use these instruments. Your best bet is to seek help from someone in your radio club who is knowledgeable about microprocessors.

If you have the scope, you might try the following steps. Remove C3 from the input of U13A and connect the U13A input to the U13C output. The system will be reset about once every 125 microseconds. Use the falling edge of the RESET signal as a trigger for the scope. Now, with the BR lead being pulsed by this clock, the system is deterministic. That is, after each reset pulse it operates the same way until the next reset pulse occurs.

By adjusting the delay on the scope, you should be able to read address and data information from the buses when the proper control signals are active. The first instructions executed are NOP; NOP; DI; JR; LD SP,nn; and LD IX,nn. What you will probably find, is that a signal is open or shorted to another. It is a problem that could have been discovered with a good visual inspection. Thus the fancy equipment is useful, usually, only for locating the interconnection problem, something your eyes or ohmmeter can also do with a little more time. After all this effort, if you *still* have a problem, drop me a note describing your problem and I will try to provide some help.

Operating Manual

This section describes the operating controls, the keystroke sequences to set up the various options, and the information presented by the status LEDs. It is meant to guide your use of a working Z-AMTOR system.

Operator I/O

The operator interfaces directly with Z-AMTOR via the switches and lamps, and indirectly via the terminal. What follows is a discussion of how to use the switches to control Z-AMTOR and how to interpret

Table 1

Control-Switch Functions

RESET	Closing this contact causes Z-AMTOR to be reset. Releasing it will allow the microprocessor to begin execution.
ORT	This button is used to stop current operation or request a change of state.
CHANGE	This switch is used to change a mode or change the station ISS/IRS state.
A	Pressing A causes Z-AMTOR to alternate parameter options during configuration, or to begin MODE-A communications when in STANDBY.
B	Pressing this button causes Z-AMTOR to begin MODE-Bc communications when in STANDBY.
S	This button begins MODE-Bs communications from a STANDBY condition.
L	Closing this contact causes Z-AMTOR to begin MODE-L monitoring when in STANDBY. When already in MODE-L, it causes Z-AMTOR to reframe the data. When in MODE-A, MODE-Bc or MODE-Bs, pressing this button will clear the transmit buffer and switch the terminal to LETTERS case.
CWID	This switch sends the CW identification via the RF-RTS lead. This button may be pressed when in STANDBY or MODE-A. Sending CW while in MODE-A will not cause loss of data or synchronization.
EAE/EAS	This switch is a SPST type. When open, Z-AMTOR echos all data as it is sent by the terminal. (Echo As Entered [EAE]) if the ECHO ON parameter has been selected. When closed, Z-AMTOR echos all data as it is transmitted (hence, Echo As Sent [EAS]) regardless of the parameter selected for ECHO.

Table 2

LED Indicators

HTB	*HearT Beat* is an indicator that is always on unless a fatal error condition has occurred in the system. It will be interrupted once every 4 seconds for 250 ms if Z-AMTOR is operating normally. This lamp may be mounted on the front panel and used as a pilot light.
TBF	*Transmit Buffer Full* shows that Z-AMTOR's transmit buffer is full of data. When this light is on, data should not be sent from the terminal to Z-AMTOR. It should rarely come on, since the transmit buffer can store about 1000 characters.
STB	*STandBy* indicates that Z-AMTOR is in the STANDBY mode and is ready to receive a call.
IDL	*IDLe* shows that communication is underway but there is no user data being sent at the moment.
TFC	*TraFfiC* indicates that communication is underway and there is user data being transferred.
ISS	*Information Sending Station* shows that your station is currently the ISS, or sending station.
CHG	*CHanGe* indicates that the direction of transmission is being changed.
PHS	*PHaSing* shows that Z-AMTOR is trying to frame or phase-lock to the data being received.
RQR	*ReQuest Repeat* means that the data being received is a request for the last block to be repeated.
ERR	*ERRor* shows that the data being received is in error.

Table 3

Fatal Error Indicators

Lamp	*Error Type*
ERR	Real Time Error
RQR	ROM Error
CHG	RAM Error
PHS	none
ISS	none
TFC	none
IDL	none
STB	none
CTS	none

the lamps that Z-AMTOR provides to indicate the communications status.

There are nine user switches for control of Z-AMTOR; all are momentary contact switches except for the EAE/EAS switch. A list describing the major use of each switch is given in Table 1. It is important to remember that the particular use of a switch depends on the current Z-AMTOR operating mode.

Z-AMTOR uses 10 LEDs as indicators to show the current state of the system. Table 2 provides a brief description of their meaning.

One special condition can occur that is not covered in Table 2. That is the case in which the heartbeat LED is not lit, and one other lamp is lit. This condition indicates that a fatal error has occurred and the processor is halted. This special error monitoring is included so obscure errors can be detected and corrected in later firmware releases.

Table 3 shows the correspondence between lamps and fatal errors. If you are unable to resolve the cause of an error, contact the firmware supplier.

Any Z-AMTOR control-button closure (except RESET) can be simulated electronically from an ASCII terminal. To do so requires two keystrokes. The first is the greater than symbol (>). That is usually generated on computer terminals by typing a SHIFT/. (period) key. The next character typed determines what button you want to press.

Keyboard commands can also be issued from an ASCII terminal in the same way that button closures can be simulated. Again, each command requires two keystrokes. These keyboard commands are summarized in Table 4.

Terminal Interface

Z-AMTOR supports two major types of terminals, ASCII and ITA No. 2 (telex or Baudot). The ITA No. 2 interface will run at 45, 50 and 74 bit/s while the ASCII interface will run at either 110 or 300 bit/s.

ASCII Terminals

The ASCII input is converted to ITA No. 2 code — a code that is almost the same as the code used by most amateurs with Baudot terminals. The only significant change is that the codes for BELL and apostrophe (') are reversed. The ITA No. 2 code was used instead of Baudot code because the CCIR 476-3 standard demands use of ITA No. 2.

Also of importance is that the ASCII interface does not implement an unshift-on-space-reception (UOSR) feature. For each mode, there is a method to force the terminal to the LTRS state.

If you type a character on the ASCII keyboard that has no ITA No. 2 equivalent, Z-AMTOR will send a BELL character to the terminal to let you know that the character cannot be transmitted. Also, if you wish to force a FIGS or LTRS character from the ASCII keyboard (this is necessary in OPTION mode) use >F for FIGS and >T for LTRS.

ITA No. 2 Terminals

The ITA no. 2 interface requires little explanation except that each character generated from the keyboard will be sent by Z-AMTOR. For that reason, it is important that any keyboard or terminal does not generate a diddle signal. Any diddle or null characters received by Z-AMTOR will be transmitted and hence, can clog throughput.

Z-AMTOR doesn't know anything about UOSR. It simply passes FIGS, LTRS and SPACES to and from the terminal. If, for some reason, the station with which you are communicating sends only a SPACE character to shift from FIGS to LTRS case, you can force the terminal to the LTRS case by pressing one of Z-AMTOR's buttons. Forcing letters case also clears the transmit buffer. When in Mode-A, Mode-Bc or Mode-Bs, press L to clear the transmit buffer and force letters case. When in Mode-L, press CHANGE to clear the transmit buffer and force letters case.

The terminal serial interface may use either RS-232-C or TTL for I/O; the modem uses only TTL. If TTL is used for the terminal, all associated Z-AMTOR RS-232-C inputs must be grounded. Line states are defined as follows: MARK (or INACTIVE) RS-232-C is between −3 and −15 V, and MARK TTL is between 2.4 and 5.0 V; SPACE (or ACTIVE) RS-232-C is between +3 and +15 V, and SPACE TTL is between 0.0 and 0.4 V.

Electrical Connections

The electrical interface consists of six wires that connect the terminal to Z-AMTOR. Leads are used as follows:

TTY-GND — TTY Ground: The com-

Table 4

Keyboard Control of Z-AMTOR

Control Character	Simulate Closure of Button
>A	A.
>B	B.
>S	S.
>L	L.
>Q	QRT.
>C	CHANGE.
>I	ID.
>T	*leTters character* — This command causes Z-AMTOR to change the input code converter to the letters case and generates a LTRs character.
>F	*Figures character* — This command causes Z-AMTOR to change the input code converter to the figures case and generates a FIGs character.
>W	*Who are you* — Causes Z-AMTOR to send the WRU command (FIGS D) to the other station. This command is handy for those ASCII terminals that can't generate the control E character required for the ASCII "enquiry" signal.
>G	*ascii control G* — This command causes Z-AMTOR to send the BELL command (FIGS J) to the other station. This command is for those ASCII terminals that can't generate the control G character required for the ASCII "BEL" signal.
>K	*Klear transmit fifo* — Z-AMTOR responds to the >K command by clearing the transmitter fifo regardless of mode.
>U	*send nUll* — Z-AMTOR responds to the >U command by placing a NULL character on the transmitter fifo. This may be useful for terminals that cannot generate a NULL character.
>M	*Mode status* — Z-AMTOR responds to the >M command with a one-character lowercase response. This response can be interpreted as follows: Convert the ASCII character to hex (or binary). Subtract from it the hex value Ø5. With that conversion and calculation complete, bit Ø represents the ISS flag (1 is true), bit 1 the MODE-A flag, bit 2 the MODE-Bc flag, bit 3 the MODE-Bs flag, bit 4 the MODE-L flag.
>N	*liNk status* — Z-AMTOR responds to the >N command with a one-character lowercase response. This response can be interpreted as follows: Convert the ASCII character to hex (or binary). Subtract from it the hex value 5B. With that conversion and calculation complete, the least significant three bits indicate the last state of the link. The appropriate link status condition will be indicated as follows. ØØØ — ERROR; ØØ1 — RETRY; Ø1Ø — CHANGE; Ø11 — PHASING; 1Ø1 — TRAFFIC; 11Ø — IDLE; 111 — STAND-BY. An indeterminate state is indicated if these bits are 1ØØ.
>Z	*Zero the escape state* — Z-AMTOR responds to the >Z command by taking no action other than removing itself from the escape state.

mon signal from the terminal should be connected to this line.

TTY-TXD — TTY-Transmit Data: The terminal keyboard output should be connected to this line.

TTY-RXD — TTY-Receive Data: A printer input should be connected to this line.

TTY-CTS — TTY-Clear To Send: This line tells the terminal that it may send data to Z-AMTOR. If this lead is INACTIVE and the terminal sends data, the data may be lost. It should rarely go inactive since Z-AMTOR's transmit buffer can store over 1000 characters.

TTY-DTR — TTY-Data Terminal Ready: When the WDTR ON parameter is selected, this line tells Z-AMTOR that the terminal is ready to accept data. Z-AMTOR will not send data to the terminal if this signal is inactive and WDTR ON is selected. Additionally, in Mode-A, Z-AMTOR will not let the other station send more data than can be stored in Z-AMTOR's memory when this line is INACTIVE and WDTR ON is selected.

TTY-DSR — TTY-Data Set Ready: This signal goes active when there is a call in progress. It may be used by terminal equipment that scans several Z-AMTOR units to determine which are active.

Modem Interface

The modem interface consists of 12 leads and are to be used as follows:

M-GND — M-GrouND: The common signal from the modem should be connected to this line.

M-P12 — M-Positive 12 volts: Power for the modem may be drawn from this line.

M-500 — Modem 500 Hz: This may be used by the modem for a 500-Hz reference signal.

M-4MHz — Modem 4 MHz: This may be used by the modem for a 4.096-MHz reference signal.

M-PGO — Modem PLL Gate Open: This output is a MARK when the PLL on Z-AMTOR is looking for clock edges. The output may be used by a modem to aid with high-performance demodulation.

M-DCK — Modem Data ClocK: This output may be used by the modem for external data sampling. Data is strobed in within 150 μs before this signal changes from SPACE to MARK. This output may be used by a modem to aid with high-performance demodulation.

M-CIP — Modem Call In Progress: This output line goes to a MARK state when Z-AMTOR is in the process of receiving or sending a call. The signal may be used by the radio equipment to inhibit frequency scanning.

M-TXD — M-Transmit Data: This lead is used to send data from Z-AMTOR to the modem. The higher frequency (of the two tones) is required from the modem/radio when this lead is in the MARK state.

M-RXD — M-Receive Data: This lead is used to receive data from the modem to Z-AMTOR. A MARK state is required from the modem when the received RF is the higher of the two tones.

M-RTS — M-Request To Send: This lead is used to turn on the transmitter when a SPACE is sent on this lead and is used for both data transmission and CW identification.

Setting Options

Normally, all user parameters are stored in battery-backed-up RAM (BBRAM). When power is applied, Z-AMTOR prints the sign-on message and enters the STANDBY state. If the data in the RAM was lost, however, then user parameters must be reentered.[5] When the data in the RAM has been corrupted, either because battery backup has failed or because it was not provided, the user must reenter the operating parameters. If such a condition has occurred, Z-AMTOR will light only the HTB lamp and wait for the operator to complete the TERMINAL SPEED/CODE SELECTION procedure.

Terminal speed and code can only be changed by causing the BBRAM to lose data and pressing RESET. If battery backup is provided and the user wishes to change terminal type, CHANGE should be held down while RESET is pressed and released. Following the RESET, the HTB lamp will be lit and CHANGE may now be released. With a terminal connected to Z-AMTOR, press A (Alternate) until a readable message is printed. Don't press A more than once every 3 seconds. Z-AMTOR won't get confused but you might! The message Z-AMTOR prints tells you the speed at which the teleprinter is sending. Make sure that this is the correct one for your terminal.[6] When you have selected the correct speed, press QRT. You are now in the OPTIONS mode and the default parameters have been selected for you. You should continue through the OPTIONS procedure to set up the remaining parameters.

To change from the STANDBY mode to the OPTIONS mode, press QRT once and

note that only HTB is now lit. Also, the last parameter selected has been printed on the terminal. You are now in the OPTIONS mode.

Press CHANGE until the SELCALL parameter is displayed on the terminal. It will be in the form: SELCALL : ABCD :. If you wish to change this parameter, type one (or more) WHITESPACE characters, LTRS and four characters on the keyboard — W X Y Z, for example.[7] Next, press A (for Alternate) and the new SELCALL will be printed. Such as: SELCALL : WXYZ :. If this is incorrect enter another selective call. SELCALL is the selective call used for Mode-A and Mode-Bs reception. Any station that wants to call you should call with the SELCALL that you have chosen. When finished, press CHANGE to select the next parameter. As each option is displayed you must press A (Alternate) to select the desired parameter.

The ALTCALL parameter is displayed next. Follow the same procedure that was used to select SELCALL. ALTCALL is used for Mode-Bs communications and may also be used in Mode-A (see the AALT option). If a Mode-Bs call is received with either your SELCALL or ALTCALL as the selective call, Z-AMTOR will print the message.

Press CHANGE again and the CWCALL parameter prints on the terminal. Follow the same procedure that was used to select SELCALL. Only the characters following the last WHITESPACE entered will be used. CW identification is in the form of "QRA CALL", where CALL is the string entered for CWCALL.

Press CHANGE and a message of the form: DLY xx (DeLaY) is printed. The delay value determines the amount of time delay (in milliseconds) between transmitter turn on and data transmission. Avoid using a delay of ØØ; this value causes problems with communications over short distances.

The next time you press CHANGE, a message of the form: ECHO xx is printed. When OFF is selected, data will be echoed to the terminal only when the EAE/EAS switch is in the EAS position. When ON is selected, data will be echoed to the terminal regardless of the EAE/EAS switch position.

Another press of the CHANGE button displays a message of the form: ANL xx (Automatic New Line). When OFF is selected, Z-AMTOR operates normally. When CR is selected, Z-AMTOR will ignore line feed characters and convert each carriage return character typed on the keyboard to a carriage return, line feed, and LTRS character for transmission. When LF is selected, Z-AMTOR will ignore carriage return characters and convert each line feed character typed on the keyboard to a carriage return, line feed, and LTRS character for transmission.

Pressing CHANGE again displays a message of the form: RETRY FE xx (RETRY ForEver). If ON is selected and Z-AMTOR is a MODE-A master station, it will retry calling the slave station, following loss of communications, forever. When OFF is selected, it will retry for about 90 seconds and then return to standby if communications was not reestablished.

The next time you press CHANGE, a message of the form: BRX xx (Mode-Bc Receive) is printed. Z-AMTOR will not respond to Mode-Bc signals when OFF is selected.

When you press CHANGE again, a message of the form: BWNL xx (Mode-Bc, Wait for New Line) is printed. When ON is selected, Z-AMTOR will not print Mode-Bc messages until it receives a carriage return or line feed character from the sending station.

Press CHANGE, and a message of the form WDTR xx (Wait for DTR active) is printed. When ON is selected, Z-AMTOR will not send data to the terminal when the TTY-DTR signal is inactive. Data received from the radio is stored in Z-AMTOR until the TTY-DTR signal is active.

A message of the form: BS SPEED xx (Mode-Bc and Mode-Bs transmit SPEED) is printed when you press CHANGE again. When 45 is selected and Mode-Bc or Mode-Bs transmission is in progress, Z-AMTOR will pad the data with enough IDLE characters so that a receiving station with a 45-bit/s terminal will not over-run its buffers. When 50 is selected and Mode-Bc or Mode-Bs transmission is in progress, Z-AMTOR will pad the data with enough IDLE characters so that a receiving station with a 50-bit/s terminal will not over-run its buffers.

Pressing CHANGE again will display a message of the form: SRXALL xx (Mode-Bs Receive ALL traffic) is printed. When OFF is selected, Z-AMTOR will only print Mode-Bs traffic prefaced with selective calls that are programmed into either SELCALL or ALTCALL. If ON is selected, Z-AMTOR will print all Mode-Bs traffic regardless of the prefaced selective-call.

One last press of the CHANGE button prints a message of the form AALT (Mode-A ALTcall). Z-AMTOR will respond in Mode-A to calls that match only the SELCALL parameter when OFF is selected. When ON is selected, Z-AMTOR will respond in Mode-A to calls that match either the SELCALL or ALTCALL parameters.

You can change from OPTIONS mode to STANDBY mode at any time by pressing QRT once. Both HTB and STB LEDs will light, indicating that Z-AMTOR is in the STANDBY mode.

Communications Modes

When Z-AMTOR is in the STANDBY condition, it constantly listens to the radio channel for AMTOR signals. If it hears your selective-call from a Mode-A station, it switches to Mode-A and responds. If it hears the Mode-Bc synchronization pattern, it switches to Mode-Bc and prints the message. If it hears your selective call from a Mode-Bs station, it switches to Mode-Bs and prints the message. In STANDBY, Z-AMTOR automatically determines what mode the calling station is using and switches to that mode for you.

To begin a call in Mode-A, enter a 4-character selective call by typing one (or more) WHITESPACE, LTRS (use >T on an ASCII terminal), and the 4 selective-call characters. If you make a mistake, just type the sequence again. Z-AMTOR locates the last WHITESPACE you typed and uses the following four printable characters for the selective call. Next press A. Z-AMTOR will type the selective call on the terminal, light the ISS and PHS lamps, and begin calling the station. If the PHS lamp doesn't light when the A button is pressed, then the character sequence was incorrect. If the other station does not respond and you wish to stop calling, press QRT. When the called station does respond, the idle lamp will light and you may now send data to the other station as long as the TBF lamp remains off. If this lamp comes on, the type ahead buffer in Z-AMTOR is full and you should not send more data from the terminal until the lamp goes off. The CTS lead to the terminal will also be inactive when the TBF lamp is off. This is useful for interfacing Z-AMTOR to a computer system.

When you wish to let the called station send data, transmit the three characters: FIGS Z B (+? on an ITA No. 2 keyboard). This tells the other station's AMTOR unit to handshake with yours, and lets it send data. While it is sending data you may break into its transmission by pressing CHANGE. After your CHANGE request has been acknowledged, the other station will relinquish control to you and you may now send data. When you are finished with the contact, the sending station may press QRT to close the contact. When the sending station presses QRT, the units will handshake again and go off the air.

To begin a Mode-Bc contact press B and begin sending. All user messages sent via Mode-Bc or Mode-Bs should begin with carriage return and line feed characters. Before your data is actually sent, a 5-second synchronization pattern is transmitted. Any data you input will be stored and sent after the synchronization pattern has been completed. When finished with a Mode-Bc transmission press QRT. If there are characters in the transmit buffer Z-AMTOR will continue sending until that buffer is empty, then it will turn the transmitter off. If QRT is pressed a second time, before the type-ahead buffer is empty, the buffer will be immediately cleared, the data discarded, and the transmitter turned off.

To send a message with Mode-Bs, the selective-call characters are entered from the keyboard as in Mode-A. Press S, and the selective call will be printed on the terminal. Z-AMTOR now operates exactly as

in Mode-Bc but the message will only be printed by AMTOR units with the selective call you have entered. When you are finished, press QRT.

Mode-L is used to monitor Mode-A communications. To enter Mode-L press L. The PHASING lamp will now light and Z-AMTOR will search for Mode-A ISS communications.

If Z-AMTOR hears a selective call the RQR lamp will light and the characters will be printed on the terminal. If it hears data it will light the TFC lamp and print the data on the terminal *if* the received data block is not the same as the previous block. This is done so that an ISS station that is sending the same block over and over again in response to RQR will not print on the Mode-L terminal. Mode-L requires some operator intervention to establish framing. Sometimes Z-AMTOR will misframe a Mode-A station; this is difficult to prevent. To get Z-AMTOR to reframe, press L again. Once proper framing has been established, little operator attention should be required.

Bringing Up A System

Now that you understand how to operate the system, it is time to connect a keyboard to Z-AMTOR. Connect an ASCII or ITA No. 2 (Baudot) terminal to either the TTL or RS-232-C input, as required. If you use the TTL interface, make sure that the RS-232-C inputs are grounded.

Press and release RESET and note again that the HTB lamp still functions normally: on with an interruption every 4 seconds. Following the described procedure, set Z-AMTOR for the proper terminal speed. If you do not get any message, check the connections between the terminal and Z-AMTOR.

With the terminal speed selected, Z-AMTOR wants you to enter your SELCALL string. This is apparent from the SELCALL prompt printed by the terminal and only the HTB lamp lit. Press QRT and the STB lamp should light. With that, select EAE, press B, and the IDL and ISS lamps should light. Type a few characters on the keyboard. The TFC lamp should light, showing you that characters are being sent. Also, the characters you typed should print on the teleprinter. If not, check connections. Press QRT, and the STB lamp should light.

It is important to note that I have assumed that you are using the standard OPTIONS when conducting these tests. Included in the standard OPTIONS are ECHO-ON and WDTR-OFF. If these OPTIONS are not selected you won't get the results described above. Standard OPTIONS are loaded into the RAM when it has lost power for any reason.

With Mode-Bc working you should now connect a modem and radio to Z-AMTOR. It is up to the modem, or some other external circuitry, to convert the RF-RTS signal to a "key-down" signal for the radio. Tune to an active amateur or commercial channel and see if you can receive Mode-Bc signals. It will be helpful to refer to a schedule of U.S. or Canadian Coast Guard SITOR weather broadcasts or W1AW AMTOR bulletins. If you cannot print these transmissions, check the REVERSE/NORMAL switch on your modem.

It is important that Z-AMTOR be housed in a metal enclosure before it is exposed to any stray RF fields. If you allow RF to get into Z-AMTOR, you are assured of weird operation. Once you have Mode-Bc receive working, switch to an active amateur AMTOR channel and call CQ in Mode-Bc. With AMTOR, operation is somewhat like 2-meter FM. Use only a two-line CQ message with a few BELL characters. Any station listening will print the message so keep it short. If Mode-Bc transmission doesn't work, check the connections to the modem and check the reverse/normal switch setting.

After Mode-Bc is operating, you are ready to try Mode-A. Mode-A is the most complex and most useful mode of AMTOR. Refer to the OPTIONS section and set the transmitter Delay to 40 milliseconds (DLY 4Ø). This ensures that there will be plenty of time for the transmitter to get the RF flowing before sending data. Most modern SSB radios are able to have everything up to snuff in about 15 ms. Using Mode-Bc, locate a station that is willing to do some testing with you and call the other station.[8] After your transmitter begins calling you should hear the other station's system respond with short chirps. If your PHS lamp stays lit, Z-AMTOR is not receiving the chirps correctly. If your RQR lamp is lit, you have heard his chirps correctly twice in a row but now the other station is not receiving you properly. If your IDL lamp is lit, you have Mode-A working — congratulations! Send some data to the other person and end it with FIGS Z B, the AMTOR over signal. The CHG lamp should light momentarily, the ISS lamp should go out, and the other station may now send data to you. Before finishing, reduce power so that occasionally your RQR lamp lights. This indicates that the other station is getting bad blocks once in a while. When finished, the current sending station presses QRT to close the contact.

Now reduce the transmitter delay one step and call the station again. You don't need to send any data. If you get the IDL lamp, things are working. Press the QRT button. Keep doing this until you fail to establish contact with the other station. Adjust transmitter DLY for the minimum amount of delay that provides reliable communications, but don't use DLY ØØ if possible.

Transmitter DLY is a straightforward adjustment. You are adjusting the time delay between when the transmitter is turned on and when data is sent. If it is adjusted too long, then Z-AMTOR won't operate well on lengthy paths. If adjusted too short, then Z-AMTOR won't operate well on short paths.

Ideally, DLY should be adjusted for the minimum amount. But even if you have a QSK radio (one that switches RX-TX or TX-RX in less than 5 ms) you don't want to operate with no time delay. If your Z-AMTOR unit is set for minimum delay (0 or 10 ms) and you are close to the station you are communicating with, you could be chirping to it before the other station has fully changed from transmit to receive. This needs to be avoided. Also keep in mind that if you change radios, you may need to readjust DLY.

With all this complete, both Mode-A and Mode-Bc are operational, and your battles are over. Return to the OPTIONS mode

Table 5

Standard Z-AMTOR Options

All values are hexadecimal numbers.

INDEX — This value determines what the first OPTION the user is presented with following power up. To start with ECHO load this location with Ø; to start with WDTR load this location with 6. Values must range between Ø and ØB.

DLY — Ø selects DLY ØØ, 1H selects DLY 10, 2 selects DLY 2Ø, 3 selects DLY 3Ø, and 4 selects DLY 40.

ECHO — Ø selects OFF, 1 selects ON.

ANL — Ø selects OFF, 1 selects CR, 2 selects LF.

RFE — Ø selects OFF, 1 selects ON.

BRX — Ø selects OFF, 1 selects ON.

BWNL — Ø selects OFF, 1 selects ON.

WDTR — Ø selects OFF, 1 selects ON.

BS SPEED — Ø selects 45, 1 selects 50.

SRXALL — Ø selects OFF, 1 selects ON.

AALT — Ø selects OFF, 1 selects ON.

UNUSEDx — Ø selects OFF, 1 selects ON. This option currently has no effect.

SELCALL — This is an array of up to 16 bytes of TOR characters that must end with a Ø. The form is TORLTRS, the four TOR characters of the selective call and a Ø. Any unused bytes of the array must be Ø.

ALTCALL — this is an array of up to 16 bytes of TOR characters that must end with a Ø. The form is TORLTRS, the four TOR characters of the selective-call and a Ø. Any unused bytes of the array must be Ø.

CWCALL — This is an array of up to 16 bytes of TOR characters that must end with a Ø. The form is similar to SELCALL except that either a TORLTR or TORFIG can start the array. The remaining characters represent the CW call sign, with necessary TORFIGS or TORLTRS characters inserted, followed by a Ø. The array including the trailing Ø must be 16 bytes or less. Any unused bytes of the array must be Ø.

TERMTYP — This byte selects the type of terminal that Z-AMTOR will be connected to. Ø selects ITA No. 2 at 45 bauds, 1 selects ITA No. 2 at 50 bauds, 2 selects ITA No. 2 at 74 bauds, 3 selects ASCII at 110 bauds, and 4 selects ASCII at 300 bauds.

LAG — Load And Go is Ø. If you do not want to load the standard options table at reset and go to STANDBY. If 1, standard options will be loaded at reset and Z-AMTOR will switch to standby unless CHANGE was pressed during the reset process.

and select the user parameters you desire. Welcome to AMTOR!

ROM Options Patching

In an effort to provide a flexible system, details of the standard options are presented in Table 5 so others, who do not wish to provide a BBRAM, can select parameters appropriate for their system at power up. This data is not checked by the internal ROM test. Therefore, any patches you make to this section of code should not cause the program to output a ROM FATAL ERROR message. Table 6 lists the OPTION, starting address and number of bytes used. Table 7 lists information for converting keyboard characters to TOR values. These values are hexidecimal, but must be converted to binary form for transmission. A one represents the high tone and a zero represents the low tone. The bits are sent from right to left.

Conclusion

Z-AMTOR is a simple construction project that can help to put an HF RTTY station into the 1980s with some new technology. Although the principles that Z-AMTOR uses to provide nearly error-free data communications in a nonideal radio channel environment are not new, Z-AMTOR and other AMTOR controllers provide utility that has not been available on a widespread, internationally adopted, basis.

The author will program EPROMS for those building Z-AMTOR if no other supplier is available. Send a 2764-2 IC (250-ns access time) and an s.a.s.e. for its return. (One EPROM per request, please.) If you can program the EPROM yourself, just send an s.a.s.e. and request a printed copy of the object code listing (no dealers, please). A list of suppliers for circuit boards (when they are ready) will also be included. The ARRL and *QST* in no way warrant these offers.

Be sure to check the ads in Amateur Radio and hobby computer magazines for parts. If your club or group wishes to get together to build many Z-AMTOR systems, you can often take advantage of group purchases.

Notes

[1]The protocol is described in detail by CCIR Recommendation 476-3.

[2]J. P. Martinez, G3PLX, "AMTOR, An Improved RTTY System," *QST*, June 1981, pp. 25-27.

Table 6

ROM Patch Information

OPTION	*STAR ADDR (hex)*	*LENGTH*
INDEX	1FB0	1
DLY	1FB1	1
ECHO	1FB2	1
ANL	1FB3	1
RFE	1FB4	1
BRX	1FB5	1
BWNL	1FB6	1
WDTR	1FB7	1
BS SPEED	1FB8	1
SRXALL	1FB9	1
AALT	1FBA	1
UNUSED0	1FBB	1
UNUSED1	1FBC	1
UNUSED2	1FBD	1
UNUSED3	1FBE	1
DUMMY	1FBF	1
SELCALL	1FC0	16
ALTCALL	1FD0	16
CWCALL	1FE0	16
TERMTYP	1FF0	1
LAG	1FF1	1

Table 7

Conversion of Keyboard Characters to TOR Values

TOR (hex)	*Letters*	*Figures*	*TOR (hex)*	*Letters*	*Figures*
47	A	—	1D	C	:
56	E	3	35	G	
4D	I	8	1	K	(
39	M	.	71	O	9
2E	Q	1	4B	S	'
4E	U	7	27	W	2
2B	Y	6	78	CR	CR
5A	LTRS	LTRS	5C	SPACE	SPACE
72	B	?	53	D	WRU
1B	F		69	H	
17	J	BELL	65	L	)
59	N	,	2D	P	0
55	R	4	74	T	5
3C	V	=	3A	X	/
63	Z	+	6C	IF	IF
36	FIGS	FIGS	6A	NULL	NULL

[3]Paul Newland, AD7I, "An Introduction To AMTOR," *QST*, July 1983, pp. 11-13.

[4]RQ in the second position is excluded from MODE-L during phasing because I have found that when Z-AMTOR misframes a signal, an RQ character has been received in that position.

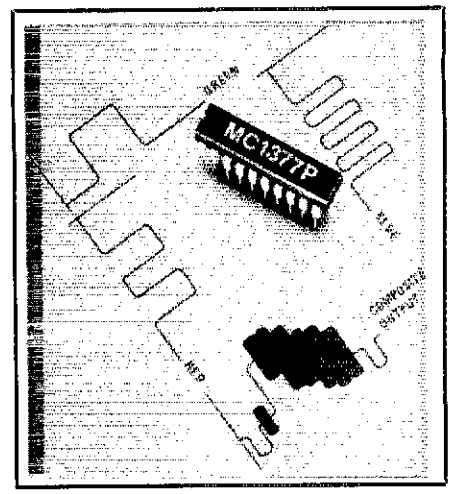
[5]Alternatively, users familiar with ROMs can patch their own standard options into scratch pad space in the ROM. Also, they may select that the standard options be loaded into BBRAM following reset and enter the STANDBY state directly.

[6]This is only a problem for 45- and 50-baud ITA No. 2 terminals.

[7]WHITESPACE is a space, carriage return or line feed character. However, avoid the use of the SPACE character for this definition. SPACE probably will be dropped in a later release.

[8]If you know the SELCALL of a 24 hour/day station you don't need to find someone to help you. That system can help you automatically. ☐

New Products



NEW LSI CHIP SIMPLIFIES VIDEO ENCODING FUNCTION

☐ An LSI device that combines the functions of a boardful of components previously required for the implementation of a color video encoder has been introduced by Motorola. The new monolithic encoder represents a major system simplification for a wide variety of end products, including color cameras, color graphics computers and teletex generators, and is estimated to reduce the cost of implementing this function by an order of magnitude.

This new encoder — the MC1377P — combines the RGB (red, green, blue) video information into a composite video signal in either the NTSC format (used in the U.S.) or the PAL format (used in Europe and much of the rest of the world) and is being marketed worldwide.

Technically, the MC1377P contains a subcarrier oscillator, voltage-controlled 90° phase shifter, two double-sideband modulators, RGB input matrices and blanking-level clamps. Its oscillator can be used as the "master" in a system, or it can be driven by an external source. R, G and B inputs are ac coupled to simplify interfacing a variety of equipment. A 1.0-V P-P input level produces full saturation of colors in the output.

The only other input required is a composite sync (synchronization) signal, which is combined with the encoded video to produce the composite video output. The sync is also used to trigger the generation of color (burst) reference. Both chroma and luminance signals are "looped out" of the chip to permit tailoring bandwidth and delay to the designer's taste. This permits elegant applications as well as simple ones.

The MC1377P price, in 100-999 quantities, is $2.35. Delivery estimates are a normal 10 to 14 weeks, but could stretch out rapidly because of a high anticipated-order influx. — *Paul K. Pagel, N1FB*

Strays

***QST* congratulates...**

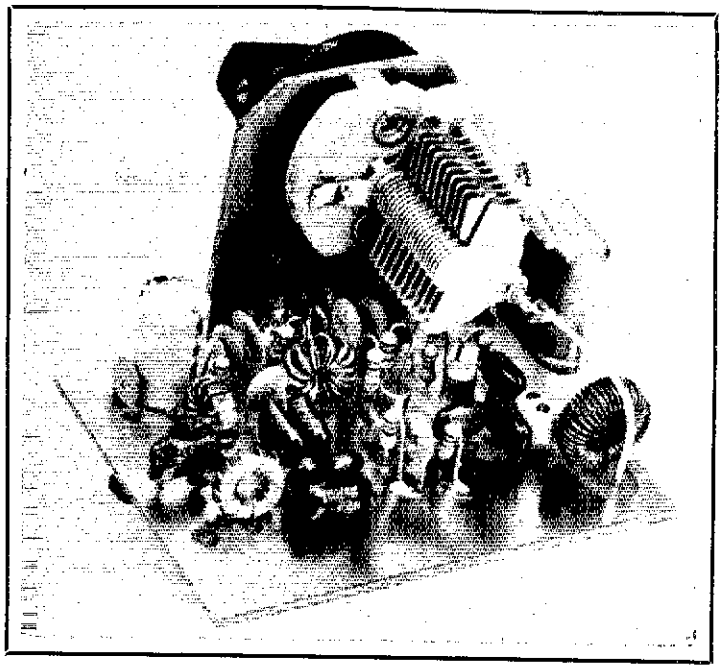
☐ Rod Newkirk, W9BRD, of Norridge, Illinois, on receiving the Department of Law Enforcement Civilian Award for 25 years of service with the State Police.

☐ ARRL Technical Advisor Al Markwardt, W5PXH, on being elected a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE).

☐ William Goggin, KC8OF, of Midland, Michigan, on receiving the Alma 1983 Distinguished Alumni Award.

BEGINNER'S BENCH

A Beginner's Look at Basic Oscillators



A frequency generator is the heart of any signal source. Simple crystal or LC oscillators have many uses in amateur circuits. Let's learn how they work and where some common problem areas exist.

By Doug DeMaw,* W1FB

"Don't try to dazzle me with exotic circuits! I want to learn the theory of simple circuits first." Those statements are voiced frequently by radio amateurs. Are you one of those frustrated persons?

Perhaps the blind spot that exists with some writers (and I'm one myself) results from the belief that in order for a ham to have passed the license exam, he or she fully understood the answers to the theory questions. This is not a fact, because (unfortunately) many amateurs memorize the suggested answers to the FCC examinations. This makes it difficult to comprehend even the most basic of discussions about electronics.

Something else is awry for those who don't understand the fundamentals of our radio pastime: They can't experience the joys of building and using homemade gear! The purpose of this Beginner's Bench series is to encourage those of you who are less technically inclined to climb the ladder to a level that will enable you to enjoy the technical section of *QST* more fully, and to do some dabbling in your home workshops.

Perhaps the most common circuit in RF (radio frequency) projects is the oscillator. A single oscillator can serve by itself as a transmitter for CW. It may also be used as a frequency generator to be followed by one or more amplifier stages to provide a high-power transmitter. But, oscillators are used also in receivers, frequency standards, signal generators (test equipment) and many other pieces of apparatus for amateur use.

Perhaps you're saying to yourself, "Why hasn't he mentioned frequency synthesizers?" Well, that's not a topic that can be handled properly in a beginner's discussion. The synthesizer is a very exotic item that involves a host of subjects that are beyond the intent of this series. There's no doubt that synthesizers are becoming the way of life with most manufacturers of commercial amateur equipment. But, for the sake of experimenting with useful, simple circuits, we will focus on crystal and LC (coil and capacitor) oscillators. They are by no means obsolete!

What is an oscillator? In electronics, an oscillator is a device that generates an alternating current (ac). *Oscillation* is a variation in the magnitude of electrical current with time. Typically, the output of an oscillator alternates between positive and negative current values centered on zero current.

Everyone has alternating current available from an electrical wall outlet. Why is an oscillator needed to produce ac? The ac from the wall outlet is alternating at 60 Hz (cycles per second). In radio we need oscillators that will produce a wide variety of other frequencies from the audio range (20 to 20,000 Hz) throughout the radio-frequency range (as high as 300 GHz, or 300 billion cycles per second).

To make an oscillator, we must have two things. One is a frequency-determining element. This element is an energy-storage device with a special ability to build up energy in one direction, discharge it, build it up in the opposite direction, and discharge that. A pendulum is an example of a mechanical oscillator that does just that. Another example of a mechanical oscillator is the tuning fork used as a standard by musicians. Both of these mechanical devices store energy and oscillate at a certain frequency. In an electrical oscillator we generally use a quartz crystal or a tuned circuit consisting of a coil and a capacitor as the energy-storage and frequency-determining device.

The second ingredient of an oscillator is the ability to supply carefully timed pulses to keep it oscillating. Recall that a tuning fork oscillates for only a short while after it is banged against something. Similarly, a pendulum eventually winds down as the effects of gravity and friction win out.

Neither the mechanical nor electrical oscillators are perpetual-motion machines. The mechanical devices can be kept going by giving them a kick every now and then in exact timing needed to replace the power lost to gravity and friction. The same idea applies to electrical oscillators — there must be a pulse of electrical power supplied to the frequency-determining element exact-

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ly synchronized to the frequency of oscillation. The amount of power supplied must replace power lost to circuit resistance. This replacement power is called feedback. To obtain the extra power needed for feedback, it is necessary to sample some of the oscillating energy from the frequency-determining element, amplify it, and feed it back to the frequency-determining element so that it *aids* the power build-up. So an electrical oscillator needs an active device (such as a transistor or a vacuum tube) to serve as an amplifier to produce the correct feedback to keep the circuit oscillating.

Crystal Oscillators

A crystal oscillator circuit can be built with a quartz crystal and an amplifier to provide the needed feedback. When the amount of feedback is sufficient, the quartz element in our crystal holder will vibrate at a specified rate (depending on its thickness and the stray capacitances present in our circuit). The crystal is ground to the proper thickness at the time of manufacture, and the resultant frequency is marked on the crystal case. Therefore, if our crystal was marked "3.700 MHz," it would vibrate 3.7 million times a second to provide the desired oscillator frequency. The thinner the quartz crystal, the higher the operating frequency. This limits the practical upper frequency of a fundamental crystal, for if it were too thin the element would become impossible to fabricate or would shatter easily during oscillation. Generally, 20 MHz is the upper limit for quartz crystals that operate on their fundamental modes.

Although a crystal may be marked for a specific operating frequency, this does not mean it will produce that exact frequency when we plug it into an oscillator. The crystal must be ground or etched in accordance with the circuit capacitances that exist in our oscillator. This is specified by the manufacturer as the "load capacitance," the existing circuit capacitance that "loads" the crystal. Normally, the load capacitance of a standard oscillator circuit is somewhere between 10 and 40 pF, with 20 or 30 pF being the most typical value. Some circuits are very difficult to analyze with regard to the effective load capacitance. For this reason amateurs who need to have the crystal work at a precise frequency must tell the crystal supplier the model number of the equipment in which the crystal will be used. If the circuit is homemade, or if the model number is not known, the supplier should be provided with a copy of the oscillator circuit, with all parts values marked plainly on the diagram. We can take advantage of the effects of load capacitance by introducing changes in capacitance intentionally. This enables us to shift the operating frequency of a crystal. More on this subject later.

LC (coil/capacitor) frequency elements

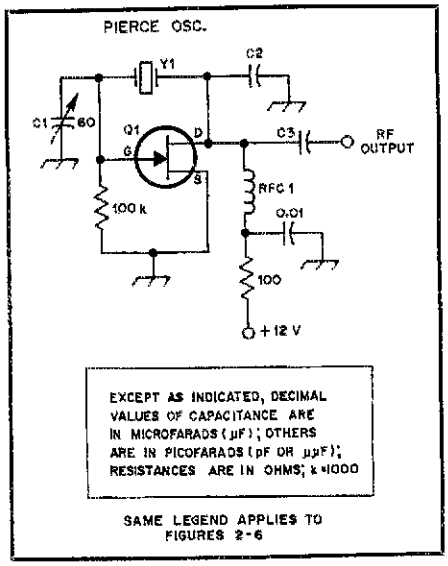


Fig. 1 — Simple example of a Pierce crystal oscillator.

in an oscillator must also be supplied feedback energy to cause oscillation. The coil and capacitor do not vibrate as is the case with a crystal element. Instead, the combination stores and discharges energy at a specific rate to establish the frequency of oscillation. The LC oscillator is seldom as frequency-stable as a crystal oscillator. Changes in temperature and mechanical vibrations (unwanted) tend to change the inductance and capacitance elements of the LC oscillator in a more dramatic manner than when a crystal is used. This causes an instant (mechanical) or gradual (electrical) change in the operating frequency. The gradual change is referred to as "drift."

The Pierce Oscillator

One of the simplest types we hams can use is the Pierce oscillator (named after a person, as are most oscillator circuits). Very few parts are required, as shown in Fig. 1. It makes no difference whether we use a vacuum tube (triode), bipolar transistor or an FET (field-effect transistor) in the circuit. The operating conditions remain the same except for the dc voltages applied to the circuit: The tube would require filament voltage and a higher dc voltage.

Y1, the quartz crystal, is located in the feedback path (between the drain and gate of Q1) to ensure oscillation. We must be careful to make certain we have neither too little nor too much feedback. Insufficient feedback will prevent oscillation, or sluggish starting of the oscillator when operating power is applied. Too much feedback can cause unwanted "frigglies" (oscillations at other than the crystal frequency) or, as some call the condition, "squegging."

To have control over the amount of feedback in Fig. 1 we have added C1 and C2. C1 is variable (a trimmer capacitor) to permit adjustment of the feedback energy. Once the correct value of capacitance is

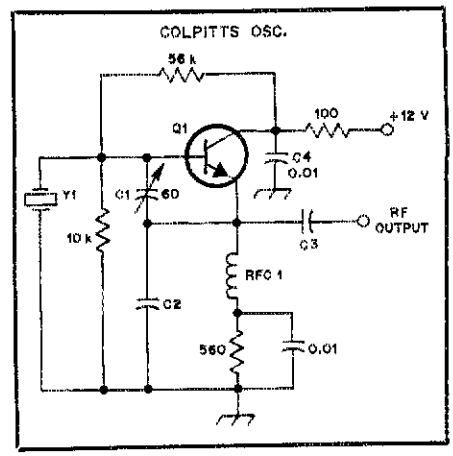


Fig. 2 — A basic Colpitts oscillator using a crystal.

found for our crystal, by virtue of C1, we may install a fixed-value capacitor. A 100-pF capacitor is suitable for C2 for hamband use from 1.8 to 21 MHz. C1 can be a 60-pF trimmer. An MPF102 or 2N4416-family FET will be suitable at Q1. RFC1 is an RF choke that is resonant with the stray circuit capacitance (roughly 10 pF in most cases) well below the crystal frequency.

For example, using the ARRL Type A L/C/F slide-rule calculator, we would find that a 150-μH RF choke with 10 pF of stray capacitance would be resonant at the high end of the 75-meter band (4 MHz). If our oscillator were for use in that part of the spectrum we would want to avoid this condition. It would be better to use a 500-μH choke, which would provide resonance at approximately 2.2 MHz. We could remove all doubt by using a 1-mH (millihenry) RF choke, which is 1000 μH.

Output from the oscillator of Fig. 1 is taken from the drain of Q1. In order to help prevent the circuit that follows our oscillator from impairing oscillations (loading the oscillator too heavily), a small value of capacitance is used at C3. It should be the smallest value that is practical for delivering the required power to the next stage of the overall circuit. Usually, this will be between 10 and 100 pF in the 1.8 to 30 MHz range. Too much oscillator loading can prevent oscillation.

Colpitts Oscillator

A popular oscillator is shown in Fig. 2. This is the Colpitts circuit. Although a bipolar transistor is shown at Q1, a tube or FET could be used with equal success. In Fig. 1 we found the source of Q1 at ground potential, respective to dc and RF. In Fig. 2, the collector of Q1 is at RF ground by virtue of the collector bypass capacitor, C4. Hence, the feedback path for the Colpitts circuit we have illustrated is between the emitter and base. Other forms of the Colpitts oscillator are common; this is but one variation.

Once again we have used two capacitors

(C1 and C2) for controlling the feedback. C1 and C2 are for that purpose. I find that in a practical circuit that uses a good, active crystal, the ratio of capacitance for C1 and C2 is on the order of 4:1. The larger value is used at C2. By placing a trimmer at C1 we can adjust the feedback for best performance of the crystal we use at Y1. A value of 100 pF seems to be fine for C2, with C1 being a 60-pF trimmer. The RF-choke rule for Fig. 1 does not apply here, entirely. The self-resonant frequency should be well below the crystal frequency. But, with a 100-pF capacitor in shunt with the choke (RFC1 and C2), the resonant frequency will be rather low compared to what it would be if only 10 pF of stray capacitance were present.

Output is taken via C3, which should again be a small value of capacitance to prevent the succeeding circuitry from loading the oscillator excessively. The 10- to 100-pF range is applicable to this circuit also. Q1 can be any small-signal bipolar transistor that has a fairly high cutoff frequency (f_T). I like to use a transistor that has an f_T of 5 to 10 times, or greater, the crystal frequency. Such devices as the 2N3904 and 2N2222A are fine for frequencies up to 20 MHz — the approximate limit for fundamental-cut crystals.

There are, indeed, many kinds of crystal oscillator circuits, but it would take many articles of this length to show them and describe their basic performance characteristics. The Pierce and Colpitts form the basis for most amateur oscillator circuits.

Overtone Oscillators

How might we obtain crystal-oscillator performance above the frequencies for which fundamental crystals are limited? Well, we adopt what is called the "overtone oscillator." As is true of fundamental types of oscillators, there are countless overtone-oscillator circuits. We will deal with but two of them, mainly to illustrate the principle of operation. A simple triode overtone oscillator is shown in Fig. 3A. Y1 is manufactured as a crystal that operates at an odd multiple of its fundamental frequency. This means that we may use a third- or fifth-overtone crystal in our circuit to obtain output at some frequency above, say, 20 MHz. Let's imagine that we wanted a crystal oscillator for use at 28 MHz. We should order a third-overtone crystal for the exact 10-meter frequency of interest. The manufacturer would again need to know the load capacitance presented by our circuit in order to grind or etch the quartz correctly. The crystal is ground for roughly one third the operating frequency. That is, a 28-MHz crystal would be ground for approximately 9.333 MHz. An overtone crystal does not oscillate at exactly three times the frequency of the quartz element, however, so the manufacturer must know the exact overtone frequency we desire. Likewise with fifth-overtone crystals, and so on.

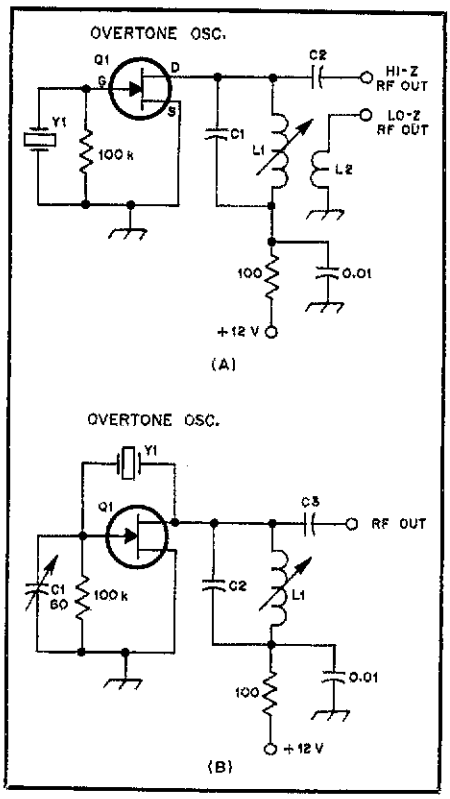


Fig. 3 — Two common types of crystal overtone oscillator.

The circuit at A of Fig. 3 is rather simple. Sufficient internal coupling exists within Q1 to provide the feedback we need for oscillation. This would not necessarily be true of oscillators operating at the fundamental mode of the crystal. C1 and L1 are tuned to the desired overtone frequency, thereby providing feedback at the required frequency. If all is as it should be, Y1 will oscillate and provide RF output from Q1 at *only* the overtone frequency. Too much feedback will permit the crystal to oscillate at its fundamental frequency. This will cause the oscillator output to contain two frequencies — the fundamental *plus* the overtone. Output can be taken at high impedance by means of C2, or a link can be wound on L1 to provide low-impedance output via L2. The choice will depend on what we couple our oscillator to.

Another kind of overtone oscillator is illustrated at Fig. 3B. At first glance we might conclude that it is a Pierce oscillator. But, it is an overtone type of oscillator, with the crystal inserted between the drain and gate of the FET. C1, used to control the feedback, will have a slight effect on the operating frequency as it is adjusted. C2 and L1 again form a resonant circuit at the overtone frequency.

LC Oscillators

Most LC oscillators are used as VFOs (variable-frequency oscillators). But, we may elect to use them on occasion as single-frequency devices, just as we would with a crystal oscillator. How useful an LC oscillator may be will depend entirely on how frequency-stable we can make it. Although crystal oscillators are more expensive, they do offer the best stability of the two types.

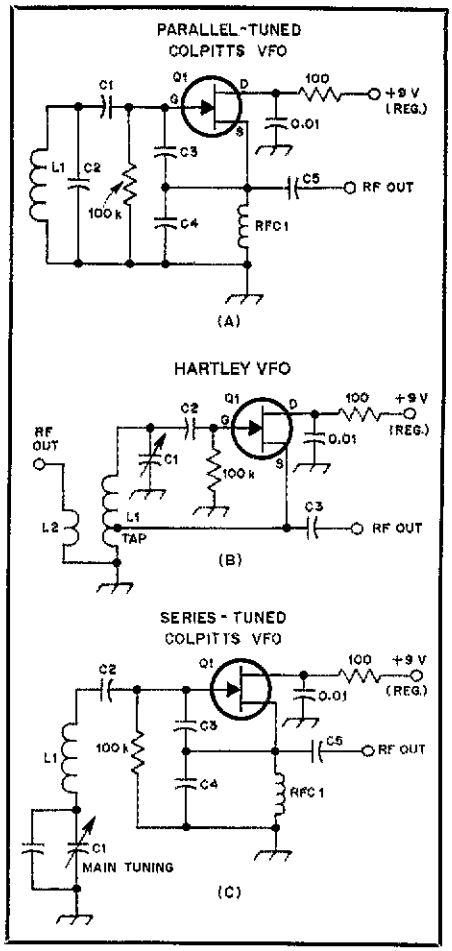


Fig. 4 — Examples of coil-capacitor oscillators (see text).

Acceptable frequency stability is obtained through careful selection of the circuit components, the amount of feedback used, regulation of the operating voltages and providing as nearly a constant temperature environment as possible. Special temperature-compensating capacitors are often used to minimize frequency changes. The coil and capacitor must be mechanically and electrically well built to enhance stability. Similarly, nothing in the immediate vicinity of the LC oscillator must be allowed to move position, for this can change the operating frequency. Changes in oscillator loading, caused by operating-condition variations in succeeding circuit stages, will also shift the frequency. LC types of oscillators are more prone to this malady than are crystal oscillators.

Three types of LC oscillators are shown in Fig. 4. The first example (A) is probably the most common of the three in ham equipment. Since C2 and L1 are in parallel, this is called a parallel-tuned oscillator. C3 and C4 provide the path for our feedback energy. In LC oscillators the value of C3 and C4 are approximately the same. A

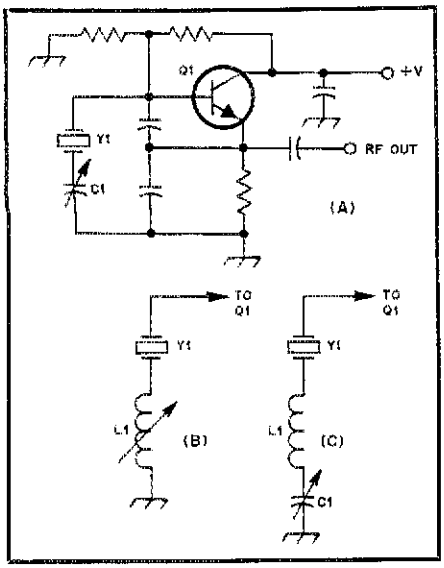


Fig. 5 — Details of how C, L or both elements can be added to an oscillator circuit to shift the crystal frequency.

3.5-MHz VFO, for example, might use 1000 pF for each of the feedback capacitors. C5 is once more a small-value coupling capacitor to minimize output loading.

The circuit of Fig. 4B relies upon a tap near the grounded end of L1 to provide feedback for oscillation. The tap is usually located approximately ¼ of the way up the coil from ground. Output can be taken via C3 or by means of a link winding (L2) at the ground end of L1.

A series-tuned Colpitts VFO is illustrated at Fig. 4C. The name applies because C1 and L1 are in series for this circuit. The advantage of this configuration over that of Fig. 4A is of particular interest as we raise the operating frequency. Sometimes we end up with impractical (small) values of inductance for L1 in a parallel-tuned circuit, especially at high operating frequencies: The series-tuned arrangement requires a much larger amount of inductance and a smaller value of capacitance at C1 for a given tuning range. The series-tuned format can often lead to improved frequency stability for reasons that we cannot address here.

Shifting the Crystal Frequency

We discussed earlier the possibility of making small changes in the operating frequency of crystal oscillators. This can be done by adopting the methods depicted in Fig. 5. The smallest frequency change will be experienced when using only a variable capacitor as shown at A in Fig. 5. The higher the crystal frequency the greater the frequency shift as C1 is adjusted. The trimmer can also be placed in parallel with C1. One method raises the frequency while the other lowers it. An inductance can be added in series with a crystal, as shown in Fig. 5B, to shift the frequency of oscillation. Too much inductance at L1 will convert the crystal oscillator to an LC type of circuit, and the benefits of crystal control will be lost. I prefer to use an inductive reactance of approximately 850, maximum. Hence, for a 7.0-MHz crystal the maximum inductance at L1 would be 19.3 μH, derived from

$$L(\mu H) = \frac{X_L}{2\pi f} = \frac{850}{6.28 \times 7} = 19.3 \quad \text{(Eq. 1)}$$

where X_L is in ohms and f is in MHz.

The greatest amount of frequency pulling or swing will be obtained if we employ the method at C of Fig. 5. Here we have a coil and capacitor in a series arrangement at the bottom end of Y1. A 100-pF variable capacitor can be used along with a coil whose value is derived from Eq. 1. Frequency shifts as great as 10 kHz can be had at 10.1 MHz, with 5 kHz being typical at 7 MHz, and 3 kHz being about the limit at 3.5 MHz. Anything greater than that suggests that L1 has too much inductance for full crystal control. A circuit like the one in Fig. 5C is usually referred to as a VXO (variable crystal oscillator). In some circuits we will find that C1 has been replaced by a varicap diode, or voltage-variable capacitance diode. The frequency change will not be as great as with an air variable capacitor, since the minimum capacitance of a varactor diode will be much higher than that of a mechanical capacitor.

Buffering and Isolation

Throughout our discussion we have mentioned loading at the output of oscillators, plus the frequency shifting caused by load variations. We considered also the effects on oscillation that too much loading might cause. These problems can be reduced or eliminated by adding buffer stages after the oscillator, as shown in Fig. 6. In effect, these additional stages help to isolate the oscillator from the circuits that succeed the frequency-generating chain. Some buffer stages can also provide signal amplification, whereas others might reduce the effective output level of our oscillator. FETs work well as buffer stages, owing to their very high input impedance (usually a megohm or greater). The gate resistor in Fig. 6 determines the input impedance of Q2, since it is lower in ohmic value than the natural gate impedance of Q2. Since we show Q2 as a source-follower stage, the output of the FET will be slightly less than the output of Q1 — approximately 10% lower.

Most VFO circuits have at least two buffer stages, and sometimes three. One or more of the buffers can be designed as amplifiers if we wish. This enables us to extract greater output power than would be possible if we took the output directly from the oscillator. C1 and C2 of Fig. 6 are small in capacitance value. This helps limit loading effects after the oscillator. If you have built a VFO-controlled CW transmitter that is chirpy (frequency shifting when the key is closed), chances are that you did not include sufficient buffering to isolate the VFO.

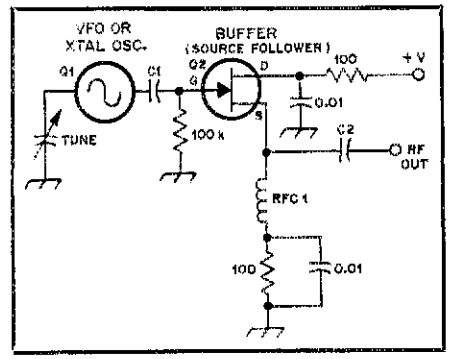


Fig. 6 — Illustration of how a buffer stage can be used after an oscillator to minimize frequency changes caused by load variations.

A Practical Universal VXO

I lean rather strongly toward the use of VXOs (Fig. 5C) above 7 MHz, especially for portable transmitters and receivers that are apt to be used in an environment of frequent temperature changes. They are stable and reliable. The VXO is nice for use as a VFO when operating VHF equipment. We will not obtain as great a potential frequency swing with our VXOs as can be had with an LC type of VFO, but more than one crystal can be switched into the VXO for wide frequency coverage in some amateur band.

The circuit in Fig. 7 shows the diagram of a VXO I developed for my use at a number of frequencies. C1, C2, C3, FL1 and Y1 can be changed to appropriate values for the frequency of interest. This circuit is set up for use as a 2-meter VFO, and when its output is multiplied eight times to 144 MHz, I can obtain coverage from 144 to approximately 144.250 MHz — about right for the CW and SSB part of the band.

Those of you who like to experiment may want to build this circuit. It can have many uses, depending on the frequency to which it is tailored. For example, we might use a VXO for the local oscillator in a homemade receiver. It could be the heart of a little signal generator for workshop use. We might multiply the output more than eight times for the purpose of using the VXO as a frequency source at 220 or 432 MHz, or as a signal generator for VHF and UHF testing. By lowering the VXO frequency to 20, 30 or 40 meters, it can serve nicely as the frequency-controlling element for a home-built CW transmitter.

Best operation (maximum frequency swing) will be had if we use AT-cut crystals. Preferably, they will be the type that are suspended by tiny wires inside the crystal holder (HC-6/U), and they will be cut for fundamental-mode use. I use International Crystal Mfg. Co. general-purpose types of crystals with a 30-pF load capacitance.

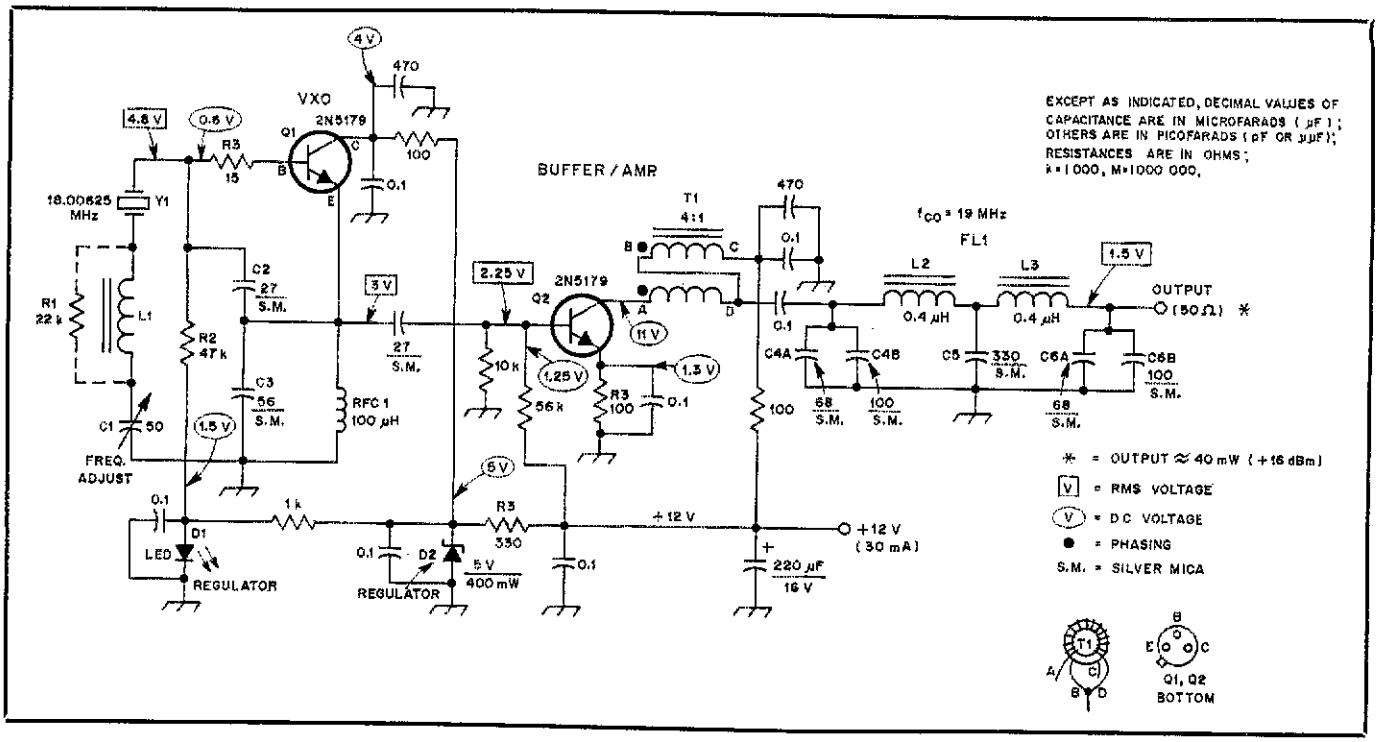


Fig. 7 — Schematic diagram of a universal VXO. Fixed-value capacitors except those in Table 1 are disc ceramic. The polarized capacitor is tantalum or electrolytic. Resistors other than R3 are ¼- or ½-W carbon composition. R3 is a ½-W unit.

C1 — Panel-mounted miniature air variable, 50 or 100 pF (not critical).
C2-C6, incl. — See Table 1.
L1, L2 and L3 — See Table 1.
D1 — 1.5-V regulator. Use an LED or two 1N914 diodes in series.
D2 — 5-V, 400-mW Zener diode.
R2 — Value may be adjusted for purest output waveform from Q1.
T1 — Broadband toroidal 4:1 transformer (see Table 1).
Y1 — AT-cut fundamental crystal in HC-6/U holder, 20- or 30-pF load capacitance suitable (International Crystal Mfg. Co. type GP).

Table 1

Typical L and C Values for Various Operating Frequencies

Crystal (Y1) Range (MHz)	C2 (pF)	C3 (pF)	C4, C6 (pF)	C5 (pF)	L1	L2, L3	T1
6.000 to 9.000	68	100	390 (for 40-meter use)	820	17 μH max. 55 ts. of no. 26 wire on a T68-2 toroid core.	1 μH. 18 ts. no. 26 wire on a T37-6 toroid core. (40-meter use)	15 bilifar ts. of no. 26 on an FT-37-43 toroid core.
9.000 to 15.000	39	68	287 (for 30-meter use)	560	12 μH max. 49 ts. of no. 28 wire on a T50-2 toroid core	0.72 μH. 15 ts. no. 26 wire on a T37-6 toroid core. (30-meter use)	15 bilifar ts. of no. 26 on an FT-37-61 toroid core.
9.000 to 15.000	39	68	212 (for 20-meter use)	424	12 μH max. Same as above.	0.53 μH. 13 ts. no. 24 wire on a T37-6 toroid core. (20-meter use)	Same as above on FT-37-61 toroid core.
15.000 to 20.000	27	56	168	330	7 μH max. 42 ts. of no. 26 wire on a T50-6 toroid core.	0.42 μH. 12 ts. no. 26 wire on a T37-6 toroid core. (for 18-MHz use)	Same as above on FT-37-61 toroid core.

The capacitors are silver-mica or polystyrene types. All toroid coils should be doped with two coats of coil cement or General Cement Q-Dope® after they are wound. Toroid cores are available by mail from Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607. Also check QST ads for Palomar Engineers and RadioKit. Values for C4, C5, C6, L2 and L3, when FL1 of Fig. 7 is to be used for frequencies other than those listed, can be obtained from the filter tables in *The Radio Amateur's Handbook*, transmitting chapter. Nonstandard capacitor values can be closely approximated by using series or parallel combinations of standard values. The nearest standard values have been listed, where possible.

They are the least expensive and seem to be very "rubbery" in VXO circuits. Irrespective of the brand of crystal used, no two identical crystals will yield the same amount of frequency swing in a VXO. I have never understood exactly why this happens, but I have observed it countless times.

If a coil with very high Q (quality factor) is used at L1 of Fig. 7, it may be necessary to swamp the coil with a resistor (R1) to lower the Q. Values from 10 kΩ to 27 kΩ seem to do the job. The need for R1 will be evident if while we are tuning C1 through its range the VXO will break into oscillation at some other frequency (mode changing) and be erratic in operation.

As an aid to the overall frequency stability of Q1, I decided to regulate not only the collector voltage, but put a separate regulator on the feed for the base bias. D1, a standard LED (light-emitting diode), makes a fine 1.5-V regulator when used as shown. Alternatively, we can use two 1N914 diodes in series at D1.

Q2 functions as a buffer/amplifier. It is a broadband, linear Class A stage. Output from Q2 is filtered by means of FL1, a half-wave harmonic filter. It is designed for a 50-ohm input/output characteristic.

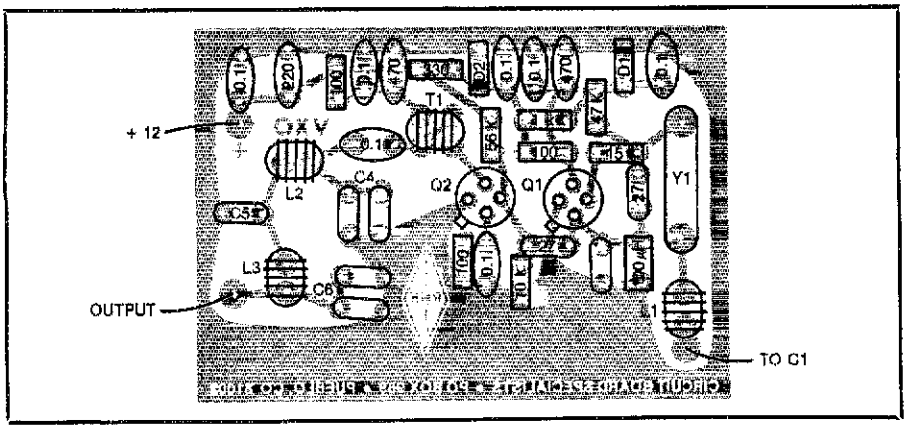


Fig. 8 — Parts-placement guide for the universal VXO, shown from the component side of the PC board.

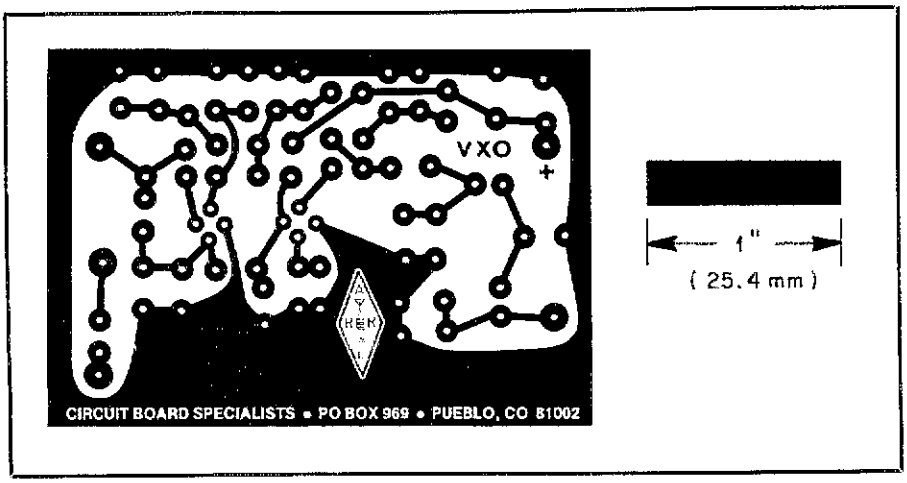


Fig. 9 — Circuit-board etching pattern for the Universal VXO. The pattern is shown full-size from the foil side of the board. Black areas represent unetched copper foil.

Typical output power is 40 mW, which equates to +16 dBm. This is ample to excite most low-level amplifiers or DBM (doubly balanced mixers) of the diode-quad type. If the DBM calls for +7 dBm of injection, a resistive 50-ohm attenuator can be inserted in the line between FL1 and the mixer. The *ARRL Electronics Data Book* (out of print) contains tables of values for resistive attenuator pads. Circuit boards and complete parts kits for this workshop project are available.[1]

I have included key dc and RMS (root-mean-square) voltages on the schematic diagram. These can be used for trouble-shooting the circuit if problems arise. An RF probe and VTVM can be used to check the RMS voltage values, or you can use a scope if it has ample bandwidth to provide accurate P-P (peak-to-peak) voltage readings. Multiply your P-P voltages by 0.3535 to obtain the equivalent RMS voltage. All dc readings are referenced to circuit ground.

Although 2N5179 CATV transistors are specified in Fig. 7, other NPN devices of similar characteristics will work satisfactorily. I have used 2N3572s with good results. The common 2N2222A should offer acceptable performance as well. The output power of this circuit can be lowered by increasing the resistance of R3. This can eliminate the need to add outboard attenuator pads for power reduction.

If possible, use a double-bearing variable capacitor at C1 (a bearing at each end of the rotor). Addition of a panel-mounted vernier drive will facilitate dial calibration and provide a better (slower) tuning rate. A frequency counter can be used to develop a dial-calibration chart.

Frequency drift from a cold start to an hour later (at 70° F) was 30 Hz. At 2 meters this would multiply to 240 Hz — an acceptable value. The VXO or any LC VFO should be built in a separate shielded box for best results. This will help to maintain a more constant temperature and will prevent unwanted RF energy from entering the circuit and causing frequency changes that aren't wanted. Table 1 lists some typical values for other operating frequencies. Fig. 8 shows the parts placement for the circuit board. A scale pattern for the PC board can be found in the Hints and Kinks section of this issue of *QST*.

[1]Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002. Catalog of kits available on request.

Closing Thoughts

We have barely scratched the veneer in this discussion of oscillators. But, I hope you have acquired a better understanding of how they work and what can be done to improve their performance. I suggest you take soldering iron in hand and tack together some of the one-stage oscillators that are presented in this article. Experiment with them to study the cause and effect of value changes, and so on. There is no substitute for "learning by doing." There is no reason you can't tackle the VXO project of Fig. 7. It can be useful in many applications in your ham shack. Good luck!

Strays

MOVING, CHANGING CALL?

☐ When you change your address or call sign, be sure to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper if at all possible. Address your letter to Circulation Department, ARRL, 225 Main St., Newington, CT 06111. Please allow six weeks for the change to take effect. Once we have the information, we'll make sure your records are kept up-to-date so you'll be sure to receive *QST* without interruption. If you're writing to Hq. about something else, please use a separate piece of paper for each request.

STRAY HINTS

☐ "Strays" are those interesting fillers used when space allows in *QST*. Think you have an item with Stray potential? Here are some hints to help your submission become one. (1) Be sure the information will be of interest to most readers of *QST*. (2) Submit your material before deadline — the 8th of the second month preceding desired publication (i.e., arrive at Hq. before February 8 for April *QST*). (3) Any photographs you send should be good-quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce well.

Items submitted are normally acknowledged, but that doesn't necessarily mean that your Stray will be appearing in *QST*. We receive far more material than we can find room for. If you want your material returned, please include a statement to that effect and an s.a.s.e.

Follow the above hints and maybe your Stray will find a home in *QST*. — *Andrew Tripp, KA1JGG*

Product Review

Conducted By Paul K. Pagel,* N1FB

The Heath SS-9000 HF Transceiver

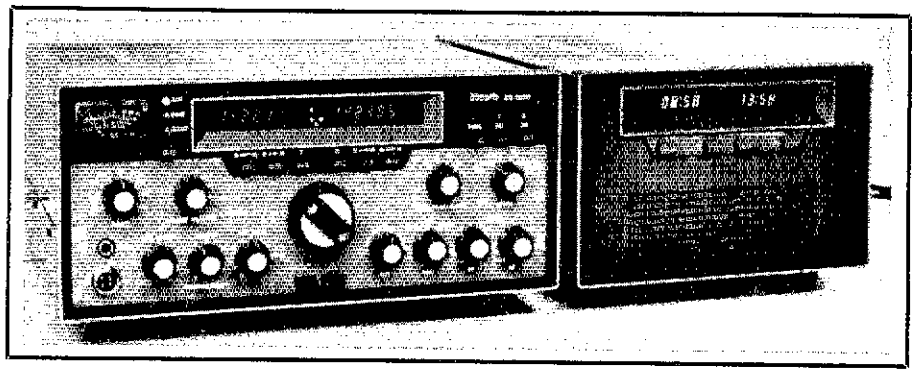
☐ When the Heath SS-9000 was offered to me for product review, I was delighted. Recent months had seen my Amateur Radio activities take a back seat to an interest in computers. I could not resist the temptation to use a microprocessor-controlled HF rig complete with an RS-232-C interface! Before the radio arrived, I started to acquaint myself with its operation by reading through the owner's manual several times.

The manual is brief and to the point, especially when explaining operational theory. Several large diagrams are included, all aimed at making the transition to on-the-air operation fast and easy. You're guided through an explanation of the various controls and their functions, and operation of the radio. A small but helpful "In Case of Difficulty" chart is included. A large portion of the operator's manual is devoted to computer interfacing. Although Heath apparently took great pains to write this section, they assume that a large percentage of the readers own Heath/Zenith computers. Little information is put into the non-Heath/Zenith section. It would be advisable to have a thorough understanding of the system's capabilities before attempting to interface the SS-9000 with another type of computer. A reasonably good grasp of software development would also be helpful. The radio comes with a demo software program stored on a floppy disk. More about this later.

Heath has made some aesthetic changes to its product line. The standard green/gray color combination has been changed to a more subtle two-tone brown. Certainly not what I was accustomed to, but I did find it to be a pleasant change.

Front Panel Controls

The SS-9000 front panel is neat and orderly. A single meter, located on the left side of the radio, monitors all appropriate functions. During receive, it serves as an S meter. In the transmit mode, a single push button allows the meter to monitor either ALC, PWR or speech COMPression levels. Three green LEDs indicate the function being monitored. I am quite impressed with the accuracy of the meter when used as a power-output monitor. Indicated power agrees closely to readings obtained with a Bird Model 43. Directly below the S meter are the BAND SELECT and POWER OUTPUT controls. The headphone jack accepts a standard two-conductor phone plug; impedance is 4-8 ohms. The MIC/PTT input uses a 4-pin DIN connector (supplied). Microphone impedance required is 25 kΩ. The VOX DELAY, SPEECH COMPRESSION and MIC GAIN controls are located at the bottom left of the front panel. Speech-compression reports were excellent. In fact, I was complimented on the superb sounding audio more than once. VOX GAIN, ANTI-TRIP and CW SIDETONE controls are adjusted through holes located on the right side of the cabinet.



Heath SS-9000 Transceiver

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: 1.745 to 2.055, 3.425 to 4.075, 6.925 to 7.375, 10.1 to 10.15, 13.925 to 15.008, 17.699 to 18.200, 20.925 to 21.760, 24.89 to 24.99, 28.00 to 29.700 MHz.	Receive: As specified. Transmit: As specified except 1.8-2.055, 13.925-14.425, 18.068-18.168 and 20.925-21.575 MHz.
Modes of operation: CW, SSB, RTTY.	As specified.
Frequency resolution: 100 Hz.	As specified.
kHz/turn of knob: 5 kHz.	As specified.
Dual frequency display: six digits.	As specified.
S-meter sensitivity (μV for S9): Not specified.	160 m — 100; 80 m — 54; 40 m — 50; 30 m — 58; 20 m — 42; 15 m — 42; 10 m — 64.
Transmitter RF power output: 100-W (minimum) CW/RTTY; 100-W PEP (minimum) SSB.	105-120 W dc, 160-10 m.
Harmonic suppression: 50 dB.	−55 dB.
Spurious suppression: 50 dB, (except at 17 m, 40 dB).	−60 dB.
Third-order IMD: −30 dB.	See Fig. 2.
Receiver sensitivity: (0.3 μV for 10 dB S+N/N for 40-10 m; 0.5 for 160 and 80 m.	

	80 m	*20 m*
Noise floor (MDS) dBm:	−138	−140
Blocking DR (dB):	119	118
Two-tone 3rd-order IMD DR (dB):	88 high, 90 low	91 high, 92 low
Third-order Intercept (dBm):	−4.5	−2.75

Size (HWD): 6-1/8 × 14 × 13-3/4 in.†
Weight: 35 lb.

†mm = in × 25.4; kg = lb × 0.454.

Frequency Control

Operating frequencies are indicated on two digital displays. Frequency control is accomplished by the tuning knob or by means of push-button switches. The frequency is changed manually in 100-Hz steps, with one revolution of the tuning knob producing a change of 5 kHz. Directly below the tuning knob are two push-button switches that control the scanning function. A slow scan rate of 2.5 kHz per second to a high rate of 270 kHz per second is obtained by setting four internal DIP switches. In all, 16 different scan rates are possible.

Split-Frequency Operation

Split-frequency operation of the SS-9000 took some getting used to, perhaps because I had never used split frequencies before. After a short time, though, it became almost second nature. Four LEDs (two red for transmit, two green for receive) indicate which VFO controls the frequency. Split operation is accomplished by toggling the (T)ransmit and (R)eceive push-button controls. Four additional push-button switches control the display-to-memory and memory-to-display functions. A D→M push-button switch stores the frequency shown on the display into

*Assistant Technical Editor

memory, while the D→M switch is used to exchange the frequency being displayed with the frequency stored in memory. Both the right- and left-side VFOs have these capabilities. In all, the RAM (random access memory) stores the two display frequencies plus an additional frequency on each of the nine bands. This gives a total of 27 different frequencies that can be stored. Three AA-size batteries, located under the synthesizer board, are used as memory back-up power. I found it convenient to store my favorite net frequency into memory. Perhaps my favorite function is the automatic frequency disable. In the transmit mode, an automatic disabling feature ensures that the main tuning knob and all frequency-controlling switches are inoperable. I found it particularly comforting to know that I could not inadvertently change frequency or "swoosh" the band.

To the right of the displays is the PASSBAND SHIFT control, which changes the IF filter response. The shifts are at: −600, −400, −200, −100, 0, +100, +200 and +400. This function operates in the sideband modes only. The MODE switch selects: USB, LSB, CW-W(ide), CW-M(edium), CW-N(arrow) and R(TTY). The wide CW position uses a 2.1-kHz filter, while the medium and narrow positions utilize 400-Hz and 200-Hz filters, respectively. The lower-right side of the front panel contains the RIT and AGC controls. The RIT varies the receive frequency 250 Hz either side of the displayed frequency. It is activated by a separate push-button switch with a green LED indicating the "on" state. A similar push-button switch and LED is used for the NB circuit. The TUNE function uses yet another push-button switch to place the radio in the tune position. On the extreme right of the front panel are the AGC, RF and AF-ON/OFF controls. Fast or slow action is selectable with the AGC control.

Protective Circuits

The broadband solid-state design of the radio eliminates tune-up. When the SS-9000 is connected to a 50-ohm load, it will deliver 100 watts of power. With a high SWR condition, the automatic cutback circuit will reduce power output. Typically, an SWR of less than 2:1 assures that at least 80% of full power will be delivered. This feature was tested several times, once inadvertently, and was found to work satisfactorily. A self-diagnostic feature has also been included in the SS-9000. For example, if one of the synthesized circuits malfunctions, the radio will lock in the receive mode. A message indicating the faulty loop will then be displayed. For example, if the HFO loop becomes unlocked an HFO UNLOC message will be displayed. An internal thermal sensor and over-current protection round out the protective systems.

Rear Panel

The antenna connection (SO-239) is mounted below the band-switch motor housing. Its proximity to the housing makes it awkward to connect or disconnect the antenna lead. All cables from the power supply are connected to the rear panel. Facilities for up to four external speakers are provided! I found it adequate to use just one. Other rear panel connections include: EXT RLY (to key an amplifier), ALC IN, ALC ADJUST, T/R IN, T/R OUT, XMIT AUDIO INPUTS (for RTTY or phone patch), MUTE, REMOTE COAX SWITCH SOCKET and TERMINAL (RS-232-C).

Computer Interface

The SS-9000 cannot be fully appreciated until it has been interfaced with a computer. At times I thought it could stand up and dance. A controller circuit interfaces the front-panel controls with an RS-232-C port. As mentioned earlier, a better-than-average understanding of hardware operation and software development is required to realize the full potential of this radio. The Terminal Interface section of the operator's manual does a fair job of explaining the terminal interface, although at times it does seem to get bogged down with "technobabble." I interfaced the SS-9000 to one of the two Heath/Zenith computers used at W1AW. The demo program supplied with the radio, intended to give the operator an idea of how the SS-9000 can be computer controlled, was LOADed into the computer. I was quite surprised to see the program make use of some graphics. A representation of the SS-9000 front panel has been written into the software. The dual frequency displays almost give you the impression you're looking at the radio and not a monitor. The program is written entirely in MBASIC. I found it helpful to get a printout. This can be a powerful tool when attempting to develop a program tailored to a specific application. It's unfortunate that Heath does not include one with the demo program. An assembly-language routine, however, is provided for Heath/Zenith computer owners.

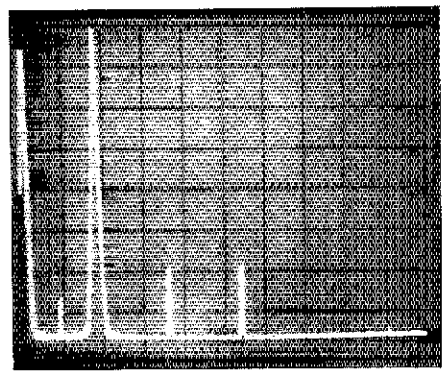


Fig. 1 — Worst-case spectral display of the Heath SS-9000. Vertical divisions are each 10 dB; horizontal divisions are each 1 MHz. Output power is approximately 100 watts on 160 meters. All spurious emissions are approximately 60 dB below peak fundamental output. The SS-9000 complies with current FCC specifications for spectral purity.

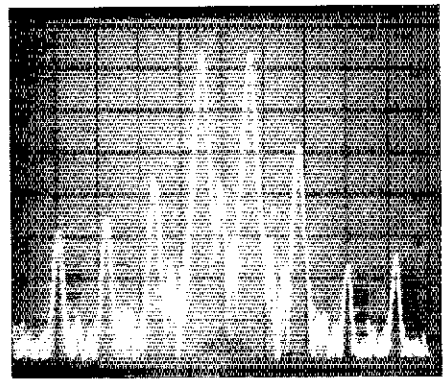


Fig. 2 — Spectral display of the SS-9000 output during transmitter two-tone IMD testing. Third-order products are about 29 dB below PEP and fifth-order products are 44 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on the 20-meter band.

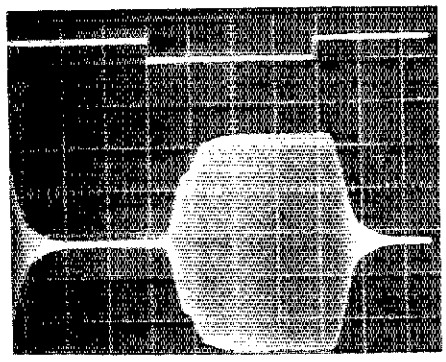


Fig. 3 — CW keying waveform of the SS-9000. Upper trace is the actual key closure; lower trace is the RF envelope. Each horizontal division is 5 ms.

One of the more useful sections of the documentation is the list of commands. All transceiver functions that are under microprocessor control can be set or changed by a specific command. For example, the MO= command displays the mode setting, while the MO=n command sets the mode function of the radio to the value of n. In this case, n can be equal to: LO(wer), UP(er), W(ide), M(edium), N(arrow) or R(TTY). Similarly, to change bands, a BA= n command would be used. Again, n is equal to the desired band of operation. If an unrecognizable command is sent to the CPU, a syntax error message in the form of ERR# n will be displayed. In this case, n is equal to one of 12 error codes. The SS-9000 will alert you if you attempt to operate out-of-band.

Buffers

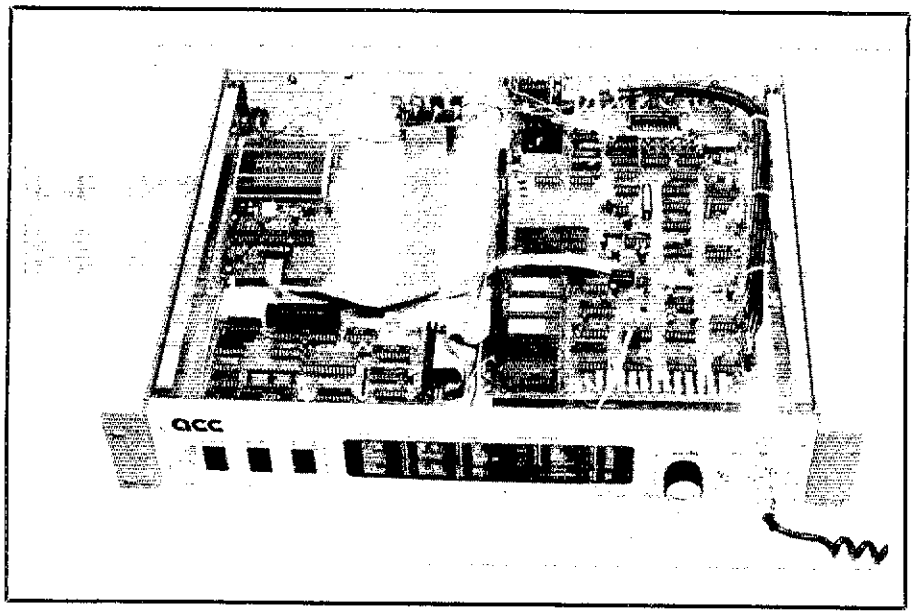
The SS-9000 uses a 16-character input and a 64-character output buffer. Although I did not have a problem overflowing the input buffer when controlling the radio with the demo program, a more elaborate program could fill it quickly. To guard against lost characters from a full buffer, a bell character indicates the character(s) not accepted. The SS-9000 can also be operated via a modem. I did not have the facilities to test this particular function, however. According to the operator's manual, if the carrier loses the audio tone from the telephone line, it forces the transceiver into the receive mode.

Power Supply

An external power supply, rated at 25 A, supplies all necessary voltages to the SS-9000. Housed in a matching cabinet, the PS-9000 includes an external speaker and two 12/24-hour digital-readout clocks. The clocks can be set independently for either 12- or 24-hour display. This is accomplished by changing internal jumper wires. Clock time is set with two FAST-SLOW push-button switches located below the display. Brightness controls for the dual display are located internally. The PS-9000 employs high-temperature and surge-current protection circuits. In the event of a short or overload, a master ON/OFF-RESET switch, located under the bottom panel will reset the system. I found that it can also be used as a master or "kill" switch to discourage any unauthorized use of the radio.

My impression of the Heath/Zenith SS-9000? I liked it! I think Heath has realized the potential of a transceiver that can be interfaced with a computer and has entered the market headfirst. Overall, I found the radio to be solid and

reliable. After I learned its operation I knew exactly what to expect from it, and it delivered flawlessly every time. All microprocessor-controlled functions of the radio worked according to the manufacturer's specifications. The potential applications for this radio are almost endless, restricted only by the user's imagination. I think Heath should supply additional software documentation to the non-Heath/Zenith computer owners. This would certainly help entice more people to take a serious look at the radio. The SS-9000 is available from Heathkit, Benton Harbor, MI 49022. Price class: SS-9000, $2800; PS-9000, $295. These units are available only assembled and tested. — *Ed Raso, WA2FTC*



RC-850 REPEATER CONTROLLER BY ADVANCED COMPUTER CONTROLS, INC.

☐ The RC-850 is the type of product that reviewers dream of — it's a delight to operate, work with and write about. Perhaps my biggest problem is deciding which features to talk about, because there are so many — and they are all top notch. Did I hear a sigh out there in hamland? "Okay, here comes another syrupy whitewash by some dimwitted reviewer who will gloss over the bad points of the system." Wrong; this product is *that* good.

The worst thing about the RC-850 is the manual. But it is not one of those skimpy little sheets that's folded once and gives you all the information you could deduce from looking at the front panel. No, this manual has so much data packed so succinctly into so few pages (just under 150) that it takes a long time to find something the first time you go looking for it.

This is a problem? The reason there is so much data included is that the RC-850 is so versatile. For the tech crew and control operators to make full use of its features, the data is necessary. (Anyway, if you are stuck you can always pick up the phone and call Ed Ingber, WA6AXX, designer of the RC-850. I called him frequently while the RC-850 was being tested at W1AW/R, and he always had the answer, no matter how crazy the question.)

For the Repeater Users

The casual user of a repeater with an RC-850 will be thrilled with what might be called the *Star Wars* functions — synthesized speech IDer with sound effects (200-word vocabulary), synthesized remote base control, various user functions that can be accessed via tone codes, etc. (Its vocabulary is expandable at an additional charge for special or unusual words.) The autopatch is really three patches in one. The Emergency Patch stores 10 phone numbers for local emergency services and each is accessed with * and a single digit. As the controller dials the number, it reads back a message telling the user what is being dialed, e.g. F I R E. The second patch is the User Autodialer, which has 90 positions that can be loaded with frequently called numbers. The RC-850 can be programmed to read out the number as it is being dialed. The third patch is the regular patch with the RC-850 detecting the tones for the phone number as the user sends them, then the controller either regenerates DTMF tones or pulses — whichever the 850 is programmed for. Again the number can be read back as it is being dialed.

A mailbox system is built into the RC-850, which allows the user to load a message for another user into the memory. When the repeater is keyed up, a tail message is generated that alerts users that there are messages waiting. One sequence of tones causes the controller to announce the call signs of the person(s) to whom the message(s) are addressed. Another tone sequence causes the message to be read out, and a third set of tones will cause the RC-850 to erase the message after it has been read. If the message is not erased within two days, the controller automatically erases it.

Another feature allows the RC-850 to be used as a pager. Why would anybody want to turn the repeater into a pager? Think about it for a second. If your system is moderately busy, you probably won't be able to monitor it and concentrate on your work. Suppose you have a decoder installed in your radio — you are available for calls directed to you without being bothered by the chit-chat. One-way transmissions are restricted in the Amateur Service, but that does not mean that two-tone sequential alerting cannot be used legally for the good of ham radio.

If the voice-response telemetry option is included in the package, the user can enter a set of tones that causes the RC-850 to read back any of 16 channels of analog meter measurements. For instance, the inside and outside temperatures can be had (assuming the sensors have been obtained and connected to the RC-850). Other possible meter readings that the tech crew can add to the system are forward and reflected power, voltage, current, signal strength, frequency error, quieting, deviation and anything else that can be measured with a meter. The sensors must be added by the repeater owner, but the programming, connections and vocabulary are included in the RC-850. The telemetry option includes sensors for supply voltage and internal temperature — other sensors may be added at the discretion of the repeater operators.

There is even a feature built into the machine for testing tone pads. A user simply enters a 5 followed by any of the other tone-pad digits (any of the 16 in the two-of-eight DTMF system). The RC-850 then reads back the sequence that followed the 5. After the carrier is released, if the RC-850 does not respond at all or omits some of the digits, the user knows he or she has problems that require additional testing.

Do casual users like these features? You bet they do. W1AW/R, operated by the ARRL Hq. Employees Club in conjunction with the Newington Amateur Radio League (NARL), has been on the air for several years as a low-power, low-profile, local-coverage machine. With the exception of NARL members and ARRL Hq. employees, few "locals" had displayed much interest in using the repeater. Once the RC-850 was on the air, locals began "coming out of the woodwork" wanting to know more about it and how to become involved. NARL has had quite a boost in membership as a result of the RC-850 being added to the repeater.

For the Tech Crew and Control Operators

Although the division of labor and lines of responsibility for maintenance and monitoring vary from one repeater group to the next, there is a clear division between those officially responsible for the operation of the repeater and those who simply use the repeater facilities. For the sake of simplicity, I am lumping the tech crew, control operators, managers, etc., into the category of *operators* — as opposed to users.

What does the RC-850 offer the operators? It offers tremendous versatility to any operator who wants to tailor the repeater's operation to the needs and desires of a group. Since virtually every operation is controlled by the on-board microprocesssor (80C85), nearly every operation can be altered by changing the software. The main operating program is stored in ROM, so as ACC updates the operating system, your old RC-850 becomes one of the new RC-850s. How much does this cost? It'll cost you the postage that it takes to return the old ROMs to ACC. As long as you promptly return the old ROMs, ACC will send you new versions of the firmware as they are released.

But the power to alter the RC-850 programming doesn't stop here. A control operator desiring to modify some aspect of operation simply dials the controller's telephone number. After announcing its identity, the controller waits for a few seconds for the calling party to enter a special multi-digit security code via a tone pad. If the correct code is not entered in a short amount of time, the controller hangs up. After entering the correct code, the operator then may modify the repeater functions by entering appropriate commands via the tone pad.

Suppose you, as the control operator, want

to change one of the phone numbers in the emergency autodialer. No problem; just dial the RC-850 and enter the appropriate commands — after you get through its security. Suppose you are having trouble with someone making unauthorized autopatch calls. Just dial the controller and change the access code. You'll have no more trips to the repeater site just to reset the talking time of day clock, assuming your repeater does have one, when switching to and from Daylight Savings Time.

Virtually everything can be adjusted or changed; this gives the operator tremendous flexibility. If you don't like something about the repeater's operation, just dial the number and change it.

Even though the RC-850 is designed for battery back-up, sooner or later there could be a total power failure. Does that mean the operator will have to reprogram every custom parameter back into the memory? No, because the RC-850 has an on-board EEPROM (Electrically Erasable PROM) programmer/eraser that permits the operator to store program changes in non-volatile memory. The operating parameters stored in non-volatile memory are called the "initialization state." Temporary adaptations can be stored in the scratch-pad RAM; they will be lost during a total power failure.

A 75-ms audio delay line on the RC-850 is used in conjunction with CMOS analog switches to mute squelch tails and, optionally, tones arriving at the receiver. Since the repeater will not retransmit tones used by the repeater users to access certain functions, such as the autopatch, this adds to the overall security of the system. Someone cannot simply listen to the output of the repeater to determine what the various access codes are.

Four classes of CTCSS access can be programmed into the RC-850 if the CTCSS option is added. Provisions are available for adding a control receiver, in addition to control over the phone line. Noise and "kerchunk" filtering is built into the system. Provisions are included for remote base linking and, with minor interfacing, repeater-to-repeater linking. The ID messages can be rotated, or one can be selected. Special messages indicate various conditions at the repeater — and, of course, the message content can be changed with a simple telephone call.

ACC has included another control option that further increases the versatility of the RC-850. The "scheduler" permits the operator to configure the repeater differently for specified times on specified days of the week, all automatically. For instance, since FCC rules require a control operator on duty for third-party traffic (autopatches), the operators might want the patches disabled from 11 P.M. until 5:30 A.M., Sunday through Thursday nights. On Friday and Saturday nights, one of the operators is around until 1:30 A.M., but no one gets up before 7 A.M., so the patches would be disabled between those hours. (Of course, the emergency autodialer could be left enabled at all times.) Or a CTCSS machine might be scheduled for carrier access during certain hours of each day. Another possibility is to change the timers to discourage long "monologue" conversations during certain hours. The RC-850 scheduler can handle these and much more complex chores, all automatically.

If the control operator has a "mean streak," the RC-850 offers a perfect vehicle for getting even with the less-than-ideal users. Just after we installed the '850, we were plagued with people who wanted to "play" with the various user functions, but who did not want to identify their stations. We don't mind them using the functions available, but this being W1AW/R, we do want things kept legal. No amount of coaxing on the part of control operators seemed to have much effect on their behavior. So I programmed in a message ID that said, "Alert! Intruder! You fail to ID. This is W1AW Repeater." This message ID was not in the normal rotation, but it could be brought up by dialing the controller and entering a special code. I leave the rest to your imagination, but let me point out that recently we have had very little trouble with stations failing to identify.

During the summer, thousands of hams stop by ARRL Hq. for a visit and a tour. Many of the visitors on their way into Newington would access W1AW/R looking for directions to Hq. Since FCC rules prohibit ARRL employees from making contacts during work hours and from using Amateur Radio to facilitate the business of ARRL, employees cannot respond to these calls while on duty. The male and female voices of the synthesizer are so realistic that a large number of visitors tried to engage the RC-850 in conversation. If a NARL member was not available to give them directions and explain that the voice was a machine, the typical response seemed to be anger directed at those "snobs at W1AW/R." We now include some sound effects in the messages to clue the uninitiated into what is happening.

Technical Considerations

First-class construction techniques are used throughout the RC-850. Components are of the highest quality. The RC-850 is state of the art through and through.

Besides the 80C85 microprocessor, the main board carries 24 kbytes of programming in PROM. Standard on the RC-850 is 2 kbytes of RAM and EEPROM — both expandable to 8 kbytes. The total memory system can be expanded to 64 kbytes.

Valid logic inputs range from 0 to 0.8 V for low and from 2.4 to 15 V for high, making them compatible with TTL and 5/12-V CMOS. Logic outputs are high-voltage, high-current VMOS compatible with TTL, 5/12-V CMOS, relays, etc. The inputs and outputs are programmable as active high or active low. Power requirements are 175 mA at 12.6 V ±10%, with the display turned off.

Although the site for W1AW/R is not the worst possible, it is far from ideal. Located in the elevator penthouse of a nearby hospital, W1AW/R with the RC-850 has been exposed to temperatures ranging from near freezing to over 150° F — according to the temperature sensor built into the voice-response telemetry board. The RC-850 was mounted within 2 feet of the elevator clutch, which draws 18 A at 28-V dc! We did not notice any aberations in the performance of the RC-850. There are also a number of two-way business radio transmitters in the same room, and they have not affected the performance of the controller.

Arnie Chase, WA1RYZ, who owns two RC-850s for his repeaters, recently said of Ed Ingber and the RC-850, "The boy sure has done his homework." True, and he is continuing to do it. By the time you read this, Ed will probably have a new release of firmware programming, adding even more features to the RC-850. If you are interested in having a first-class repeater, you should seriously consider the RC-850.

Price class for the main board, which includes most of the features except voice response (response is in CW) and the actual telephone interface for the autopatches is $1195; in a rack-mount cabinet (2½ × 17 × 14½-in HWD), $1549. (Logic support for the patches is included; the interface is not. If you have an autopatch now, you can use the existing interface with the RC-850 board.) Price class for a registered telephone interface is $349 and for a non-registered one is $175. The speech synthesis board without telemetry readback (talking meters) is $395; with the metering it is $595. The front panel display option is $295. A CTCSS tone encoder/decoder is $75. Local control is via a DTMF encoder microphone, which is $60. Additional information may be obtained from Advanced Computer Controls, 10816 Northridge Square, Cupertino, CA 95014, tel. 408-749-8330. — *Peter R. O'Dell, KB1N*

1mm = in × 25.4, m = ft × 0.3048.

KANTRONICS INTERFACE AND SOFTWARE

☐ If you're looking for a way to hook your personal computer to your Amateur Radio station, Kantronics has some quality products that will get you and your computer on the air with Morse code, Baudot and ASCII RTTY. The Interface™ , accompanying software (called Hamsoft™ and Hamtext™ are priced for the moderate budget. These products enable an amateur to use any of six popular personal computers for Amateur Radio communications: the Apple® II, II+ or //e; the ATARI® 400/800;™ the Radio Shack TRS-80® Color Computer; Texas Instruments TI-99/4A™; Commodore VIC-20™; or the Commodore 64™.

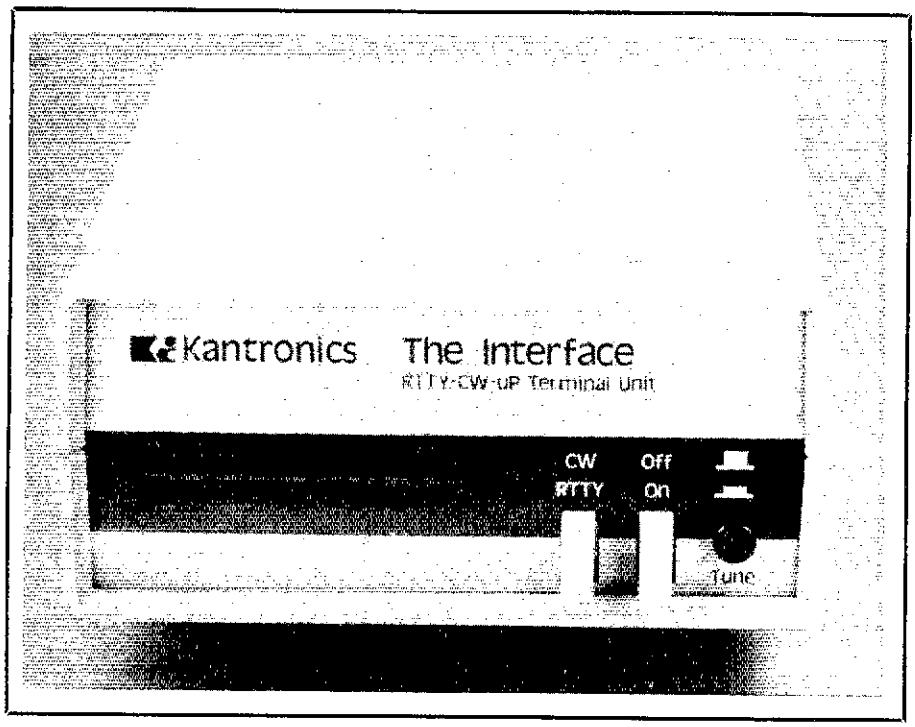
The Interface requires a power supply of from 8- to 15-V dc, at a minimum of 150 mA. Your computer is connected to the Interface using a five-conductor cable that is supplied when you buy the software. Though the Interface is designed specifically for use with Kantronics software, the instruction manual also provides information that allows Interface use with alternate software. Kantronics does not warrant the use of the Interface with non-Kantronics software, however.

I used my VIC-20 personal computer, a Yaesu FT-101ZD with the Interface and the Kantronics Hamtext software. The hook-up is extremely simple, and all the necessary connectors are supplied. The signal input for the Interface comes from the audio output of the transceiver. With my rig, making a connection to the external speaker jack mutes the FT-101ZD's internal speaker. The Interface, however, has a jack suitable for an outboard speaker.

The next connection involves attaching a shielded-conductor audio line between the MIC jack of the transceiver and the AFSK (audio frequency shift keying) output port on the back of the Interface. The PTT (push-to-talk) lines between the MIC jack and the Interface control the transmit/receive functions. The AFSK lines are used to drive the audio input of the transceiver when you are using the Baudot/ASCII modes.

The final connection between the transceiver and the Interface is for the CW mode. There is a CW KEY OUT port on the back panel of the Interface; this line goes to the key jack of your rig. This enables the CW generated by the computer to key the transmitter. Connecting the Interface to a rig is simple. It may be necessary to make modifications for its use with some transceivers, however. The instruction manual (which is well-written) shows how to make the necessary modifications for the ICOM '720 and

'730 transceivers. It also warns that modifications may be necessary in some older Drake and Swan transceivers. The manual shows how to place a readily available Radio Shack miniature relay between these rigs and the Interface to use an otherwise incompatible keying circuit. The same relay will also take care of a similar problem for keying proper CW with transceivers such as the Yaesu FT-101E, FT101EE and FT-101EX.



The Software

Kantronics has two kinds of software available. The more advanced version, Hamtext, consists of a small board that is inserted in the expansion port of the VIC-20. Hamsoft, the "stripped-down model," is also available; I used Hamtext. There is no tape or disk to load into the computer; rather, the entire program is contained in two PROMs. There is an advantage to having the software in this form: Very little of the VIC memory is used for operation, leaving most of the RAM (random access memory) free for storage and retrieval of messages. If you are using the standard 5-kbyte VIC, over 3500 bytes are available for this purpose.

Using a so-called "mother board," I expanded my VIC by plugging in a 16K expander board. That gave me nearly 20 kbytes free for messages. Kantronics warns, however, that use of an expander or mother board may affect the operation of the Hamtext program. I found no problems.

On-the-air Operation

It is necessary to study the manual and practice operating the computer with the software before actually getting on the air. The instruction manual goes through the various functions in sufficient detail, but a summary sheet of the various commands would have been helpful, too. I ended up making my own summary of the functions.

1) Initialize computer. Type: 40960 RETURN.

2) You get a menu. Type M for Morse, R for Baudot RTTY, A for ASCII.

3) Tune in a signal. When all the red LEDs on the bar of the Interface are lit, you are tuned in.

4) Once the signal is properly tuned in, the lower portion of the monitor screen becomes the receive area.

5) At the top of the screen is the status area. It tells the mode you are in, and, when you are in the Morse mode, tells you the speed at which the signal is being received.

6) When the first character of what you want to send is typed, the screen is immediately divided into four areas. The two new areas are the transmit buffer and the transmission line, which shows what is actually being sent.

Control Key Commands and Function Key Commands

The VIC 20 has eight function keys at the right of the keyboard, and the Kantronics puts seven of them to good use. F1 = receive. This is good human engineering because if anything goes wrong (for example, you see something coming up in your buffer that you don't want sent over the air), you can immediately stop everything by hitting F1 and putting the system into the receive mode. F2 = transmit. You can type into the transmit buffer when you're receiving, and when the other station turns it over to you, you can hit F2 and be on the air immediately. F3 changes speed. F4 is a break-in key. It provides a short keyboard buffer for immediate transmissions. F5 will invert the incoming RTTY or ASCII signal. I found this to be quite useful for compensating for what I detected is a shortcoming of the Interface itself. The Interface demodulates only the mark signal and assumes that the space is there. On weaker signals, the demodulator sometimes got confused. I used the F5 key to "straighten out" the confused demodulator. Of course, there are those who do run with their mark and space inverted from what is customary, but I found that to be an exception to the rule. F6 clears the transmit buffer and F7 is a printer toggle switch that I didn't use.

Some of the control keys are commands that you can actually imbed in the text you are typing into the transmit buffer. For example, if you are finished typing your text, you can enter a "CTRL E" command so when that command is encountered in the transmitter line, the program is returned automatically to the receive mode. Another useful control command I used frequently was the "CTRL I" command. When the transmission line encountered this, a CW ID is sent from one of the message storage areas.

There is a "CTRL T" to place the clock time into the transmit buffer, but I did not use it because the clock accuracy suffered whenever I went into loading or editing message storage areas. The "CTRL F" command is used for transmitting a message from disk or tape. Since I have only the tape datasette with my VIC, I did not find this useful. However, this would be very useful with a disk drive.

"CTRL J" and "CTRL M" commands can be embedded in the text to send a manual carriage return and line feed, respectively. Since the program has provisions for automatic carriage return and line feed, I didn't use the manual commands.

Control commands 0-9 designate 10 message storage areas that can be loaded with your ID, brag tape, short story about your prize-winning kumquat or whatever. If you want long-winded brag tapes, you can manipulate the number of bytes of available computer memory by "robbing" some of the bytes that are assigned to the receive buffer by default.

This is the best part of the program. Furthermore, you can load the message areas and then save them to either tape or disk; you never have to retype them. Once the messages are saved to tape or disk, initializing the computer from a "cold start" is easy. Just load in your messages.

Updates

We understand that Kantronics has recently come up with a version of software with AMTOR capability. AMTOR is a teleprinter code that provides for automatic error correction. See July 1983 *QST*, p. 11, for more information about AMTOR. Kantronics has also released an upgraded Interface unit. Check with your local dealer for details.

I found the Kantronics Interface and Hamtext to be a lot of fun and a good buy. There are, without a doubt, more sensitive and discriminating modems available, but of course you must expect to pay more. On strong and moderate signals the Interface performed adequately. The weaker signals, however, were difficult to copy. Of course, your success will depend to a great extent on the capabilities of your transceiver and antenna system.

Hamtext is excellent and should satisfy nearly everyone's radioteleprinter needs. It was easy to learn and contained a lot of helpful features.

Anyone with a popular home computer who wants to get on radioteleprinter quickly and easily should definitely consider the Kantronics products. — *Dale Clift, WA3NLO*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

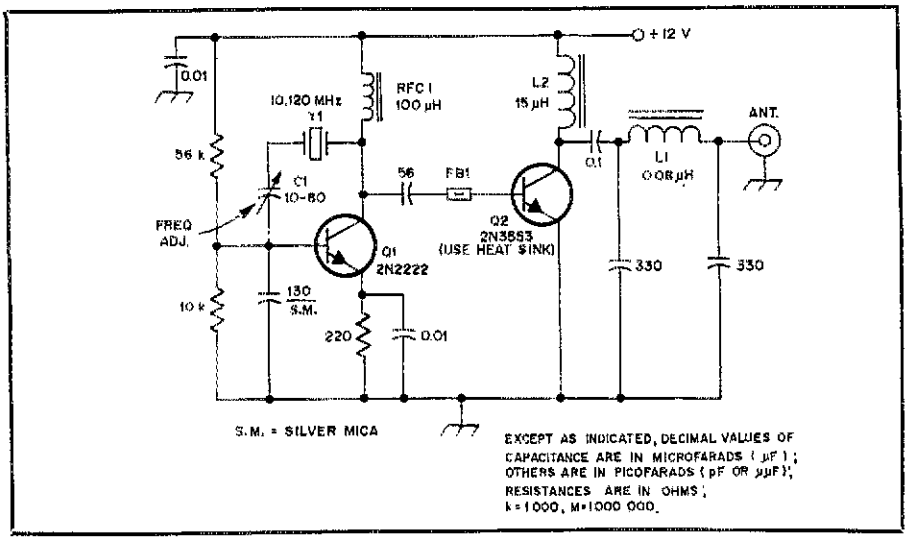


Fig. 1 — Schematic diagram of a simple 30-m transmitter built by KB4PY. Resistors are ¼-W, carbon-composition types. Capacitors are disc ceramic, except C1.

C1 — 10- to 80-pF mica trimmer.
FB1 — FB43-101 ferrite bead.
L1 — 13 turns no. 22 enameled wire on a T68-6 toroid core (yellow), 0.08 µH.
L2 — 30 turns no. 28 enameled wire on an FT37-63 toroid core, 15 µH.
RFC1 — 100-µH RF choke, such as Miller part no. 4632.
Y1 — Fundamental-type crystal in FT-243 holder for any frequency in the 10-MHz amateur band.

A TWO-TRANSISTOR TRANSMITTER FOR 30 METERS

☐ When I decided to become active on the 30-m band, I wanted to build a simple transmitter. I have a Yaesu FT-101E that receives WWV on 10 MHz. Others may have general-coverage receivers, and need only a transmitter. April 1983 *QST* described an elaborate 30-m rig.[1] But even the transmitter section is more than just a "junk box" project.

After testing a variety of other circuits, I finally came up with the one shown at Fig. 1. The circuit is simple and inexpensive. It uses fundamental-type crystals in FT-243 holders, which are easy to obtain from a variety of sources. The transmitter output is almost 1.5 W, and the harmonics are 34 dB down from the fundamental. With a reasonably stocked junk box the total cost for this transmitter should be under $10.

My antenna system is a 150-ft random wire and a Transmatch.[2] A two-position coax switch is used to change between transmit and receive. I leave my receiver active during transmit, and it provides a nice sidetone. Keying either the positive or negative power-supply leads seemed like the easiest method to me. The keying waveform is a bit soft, but I don't believe the slight chirp is objectionable. Others may wish to experiment with alternate keying methods.

I built my rig on a piece of perf board, and mounted the circuit inside of an aluminum box, as shown in Fig. 2. An etching pattern and parts-placement diagram are shown in Fig. 3. Many of the parts are available from RADIOKIT. Circuit Board Specialists also has a PC board and a complete kit of parts available for this project.

I used an oscilloscope and frequency counter to align the circuit. Alternatively, use a calibrated

[1] D. DeMaw, "Putting the '8P6 Special Hamcation Rig' on 10 MHz," *QST*, April 1983, pp. 19-21.

*Assistant Technical Editor

[2] m = ft × 0.3048, mm = in × 25.4

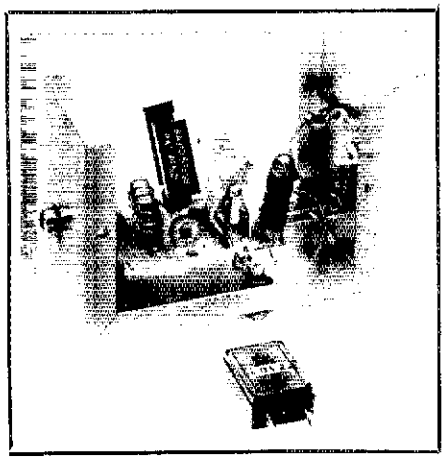


Fig. 2 — Photo showing the construction technique used by KB4PY on his 30-m QRP transmitter. Note the heat sink used on Q2.

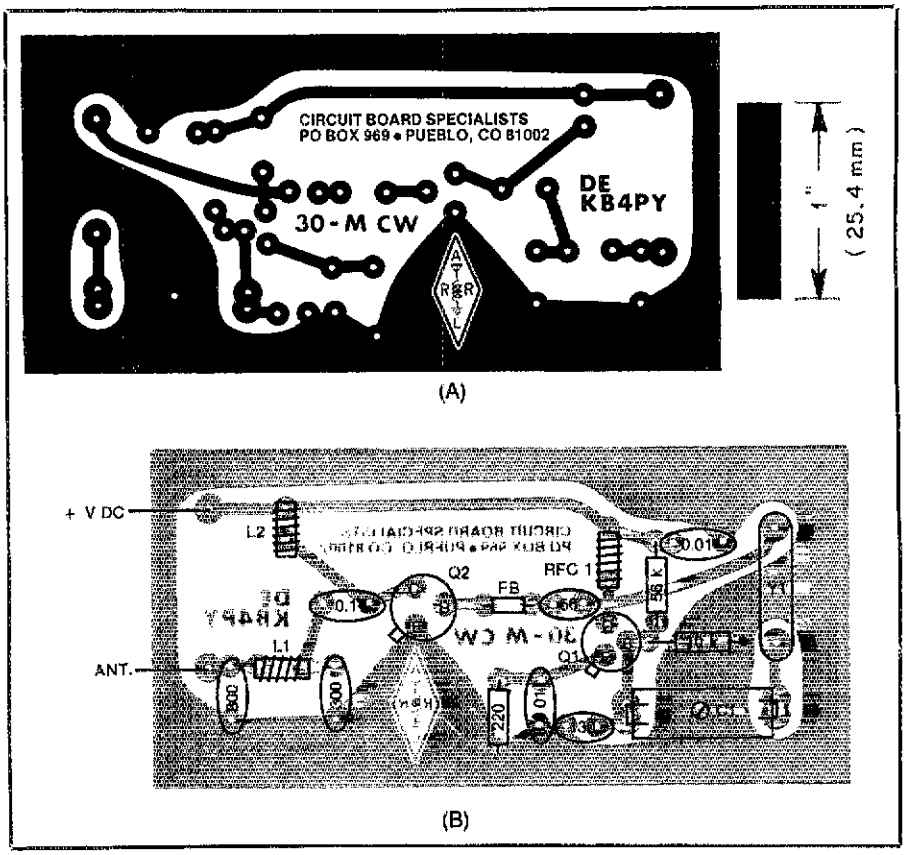


Fig. 3 — A PC-board etching pattern is given at A. Black represents unetched copper, viewed from the foil side of the board. The pattern is shown actual size. B shows a parts-placement diagram. Components are placed on the non-foil side of the board; the shaded area represents an X-ray view of the copper pattern.

receiver, and tune C1 for maximum output. I hope others have as much fun with this little rig as I have. — *Paul Hoffman, KB4PY, Decatur, Alabama*

IMPROVED BYPASS SWR FOR THE MFJ-984 VERSA TUNER

☐ While checking out my new MFJ-984 Versa Tuner IV, I discovered a small anomaly in the operation of the COAX 1 DIRECT (straight-through or bypass) switch position. I noted a slight increase in SWR when compared to connecting the coaxial cable directly to the transmitter. This effect was just noticeable on 20 meters, a little greater on 15 meters, and on 10 meters my readings indicated an SWR of 1.2:1 with the cable connected directly to the rig, but 1.5:1 with the coaxial cable bypassed through the '984. This may not make a difference in signal strengths, but I had just gone to a great deal of trouble to change my quad system to separately fed loops, complete with a remote coaxial switch. I had been especially careful to match the cable to the antennas, so I was not happy about having my efforts negated in an antenna-matching network! (My use involves bypassing the network on 10, 15 and 20 meters, and switching it in on 40 and 80 meters.)

In a phone call to the technical department at MFJ, I learned that they had also discovered the problem. They have incorporated a simple cure into later production runs, so not all of the units will need this modification. You may want to check yours to be sure.

The fix involves connecting a 47-pF, 3-kV disc capacitor between the COAX 1 center conductor and ground. (Although this matching network has three coaxial connectors that are switchable, only number 1 can be bypassed through it.) I did not have a single capacitor of the proper value, so I wired a 100-pF and an 82-pF unit in series. Solder one end of the capacitor to the appropriate switch wafer, mounted on an L bracket near the back of the chassis. To make the ground connection, simply remove one nut from a wafer-mounting screw and slip a solder lug over the screw. Replace the nut and solder the capacitor lead to the lug.

Before replacing the top cover, be sure to read the warning in the owner's manual. Two of the screws are a bit shorter than the others. The shorter ones *must* be used for the center of the cover sides. The two variable capacitors are mounted very close to the sides of the aluminum chassis, and using one of the longer screws in either of these holes will short the capacitor to the chassis.

The results of this modification are gratifying. Even on 10 meters, it is virtually impossible to detect the difference in SWR with the feed line bypassed through the matching unit or connected directly to the rig. — *John LaFontaine, NØADJ, Richfield, Minnesota*

AN AMPLIFIER FOR THE RC ACTIVE CW FILTER

☐ One of my first building projects since becoming a ham was a three-stage RC active audio filter for CW.[1] This filter has performed flawlessly, and is very useful in sorting out signals on the crowded CW bands. I have never been satisfied with the fact that I must use headphones whenever I want to use the filter, however.

I decided to build an audio amplifier that could be included after the filter to drive an 8-Ω speaker. The LM386 amplifier chip is readily available, and the associated parts fit easily on the existing filter circuit board. Fig. 4 is a schematic diagram of the circuit I built. The 10-kΩ variable resistor is optional. The gain can be controlled adequately from the receiver, but I find it helpful to have a second control. This circuit only takes a few minutes to hook up, and it is a pleasure to hear filtered CW signals through my station speaker. — *David Mishoe, KF4RD, Raleigh, North Carolina*

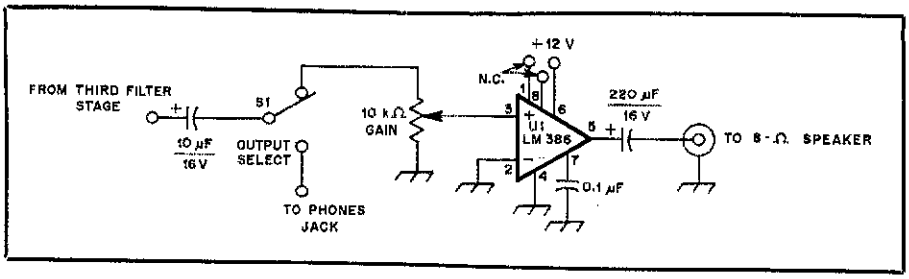


Fig. 4 — Schematic diagram of a simple audio amplifier to drive a speaker from the output of a CW filter.
U1 — LM386 Audio Amplifier (Radio Shack no. 276-1731 or equiv.).

LINEAR-AMPLIFIER ANTENNA-SWITCHING RELAY PROBLEMS

☐ Over time I began to experience some problems with my Dentron MLA-2500 amplifier. When switching to transmit, I could hear some internal arcing. I also noticed severe TVI during those times, along with a jump in plate current and higher SWR readings. What could the problem be?

After some extensive research and troubleshooting I discovered the cause of these symptoms. The cure is fairly simple, but serious damage can be done if you don't take action when the symptoms first develop. The problem turned out to be caused by wear on the RF relay, and could affect any amplifier.

Linear amplifiers normally use a control line from the exciter to operate a control relay. This relay in turn activates an RF relay in the coaxial cable input/output section of the amplifier. If the amplifier is off, the control relay is inoperative, and the RF relay connects the exciter to the antenna at all times. When the amplifier is on, the RF relay serves to connect the exciter output to the amplifier and the amplifier output to the antenna. On receive, the antenna switches back to the exciter.

When the exciter is turned to transmit there will be a rapid rise of RF power within the amplifier. If the amplifier produces this power before it is connected to the antenna, an instantaneous pulse of high voltage arises and with it the potential for arcing in the plate tank circuit or other parts of the amplifier. Once an arc-over occurs, an ionization path is established and the arc current can be sustained even though the potential drops below the critical value. Meltdown of elements and damage to the now-shorted final tubes can easily result.

This was exactly the problem that my rig developed. Several millimeters was vaporized off the tips of the high-voltage plate tuning capacitor. I also observed both momentary and sustained shorting between the elements of the 8875 triodes. This certainly contributed to the damage of an expensive pair of amplifier tubes.

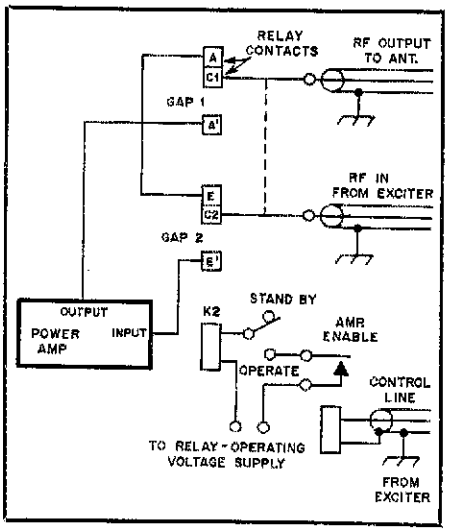


Fig. 5 — Pictorial diagram of a linear-amplifier RF relay mechanism.

Fig. 5 illustrates the operation of a DPDT relay, such as is used in many amplifiers. When the armature is pulled down, the movable contacts C1 and C2 go from A and E to A ' to E '. Both the input and output circuits are broken momentarily. If GAP 1 is narrower than GAP 2, the amplifier output will be activated just after the antenna is connected to it, and no problem will occur. But if GAP 2 is smaller, the C2-E ' connection is made first, and the high RF power will be applied to GAP 1. This can cause a spark to be generated between C1 and A '. The result will be a nice spark-gap transmission, a big RFI pulse, high SWR and a detuning of the linear output stage with an associated jump in plate current. Induced high voltages may lead to internal arcing and damage to the amplifier circuitry.

These undesirable conditions can arise from normal relay wear or bending of the relay elements during contact cleaning. If you notice any of the symptoms mentioned, you should look for sparks between the relay contacts or other internal arcs.

To correct the problem, I used a pair of needlenose pliers to reduce the movement required to close GAP 1. The contact arm will only have to be bent a small fraction of an inch, so be gentle! Try operating the relay by hand and observe the contact movement to ensure that contact C1 strikes A ' prior to C2 closing E '. *Caution:* The high dc voltages present inside a linear amplifier are deadly! Be sure the power is disconnected and the filter capacitors discharged before attempting this procedure. — *Dr. Keith W. Reiss, KB4LK, Annandale, Virginia*

[1]D. DeMaw, "Beating Rotten QRM — CW Filtering for the Beginner," *QST*, Oct. 1981, pp. 38-42.

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

THE FRANKLIN BROADSIDE

☐ The Franklin Array is the original collinear antenna.[1] The appearance of a Franklin array is similar to what we know today as a collinear, but instead of coupling the λ/2 sections through λ/4 stubs, they are coupled by parallel-tuned circuits. When a lumped L-C circuit is connected between adjacent ends of collinear λ/2-elements, it provides the required 180° phase reversal.

The major difference between using a tuned stub and a lumped LC tuned circuit is the I^2R losses. Losses in linear stubs are very small when compared to conventional LC circuits; however, traps used in multiband dipole antennas are low-loss, parallel-tuned circuits suitable for use in the Franklin array.

One of the most efficient trap designs is that described by R. H. Johns.[2] These parallel-tuned circuits consist solely of coax cable. Traps made from modern cable offer low loss, high Q, high voltage ratings and good stability. Also, coax traps exhibit less inductive loading than LC circuits when operated on frequencies below their resonance. Coax traps contribute only 1.4-2.8% to the electrical length of a dipole operated at the first, or second, sub-harmonic of the trap. Therefore, we can develop a multiband Franklin array, with coax traps, that does not suffer from pattern distortion caused by excessive LC loading or stub radiation. (The phasing stubs used in collinear arrays radiate when excited at frequencies other than their resonant frequency.) In addition, these traps offer good protection from climatic effects that was not available in the 1920s and '30s.

When compared to collinear arrays that use phasing stubs (including the recently developed "JF" wide-spaced versions), a Franklin array offers the following advantages[3]:

1) There is no pattern distortion from hanging stubs during multiband operation.

2) Traps can be adjusted to resonance before connection to the antenna. (Deployment is simplified; there are no in-place adjustments.)

3) Overall length is reduced (for an equivalent number of elements) compared to the JF wide-spaced version. (A small reduction of gain results from close element spacing.)

4) Coax-tuned circuits are structurally superior. (Hanging stubs tend to sway in the wind.)

The Franklin array is intended to provide a wide-aperture, moderate-gain radiation pattern. This is a presentation of three such systems. All incorporate coax-tuned circuits that act as phase-reversal networks. (Construction, tuning and installation details of the coax traps are described by Johns in his article; I will not repeat them here.) Each of the systems provides broadside gain and directional characteristics on all but the lowest operating band (where they act as a λ/2-dipole).

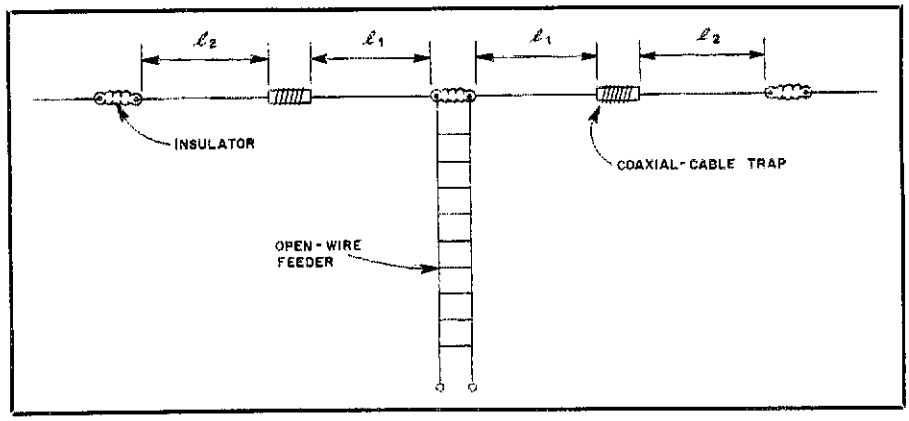


Fig. 1 — The Franklin Broadside array. Coaxial-cable traps are made of RG-58 wrapped on a 1½-inch diameter form. Construction details for the antenna are given in Table 1.

Table 1
Construction Measurements for Franklin Broadside Antennas

Bands Covered	*ℓ1*	*ℓ2*	*Trap*	*Feeders*	
160 m, 80 m, 40 m and 20 m	34′6″ (20-m phone) 35′0″ (20-m CW)	34′6″ 35′0″	6-3/4 turns	300-600 Ω	30′, 41′, 56′, 75′, 90′
80 m, 40 m and 30 m	24′4″	48′8″	9-3/4 turns	300-400 Ω	37′, 52′, 72′
40 m, 20 m and 15 m	11′5″ (15-m high) 11′6″ (15-m middle) 11′8″ (15-m low)	22′11″ 23′2″ 23′4″	5 turns	300-400Ω	29′, 47′, 64′, 75′

I refer to a four-λ/2 Franklin broadside as "The Big Gun." The array shown (Fig. 1) features coax traps, tuned for the 20-meter band, placed between each λ/2 element. This system will operate effectively as a four-element, close-spaced, collinear array on 20 meters and as a two-element collinear on 40 meters. The system also operates as a λ/2 dipole on the 80-meter band. The "Big-Gun" is also a viable antenna system on the 160-meter band, provided that the open-wire feeder length exceeds 60 ft.[4]

The "Big-Gun" exhibits approximately 6.6 dBi gain on the 20-meter band with a bidirectional beamwidth of about 37°. As a two-element array on 40 meters, the system has some gain, but shows a much sharper beam pattern than that of a λ/2 dipole on that band.

"Little Gun" Franklin arrays (also Fig. 1) use only three λ/2 elements each and offer the amateur broadside performance on specific operating bands. Each "Little Gun" yields about 5.4 dBi (50° beamwidth), 3.9 dBi and 2.14 dBi gain on their highest, middle and lowest frequency bands, respectively.

The feed impedance of a three-element collinear is very close to 300 ohms. Therefore, the amateur may use 300-ohm open-wire or ribbon line attached to 75-ohm coaxial cable through a 4:1 balun as a feed system. The length of the 300-ohm and coaxial lines would not be critical; however, such a feed system would be unsuitable for multiband use. For multiband purposes, use open-wire line of any reasonable impedance and recommended length (see Table 1) along with a balanced impedance-matching unit between the feed line and the station equipment. A matching unit will resonate the feeders, and provide proper impedance transformation for the transmitter. — *R. Schellenbach, W1JF, Reading, Massachusetts*

IMPROVED METERING FOR THE LINEAR, SELF-CALIBRATING OHMMETER

☐ In response to a request for a circuit change to use a 1-mA meter in the Linear, Self-Calibrating Ohmmeter (Sept. 1983 *QST*), I devised a circuit, using protective diodes, that maintains linear operation. A heavily fed-back op-amp has an output impedance of much less than 1 ohm for low values of output current; for high values of output current, the device functions not as an op-amp, but rather as a resistor of several hundred ohms in series with the dc supply.

We make use of this performance by shunting the output with a pair of silicon clamping diodes (See Fig. 2) and operating the meter at levels between zero and 360 mV. In this range, the cur-

[1] J. Brainerd, *"UHF Techniques,"* Van Nostrand, 1942, p. 427, also: J. Stratton, *"Electromagnetic Theory,"* McGraw-Hill, 1941, p. 446.
[2] R. Johns, "Coaxial Cable Antenna Traps," May 1981 *QST*.
[3] R. Schellenbach, "The JF Array," Nov. 1982 *QST*.

*TIS Specialist, ARRL

[4] m = ft × 0.3048.

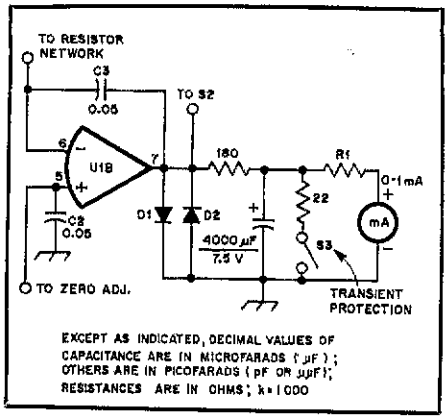


Fig. 2 — A partial schematic diagram of the Linear, Self-Calibrating Ohmmeter showing the modifications described by Noble.
D1, D2 — Diodes, silicon, low power (1N914).
R1 — See text.

rent passed by the forward-biased diode is supplied by the op-amp without affecting the output voltage. Hence, a meter with a full-scale range of 360 mV will be linear. If the op-amp output exceeds 600 mV, the forward-biased diode will start to conduct heavily, and will fully clamp the output at about 800 mV. Thus, the meter is linear throughout its scale, but it cannot be subjected to much more than twice full scale under any circumstance. This protection may be added to the original circuit by simply connnecting the diodes from pin 7 of U1B to ground.

Capacitance is used to slow the meter and prevent "pin slam" as in the September *QST* article. It is most effective when connected at the mid-point of the meter-multiplier resistance, as shown in Fig. 2 for a 1-mA meter. Choose a value for R1 such that R1 and the internal resistance of the meter total 180 Ω. As an added precaution, a low-value shunt is connected by S3 whenever transients are expected. (Open S3 only while reading the meter.) — *Frank Noble, W3MT, Bethesda, Maryland*

POWER INTERLOCK SAFETY

☐ I read with interest the letter by Bruce Chadbourne, KA2PAS, in Nov. 1983 *QST* (Technical Correspondence) concerning the series-plug/receptacle station interlock. While Bruce certainly did bring up a matter of safety concerning the accidental insertion of a shorted plug into a regular household outlet, there is a simple way to overcome such a hazard and still maintain installation security.

Plugs and receptacles are manufactured in a variety of pin configurations according to voltage, current rating and number of conductors. An amateur desiring to install a system as described in *The Radio Amateur's License Manual* need only install a plug/receptacle combination that is unique in the household. Such devices may be economically obtained from electric supply houses, hardware stores, and so on.

Some points in selection and installation of the system are:

1) Choose devices that are rated equal to or greater than the capacity of the circuit to be controlled.

2) Before choosing a device, take inventory of the different plug configurations in your house and choose one that is not in use.

Devices used for 240-V service will work in a 120-V system. Also, if you have 240-V split circuit (two 110-V legs of opposite phase) in your shack, and do not wish to bother with two plugs, then use a three-phase device that can be wired so as to disconnect both sides of the 240-V line. Under no circumstances should you break the neutral or ground conductors when installing this system. Do not depend on the ac neutral or ground to protect you; install a separate ground in accordance with good practice.

While Bruce's suggestion to use power-isolation breakers is good, there may be circumstances that would prevent an amateur from using such a device. One may have good reason to use a plug/receptacle system. These guidelines increase both safety and security of these installations. Since I do not have control over individual installations, however, I cannot assume responsibility for applications of the guidelines.

In answer to Bruce's query about accidental insertion of an appliance into a security outlet, both the station and appliance would become partially energized. The station and appliance would each have an IR drop across them in accordance with Ohm's Law. (Of course, such a circuit is totally undesirable.) — *Charles J. Rabley, WA8RUO, Arcanum, Ohio*

SVC FILTER DESIGNS

☐ The construction of the passive LC filters used at the output of Doug DeMaw's power MOSFET amplifiers can be simplified by using designs requiring only standard-value capacitors.[5,6] These standard-value-capacitor (SVC) filter designs have been widely published, but the designs are apparently not yet familiar to those who need them.[7-9] I would like to bring the advantages of SVC LC filter designs to the attention of *QST* readers and authors again. Perhaps with this reminder, the SVC designs will be used more frequently. Future applications of this design procedure, as applied to the passive LC filter, has been considerably facilitated by the publication of SVC designs in the 1984 edition of *The Radio Amateur's Handbook*, which is now being distributed.

For example, the component values of the 7- and 10-MHz Chebyshev filters published in the March (p. 27) and November (p. 33) issues of *QST* are compared with recommended SVC designs in Table 2. The stopband attenuation and maximum passband SWR of the two *QST* filters are very similar; both filters have a maximum SWR of 1.10:1 and a stopband attenuation of about 40 dB one octave above the cutoff frequency. In comparison, the SVC filter designs have a maximum SWR of about 1.06:1 with a stopband attenuation of about 36.5 dB. The major advantages of SVC designs are that a minimum number of standard-value capacitors are required and that parts values are published (1984 Handbook) for 50-Ω designs. In addition, the frequencies at the 3-, 20- and 50-dB attenuation levels can be read directly from the tables available. — *Ed Wetherhold, W3NQN, Annapolis, Maryland*

[5]D. DeMaw, "Go Class B or C with Power MOSFETs," March 1983 *QST*.
[6]DeMaw, "A VXO CW Rig for 30 Meters," Nov. 1983 *QST*.
[7]E. Wetherhold, "Low-Pass Filters for Amateur Radio Transmitters," Dec. 1979 *QST*.
[8]Wetherhold, "Elliptic Low-Pass Filters for Transistor Amplifiers," Jan. 1981 *Ham Radio*.
[9]*The Radio Amateur's Handbook*, 61st ed. (Newington, CT: ARRL 1983), pp. 2-40 to 2-45.

Table 2

7-MHz Low-Pass Filter
(Fig. 4, Mar. 1983, *QST*, p. 27)

	0.01-dB Chebyshev Filter Design	*SVC-Chebyshev Filter Design*
C1, 3	560 pF	560 pF
C2	470 + 180 pF	680 pF
L1, 4	0.790 μH	0.710 μH
L2, 3	1.74 μH	1.725 μH
SWR	1.101:1	1.051:1

10-MHz Low-Pass Filter
(Fig. 2, Nov. 1983 *QST*, p. 32)

C1, 3	390 + 12 pF	390 pF
C2	470 pF	470 pF
L1, 4	0.576 μH	0.506 μH
L2, 3	1.26 μH	1.204 μH
SWR	1.101:1	1.059:1

UNATTENDED MESSAGE SYSTEMS

☐ [The following is a portion of P. Martinez's (G3PLX) letter to P. Newland that is not part of the AMTOR discussion that appears in the Dec. 1983 TC column. — Ed]

I was a little worried to see reference to my station as unattended operation, with store-and-forward facilities. Fortunately, the wording is sufficiently vague that in the unlikely event of a copy of *QST* reaching our authorities, I could talk my way out of it. The point is that: (a) handling of messages for a third station is definitely not permitted under British license, or that of most other countries, and (b) it has never been established whether one is permitted to operate a station while not present (the authorities would probably argue that the licensee could not control the station in the event that interference was being caused). All unattended repeaters in Europe are licensed on the basis that a telephone number is available so that the responsible authority can call and ask the station operator to close within a reasonable time. In short, mailboxes are probably illegal almost everywhere. — *Peter Martinez, G3PLX, Gosport, Hants, England*

FEEDBACK

☐ There are some errors in "A Tunable CW Filter" (Oct. 1983 *QST*, pp. 14-16), by Richard A. Nelson, WBØIKN. Fig. 1 is actually a bottom view of the LM13600; therefore, pins 6 and 11 (the power leads) are transposed. This error carries over into Fig. 3, the schematic. Pins 6 of U1 and U2 should be connected to −12 V, and pins 11 to +12 V. These connections are correct in Figs. 4 and 5. On the parts placement guide (Fig. 5), the AUDIO AMP IN connection should go to R10, not R7; CONTROL CURRENT IN should connect to R5, not R3.

☐ Ced Tanner, VE3BBI, has pointed out an error in his article, "The London Tone Alert" (Nov. 1983 *QST*). On the schematic (p. 36), the crossover of wires just to the right of the AUDIO INPUT should be a connection, so the audio is routed to the speaker *and* the decoder circuit.

☐ The 1982 EC SET report for Pinellas County, Florida, was inadvertently left out of the June 1983 *QST* write-up (p. 88). The Pinellas Co. local activity point total as reported by EC W4GPL should be 949, making the overall score for the Southern Florida section 6978.

1983 — An Active, Productive Year

It was a year with a little of everything — from the tragedy of the death of ARRL President Clark, to the euphoria in the wake of W5LFL's operation from space and the FCC's "no" vote on a no-code license.

By Andrew Tripp,* KA1JGG

As 1982 had been a time of planning, 1983 was a year for action. The pace had been established at the outset, in January, when the League set in motion its major overhaul of the ARRL volunteer field organization. Using a revitalized structure that redefined and increased the number of section-level appointments and established a new class of affiliated club, radio amateurs at the grass-roots level began taking an even greater part in League affairs. Ultimately, these actions will shape the course that Amateur Radio will take in years to come.

Radio amateurs won a major regulatory victory late in the year when the FCC Commissioners voted unanimously to kill the agency's proposal for a codeless amateur license class, capping amateurs' year-and-a-half-long fight to retain the Morse code requirement for all classes of amateur license. On another front, the amateur community and the cable television industry squared off over the issue of CATVI, with amateurs calling for the expulsion of cable operations from amateur bands.

The passage of Public Law 97-259 in late 1982 opened the door for greater autonomy for the Amateur Radio Service in 1983. Through this legislation, the Volunteer Examining Program was established and subsequently approved by the FCC, changing dramatically the way radio amateurs will be licensed in the future.

Meanwhile, the ARRL stepped up efforts to recruit new hams, help amateurs at the local level handle antenna-ordinance problems, and curb harmful interference on the amateur bands. The implementation of new programs, such as Ham Radio on the Road, the Volunteer Counsel Program and the ARRL Interference Reporting System (AIRS), continue to aid the amateur community in addressing these areas of concern.

Beginning in October, and continuing to year's end, the pace quickened and then rapidly accelerated, with events taking amateurs' emotions on a roller coaster ride — from the drama of an amateur response to a crisis in the Caribbean to the shock at the sudden death of ARRL President Victor C. Clark, W4KFC, to the elation of the first live Amateur Radio operation from space.

The amateur satellite program reached another milestone with the successful launch of AMSAT-OSCAR 10, marking the beginning of longer distance, more reliable satellite communications for amateurs. The year ended with expectations for the launch of the UoSAT-B satellite in early 1984.

Internationally, radio amateurs actively participated in World Communications Year 1983, promoting the growth of telecommunications for the betterment of peoples the world over. The IARU, through a new organizational structure, began to modernize by drafting a new constitution and set of bylaws, which went to the member-societies for consideration at the end of the year.

As had been predicted, the year's docket was an ambitious one. Amateurs rose to the challenge, though, fulfilling the many plans and promises that 1982 had left them to make good on in 1983. On that score, Amateur Radio came out a winner.

Death of a President

On Thanksgiving weekend, the amateur community was shaken as news spread of the sudden death of ARRL President Victor C. Clark, W4KFC. Bothered by heart problems for the past several years — a factor he never let interfere with his passion to serve League members and the Amateur Radio Service — Vic succumbed November 25 to a massive heart attack. He was 66.

Messages of condolence poured in from individuals as well as organizations far and wide as word of Vic's death reached all corners of the global amateur community. At a memorial service in Washington, DC the next week, more than 400 representatives from government and Amateur Radio paid their final respects to the man who for nearly five decades unselfishly championed the cause of Amateur Radio.

Although his 20 months as ARRL President were far too brief, Vic's contributions to Amateur Radio through the years have left their mark. As IARU Region 2 President, for example, he played a key role in the Amateur Radio successes gained at the World Administrative Radio Conference in Geneva in 1979 (WARC-79), which continue to be felt and appreciated by amateurs today. Chairman of the ARRL Long-Range Planning Committee from 1979 to 1982, Vic helped lay the groundwork for the revitalization of the League's Field Organization he had worked so hard with ARRL Hq. to implement. The first recipient of the Hiram Percy Maxim Memorial Award, in 1936, Vic led the effort to reestablish this prestigious award for the new generation of radio amateurs.

To fill the void left by Vic's manifest absence, ARRL First Vice President Carl Smith, WØBWJ, will serve as League President for the remainder of the term. Elections for a new two-year term are scheduled for the March 26-27, 1984 ARRL Board Meeting in Hartford, Connecticut.

League Internal Affairs

Effective January 1, ARRL officially unleashed its revitalized volunteer field organization, a plan based on earlier recommendations from the ARRL Long-

*QST Features Editor

Range Planning Committee. To increase ARRL involvement at the local level, Section roles have been expanded into other areas, such as government liaison and public relations, and the post of Section Manager (formerly Section Communications Manager) has been given greater authority to delegate responsibilities.

To augment this phase of reorganization, a new class of affiliated club was implemented, effective March 1983 — Special Service Clubs (SSC). Under this program. local clubs are encouraged to take a more active role in guaranteeing the future of Amateur Radio by organizing programs in technical development, public relations, emergency communications and training. To date, more than 60 clubs have achieved the status of SSC.

At its two meetings during the year, the ARRL Board of Directors deliberated and acted on a variety of topics directly affecting the internal workings of the League and Amateur Radio in general. Out of the April meeting came:

- reiteration of the League's position on the no-code proposal: It is unacceptable to the amateur community;
- a two-year pilot project whereby general meetings would be held at the 1983 (Houston) and 1984 (New York City) National Conventions, enabling ARRL members and officials to exchange views;
- the finishing touches on League comments on the FCC NPRM in Docket 83-27, the proposal to allow the use of volunteers to prepare and administer amateur exams;
- approved plans for greater League presence in Washington, DC; and
- a new Product Review procedure allowing Hq. to purchase equipment "off the shelf."

From the October meeting:

- eligibility of U.S. Technician class and Canadian Amateur Certificate holders to hold any League elected office;
- League willingness to participate as a Volunteer Examiner Coordinator, assuming certain funding problems were resolved;
- continuation of efforts to have the new WARC bands at 18, 24 and 902 MHz released to amateur use;
- endorsement of early preparation for possible general WARCs in the next decade; and
- reduced subscription rates for the *ARRL Letter* to section-level leadership appointees and club newsletter editors.

The RFI Task group neared completion of an updated RFI Assistance List. This list contains the names of manufacturers of electronic equipment who have recognized their obligation to help in resolving RFI problems with their equipment when they arise.

To bolster its ongoing fight against harmful interference on the amateur bands, the ARRL revitalized the Intruder Watch, originally established in 1963. Now called the ARRL Interference Reporting System (AIRS), the general objectives are to report and record instances of harmful interference and to accumulate data for presentation to appropriate federal authorities.

Faced with declining numbers of people entering Amateur Radio each year, particularly young people, radio amateurs began a nationwide recruitment program called Ham Radio on the Road. Through the efforts of local clubs and individuals, teams of "Roadies" organize and conduct live Amateur Radio demonstrations in classrooms and for youth organizations, following this up by providing opportunities for those interested to receive proper training.

In support of local amateurs faced with overly restrictive antenna ordinances and other challenges to their right to operate, the ARRL instituted the Volunteer Counsel Program. This reserve of volunteer lawyers across the country will advise ARRL members in their area of legal recourses available to them.

ARRL Foundation activities during the year blossomed with the establishment of two scholarship programs: the Perry F. Hadlock (K2IK) Memorial Scholarship Fund — an annual award for electrical engineering students; and the Scholarship Endowment Fund Honoring Senator Barry Goldwater, K7UGA — an annual award of $5000 to encourage the spirit of achievement and dedication in the field of communications.

Another scholarship program, the Hiram Percy Maxim Memorial Award, was resurrected after many years of dormancy. It is to be awarded annually to honor young people who make outstanding contributions to Amateur Radio.

First Ham in Space

"An unqualified success" are the words used to describe the first-ever manned Amateur Radio operation from space. In his off-duty hours during a 10-day mission aboard the Space Shuttle *Columbia* beginning on November 28, NASA Astronaut Owen Garriott, W5LFL, used a specially designed 2-meter hand-held transceiver to make hundreds of historic two-way contacts while orbiting in the Space Shuttle.

Prior to the first-ever live Amateur Radio operation from space, NASA Astronaut Owen Garriott, W5LFL (left), and ARRL President Vic Clark, W4KFC (SK), who initiated the proposal for the operation, shared a private moment inside the Space Shuttle Trainer. Ironically, Vic died a few days before the *Columbia* STS-9 mission, during which W5LFL made his historical two-way contacts with hundreds of radio amateurs worldwide. *(NASA photo)*

His first opportunity for an Amateur Radio communication came two days, 10 hours and 40 minutes into the mission, and his first contact was with Lance Collister, Jr., WA1JXN/7, of Frenchtown, Montana. Later, Owen would make many more contacts, including highly publicized QSOs with Senator Barry Goldwater, K7UGA, King Hussein of Jordan, JY1, and W1AW.

The operation was the fruition of 11 years of planning, involving countless hams and nonhams in NASA, ARRL and AMSAT. A tremendous success, this first amateur operation from space has broken the ground for other such opportunities in the future. An article elsewhere in this issue gives the full details of Amateur Radio's latest achievement.

The amateur satellite program took its own quantum leap, in the summer of '83, when the long-awaited Phase IIIB spacecraft joined Earth's orbiting community of man-made satellites. Launched on June 16 as a secondary payload aboard a European Space Agency rocket from French Guiana, South America, AMSAT-OSCAR 10 marks the beginning of an era of longer-range, longer-duration amateur satellite communications. In its highly elliptical orbit, the satellite provides users in the Northern Hemisphere with more than 10 hours of access each day, and makes communications with stations in most of the world more reliable and predictable.

In August, a new Phase III communications "tool" was used for the first time — Special Services Channels. Derived from four years of discussion among AMSAT, ARRL and other interested satellite users, the SSC plan strives to get maximum usage of the available passband while providing a wide variety of options. Some of the unlimited number of possibilities available to users include the sending of bulletins, linking of scientific programs or classrooms thousands of miles apart, two-way computer links and packet radio gateways for long-haul traffic.

To round off a successful year for satellite communications, Air Force Major General James A. Abrahamson announced that NASA will allow UoSAT-B to be a secondary payload on the LANDSAT-D mission, scheduled for launch early this year.

Regulatory Matters

The big news on the regulatory scene in 1983 broke in December: No-code is dead! Heeding a staff recommendation that its proposal for a codeless amateur license (Docket 83-28) be dismissed "for keeps," the Commissioners voted unanimously to retain the Morse code requirement for all classes of U.S. Amateur Radio licenses.

A year ago, few would have predicted this turn of events. In February, the FCC released a Notice of Proposed Rule

Making, stating its case for the no-code license. The Commission offered two alternatives: Drop the code requirement from the existing Technician license, or create an Experimenter class license, modeled loosely after the Canadian Digital Amateur Class Certificate. Such a license, the FCC argued, would help attract more young people into the amateur ranks. Some form of codeless license seemed imminent.

Although on record as being opposed to the no-code concept, the ARRL maintained a neutral stance editorially on the issue until membership response could be assessed. At its April meeting, the ARRL Board of Directors voted to file comments with the FCC stating, in the strongest possible manner, the League's opposition to a codeless amateur license, reflecting overwhelming membership opposition to such a license class. The League argued, in its comments in June, that the structure of Docket 83-28 was deceiving, that the so-called benefits of such a license are "illusory and insubstantial," and that knowledge of the Morse code is an essential part of each amateur's qualifications.

With public opinion on its side — in a ratio of about 20 to 1 against the no-code license — the amateur community continued to gain ground in its effort to defeat the proposal. By December, amateurs had the added support of many influential individuals and organizations, including several members of Congress.

In presenting the staff recommendation to the Commissioners before the voting, Private Radio Bureau Chief Robert Foosaner summed up the PRB's conclusions on the no-code issue: "Basically I feel the item is a report on the health of the Amateur Radio Service. The Amateur Radio Service is well, it's thriving, and it's providing an excellent service to the American public."

Another major development was the emergence of the Volunteer Examiner Program, which allows the use of volunteers to prepare and administer Amateur Radio examinations for license classes above Novice. The FCC announced its approval of the program in a Report and Order (P.R. Docket 83-27) in September, in response to an ARRL petition for Rule Making (RM-4229) filed in October 1982, and subsequent comments from the ARRL and other interested parties. The Commission was authorized to accept the use of volunteers by the passage of the Communications Amendments Act of 1982, Public Law 97-259, known in amateur circles as the Goldwater-Wirth Amateur Radio bill.

In recent years, budget and staff cuts have hampered the FCC's ability to provide acceptable licensing opportunities for the amateur community. With the Volunteer Examiner Program, testing will be more frequent and more accessible. In addition, question pools released to the public will eliminate "test shock" without compromising the effectiveness or credibility of the tests.

With the Volunteer Examiner Program having been approved by the FCC, the search was on for qualified amateurs to give tests under the new guidelines. By year's end, more than 3000 radio amateurs had expressed interest in becoming volunteer examiners.

The League intends to be a Volunteer Examiner Coordinator (VEC) for all 13 FCC-defined call districts, plus any worldwide location where U.S. licensees establish volunteer examining teams. Aside from enlisting and accrediting volunteer examiners, the VEC will be responsible for printing and distributing all materials necessary to operate the program successfully, and to maintain the program's integrity.

At year end, more than 3000 amateurs from across the nation have expressed an interest in becoming volunteer examiners, and the ARRL has come forward as a possible VEC. The Report and Order establishing the Volunteer Examiner Program went into effect on December 1, 1983, but full implementation of the program is not expected until later in 1984.

Late in the year, a major stumbling block to ARRL's becoming a VEC was removed. On December 9, President Reagan signed into law a bill that contains a provision introduced by Sen. Goldwater that permits volunteer examiners and VECs to recoup out-of-pocket costs from those taking exams. ARRL filed a Request for Agency Action with the FCC urging that the Commission quickly incorporate these provisions in its Rules.

In June, the FCC adopted new procedures for giving Novice class Amateur Radio tests, cutting much of the administrative red tape. Effective August 30, 1983, applicants have been taking both the code and the written parts of the test from volunteer examiners, eliminating the customary wait between sending in the code test results and the arrival of the written exam from the FCC.

During 1983, cable-television interference continued to be a thorn in Amateur Radio's side. In response to the industry's failure to resolve interference problems caused by leaky cable TV systems, the ARRL filed a Motion for Expedited Action on its Petition for Rule Making (RM-4040) requesting that cable TV operations be removed from Channels E (144-150 MHz) and K (222-228 MHz). In this latest move, ARRL argued that while the amateur community has done all it can to achieve a workable solution with the cable industry, the National Cable Television Association (NCTA) has done little more than drag its feet. The original petition, filed in January 1982, was the result of repeated complaints from amateurs about leaky cable TV systems.

The cable TV industry countered, calling the League's motion "absolutist" and "a classic case of unjustified overkill." NCTA and others cited "comprehensive efforts to cooperate with ARRL and its members to identify and resolve interference problems." Nonsense, replied the ARRL, to the cable industry's complaint that amateurs are expecting too much — a "pristine" RF environment.

In other regulatory developments during the year:

- the FCC extended amateur station and operator license terms to 10 years and okayed a two-year grace period for expired licenses;
- the Commission expanded the 20-meter phone band, consistent with the recommendations of ARRL: 14,225-14,350 kHz — General, Advanced and Extra; 14,175-14,225 kHz — Advanced and Extra; and 14,150-14,175 kHz — Extra only. Further expansion of the 80, 15, and 10-meter phone bands was pending at year end;
- effective August 29, 1983, transmitter power in the Amateur Service is regulated in terms of PEP output rather than dc input;
- amateurs using Baudot, ASCII or AMTOR may identify using the particular digital code being used, and fast-scan TV operators may use the U.S. 525 scan-line standard (Part 73). The CW or plain-language voice ID requirement still applies to SSTV and facsimile transmissions; and
- Robert S. Foosaner became the new chief of the FCC Private Radio Bureau, succeeding James C. McKinney, who became chief of the FCC Mass Media Bureau.

"One More Shining Hour"

While most of the Western Hemisphere slept, a compelling message bristled over the amateur airwaves: "Under heavy artillery fire ... (several) helicopters were seen going down ..." That graphic description, heard in the early morning hours of October 25, provoked an Amateur Radio response that later would be described by one FCC official as " ... one

more shining hour of Amateur public service for the benefit of all Americans."

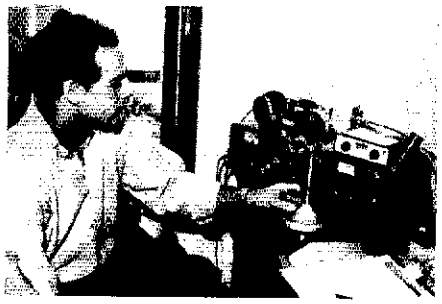
A multinational force of troops from the U.S. and several Caribbean islands had begun an invasion of Grenada, a small Caribbean island whose government had recently been overthrown, in an attempt to stabilize the region and to rescue about 1000 U.S. citizens whose safety was threatened. In the early stages, radio amateurs on and off the island would play an instrumental role in reporting developments in the crisis.

The handle on the Caribbean end of the message was Mark Barettella, KA2ORK, a 22-year-old American medical student at the island's St. George's University. Mark and another amateur, Don Atkinson, J37AH, had the world's attention as they relayed eyewitness accounts of the fighting in the first two days of the conflict — reports relied on heavily by the U.S. news media, whose access to information coming out of Grenada at that time was severely limited. Before and during the evacuation, Mark was the primary link between his fellow students and their anxious families on the mainland.

For the record, the U.S. State Department clarified the legal points of the amateur activity during the crisis. Though under normal circumstances third-party traffic between the U.S. and Grenada was not permitted, the State Department said, "where there exists threat to life or property ... this limitation may be waived." (A permanent third-party agreement has since been concluded.)

At other times of the year, in other parts of this hemisphere, radio amateurs were also busy putting their public-service capabilities to work. In early April, when excessive rainfall flooded parts of southern Louisiana and knocked out telephone service in the area, amateurs provided emergency lines of communication for several days. The following month, teams of amateurs assisted emergency relief officials in the wake of an earthquake that left Coalinga, California, a disaster area. And in August, when Hurricane Alicia slammed into the Texas Gulf Coast, heavy amateur involvement helped ease the load for local officials trying to get the area out from under one of its worst disasters in recent history.

In June, the ARRL and the National Communications System (NCS), a confederation of government agencies formed to ensure communications needs are met in a disaster, took a big step toward developing a national emergency communications plan by signing a Memorandum of Understanding. The Memorandum, intended to "enhance the nationwide posture of telecommunications readiness for any conceivable emergency," was the direct result of simulated emergency tests that helped convince the NCS that amateurs' capabilities should be "utilized and further developed to improve national security." These NCS tests are ongoing, with several more scheduled for 1984.



For Mark Barettella, KA2ORK, operating from his home station in Ridgefield, New Jersey, is a far cry from his experience on Grenada. For several hours last October, his eyewitness account of the rescue of American students from that Caribbean island commanded the attention of the news media and radio amateurs throughout the Western Hemisphere.

Also in June, Amateur Radio reached another of its many milestones, this one for the most popular operating activity of the year — the Golden Anniversary of Field Day. The event was celebrated in the usual Field Day tradition: in the field, sometimes under the most difficult of operating conditions, enhancing awareness of amateurs' readiness for any emergency.

Technical Developments

The key technical achievement in 1983 undoubtedly was the establishment of AMTOR (Amateur Teleprinting Over Radio) as a viable means of amateur communication. Introduced to the U.S. amateur scene in 1982 when a handful of amateurs with FCC temporary authorizations began experimenting with the digital teleprinter code, AMTOR uses an automatic "hand-shaking" technique to deliver reliable, error-free copy even under marginal propagation conditions.

It was in 1983, however, that AMTOR made its impact felt. With support from the FCC, amateur use of the new mode flourished. AMTOR software and hardware proliferated, and the number of amateurs using AMTOR on the air increased signficantly during the year. In July, *QST* published a comprehensive introduction to AMTOR by Paul Newland, AD7I, to supplement the 1981 article by AMTOR pioneer G3PLX. More articles on this subject are forthcoming.

Meanwhile, Amateur Radio was beginning to make headway into a new electronics age dominated by computer technology. Techniques for interfacing Amateur Radio and computers enjoyed a surge during the year — particularly among the new generation of computer enthusiasts — as witnessed in the pages of *QST* and other Amateur Radio publications. Amateurs also made strides in other areas, including satellite communications, slow-scan TV, packet radio, spread spectrum, microwave applications and antennas.

In May, Paul Rinaldo, W4RI, assumed duties as ARRL Hq. Technical Department Manager and Senior Technical Editor. He succeeded Doug DeMaw, W1FB, who retired after 18 years of service. Rinaldo, who is also editor of *QEX* and who had been president of the Amateur Radio Research and Development Corporation (AMRAD), has been particularly active in experimenting with packet radio and spread-spectrum techniques.

Canadian News

Early in February, the DOC solicited detailed input from the CRRL on possible implementation of a Volunteer Examining Program in Canada. Areas for response included methods of selecting volunteer examiners, ensuring availability and impartiality of examiners, scheduling of exams and maintaining exam integrity. The concept of volunteer examining in Canada has since been rejected.

Also, the DOC released its revised version of the new TRC 24, the syllabus for all Amateur Radio examinations, to its field offices. Scheduled to take effect this month, the syllabus explains the requirements for the technical portions of the tests in simpler terms but in greater detail. Also, the Morse code sending test has been reinstated. In a related item, the DOC released copies of all 400 questions to representatives of the CRRL and CARF for review beforehand, to speed up the process whereby questions will be approved, modified or even discarded.

National Emergency Communications Advisor Jack Strangleman, VE3GV, assigned by the CRRL Board last year to develop a national Amateur Radio Emergency Service (ARES) for Canada, announced his preliminary findings. He sees such a program developing in four stages:

1) establishment of a Central Canadian ARES file of key personnel in and information pertaining to Section ARES activities;

2) implementation of a Canadian ARES Net, bringing together Section officials for better coordination in times of national emergency;

3) development of a national ARES plan, an outgrowth of discussions among Section officials; and

4) possible extension of the Canadian ARES Net to become a nationwide Emergency and Traffic Net, to supplement the binational National Traffic System (NTS) already in use in Canada and the U.S.

In July *QST*, Canadian NewsFronts ran the results of an informal survey of CRRL members. Though not as extensive as the Florida State University Survey at the turn of the decade, this survey did meet its basic objective: to find out about Canadian amateurs — their operating preferences, the organizations they support, the services they find useful and their opinions on pending issues.

Beginning in November, all elections for Canadian Section Managers have been announced in the Canadian NewsFronts column and will be wholly conducted in Canada. This is part of a continuing program of having CRRL members take responsibility for the management of their own affairs.

With a mandate from the member-societies to modernize the 58-year-old IARU, the Executive Committee met in March and November to draft a new constitution and set of bylaws which, if approved, will take effect May 31, 1984. Members of the Committee are (clockwise, from head of table): W1RU (Chairman), K1ZZ, WØBWJ, VK3KI, JM1UXU, G5CO, PAØLOU, YV5BPG and HK3DEU. *(N1CIX photo)*

The International Front

To radio amateurs from Bangkok to Bayonne, the year carried with it a special emphasis, 1983 having been designated World Communications Year by the International Telecommunication Union. In recognition of the role amateurs would play in helping meet the goals of WCY '83, ITU Secretary-General elect Richard E. Butler praised Amateur Radio as "a fascinating educational activity whose universality fosters friendship, goodwill, technical know-how, technical assistance for developing countries and greater understanding among peoples all over the world." In response, IARU member-societies actively contributed to the success of WCY '83 by sponsoring and participating in activities to stimulate the growth of telecommunications around the globe.

As the curtain was falling on 1982, the stage was being set for major changes to occur in the way the IARU was to do things in 1983. By November 1982, IARU membership had approved the establishment of an Administrative Council, which set about modernizing the constitution of the IARU.

The members of the Council — two representatives from each Region plus the IARU officers — met as a whole for the first time in Tokyo during March 1983. There, the nine-man team fashioned a draft constitution designed to substantially strengthen the IARU and make it better prepared to meet the challenges of the future.

In November, the Council met again, in Newington, to draft a set of bylaws to accompany the new constitution prepared in Tokyo. Generally, the two documents more clearly spell out the objectives of the IARU, establish the role of the Administrative Council in carrying out IARU policies, and define the responsibility and authority of the regional organizations. By year's end, the two documents had been submitted to the IARU membership for consideration. If approved, they will take effect May 31, 1984.

Member-societies gathered in June in Cali, Colombia, to participate in the Region 2 8th Triennial Conference, the region's big event of the year. By the end of the week-long conference, 91 papers had been circulated and discussed — covering such topics as the use of various band plans, implementation of WARC-79 actions, second societies and changes in bylaws — and new Region 2 Executive Committee officers were elected to serve until the region's next triennial conference, in 1986.

In September, officers and representatives of some 16 IARU societies — representing all three IARU Regions and all six continents — met in Tokyo for the World Amateur Radio International Conference. Hosted jointly by the Japan Amateur Radio League and the Japan Ministry of Posts and Telecommunications, the conference took up many items concerning the international role of Amateur Radio, out of which came the "Tokyo Declaration." This declaration urges that the IARU be encouraged to prepare adequately for future ITU conferences, that more member-societies establish an intruder watch, that there be a uniform and international standard for entry into Amateur Radio, and that the growth of Amateur Radio in developing countries be encouraged.

Silent Keys

A part of reporting each year's events is the bidding of fond but sad farewells to many radio amateurs whose keys have fallen silent. Most notable among them in 1983, of course, is ARRL President Victor C. Clark, W4KFC, whose accomplishments as a League official and on the air over the past 50 years are unparalleled.

Another ARRL President passed away in 1983. Goodwin L. Dosland, WØTSN, served as a Director for the Central and Dakota Divisions before assuming the League presidency in 1952. For 10 years, "Dos" was at the League's helm, guiding Amateur Radio through a technical and regulatory course that included the inauguration of single sideband and satellite communications, as well as licensing changes.

Max Arnold, W4WHN, known as "a friend to all, and an enemy to none," was a League Vice President and a Director. Well-known in QCWA and ARRL circles, Max was especially active in his home Delta Division.

Mel C. Ellis, K7AOZ, was Northwestern Division Vice Director since 1981. An avid DXer, Mel was also affiliated with many local and regional amateur clubs and organizations.

Lamar Hill, W4BOL, distinguished himself as an ARRL Director, heading the Southeastern Division from 1950 to 1951 and again from 1952 to 1953.

A Final Look

A careful accounting of the events of 1983 shows that Amateur Radio remains firmly entrenched on the positive side of the ledger. Section-level ARRL activities have been given a fresh, new start, and have all the promise of a productive future. Major strides have been taken to ensure Amateur Radio longevity with the implementation of programs to attract more new members, combat harmful interference and provide the necessary licensing and upgrading opportunities. Amateurs' determined fight to keep the Morse code requirement for all classes of amateur license was victorious, with the FCC proposal for a codeless amateur license soundly defeated at year's end. Thanks to amateurs' involvement in the crisis in Grenada and W5LFL's historic operation from space during the Space Shuttle *Columbia* mission, Amateur Radio is more in the public eye now than it has been in decades.

Technically, Amateur Radio is as sound as ever, with advances being made in many areas, particularly in the merger of Amateur Radio and computer technology. Milestones were reached in space, with firsts in unmanned as well as manned satellite communications being achieved.

Amateurs worldwide, with World Communications Year '83 providing a bonding spirit, showed how a little goodwill and cooperation can go a long way in bringing the peoples of the world closer together.

Through it all, amateurs have met each challenge, each step with an eagerness to chart their own course, shape their own destiny. The amateur character is one more year better prepared, better equipped to meet what awaits it in 1984, and far beyond.

Introducing the New ARRL RFI Reporting Form

Having trouble surviving in the RFI jungle? The new RFI reporting form will help get the information into the right hands quickly and easily.

By Michael B. Kaczynski,* W1OD

Starting January 1, 1984, the ARRL began compiling RFI complaints on the form shown on this page. The format is a result of input from several ARRL sources: the RFI Task Group, and the Headquarters CATVI desk and Technical Information Service. Additional ideas were suggested by the American National Standards Institute (ANSI) C-63 ad hoc committee on RFI immunity.

The purpose of the report format is to collect and organize information on radio-frequency interference for input to a computer data base. This data base can be tapped to deliver needed information for a variety of purposes. They include:

1) informing the ARRL Board of Directors of RFI complaints and solutions so they have sufficient data to determine League strategy;

2) providing the Federal Communications Commission with up-to-date statistics on RFI as it affects the Amateur Radio Service;

3) working cooperatively with the engineering profession (including the Institute of Electrical and Electronic Engineers, the Electronic Industries Association and the American National Standards Institute) on technical investigations and standards.

How can you help? Easy! If you have an RFI complaint, make sure you have all the information requested on the form when you report the complaint to the League. If you don't know the answers to certain questions, let us know. On the other hand, don't hesitate to give us more background information if you have it.

The groundwork for the RFI reporting system is in place, but it can't work without *your* report. When you have an RFI complaint, be sure to let your League know about it.

*Editorial Assistant, Technical Dept., ARRL

COMPLAINANT'S NAME | CALL | ARRL HQ. CASE NO.

ADDRESS | PHONE NO.

CITY | STATE/PROV. | ZIP/PC

DATE (YEAR/MONTH/DAY) | LOCATION OF RFI (INCLUDING ZIP OR PC) | ARRL SECTION (IF NOT KNOWN, LIST COUNTY)

OWNER'S NAME | PHONE NO.

ADDRESS

CITY | STATE/PROV. | ZIP/PC

	TYPE (VCR, ETC.)	MANUFACTURER	MODEL NO.	NATURE OF INTERFERENCE
EMANATING EQUIPMENT				
SUSCEPTIBLE EQUIPMENT				

DISTANCE BETWEEN EMANATING & SUSCEPTIBLE EQUIPMENT (FT.)

SEVERITY
☐ BARELY PERCEPTIBLE ☐ WEAK
☐ MODERATE ☐ STRONG ☐ OVERWHELMING

COUPLING MECHANISM
☐ NOT DETERMINED
☐ CONDUCTED
☐ RADIATED

COMPLAINT RESOLVED?
☐ YES ☐ NO

DESCRIBE TECHNICAL SOLUTION

PROBLEM FIXED BY ☐ AMATEUR ☐ REPAIRMAN ☐ MFGR. OF EMANATING EQUIPMENT ☐ MFGR. OF SUSCEPTIBLE EQUIPMENT ☐ OTHER

WHO WAS INFORMED ☐ UTILITY ☐ CABLE OPERATOR ☐ FCC ☐ EIA ☐ MFGR. OF EMANATING EQUIP. ☐ MFGR. OF SUSCEPTIBLE EQUIPMENT ☐ OTHER

REMARKS

RFI IMMUNITY COMPLAINT REPORT TD 1/84

Fig. 1 — Providing ARRL Hq. with the information on this form will help document — and ultimately solve — RFI problems. If you'd like a copy of the new form, send a business-size s.a.s.e. to ARRL Hq.

Strays

***QST* congratulates...**

☐ the following radio amateurs on 50 years as members of the ARRL:

• Elizabeth Groves, W5DUR, of Odessa, Texas

• Bradfield A. Beard, W5ADZ, of Houston, Texas

• James R. Eckersley, K2IXE, of Forked River, New Jersey

• Herbert M. Berlier, K6PQ, of San Diego, California

Seventy-Three, OM

A last farewell to a very special fellow ham.

By Dennis R. Blanchard,* K1YPP

K1ZEO, this is K1YPP. Guess this will be my final transmission. I have really enjoyed all these QSOs we've had. The two of us have been keeping in touch with ham radio for some 20-odd years now. I cannot think of a better way for a father and son to have spent their time.

You got your start in radio back in the '30s; 201As and Varicouplers were the only way to go then. As a child, I recall going into our attic and finding all this old radio stuff. I asked you about it, and you got all excited and started to demonstrate what that old Hallicrafters Sky Challenger could do. It had not been powered up since before the war, and now it was to rekindle that Amateur Radio spark. It wasn't long after that Mom had me in the local radio club, W1DHT. The rest is history.

It seems like just yesterday we were Novice ops struggling with the 5-WPM code barrier. Dad, both our receiving abilities improved, but your sending always did leave something to be desired — sort of like your own code! How we've laughed about that over the years.

During the Vietnam years, I had to go off to foreign places, but even during that period I kept in touch through our hobby, either via a MARS station or as DL4ET when I was in Europe. It really helped to keep the family that much closer. The last time I ever talked with my brother, KN1FQI, before he died in combat was via ham radio. That is one QSO that will always live on in my memory.

We have had so many good times and laughs over the years. Remember the time I operated 20 meters one afternoon. You got on the air on the 40-meter Novice band, back when a Novice had to be crystal controlled, and you forgot to switch on the bandswitch and ended up calling CQ on 14.380 all afternoon? Why, for years that citation you received from the FCC in Arizona was the best DX you ever had!

Then there was the time I let you "borrow" my 2-meter FM rig while I was away. You didn't want it at first, but I left it anyway. I never did get it back. Two meters did turn out to be lots of fun. About that time, I moved from Connecticut to northern Massachusetts and we spent several years working 80-meter CW and 2-meter FM to keep in touch. After the big blizzard in '78, you decided that keeping up the house was too much for you so you accepted our offer and moved in with us. I believe that is when your hamming really got going: new gear, more antennas and lots of sideband activity (CW still was rough, and since I was the only one that could copy you, you gave the bands a break and stuck with phone). Those were good years.

Next my work took us to a new QTH in New Hampshire. Our antennas were the best yet, and for years we had all sorts of great QSOs as I traveled around New England with my work. Ham radio was always that link that kept us just that much closer as father and son. If only everyone could experience it as we have! A new ham joined us, also, with my better half getting her license as KA1FUN.

Remember the time you turned on that newfangled 2-meter rig and didn't notice that as you threw the power switch you also threw the transmit switch. As I was driving home, I could hear a very strong signal on the repeater, and on the hour and half hour I could hear this very distinct cuckoo clock sound out. It sure had most of the hams in southern New Hampshire looking for your station. When I got home and finally figured out what was happening, I turned off the transmitter and identified. One fellow came back and complained, not that the repeater was jammed all afternoon, but rather that your clock was off by three minutes. Such is ham radio.

Alas, your health, which had not been very good since World War II, started to get the best of you, and the transmissions became fewer and farther between. Finally, your key became silent this morning. Dad, if I could have any wish, I would wish to be on a spaceship many light-years from Earth and once again be able to tune across the band and catch a few of those QSOs we used to have that would just be arriving out there at the speed of light. To once again hear that awful fist would bring such a pleasure to my ears!

Well, Dad, I guess that's not possible. But maybe, someday, I will be able to work that grandson of yours — much as you worked me — and if I can, I promise, I'll give him my best fist. You gave me and ham radio the best years of your life. Nobody could ask for more. 73, Dad, and may your signals always be heard.

73 K1ZEO DE K1YPP SK

*143 East Rd., Hampstead, NH 03841

Happenings

Conducted By Carol L. Smith,* AJ2I

- *No Code — No More!*
- *WARC Implementation*
- *Cable Company Must Pay $6000*

FCC Drops No Code!

The Commission has listened to the overwhelming sentiments of the Amateur Radio operators of this country and decided to drop the issue of a no-code license in the Amateur Radio Service. The no-code proposal, PR Docket 83-28, had caused an uproar in the ham community (see March 1983 *QST*, pp. 9 and 49, and September 1983 *QST*, p. 61). Nearly 5000 comments were filed, and the vast majority, almost 20 to 1, according to the Commission's count, were *against* removing the code requirement for radio amateurs.

In his staff recommendation to the FCC Commissioners, Private Radio Bureau Chief Robert Foosaner urged that the no-code proposal be dropped permanently. He stated that "basically the item (no code) is a report on the health of the Amateur Radio Service. The Amateur Radio Service is well, it's thriving, and it's providing an excellent service to the American public."

"The Amateur Radio Service is well, it's thriving, and it's providing an excellent service to the American public." — PRB Chief Foosaner

Foosaner said that in reaching the decision, the Private Radio Bureau considered three questions: (1) Is the Amateur Radio Service growing? (2) Is the code an unnecessary barrier to young, computer-oriented individuals? (3) Is the slow-speed requirement discriminatory against handicapped individuals?

Statistics provided the answer to the first question. In 1930 there were 30,000 licensees; in 1975, 300,000 licensees; in 1983, well over 400,000 licensees. These figures dramatically show the growth (and health!) of the Amateur Radio Service.

In response to question 2, Foosaner noted that although the code test is something one must prepare for, the slow-speed exam requires a minimal amount of study. (This parallels what many amateurs have been saying for many years, and it reflects just what most commenters said.) "It is something that you do have to prepare for," Foosaner declared. "Being in the Amateur Radio Service is a privilege. We find that knowledge of the slow-speed code is necessary to maintain the traditional public service requirement of safety, and in defense problems."

Question 3 raised the issue of discrimination against individuals with disabilities. To this point, Mr. Foosaner read a portion of the comments filed by the HANDI-HAMS organization, which reported that it had trained over 5000 individuals with severe disabilities in the skills needed to pass Amateur Radio examinations. For some of those individuals, Morse code is the only means of communication available. The comments from persons with disabilities indicated that they *want* to maintain the present code requirement.

Commissioner Rivera wondered why the PRB didn't "opt for the Canadian proposal reserving some bands for digital experimenter classification while at the same time maintaining the rest of the channels and bands for no code." Mr. Foosaner gave two reasons: "... We felt that code should be applicable in all the Amateur Radio Service frequencies, and we felt that the comments made that perfectly clear. That's a positive reason. The second is the Canadian example you referred to. It is my understanding that the Canadian example experiment ... has been in existence for four years. The purpose was to attract computer-oriented individuals. It has attracted 150 people in four years, therefore not succeeding in what it set out to do. We think the code is important."

"Being in the Amateur Radio Service is a privilege. We find that knowledge of the slow-speed code is necessary to maintain the traditional public-service requirement of safety, and in defense problems." — PRB Chief Foosaner

Commissioner Dawson, who is studying for her amateur license, asked whether Foosaner "foresaw any service or any option for entry to the spectrum for people who might be in the computer hobbyist class." Foosaner answered that it is "a petition that we will look at."

In his concluding statements to the Commission, Foosaner strongly recommended that "we maintain the code requirement, we endorse the Service as it is, and we bury the concept of no code." Chairman Fowler made this concluding statement: " ... I think this is the right decision; we can put it to rest once and for all, and I agree with the item. Radio amateurs have contributed vitally to our country just recently; they were stalwart in their services in performing communications in Grenada. The code sometimes is very important, indeed even critical, for getting the messages through." A few minutes later the FCC Commissioners voted unanimously to keep the Morse code requirement for all classes of Amateur Radio licensees in the United States.

"I think this is the right decision; we can put it to rest once and for all." — FCC Chairman Fowler

Ten months ago few hams would have expected this action, despite strong League and amateur community action against the concept of no-code licensing. In November of last year, the ARRL Executive Committee went on record asking the FCC to delay issuing an NPRM on the no-code license for 18 months. The reasoning was that a new class of license would tend to compound problems associated with the new Volunteer Examiner Program. Shortly thereafter, then ARRL President Clark wrote each of the Commissioners that it seemed "unwise and unfair to bring the topic up at this time." [The ham community regrets that Vic, one of the staunchest supporters of a code requirement, died before this important decision was announced. — Ed.]

In January 1983 the FCC adopted an NPRM on the no-code license. When the Board of Directors met in April, it responded to the overwhelming opposition to no code from ARRL members, and it directed the staff to file comments stating "in the strongest possible manner" the opposition of the ARRL to the no-code proposal.

The ARRL filed its comments in June, and reply comments in July. League personnel, in preparing to file reply comments, noticed that the ratio against no code was approximately 25 to 1, and they brought this fact to the attention of the Commission.

League members also garnered the attention of members of Congress on the no-code issue. Senators, Representatives and other governmental interests took note of the proceedings. Many consequently expressed their reservations about the proposal. The League's Washington Area Coordinator, Perry Williams, W1UED, was very much attuned to this. He calls the FCC decision a "Victory for the Administrative Procedures Act, as much as anything else. This is a case where the system really worked!"

With the prospects of a no-code license "buried," ARRL President Carl Smith, WØBWJ, sent a telegram to FCC Chairman Mark Fowler thanking him. He said that " ... [Fowler's] remarks yesterday morning at the

*Membership Services Assistant

Be a Charter 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* and be a *Charter Contributor*. All Charter Contributors will have their name and call listed in a commemorative book to be presented to Senator Goldwater prior to the awarding of the first scholarship in his honor. The deadline for donations by Charter Contributors is August 1, 1984.

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 hamshack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST* and you'll receive a personal thank you call from Robert York Chapman, W1QV, President of the ARRL Foundation, which is administering the Goldwater Scholarship Fund.

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?

FCC open meeting regarding the usefulness of the Morse code and the contributions of radio amateurs to the country are deeply appreciated by the Amateur Radio community. Please accept our congratulations and thanks for the way in which you, the other Commissioners, and your staff have handled this important item. In putting the no-code issue to rest once and for all, you have demonstrated a commendable responsiveness to the people you are appointed to serve, and you have given the radio amateurs of the United States a fine holiday present."

ARRL FOUNDATION SCHOLARSHIPS AVAILABLE

The ARRL Foundation announces the availability of three scholarship awards for the 1984-85 academic 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 a student of electrical engineering. It is open to licensed radio amateurs of the General, or higher, class.

The Paul and Helen L. Grauer award of $500 will be given to a student of electronics, communications engineering or related fields who resides in and attends an accredited college or university in the Midwest Division of the ARRL.

The Long Island School Scholarship assists Long Island (New York) residents attending Long Island schools, emphasizing the importance of electronics in the curriculum and Amateur Radio in the extracurricular interests of the applicant.

Further information and application forms for these awards may be obtained by writing to: The ARRL Foundation Scholarships, 225 Main St., Newington, CT 06111.

WARC IMPLEMENTATION

The FCC recently released the Second Report and Order in General Docket 80-739, the WARC implementation proceeding (see Nov. 1981 *QST*, p. 68, and March 1980 *QST*, p. 56). By this action, the Commission has amended the domestic Table of Frequency Allocations contained in Part 2 of its Rules to bring it into compliance with the WARC-79 results. This action sets the stage for changes to Part 97 of the FCC Rules that will affect the allocations to the Amateur and Amateur-Satellite Services. There is likely to be no more than 30 days' advance notice when the Part 97 changes are made, probably sometime soon. With its action, the FCC also adopted a set of definitions that is consistent with the new international Radio Regulations.

Briefly, the effect on the *domestic* amateur allocations will be as outlined below. Note that this summary does not address the question of interference we may encounter from nonamateur operations outside the U.S., the status of which is determined by the *international* Table of Frequency Allocations and by any bilateral agreements to which the U.S. may be a party. February 1980 *QST* contains the complete international Table of Frequency Allocations as adopted at WARC-79.

1800-1900 kHz: Remains exclusively amateur, as it has been since June 1981.

1900-2000 kHz: Remains available on the same basis as before, i.e., with limitations to protect ongoing LORAN-A operations in northeastern Canada. The status of these limitations after January 1, 1984 is unclear. However, there will be a future proceeding in which we will be squaring off against radiolocation operations that are to be moved from the 1605-1705 kHz segment to make way for an expansion of the AM broadcasting band. This promises to be a long and arduous battle against offshore oil exploration interests.

3500-4000 kHz: Remains exclusively amateur.

7000-7300 kHz: Remains exclusively amateur. However, "The use of the band 7100-7300 kHz in Region 2 by the amateur service shall not impose constraints on the broadcasting service intended for use within Region 1 and Region 3." In other words, in this segment the only interference from broadcasting that we can complain about is broadcasting directed toward Region 2.

10.1-10.15 MHz: In the U.S., the amateur allocation will be on a primary basis. However, Footnote US 247 requires that we not cause harmful interference to the fixed service operations of other countries. This proceeding does not address the status of 10.109-10.115 MHz, which is presently off limits, nor the power limit (now 250 watts input).

14.0-14.35 MHz: Remains exclusively amateur.

18.068-18.168 MHz: The stage is now set for this band, and the one at 24.890-24.990 MHz, to become an exclusive amateur allocation no later than July 1, 1989. With the amendment of Part 2 it may now also be possible for an interim, secondary allocation, similar to that obtained earlier for 10 MHz, to be arranged. We will be pursuing this in accordance with Minute 50 of the October Board Meeting.

21.0-21.45 MHz: Remains exclusively amateur.

24.890-24.990 MHz: See discussion of 18.068-18.168 MHz.

28.0-29.7 MHz: Remains exclusively amateur.

50-54 MHz: Remains exclusively amateur.

144-148 MHz: Remains exclusively amateur.

220-225 MHz: The status quo is maintained for the moment, with the Amateur Service to benefit from a phasing-down of government radiolocation operations in the band through the remainder of the decade. However, the cessation of government radiolocation raises the possibility of other services, government or nongovernment, being introduced in at least a portion of the band. Here again, we're likely to have a battle on our hands in a future proceeding. Sharing with radiolocation generally has been satisfactory; finding another suitable sharing partner would help assure continued access to the band.

420-430 MHz: As presaged in August 1981 *QST*, p. 57, this segment will no longer be routinely available along the Canadian border. Some operation may be possible by waiver, subject to coordination with Canada.

430-450 MHz: There is no change in the domestic Table of Frequency Allocations, despite extensive changes to the international Table.

902-908 MHz: This new amateur band will not be available in Colorado and Wyoming, bounded by the area of latitude 39° N to 42° N and longitude 103° W to 108° W, and is allocated on a secondary basis to the Amateur Service. Amateur stations must tolerate any interference from industrial, scientific and medical (ISM) devices, Automatic Vehicle Monitoring (AVM) systems and government stations. Whether the entire 26 MHz will be allocated to us on a secondary basis, or whether there will be limitations to protect the AVM systems, remains to be seen.

1215-1240 MHz: As expected, this segment is to be withdrawn to protect the NAVSTAR GPS radionavigation-satellite system from interference.

1240-1300 MHz: The new amateur-satellite uplink at 1260-1270 MHz is recognized. The only other changes are in the international footnotes, but at this point we know of no plans for domestic implementation of new sharing arrangements in the band.

2300-2310 MHz: In this 10-MHz segment, we retain our existing domestic status: We must protect government radiolocation from interference, but government fixed and mobile must protect us. In this country, most narrowband (CW and voice) activity is centered at 2304 MHz; unfortunately, European amateurs generally are losing access to the 2300-2320 MHz segment, and in Japan are limited to the 2400-2450 MHz segment of what used to be a 150-MHz-wide band. The result is that there is no common, worldwide allocation in this band that is free from the ISM interference at 2400-2450 MHz. (If you have a microwave oven check the label; it probably operates at 2450 MHz.)

2310-2390 MHz: The amateur allocation is being withdrawn in order to protect aeronautical flight test telemetry from interference. In October 1981 *QST*, p. 58, we asked for documentation of amateur activity in this segment; unfortunately, none was forthcoming. Our arguments for a continuation of the allocation are discussed, and dismissed, in the Second Report and Order.

2390-2450 MHz: The new amateur-satellite allocation at 2400-2450 MHz is recognized.

3300-3500 MHz: The new amateur-satellite allocation (for Regions 2 and 3 only) at 3400-3410 MHz is recognized.

5650-5925 MHz: The new amateur-satellite

uplink at 5650-5670 MHz, and the downlink at 5830-5850 MHz, are both recognized.

10.0-10.5 GHz: The new amateur-satellite allocation at 10.45-10.5 GHz is recognized.

24.0-24.25 GHz: The exclusive amateur and amateur-satellite allocation at 24.0-24.05 GHz, and the shared amateur allocation at 24.05-24.25 GHz, are both maintained.

Above 47 GHz: Relatively little amateur work has been done above the 24-GHz band. In the future, such work will be done within the allocations listed below:

47.00-47.20 GHz exclusive
75.50-76.00 GHz exclusive
76.00-81.00 GHz shared, secondary
119.98-120.02 GHz shared, secondary
142-144 GHz exclusive
144-149 GHz shared, secondary
241-248 GHz shared, secondary
248-250 GHz exclusive

Above 300 GHz not allocated, but available to amateurs and others for experimental use.

None of the changes discussed here will actually take effect until the FCC has amended Part 97 of its Rules, a move the Commission presumably will make without further delay.

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the Wisconsin, Illinois, Northern Florida, Santa Clara Valley, Indiana, Vermont, Maine, Oregon and East Bay sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page eight of this issue. (Editor's Note: Solicitations for petitions in Canadian sections henceforth will appear in Canadian NewsFronts).

A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopies signatures are not acceptable. No petition is valid without at least five signatures *on that petition.* No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

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

(Place and date)

General Manager, ARRL
225 Main St., Newington, CT 06111

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

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

An SM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of Technician class or higher immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, March 9, 1984.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters on or before April 2, 1984. Returns will be counted May 22, 1984. SMs elected as a result of the above procedure will take office July 1, 1984.

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, 1984.

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 appointment by the General Manager in consultation with the Director and upon recommendation of the outgoing SM.

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

David Sumner, K1ZZ
General Manager

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.

SECTION MANAGER ELECTION RESULTS

The following were elected for a two-year term of office beginning April 1, 1984:

Uncontested

Eastern New York	Paul S. Vydareny, WB2VUK
South Dakota	Fredric J. Stephan, KCØOO
San Diego	Arthur R. Smith, W6INI

CABLE COMPANY DENIED RESCISSION OF FINE

The FCC has denied Sonic Cable TV's request to rescind a $6000 fine imposed on it (see December 1982 *QST,* p. 67). The sanction was enacted because Sonic didn't maintain signal leakage within the prescribed standard, and because it didn't correct its interference to Amateur Radio communications.

Sonic operates a cable TV system serving Grover City, Arroyo Grande and Pismo Beach, California. It argued that the Commission's Notice of Apparent Liability should be rescinded because it contained an erroneous date, thus making it invalid. The Commission noted, however, that the erroneous date had been corrected well within the one-year statute of limitations applicable to the rule violations.

Sonic also said that the notice was defective because it listed Pismo Beach, where no violation had occurred. The Commission countered that Pismo Beach had been included merely to identify the cable TV system responsible for the violations.

Sonic further contended that it was being singled out for prosecution, because the "FCC has not prosecuted other cable systems for the same violations; and the real motive behind the notice is to force (Sonic) to discontinue use of certain frequencies." Moreover, Sonic claimed that since steps had been taken to eliminate the interference, no violation exists.

The Commission replied that "while it may not catch and prosecute all violators, those that are caught are not immune to sanctions for violating the rules."

Sonic then asked for a waiver of the rules to allow it to continue its interference with amateur stations. It maintained that a waiver was warranted since (1) it was in operation prior to one of the principal complainants; (2) Amateur Radio operators are engaged in an avocation rather than a vocation, and (3) there is no other channel on which it can operate. Sonic said Amateur Radio operators " ... should be viewed as having to put up with the basic undesirability of having to share spectrum."

The FCC said Sonic's request for waiver was inappropriate in this proceeding. "What is under consideration is Sonic's past violations of our rules," the Commission said. "The issuance of a waiver would not cure these violations. Moreover, Sonic, by requesting a waiver to harmfully interfere with Amateur Radio operators, asks the Commission in large extent to consider those very issues raised in the outstanding request for rulemaking filed by the American Radio Relay League (RM-4040). However, we do note that Sonic's request fails to recognize that cable systems by their very nature are not meant to share spectrum. Cable television systems employ closed coaxial cable delivery systems that are not intended to radiate frequencies over the air. It is for this reason that they may generally use most frequencies without prior Commission approval." With that, the Commission ordered that Sonic forfeit $6000 for willful, repeated violations of the FCC's rules.

NEW FCC COMMISSIONER

Dennis Patrick was recently sworn in as a Commissioner of the Federal Communications Commission. Named as a recess appointee by President Reagan to fill a seat vacated by the resignation of Commissioner Jones, Patrick will, after Senate confirmation, fill the remainder of Commissioner Jones's term. That term will expire on June 30, 1985.

A native of California, Patrick is a lawyer who has clerked for former California Supreme Court Justice William Clark. Patrick also served as an Associate Director for Legal and Regulatory Agencies, Office of Presidential Personnel, The White House, and as a Special Assistant to the Administrator of the National Telecommunications and Information Administration.

FORT WORTH HAMS DELIGHTED WITH VICTORY IN ANTENNA ZONING REGULATIONS

Fort Worth area hams have reason to celebrate — their Zoning Board of Adjustment recently agreed with many others around the country that Amateur Radio antennas are an "accessory use" of property. Thus, hams will only need building permits costing about one tenth of the heretofore-required $200 special exemption.

Ham antennas in Fort Worth will still fall under city height regulations, which are "35 feet plus one additional foot of height per foot that the antenna is set inward from the building line." Area amateurs, though, are pleased, and they call this decision "fair to the residents of Fort Worth and to the ham radio operators."

Earlier, Fort Worth amateurs had not been so happy. Several radio clubs were concerned that the city was treating them like huge commercial radio and television station towers. They consulted ARRL Volunteer Counsel Laurence Priddy, who asked for a legal interpretation of the zoning regulation. The result — ham radio antennas are not considered commercial, and subsequently require just the routine building permits.

QST Profiles

Conducted By Andrew Tripp,* KA1JGG

Ethel Smith, K4LMB: "One of the Boys"

YLs were still few and far between when I became W7FWB (in Wenatchee, Washington) back in 1936, but I found the fellows most willing to accept me into their fraternity. I have been involved in various Amateur Radio activities ever since, and have taken pride in being accepted as "one of the boys."

I was organizer of the Washington TVI Committee, Executive Secretary/General Manager of QCWA, Section Emergency Coordinator of Virginia and winner of the 1982 Roanoke Division ARRL Service Award. These were all things where the fellows were willing to forget that I am a YL. Right now, I am an Assistant Director for the Roanoke Division, Director of QCWA and Secretary of the Washington, DC Foundation for Amateur Radio.

I have received the most publicity, however, for my part in starting the YLRL, back in 1939. It is a wonderful organization and I am very proud to be a part of it, too. I have continued to be active with YLRL, having chaired its international convention in Washington, DC in 1982, and am currently the YLRL scholarship liaison. I'm also a member of the Quarter Century Wireless Women.

My first love continues to be CW; I was on 30 meters the day after the band opened, and I still like the lower end of 40. I used to be active in the traffic nets, but have been a backslider for the past few years. I seem to keep getting myself involved in organizational work and other sidelines, and seem to spend more time pounding a typewriter instead of a key. My latest distraction has been a personal computer.

Amateur Radio certainly has been good to me. It shaped my career, and provided marvelous friendships and a wonderful husband. I have no concern, now, about the approaching years as long as I have ham radio to provide activity, companionship and challenge in my life. It truly is the greatest hobby in the world. — K4LMB

QST: What attracted you to Amateur Radio in 1936, a time when fewer than 1% of the amateur community were women?

Smith: My original interest in Amateur Radio was strictly self-generated. My dad brought home an all-wave receiver one day, and I heard the strange dots and dashes of the Morse code and the voices of people actually talking to each other over the radio. I went to school the next day talking about my great discovery and found that there were a couple of those "hams" right there in my own school. I lost no time tracking them down. I borrowed a license manual and a handbook and never quit until I had my license.

World War II came along about that time, however, to alter the lives of most of us. I found myself working in Navy radar at Quonset Point, Rhode Island, and later at Naval Research Laboratory in Washington, DC. That was the beginning for me of a fascinating 28-year career in Navy electronics. As soon as the war bans were lifted, I got back on the air and into the traffic nets, as W3MSU, and promptly became involved, head over heels, in a variety of amateur organization work.

QST: Your "first love" is CW. What is it about that mode that makes it most appealing to you?

Smith: I guess it's largely a matter of ego that makes CW appeal to me. It is doing something well that just everybody can't do. There is a definite satisfaction in making use of a skill that is just a little bit unusual and challenging. CW gives you the opportunity to demonstrate your mastery of a hard-earned skill and a chance to take pride in your accomplishments — at whatever level.

QST: You have been very active in traffic handling, particularly with the Army Amateur Radio System, the forerunner of the Military Affiliate Radio System (MARS), in Washington State in the 1930s. What are some of your most memorable experiences as a member of AARS or in recent times?

Smith: There have been a number of memorable experiences. In the second year I was on the air, I picked up a call from California trying to deliver an emergency message to a ham who was traveling "somewhere" in the state of Washington. Western Union and Red Cross would not accept that kind of an address. I got on the AARS and ORS frequencies and, within three hours, had located the man and started him on his way back to California.

Being very active in the YLRL and other Amateur Radio organizations admittedly has Ethel Smith, K4LMB, spending more time pounding a typewriter instead of a key. Of the limited operating time she does have, Ethel gets the most enjoyment out of a "good CW QSO."

One of my most memorable operations was the day I talked to ZS3B, a lobster fisherman in Luderits, South Africa. He commented that he was on the air that day because a severe sandstorm made it impossible to get to the lobster pots. Right after that, I worked Nick on Dickson Island in the Soviet Arctic. He was inside that day because a severe blizzard made any other activity impossible. Those two contacts have always impressed me with the great world of Amateur Radio.

QST: Speaking as the founder and first president of the Young Ladies Radio League, how has the role of the YLRL changed over the years?

Smith: The role of YLRL has expanded considerably beyond the original concept. We started out with the idea of simply trying to compile a list of the world's YLs and perhaps putting out a newsletter that would bring us closer together. We certainly did not envision international conventions of YLRL or YLRL forums at most major Amateur Radio activities. We did not envision scores of "chapters" springing up throughout the world. We did not envision scholarship and DX hospitality programs.

Today, there are over 1500 members in YLRL, and the organization has become recognized and respected throughout the world. Our 1982 convention, for instance, attracted YLs from 36 states and from as far away as India, Japan, Holland, England, Germany and Bermuda. YLRL sponsors an annual scholarship to help a licensed YL continue her education. We have a regular column in *QST*, a fine YLRL magazine and even a great book, *CQ-YL*, written by Louisa Sando, W5RZJ, which recounts the stories of our early YL pioneers, and a complete history of the YLRL.

QST: Looking back over the nearly 50 years you have been licensed, what changes has Amateur Radio undergone, particularly in respect to attitudes toward and operating practices of women radio amateurs?

Smith: I don't feel that the role of the YLs has changed a great deal in these past 47 years, and I don't think the attitude of the majority of OMs has changed toward us, either. OMs have always been most willing to accept and encourage YLs on the air, in their clubs and in leadership positions. Generally speaking, we have always been pretty well accepted as "one of the boys," and the YLs like it that way. We just want to be a part of Amateur Radio where there are no delineations of race, creed, age, social status or sex.

Last year's Special Achievement award at the Dayton Hamvention went to one of YLRL's organizing members, W6NAZ. We have a YL on the ARRL Board of Directors and on the QCWA Board of Directors. We have many YLs who are SECs, SMs or Assistant Directors. They were all elected to those posts by their fellow hams. I think that is a pretty good testimony to the acceptance of YLs in Amateur Radio.

QST: What should we as amateurs be doing to attract more women into the fold?

Smith: The percentage of women coming into Amateur Radio has increased substantially in the past few years. I think the emphasis today should be placed on attracting more young people in general. Women will be a significant part of any increase.

*QST Features Editor

How's DX?

Conducted By Ellen White,* W1YL/4

New/Special Prefixes (June 1982-October 1983)

Even DX aficionados *of premier rank have been known to throw up their hands in despair when first confronted with prefixes such as TE, ZV, 4D or what have you! Gosh, it's hard to believe, but the last time we updated our alphabetical "nightmare" list was August of 1982, so 'tis time again (in fact, over-time) to program the memory banks with new and special prefixes in use since that last listing. A very special thank you to ARRL International Programs Manager Nao Akiyama JH1VRQ/N1CIX, for the compilation.*

A8	Liberia	TE	Costa Rica
AM-AO	Spain	TK	France (F)
AX	Australia	TO	France (F,FO)
CH,CY,CZ	Canada (VE,VO)	U2,U3,U5,U6,	USSR (UQ2,UA3,UB5
CI1,2	Canada (VO1,2)	U8,U9	UG6,UJ8,UA9)
CK1,4	Canada (VY1,VE4)	UU2	USSR (UP2)
CQ-CU	Portugal	UY,UZ4	USSR (UA4)
CW	Uruguay	V9	Venda
CY0	St. Paul I. (ex-VE1)	VC,VG	Canada (VE)
DP0	FRG base in Antarctica	VX1,2	Canada (VO1,2)
DV,DX	Philippines	XJ,XN,XO	Canada (VE)
EB-EH	Spain	YE	Indonesia
EJ	Ireland	YL3	USSR (UA3)
EK	USSR (UA,UB5)	YP	Romania
EM4,6	USSR (UA4,UF6)	YT	Yugoslavia
EN,EW	USSR	YW	Venezuela
ER,EV,EX5	USSR (UB5)	ZK9	Niue
GB	United Kingdom	ZV	Brazil
H5	Bophuthatswana	1A0	Sov. Mil. Order of Malta
HD	Equador	1S1	Spratly Is., Philippines
HG	Hungary	1Z9	Karen, Burma (not good
HW	France		for DXCC/WAC)
J4	Greece	4D	Philippines
JP	Japan	4J1	USSR (UA1)
L8	Argentina	4K1	USSR bases in Antarctica
LF,LG	Norway		and So. Shetland Is.
OF	Finland	4N,4O	Yugoslavia
P4	Neth. Antilles	4T	Peru
PF,PG	Netherlands	4V	Haiti
R3,R4,R5,R6	USSR (UA3,UA4,	5J,5K	Colombia
	UB5,UA6)	5Y	Kenya
RG6	USSR (UG6)	6C	Syria
RU5	USSR (UB5)	6D,6E	Mexico
RX7	USSR (UL7)	6T,6U	Sudan
S4	Ciskei	8J1,5,0	Japan
S8	Transkei	8J1	Japanese bases in Ant.
SN	Poland	8N1	Japan
T4	Cuba	9I	Zambia
T7	San Marino (ex-M1)		

SENEGAL

IARU Hq. notes that, effective last October 20, Senegalese amateurs have access to the following five bands: 1.80-1.85, 10.10-10.15, 18.068-18.168, 24.89-24.99 and 50.0-54.0 MHz. Before our column lead material had a chance to cool off, Senegal adds to the prefix changes noting that their hams used 6V1-6V0 through year-end to celebrate World Communications Year. For example, ARAS Secretary 6W8DY was signing 6V0DY. Effective the first of last month, different prefixes were allocated to each of the eight Senegalese regions. The current suffixes will remain the same; thus 6W8DY becomes 6W1DY: 6W1 Cap Vert, 6W2 Casamance, 6W3 Diourbel, 6W4 Fleuve, 6W5 Senegal Oriental, 6W6 Sine-Saloum, 6W7 Thies, 6W8 Louga.

*19620 SW 234 St., Homestead, FL 33031

AVES ISLAND

The Radio Club Venezolano is pleased to announce that the Isla de Aves expedition, scheduled for the end of January will be a part of the RCV's 50th anniversary celebration. DXpeditions to the island can take place only during the first quarter of the year because of the hurricane season. During this time of the year the water covers a good part of the island to the point of making the central portion disappear! Isla de Aves is a protruding part of a sandstone reef, Promontorio de Aves, of about 100 by 400 km. The shape is that of a footprint without toes. Above the water it is only 570 meters in the N-S direction, 130 meters in the widest part and 30 meters in the narrower part, with a height of only about 3 meters. The island is located 650 km northwest of La Guaira, and 540 km north of the Isla de Margarita (63° 38' W and 15° 42' N). YV0AA will be the call used and expectations are for a 72-hour operating stint, depending on the Venezuelan Navy's transportation facilities. Modes will be CW, SSB (160-10) and probably RTTY and satellite. Two stations will be manned. QSL direct via the QSL manager, YV5DFI, Box 50332, Caracas 1050-A, Venezuela.

THE EI4J SAGA

In 1971, Les, W5EIJ, wrote the family of EI4J expressing his sympathies on Frank's demise. In response, the family wrote back: "My family and I are deeply grateful to you for your kind letter of sympathy in the loss of my brother Frank, EI4J. The call originally was issued in 1936 to my brother Finton who died in 1956. With the permission of the licensing authorities Frank took over the call. As a "shut in" he got endless joy out of amateur radio, his only contact with the outside world. In the early days I was his second operator. In 1946 I received the call EI9P. Later, rather than let the family call EI4J lapse, I sought and received permission to use it myself. Thus EI4J has belonged to three successive Halpins." — *Gavin Halpin, EI4J*

THE HONOR ROLL

W6CF, the sage of Redwood Estates, California, has been doing some sophisticated compiling of DXCC material going back to the very early years. Some recent material from Jim included a graph depicting the exponential growth of the DXCC Honor Roll in the past two decades (see Fig. 1). In November 1947, 10 members showed on the Honor Roll; in September 1983, 1725 appeared on the Honor Roll. It should make the thoughtful observer question the validity of making it *easier* to achieve this illustrious ranking!

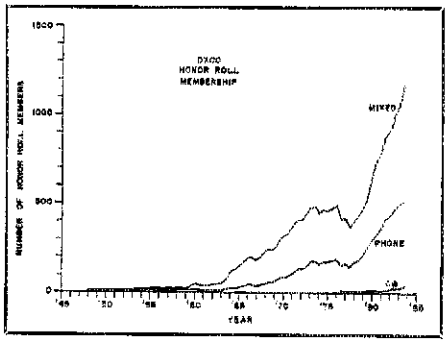


Fig. 1 — W6CF's graph of DXCC Honor Roll numbers post-WW II.

W4QCW/W4DR

W4DR just completed his goal of working 100 countries on 7 bands by working CT1CO on 10.1 MHz. Bob's original interest in multi-band DXing was stimulated by the inception of the ARRL 5BDXCC (he received the #1 plaque as W4QCW). By 1972 he had received a double 5BDXCC and in 1977 he made DXCC on his 6th band, 160 meters. He has set triple 5BDXCC as his long-range goal and now lacks 16 countries of that target. Bob's present worked/confirmed totals are as follows: 1.8 MHz 129/127, 3.5 MHz

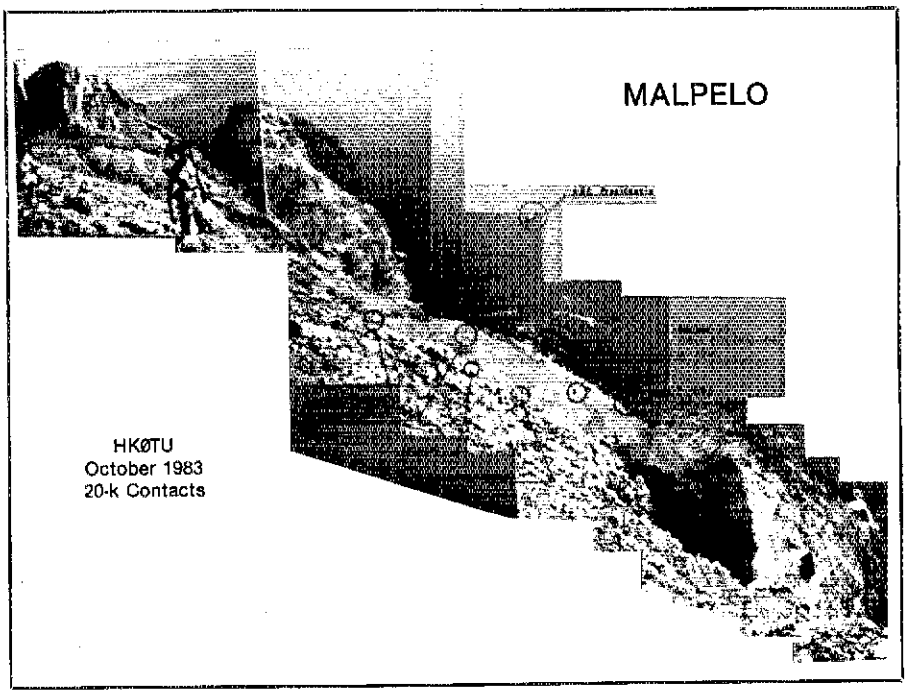
284/283, 7 MHz 324/324, 10.1 MHz 102/80, 14 MHz 357/357, 21 MHz 318/318. W4DR says, "I am sure there are 'single-band specialists' ahead of these scores on every band, but I wonder if anyone has a higher combined total than 1846/1820. This is a postwar total, but other than for a few deleted countries on 20 and 40, all have been worked since 1969."

THE CIRCUIT

☐ Malpelo: The photomontage (supplied by HK3NBB/K3ZO) was taken from the top of the peak with the HKØTU stations below. The stations were located on the east side of the peak. ARC Providencia is the ship that took the crew to the island where a total of 20,535 contacts got in the log. The crew found a flat promontory on the west side of the island that could be used by one station to prevent the blocking effect of the hill in that direction. Though all but one of the gang made it to the top, they could never have gotten the gear and generators up there. Just wait till next time (estimated to be in about seven years!). The CW crew (including HK1DBO, HK1QQ, HK1AMW and HK3BAE) made almost half the contacts with only one of the four stations.

☐ San Andres: In mid-November, the Colvins concluded from San Andres, W6KG/HKØ, making slightly more than 8000 two-ways with hams in 126 countries. Lloyd and Iris operated from the QTH of Francisco, HKØBKX, using their gear and his antennas. They found the tropical climate a welcome change from the cold of Madrid, Colombia. Their report on San Andres notes many similarities with the Caribbean Islands, with most of the people speaking Spanish. The lack of reliability of the local power system has resulted in many of the local stores having standby generators that owners bring out on the sidewalk and start up during the frequent power interruptions. Next stops include Ecuador and the Galapagos.

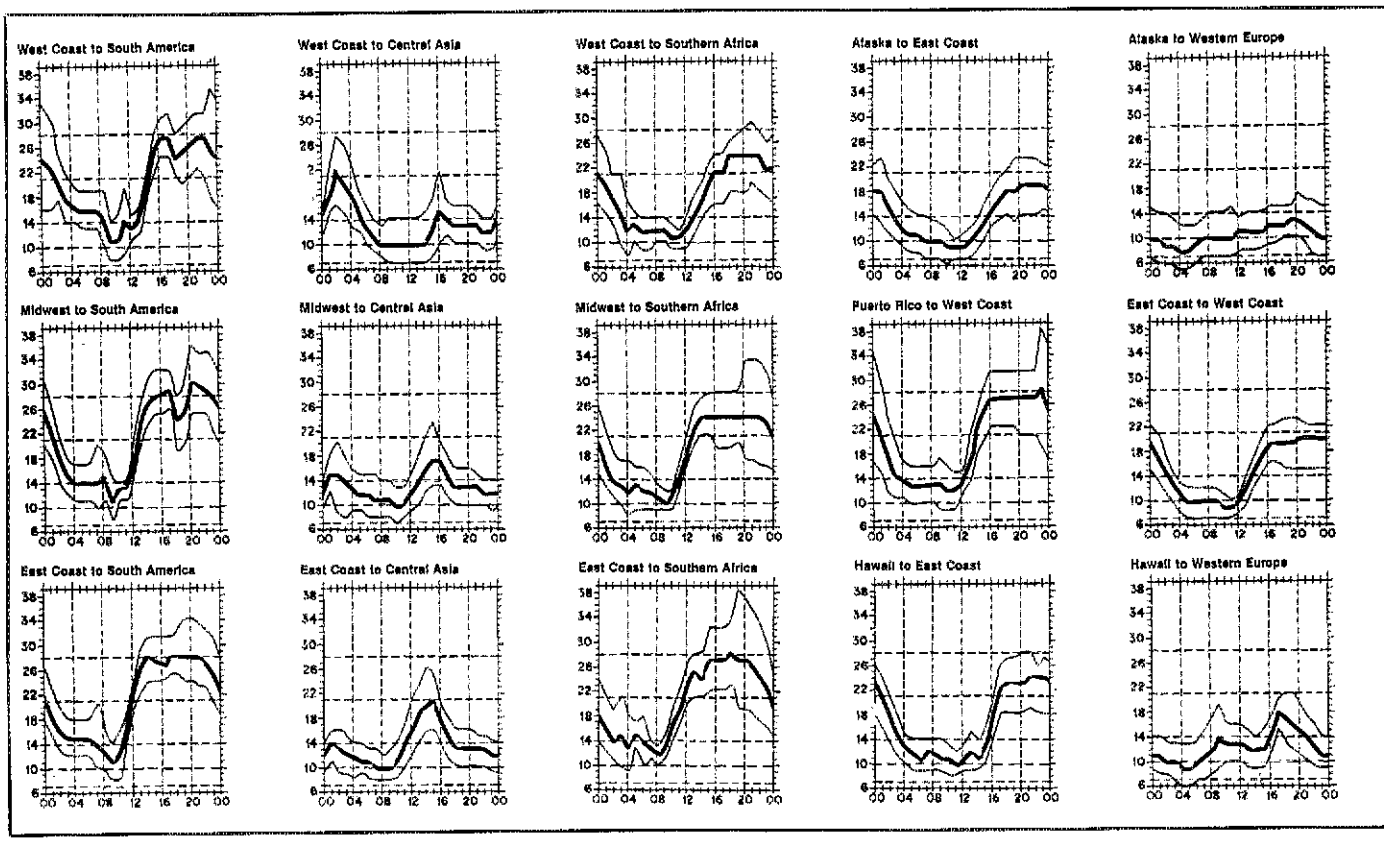
☐ 5th District QSL Bureau: Kudos to W5IO, Morris Guzick, who retired as manager of the bureau after 11 productive years. The new manager is Joe Schilling, WB5YKD, 1409 S.W. 66 St., Oklahoma City, OK 73159. The address for the bureau is now Box 44246, Oklahoma City, OK 73144.



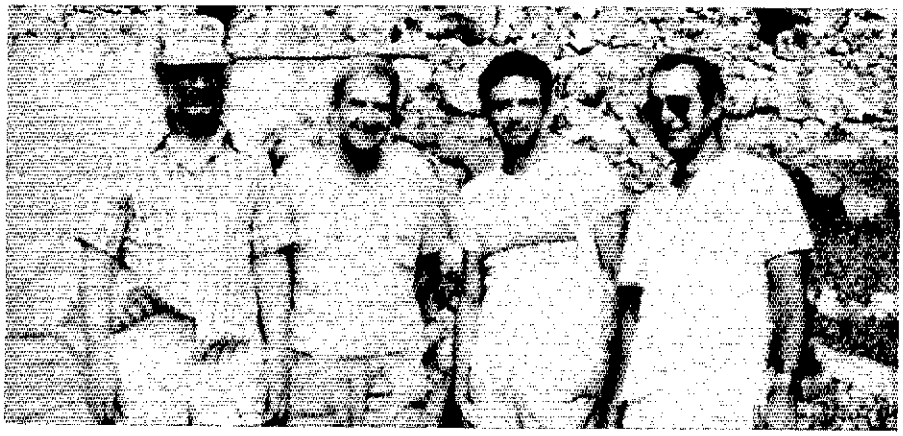
☐ K3ZO: The peripatetic Fred Laun rotates back to Washington in July where the K3ZO manor will once again be in operation, both for visiting guests and (hopefully) a competitive contest station.

☐ Vanuatu: Cards for YJ now go to J. W. Hannaford, YJ8JH, Vanuatu Amateur Radio Society, Box 665, Port Vila, Republic of Vanuatu.

☐ 10 Meters: KA1YE says that despite the "experts" bemoaning the demise of the 30-MHz propagation support, it is still a productive band. Keith is back in Western New York and the beacon is now located south of Rochester by about 10 miles at 43° 02', 77° 41' W in Grid Locator FN 13. The beacon is still operating at 4 watts output with a dipole up 20 feet, on 28.286 MHz. Any queries? Write Keith Hibbert, KA1YE, 527



When are the bands open? These charts predict this month's average propagation conditions for high-frequency circuits between the U.S. and various overseas points. One chart for East Coast to West Coast is also included. On 10 percent of the days of the month, the highest frequency propagated will be at least as high as the uppermost curve (highest possible frequency, or hpf). On 50 percent of the days of the month, it will be at least as high as the middle curve (maximum usable frequency, or muf). On 90 percent of the days of the month, it will be at least as high as the



The Malpelo CW operators (left to right): HK1DBO, HK1QQ, HK1AMW/WB3AOP, HK3BAE.

Rush-Scottsville Rd., Rush, NY 14543, 716-533-1389.

☐ Match Town Award: Jönköping, Sweden, celebrates its 700th birthday in 1984. This is the site of the world's first match-stick factory. DX stations require just 2 points to merit the 4-color diploma and silk streamer. SM stations require 4 contacts, other EU stations 3 points. Look for SM7 stations and hope for Jönköping County (F6). An extra bonus point is earned for club station contacts (SK7AX). You've all of 1984 to qualify, log copies with the award fee ($5 U.S., 10 IRCs or 30 SEK), to Award Manager, Box 2035, S-561 02 Huskvarna, Sweden.

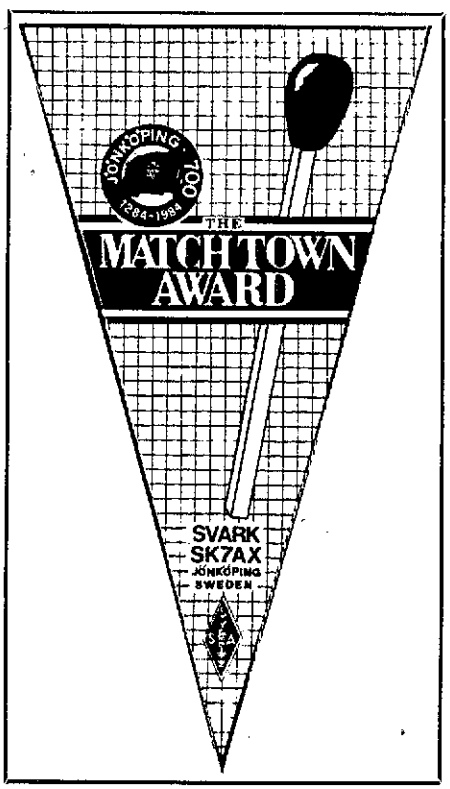
☐ Curacao: W1BIH notes that he hopes to be active from PJ2 till Spring on all bands, including OSCAR 10 (P42J for contests). All John's 1984 W1BIH/PJ2 and P42J cards should go to W1KDD.

☐ Sint Maarten: K4LTA and XYL N4FKO plan a three-week /PJ7 stint from February 17 to March 8. Bill will operate the ARRL CW DX event Feb. 18-19 with (probably) a P47 prefix. They'll be joined March 1 by KR4C and WA4CDH for multi-operating in the single-transmitter category for the March 3-4 ARRL phone spectacular. Look for them before and after the contests all bands, SSB/CW. QSL as announced, probably to K4LTA. This is Caribbean trip number five for this live-wire group from Oak Ridge, Tennessee.

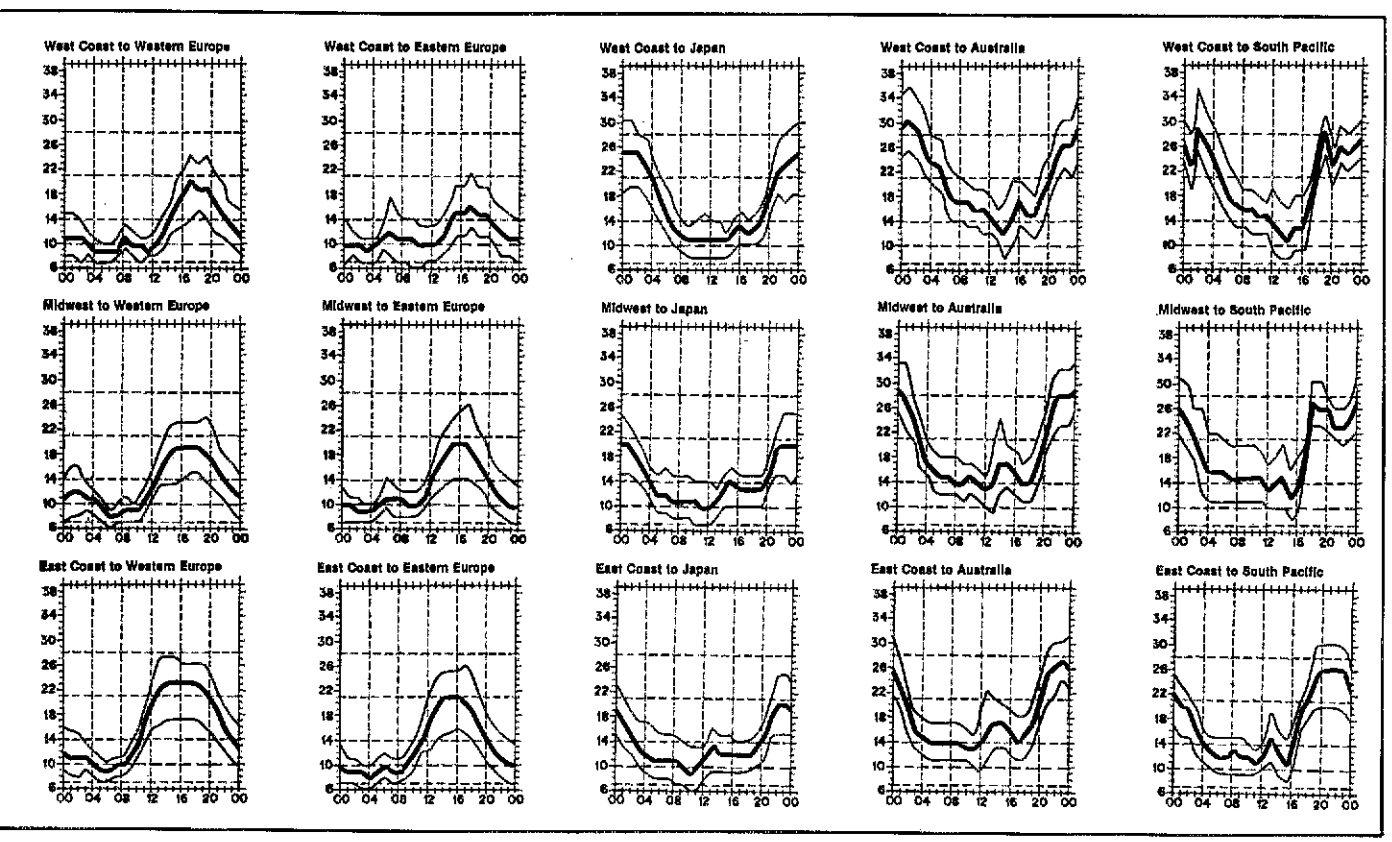
☐ Help! W8MEP, Jerry, is looking for logs/info to confirm contacts as follows: 1962, KM6BI KR6QW KR6DK UR2KA; 1963, KR6NG BV1USB VR1A; 1964-1965, KM6CE.

☐ International DX Convention: The 1984 Visalia, California, event takes place April 13-15, 1984. Details from WA6WZO.

☐ Zambia: 9J2JI (KP4CZ) expects to be active through July 1 from Lusaka. The Rev. James A. Imhof, S.M. QSLs via AG2K.



Jönköping, Sweden, was founded in 1284. 1984 is the year for you to qualify for the Match Town Award (see text).



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 15 to March 15, 1984, assume a sunspot number of 64, which corresponds to a 2800-MHz solar flux of 119.

DX Century Club Awards

Administered By Don Search, W3AZD

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from November 1 through November 30, 1983. An **s.a.s.e.** will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

DF1XC/100, DF2ME/106, DK0DO/121, DL1QQ/105, HA5PP/105, HB9BNX/213, JA1LXJ/113, JA1UTQ/109, JJ1CZR/109, JE2SPQ/162, JI2MBN/100, JJ3AFV/131, JA4AFK/119, JA5GYU/114, JA8XJF/310, JA8JES/118, OE1LO/342, OE2KGM/128, OK1AWZ/319, SL0ZZI/114, SM5SNU/159, SM5HDJ/140, YU3DTU/103, YV5IKU/100, 4X6DS/110, 5Z4CI/109, KA1T/100, KB1J/150, WA1KEA/118, KA2CHQ/101, KA2MBC/109, N2JJ/100, NC2Q/100, WB2RQW/112, K3WGR/117, KB3IW/101, KC3AI/131, W3OSE/234, KV5Y/203, W5MCH/131, WD5CIG/102, KE4AW/171, KE4RX/291, KF4YH/105, W4UCF/116, WB4WXE/KL7/106, KA6NOR/109, KJ6Y/111, NR6A/121, W6GR/337, WB6OTB/165, KA7EBX/113, KA9COM/101, KA9CZR/102, KB9MU/113, KI9G/105, KQ9O/101, N0AFL/291

Phone

DJ6OW/154, DK0DO/115, EA3CRI/109, EA7ZE/105, EA8AKN/199, F6EWX/104, I8IGZ/103, I0TBI/103, JE2SPQ/160, JA8XJF/307, OE1LO/336, ON4AAC/116, OZ4XW/112, PY4IL/130, PT7SD/102, VE3BRG/143, VK3DWJ/275, WA1KEA/109, K2HWE/292, N2CQE/126, W3OSE/228, KF4YH/104, W4BMJ/275, KA3DLT/130, W3EYF/253, NI5D/100, K6FO/183, KF6TE/100, WK4F/110, KV5Y/102, KJ6Y/107, W6VBI/165, KA7EBX/110, KC7WO/108, W7BQG/116, K8TBT/103, W8NOF/104, WD8DXN/174, KB9MH/114, AG0M/100

CW

DF9RM/250, DJ1ND/179, DK2UA/128, DL5GAG/140, EA4BV/101, JA1LKJ/113, JE2LQX/101, JA7FS/244, JA0VUJ/111, LA4IAA/106, OZ5UR/114, SL0ZZI/113, SM5FNU/130, YV5IKU/100, KS1J/107, K3WGR/106, KC3AI/120, NO4N/100, K5JII/122, KV5Y/201, NF5P/100, K6FO/235, N7DGZ/108, KA8CYC/101, KY8T/100, W9LNQ/248

Satellite

G6RH

5BDXCC

DF7NM, AF3E, KC5M, PY2ELV, ON7FK, G4IUF, EA7BLU, KA3A, UK2GAB, CT3BM, N9BBQ, W1AB, W0GAX, F6EYS, KQ2O, AC0M, VK3DWJ, I2YBS

Endorsements

Mixed

AL7DN/172, D68AM/150, DF1FX/225, DF3TN/250, DF9RM/285, DJ1BV/315, DJ5PA/252, DJ6GK/276, DK2XX/295, DK3PO/332, DK3SF/320, DK9FB/323, DL3NBL/153, DL3TJ/252, DL3WA/175, DL6UR/274, DL8FL/327, EA4AXW/180, EA6ET/265, F8DCQ/313, F6DHB/307, FY7AN/311, G5DSD/158, I1BUP/301, JE1BQE/185, JJ1EEA/149, JA2CXK/272, JA2DJH/317, JA2HMF/251, JR3LGB/149, JA7COE/253, JA7JND/193, JA8AQ/319, JA8IXM/315, KP4AM/305, LA3WV/249, OH2FS/315, OH2VB/334, OZ1APA/152, PA0TO/297, SL0AS/268, SM3LGO/231, SM6LPF/166, SM0KV/350, SP2AJO/316, SV1IW/277, VE3LDT/282, VE4ADA/180, VE5BBQ/150, VE7DFW/300, YU2AKL/306, YU2JH/153, YU3AW/304, ZL1IB/212, 9V1UQ/137, 9Y4VU/305, K1BJ/281, K1EUS/181, K1HKI/143, K1KTB/290, K1SF/304, K1VKO/301, K1WJB/280, W1CTF/151, W1JJ/309, W1UU/347, W1WAI/271, WA1HXH/178, WB1CFP/125, K2ENT/292, K2SCU/124, K2UFT/202, K2UU/321, KB2CV/294, KB2VP/242, KC2RS/254, KC2UF/206, KX2T/126, N2CIC/164, N2CQE/127, N2KW/309, NA2G/127, W2KHQ/203, WA2EUA/150, WA2OHD/301, WB2OHD/300, K3LWM/308, KA3A/236, N3CYI/155, N3RL/305, W3EYF/342, W3LDD/270, W3UM/300, WA3NGL/303, K4BXU/148, K4IBP/303, K4MRZ/250, K4PVZ/312, KC4FW/208, KC4HN/150, KC4QT/201, KD4TQ/130, KV4F/305, ND4Y/189, W4DRK/343, W4EEE/357, W4OMY/280, W4TL/285, W4ZWE/300, WA4PSF/274, WA4VDN/261, WB4ETD/201, WB4PUD/273, AD5N/325, K5BZU/323, K5FUV/265, K5JII/145, K5VT/320, KA5W/300, KT5A/293, KC4QT/201, KD4TQ/130, KV4F/305, ND4Y/189, W4DRK/343, W4EEE/357, W4OMY/280, W4TL/285, W4ZWE/300, WA4PSF/274, WA4VDN/261, WB4ETD/201, WB4PUD/273, AD5N/325, K5BZU/323, K5FUV/265, K5JII/145, K5VT/320, KA5W/300, KT5A/293, KX5L/154, W5ISF/270, W5KGX/356, W5NUT/354, W5ODD/280, W5RRK/324, WA5NFC/139, WB5RCS/259, K6INK/154, KA6GJW/174, N6DHX/128, N6NA/340, N6UC/332, NG6W/127, W6CCB/330, W6GR/337, W6GYM/249, W6KNH/336, W6OMR/304, W6ZKM/334, WA6RTA/325, K7IRO/315, N7BUP/157, W7EPA/337, W7FDJ/300, W7FP/305, W7QK/326, WA7FIG/309, K8CW/309, W8DOK/206, W8JRW/225, W8HLI/225, W8GYM/249, W8KNH/336, W8OMR/326, W8YA/346, WA6GFY/310, W6YRX/326, W6ZKM/334, WA7FIG/311, WA7IRD/250, W7FP/305, W7LGG/307, W7ORH/328, W8DOK/206, W8JRW/225, W8HLI/225, W8NJR/154, WD8IFX/250, K9BWQ/318, K9DDO/182, K9JU/251, KB9OC/311, KE9U/291, KC9Y/125, WA9MAG/280, WD9BBL/256, K0VZR/226, K9YRX/326, KA0BAI/140, KB0WM/250, W0II/198, W0LNZ/199, W0OQK/331, WB0WRL/133

Radiotelephone

CT1UA/310, CT1VY/200, CT2BV/157, CT4VP/136, DF3TN/243, DF4PL/286, DF8TK/131, DF9RM/270, DJ1BV/304, DK2XX/291, DK3PO/328, DK3SF/317, DK9KD/308, EA3ALD/308, EA5AD/251, EA6ET/242, EA7LM/252, EI8AU/225, F3DJ/346, G3UML/336, G4GED/204, G5AFA/329, GW4KGR/250, I1BUP/291, I1HAG/308, I2SLA/323, I2ZGC/314, IV3YRN/300, I5FCK/310, I8JN/321, IC8EGO/300, IT9YHR/251, JA2CXK/271, JA2HMF/237, JR4RHK/131, JA8IXM/310, KP4AM/295, LA3WV/230, OH2FS/212, OK1AWZ/317, OZ2QL/300, PA0LOU/300, PA0TO/284, PY2CYK/335, PY2ZDC/184, PY4AKL/315, SM5CZY/343, SM6LPF/153, SV1IW/265, VE3MR/343, VK9NL/242, VK9NS/277, YS1UL/150, ZP5CDV/228, 9Y4VU/290, K1JRE/153, K1KTB/288, K1SF/295, KA1YO/124, KI1G/193, W1JJ/309, WA1HXH/158, WA1PEL/260, WA1SMI/228, K2ENT/291, K2UU/320, KB2CV/289, KC2RS/251, KC2UF/206, N2CIC/164, WA2BGE/249, WA2VEG/328, K3LWM/290, KA3A/166, KB3GX/153, N3ARD/176, N3RL/300, W3KHQ/268, WB3FOB/300, WB3GOP/290, AE4X/321, KC4CY/177, KC4FW/207, KT4P/294, WB5RCS/259, K6INK/154, KA6GJW/174, N6DHX/128, N6NA/340, N6UC/332, NG6W/127, W6CCB/330, W6GR/337, W6GYM/249, KB5JX/324, W5KGX/351, W5ODD/191, W5RRK/324, WA5NFC/139, K7IRO/315, N7BUP/157, W7EPA/337, W7FDJ/300, W7FP/305, W7QK/326, WA7FIG/309, K8CW/309, W8DOK/206, W8JRW/225, W8HLI/225, W8KNH/336, W8OMR/304, W6ZKM/334, WA6RTA/325, K9ECE/349, KA9I/207, KB9OC/311, KC9OP/154, KE9U/287, KF9J/290, W9MMZ/314, W9ZX/290, WD9BBL/255, K0VZR/225, KW0H/153, N0AFL/291

CW

DF7KG/189, DJ5PA/207, EA4AXW/152, F8DCQ/287, G5DSD/127, JA1IBX/287, JE1BQE/125, JA7JND/172, OH2BN/287, OH2FS/194, OK1MP/290, OZ1EUO/213, PA0LOU/254, PT2ACZ/159, SL0AS/267, SM3LGO/212, SV1IW/206, VE3BX/290, VK9NS/189, 9Y4VU/208, K1MEM/302, K1VKO/221, KE1K/125, W1LQQ/241, WA1AER/295, K3LWM/211, KA3A/194, WA3NGL/270, AE4X/226, K5FUV/152, K5VT/308, KA5W/287, KT5A/274, KX5L/127, W5ODD/244, K6UXO/125, K6XP/291, N6AX/127, N6DW/210, NG6W/157, W6ENZ/150, W6NLG/125, K6XP/291, W6PKB/152, K7EG/226, W7EDA/267, K8CW/303, W8II/150, W8NPF/225, WD8IFX/237, K9JU/251, KE9U/252, W0II/150, W0OQK/278

DXCC Notes

Annual List Corrections: *Mixed* — K0GPD/101, W2MZV/337, K6DG/283, K0RQF/287, KB2RZ/287, KC5M/287, N4XZ/287, N5IH/287, N5RF/287, OK2SW/287, VE3NV/287, W1BFT/287, W1YN/287, W6CTL/287, KA6MKY/177, KA8JZR/177, KB2CT/177, W3AIC/177, W4KGH/177, W6DSY/177, WA3VPL/177, WA5YTX/177. *Phone* — DJ9ZB/324, W4MGN/337, W4OWJ/335, KA0DMB/207.

Honor Roll Change for 1984

Commencing with the 1983 Annual List in December *QST*, Honor Roll members have been indicated in boldface print. The traditional 1983 December submissions for Honor Roll will be published next month.

Beginning with 1984 submissions, Honor Roll standings will be published in the June issue of each year with March 31 the cutoff date for submissions. Members of the Honor Roll will again be indicated in the December Annual List in bold face.

Those wanting to update their Honor Roll listing (to appear in June 1984 *QST*) must have their cards into Hq. no later than March 31, 1984.

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Anatomy of a Rule

Any party may file a petition for rulemaking if he or she feels a change in the Amateur Radio regulations is desirable. An original and five copies of the petition should be sent to the Secretary, Federal Communications Commission, Washington, DC 20554.

When the Commission receives a petition for rulemaking, it assigns the petition a number and issues a public notice stating that the petition has been received and is available for inspection at the Commission's document room in Washington, DC. Normally, interested parties have 30 days in which to comment on the merits or demerits of the petition. In practice, however, it is usually several months before the Commission acts on the petition, and comments may be accepted up to that point. Petitions for rulemaking are listed in the Happenings column of *QST* whenever possible.

At some point the Commission will either dismiss a petition for rulemaking (if it appears to have no merit or deals with an issue already decided), or, if it appears to have merit, assign it a docket number and release it to the public in the form of a Notice of Inquiry or Notice of Proposed Rulemaking. A Notice of Inquiry simply shows that the Commission wishes to explore the subject matter of the petition further, but does not propose any specific changes to the rules. A Notice of Proposed Rulemaking proposes specific rules changes. On rare occasions, if a petition for rulemaking requests a minor editorial change to the rules, a lifting of restrictions, or a procedural change of no substantive impact, the Commission may proceed directly to a Report and Order and bypass the intermediate stage of Notice of Inquiry or Notice Proposed Rulemaking.

A Notice of Proposed Rulemaking eventually leads to a Report and Order in which the proposed rules may be adopted as proposed, adopted in part or rejected. Upon publication of the Report and Order in the *Federal Register*, an individual has 30 days in which to file a petition for reconsideration should he or she be dissatisfied with any of the new rules. Copies of Commission NOIs, NPRMs and RMs are available from ARRL Hq. (s.a.s.e., please).

FCC, ARRL and You

The League continuously monitors the regulatory scene in Washington, and participates in the rulemaking proceedings that impinge on Amateur Radio directly and indirectly. ARRL Headquarters does *not*, however, decide policy and the manner in which the League responds to FCC proposals. The Newington staff only carries out the decisions made by the members through their elected representatives who make up the ARRL Board of Directors.

In any given proceeding, members give their views on the issue to their Director, either directly or through appropriate ARRL committee channels. Directors hold cabinet meetings of key leadership officials in their Divisions, talk with members at club meetings, conventions and hamfests, read their mail and get the advice of League Advisory Committee members who are experts on the given issue. The Board of Directors, armed with their Divisions' input, then decide what comments, if any, will be submitted to the FCC. ARRL Headquarters and the League Counsel are directed to file comments accordingly.

For example, when it was apparent that the 10-MHz band would be released to amateurs following decisions made at WARC-79, the ARRL Board of Directors asked for input from their constituents as to the power limits, modes and license classes appropriate for the new band. A special Board committee was appointed to compile this information and make recommendations for Board decisions. *The Crossbander*, a publication for eastern Massachusetts radio amateurs, carried an excellent questionnaire on the 10-MHz issue to be completed and returned to the editor for compilation and forwarding to ARRL officials. It was clear from the some 300 returns that eastern Massachusetts hams preferred privileges for all license classes with a power limit of 250-W input, and modes restricted to A1 and F1. The feeling was that, because of the narrowness of the band, efforts should be taken to make rules that will limit interference and allow use by as many amateurs as possible at the same time. This position was communicated to ARRL policy-makers and, lo and behold, ARRL comments followed closely the form suggested by *Crossbander* respondents. FCC decided that the format had merit, and enacted the plan accordingly. The system works!

If you feel strongly about a particular FCC item coming up for consideration, make sure you transmit your views to the appropriate League advisory committee member *and* to your Division Director. The name, address and phone number of each Director appear on page 8 of any recent *QST*. The following ARRL Advisory Committees need your thoughts, too:

VHF Repeaters
VHF and UHF
Emergency Communications
DX
Contests
Public Relations

Ad-Hoc Committees:

Bio-effects of RF Energy
Digital Communications

For the names and addresses of committee members, contact ARRL Hq. or your Division or Section ARRL officials. Let your voice be heard!

Pending Dockets Affecting Amateur Radio

Current as of January 9, 1984

Docket	*Subject*
21006*	FCC proposal to relax leakage standards for cable television systems. (See League Lines, February 1982, *QST*, and Happenings, March 1982, *QST*, p. 58.)
78-369*	RFI Docket: Further NOI released. (See Happenings, February 1979 *QST*; also see pp. 9 and 48, March 1979 *QST*; pp. 9 and 58, September 1981 *QST* and December 1981 *QST*, pp. 70-71.)
79-144*	NPRM to solicit comments on effects of RF exposure standards on radio services and equipment; and FCC proposal to adopt regulations to protect health of employees and the public exposed to radiation in excess of national standards. (See Happenings, March and August 1980, and April 1982 *QST*.)
81-414*	NOI-NPRM to allow use of spread-spectrum in amateur bands. (See Happenings, September and December 1981, May 1982 *QST*.)
82-43*	20-meter phone band expanded. Further NPRM for phone subband expansion on other HF bands released. (See June 1983 *QST*.)
83-524*	NPRM for RACES frequencies revision. (See August and October 1983 *QST*.)

Petitions for Rulemaking Affecting Amateur Radio

File No.	*Petitioner*	*QST Reference*	*Nature of Petition*
RM-4040	ARRL	3/82, 6/82, 10/83	CATV non-use of amateur frequencies.

*Comment deadline passed; awaiting Commission action.

*Deputy Manager, Membership Services, ARRL

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

Where Do We Go From Here?

There is no doubt that the past few years have been golden for the avid 6-meter operator, and many that aren't so avid. In 1978, when it all began, no one would have dared forecast the fantastic conditions and the level of activity we have enjoyed. The 6-meter DX box, which appeared in November and is scheduled for reappearance in May, is graphic proof of how good the band has been to so many over the past five years. But, I'm afraid that the really superb conditions are past for this solar cycle. Those of us who have spent so much time and effort tuning 50 MHz and up for that fleeting signal that might mean a new country, will turn their attention to other pursuits. The following is intended to provide a few ideas along that line.

Of course, there are those whose interest in Amateur Radio is essentially limited to the 6-meter band. For them, in good times and bad, that is where they will be. A good thing this is, as it is they who keep the band alive during the lean years and encounter and report those rare long-haul openings that are bound to take place from time to time. In fact, most of our bands above 50 MHz have those dedicated inhabitants who provide the nucleus of activity that give the rest of us someone to talk to whenever we put in an appearance. I don't aim to dissuade the 6-meter stalwarts from their vigil. What I do want to do is to suggest a few ideas for those who might be inclined to turn to model railroading or collecting LaSalle hubcaps to occupy their idle hours now that F2 is not a daily occurrence.

Many have been putting off getting on other VHF bands or specialized modes on these bands. This conductor, for one, would finally like to do something about EME on one band or other. As a matter of fact, a few are talking seriously about 6-meter EME. Four good Yagis should work very well on the band. Moonbounce is certainly one long-haul mode that does not depend on solar activity. In fact, the quieter years should be superior as there is less attenuation in the ionosphere and fewer and less intense magnetic storms. Attaining and exploiting EME capability, on any band, will surely provide a fine challenge for many who haven't had the time when spending so many hours watching for F2.

For those less ambitious, just getting on another VHF band with a creditable set-up would be a good way to keep from getting bored until old sol turns active again in about five or six years. Many have been missing the thrills that the higher-frequency VHF and UHF bands can provide.

There are those, however, whose primary interest is ionospheric propagation. For them, a major attraction of 6 meters over the past few years has been the fact that it has stood at the upper reaches of that type of propagation. These people may now wish to concentrate their efforts on the next lower frequency band, 10 meters. While I hesitate to promote a band that is not in the VHF realm, nevertheless 29.7 MHz is only 300 kHz away from where the VHF part of the spectrum officially begins. It will be especially interesting to observe whether or not a similar kind of annual repetition of very-long-haul openings, such as observed on 6 meters with such uncanny regularity, also takes place lower in the spectrum when that frequency range is on the borderline of F2 propagation. Reports along this line will be most welcome. Recall that one of the most interesting of these is the long-path openings from south Florida to Japan that were noted about 1300Z around April 1 several years in a row. I wager that the same thing takes place on 10 meters. So, for those who are primarily interested in propagation that comes via the ionosphere, a first-class 10-meter set-up and some time spent on that band might be just the thing over the next few years.

Whatever bands and modes you decide on to while away those hours previously spent looking for brief openings on 6 meters, keep me informed on what you are up to and report any strange and wonderful propagation events you may observe.

UPCOMING VHF CONFERENCES

This year's Dayton Hamvention, to be held April 27-29, will, according to word from WA8ONQ, again feature a VHF conference with talks by acknowledged experts, noise-figure and dynamic-range measurements, and antenna-gain competitions, the weatherman willing. There will also be a hospitality suite for informal get-togethers. Jim advises out-of-towners to make reservations for accommodations as soon as possible, as rooms go fast for the Hamvention weekend.

Another VHF event scheduled for April is a little farther away, but those planning to be in that part of the world will certainly find it interesting. It is the 25th meeting of the Auckland VHF Radio Group to be held April 20-23. ZL1MO emphasizes that, despite the name, the group is a New Zealand-wide organization. This "Silver Jubilee" convention will feature talks on EME, m.s., tropo and amateur satellite communication. A special invitation is extended to VHFers from North America and other parts of the world. Requests for information go to Irving Spackman, ZL1MO, 78 Waima Cres., Titirangi, Auckland 7, New Zealand. Those wishing to make technical presentations at the affair should make their intentions known right away.

ON THE BANDS

6 Meters — Reports on 6-meter activity are sparse this month, which certainly reflects the rapid decline in solar activity. It is unfortunate that it took a dive right at the time of the year, November and December, when conditions normally pick up. I daresay that if the solar flux existing in July and August had held up through the fall we would have had a number of pretty good openings. Nevertheless, I've heard verbal reports, but nothing in writing or on the answering machine, of a few transcontinental F2 sessions between the West Coast and the Southeast taking place in early November. There have also been a few openings between California and KH6 and T32, with T32AB still holding forth from that remote QTH.

Late fall was also marked by a good sprinkling of Es sessions. Unfortunately, none favored us, at least in the eastern part of the country, during the Fall Sprint that took place the evening of December 11. From here near the Nation's Capital, conditions seemed only fair but activity was quite good and I had fun despite the limited time I could devote to the affair. Just for the fun of it, I kept my power to 10 watts and still managed to work western New York, Tidewater, Virginia and Connecticut.

K1TOL writes that a new job has curtailed his 6-meter activity. However, Lefty does report a big Es opening the weekend of December 3 that included a goodly share of double hop, allowing contacts into New Mexico and Colorado from his Maine QTH. He also noted hearing bits and pieces of the GB3SIX beacon on 50.018. K1TOL says that last summer was the best Es season ever for him, with daily reception of the 49.75-MHz TV carriers for several weeks from mid-June until early July. He also heard North African commercial harmonics and had three QSOs with ZB2BL. Lefty feels there are some 25 countries within Es range of the eastern part of the country. Motto: Don't give up on 6 meters just because F2 conditions appear to be mainly a thing of the past. Speaking of Es-range counties, WD4IYS passes along word that he is the QSL manager for 6-meter contacts with both TG9NX and HK1BAU. Harvey's address is 2280 SW 139th Ave., Ft. Lauderdale, FL 33325.

2 Meters — Reports of 2-meter DX are pretty slim, which is what one would expect this time of year. Tropo is almost nil in most parts of the country, except for the Gulf Coast and Southeastern states. Aurora appears down, which is undoubtedly a result of the decline in solar activity. One propagation mode not troubled by a dearth of atmospheric or ionospheric DX conditions is EME. Those who remain busy with VHF operating challenges throughout the year are the ones who have equipped themselves for this mode. As an example, take WB6NMT's report of activity from XE2BC during the second weekend of the EME Contest. Louis used a TS-700SP into a solid-state Lunar amplifier padded down to 60 watts driving a Henry 2002. This delivered 900 watts to four 11-element Lunar Yagis through about 50 feet of RG-8. Stations contacted included I2ODI, K9HMB, SM7BAE and WA1JXN/7. Local power line noise in the Tijuana suburb, where the club station is located, and relay chatter that resulted in the blowing of five preamps, hampered other contacts. Louis says that the antenna array has been donated to the club, so regular activity from XE2BC is expected in the future.

One area of the country where tropo is essentially a year 'round proposition is the Gulf Coast and Southeastern states. A number of such openings have been reported from mid to late fall, one fortuitously occurring during the 2-meter Sprint. This conductor, who was in central Florida for the Shuttle launch, heard stations as far away as Atlanta and received a 5×7 from W5HUQ/4 Jacksonville, a distance of about 170 miles. This would not appear to be unusual except for the fact that I was running 3 watts from an FT-290R into a 5/8-wave mag-mount whip and was parked behind an 8-foot concrete wall that surrounded the motel parking lot. The opening reached as far north as Chesapeake Bay. K3ONW and WB3LJK, operating portable from Maryland's Eastern Shore near the Virginia border collected grids from New England to Florida. Ken, K3ONW, says they worked some dozen 1s during the Sprint, along with four Sunshine State stations: WD4FAB, WA4LYS, WB2RJL/4 and N14Z. The last was also worked on 70 cm. He reports that signals from many coastal 2-meter stations were very strong, but that it was very difficult to work stations to the west. In all, 83 QSOs were completed in 21 grids. The two used a 160-watt solid-state amplifier to a Boomer on a 30-foot push-up mast. Power for the

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

operation was supplied by a portable generator. Everyone did not share in the good Sprint conditions. W1RIL Paxton, Massachusetts says conditions were horrible and ice forming on the antenna did not help a bit. When the VSWR reached 4 to 1, Ken decided to call it quits.

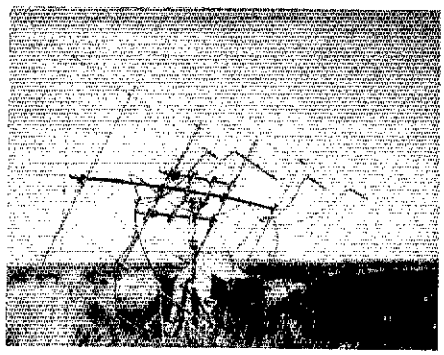
Another outstanding tropo session occurred a few days earlier, according to a report from WD4AFY Savannah, Georgia. Andy says that on November 23 between 0130 and 0500Z stations from Virginia to Key West and the Bahamas were working through the 146.37/146.97 repeater in Savannah. The piece de resistance came with the appearance of KA9KKW/C6A Nassau and K4SW/C6A Abaco. Both Bahama stations had good signals through the repeater, but attempts at simplex were unsuccessful. Perhaps if those involved had been able to use SSB some interesting two-ways would have resulted. In any case, everyone had a good time.

1¼ Meters — Certainly the major story this month concerns the events unfolding on this band. As has been true in many recent operating achievements, moonbounce is the mode that makes great accomplishments possible. In the case of this band, it could not have happened without the WØVB/WØRGU EME DXpedition to Hawaii reported last month, and the earlier DXpeditions of WØSD/WBØTEM to Nevada, Oregon, Wyoming and Idaho. These efforts have enabled many stations, particularly those in the East, to up their state totals considerably. As this is being written, one week before Christmas, WØSD is at it again, this time with WBØPJB, on a trek east with planned stops in West Virginia, Virginia, Maryland, Delaware, New York, Vermont, Rhode Island and at League Headquarters in Connecticut. This will give Western states a chance to increase their totals substantially. Followers of the band will be eagerly awaiting the results of what has to be a very arduous trip this time of year, but they wanted to do it while the moon was at high northern declination.

The 1¼ Standings published with this column, in accordance with the schedule set forth in December, displays some of the fruits of these difficult, and far from inexpensive, undertakings. It is unfortunate, however, that many did not submit their revised totals in time so the box could correctly reflect their current status. It is hoped that by the next time this box appears, in August, it will be more up to date. Deadline for submission for that update is early June.

In non-EME news, WD4DGF Tennessee reports working WØSD during Leonids and WB5LUA Texas and W5FF New Mexico during the Geminids. The latter represented Steve's best DX on 1¼-meter m.s. — 1100 miles.

The Higher Bands — One of several good openings across the Gulf is reported by KB4CRT Tampa. John says that on November 21, after a 2-meter contact with



The portable 1¼-meter EME station built by WBØTEM and used so successfully by him, WØSD, WØRGU and WBØPJB on DXpeditions to several western states, Hawaii and, recently, to the East Coast. The antenna consists of eight scaled-up 13-element RIW type Yagis. When not on 1¼, they worked 70-cm EME with eight Yagis of a design derived by KL7WE.

W5HEZ Louisiana, the two tried 70 cm and made contact at 1445Z with 4×4 and 5×5 signals. When they signed, John worked Dallas stations W5GG, W5HN and W5HPT. KB4CRT received 5×6 to 5×7 reports from all three. John runs an IC-451A to a Mirage D-1010 and a KLM LB at 50 feet, fed with 90 feet of ½-inch Hardline. Still another trans-Gulf opening, this one the weekend of December 10 and 11, is reported by N5BBO San Antonio. Fred says he wasn't present for it but W5VY was, working W4ODW in the Florida panhandle on 23 cm. Fred says they often hear Gene and can work him almost as easily on 23 cm as on 70 cm.

WØPW, in sending along his update for the 23-cm Standings, comments that he has been trying to add South Dakota to his total by mounting his own DXpeditions to the state. So far, taking his portable set-up consisting of a 75-watt transmitter feeding two 38-element loop Yagis to two different locations in the state have produced negative results for him. On the last try, from near Edgemont, he did work WA7DKZ west of Laramie, Wyoming, who was running 1 watt, and KØRZ near his home QTH in Boulder, Colorado. Bill has 125 watts. Don feels that a nearby hill covered with Ponderosa pine may be responsible for his lack of success. He notes that needles are about a half wavelength at 23 cm!

Antenna Gains Measured at the 1983 Central States VHF Conference

2-Meter Homebrew		
N5DL	12-el 2.2-λ NBS	12.3 dBd
WA8OGS	12-el 2.2-λ NBS	11.9 dBd
WD5AGO	8-el quagi	11.0 dBd
WA8OGS	6-el 1.69-λ NBS	10.0 dBd
K5IS	3-el quad	9.7 dBd
K5IS	5-el Tilton Yagi	9.1 dBd
2-Meter Commercial		
K1WHS	Cushcraft 4219	14.8 dBd
K1WHS	Cushcraft 3219	13.1 dBd
?	15-el Swedish CUDEE	12.7 dBd
1¼-Meter Homebrew		
KBØNM	3.8-λ quagi (W5UN)	13.8 dBd
WBØTEM	13 el	13.8 dBd
K9LQZ	"Long-boom NBS"	13.0 dBd
1¼-Meter Commercial		
K1WHS	Cushcraft 220B	14.2 dBd
70 Cm Homebrew		
KL7WE	10.5-λ Yagi	18.2 dBd
WBØDGF	21.5-ft Yagi	16.9 dBd
WBØDGF	Copy of Cushcraft Boomer	16.8 dBd
KØNG	"small Yagi"	15.4 dBd
K5JRH/W5UPR	12-ft dish	14.2 dBd
KØJJA	5-el quagi	11.2 dBd
WA8OGS	"small Yagi"	10.5 dBd
KØCQ	dipole and sq. reflector	10.5 dBd
WA8OGS	dipole and sq. reflector	10.3 dBd
KL7WE	3-el Yagi	8.2 dBd
70 Cm Commercial		
K1WHS	Cushcraft Boomer	16.8 dBd
WØWL	F9FT Yagi	15.4 dBd
WBØDGF	16 el KLM	14.8 dBd
KØCQ	27 el KLM	13.5 dBd
23 Cm Homebrew		
W5UPR/K5JRH	12-ft dish WA8OGS feed	23.0 dBi
W4ODW	metal boom quagi	18.4 dBi
KF5N	25-el quagi	16.4 dBi
KF5N	16-el quagi	15.1 dBi
WØPPF	rhombic	14.0 dBi
WØOHU	10-el quagi	13.8 dBi
WA8OGS	dipole and reflector	10.4 dBi
WA5VJB	coffee can	7.8 dBi
23 Cm Commercial		
KØCQ	Spectrum Loop Yagi	17.2 dBi
WA5HNK	Skeleton Slot	14.8 dBi

K6UQH passes along information on 23-cm frequencies on the West Coast. Bill says 1296.1 is used as a general calling frequency. North-south work is done on 1296.025, and 1296.0 is used only for monitoring the KH6 beacon.

1¼-Meter Standings

For WAS holders, listing is WAS number, call, state, call areas worked. For others, call, state, U.S. states worked and call areas worked. Call areas are the 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Those not showing some indication of activity or interest in remaining in the standings over the last two years have been deleted. Compiled December 15, 1983.

WAS Holders

1 WØVB*	MN	13	13
{2 WØSD	SD		
{2 WBØTEM	IA		
W1JR*	MA	31	20
K1FO	CT	22	7
K1PXE	CT	18	6
W1YTW	ME	14	8
W1GXT	MA	14	8
W1HDQ	CT	13	5
W1QXX	MA	13	5
K1JIX	MA	13	4
W1AZK	NH	10	3
K1BFA	MA	10	3
W2CRS	NY	21	—
K2CBA*	NY	19	7
W2PGC	NY	16	10
W2DWJ	NJ	15	6
K2DNR	NY	15	6
K2YCO	NY	14	7
WA2FGK	NJ	14	6
WA2FUZ	NY	14	5
W2SEU	NY	13	5
WA2YWP	NY	6	2
W3GPY*	PA	40	12
K3HZO	MD	20	10
W3IJJG	MD	15	8
W3RUE	PA	14	7
W3IP	MD	13	6
W3HMU	PA	13	4
WA3JUF	PA	12	5
K3IUV	PA	12	4
W3XO	MD	9	4
W3IY/4	VA	23	10
WD4DGF	TN	22	7
WA4CQG	AL	20	—
K4LHB	VA	18	9
WD4IIS	GA	18	7
K4GL	SC	14	6
WA4SBC	VA	14	5
N4CD	VA	13	5
KC4P	AL	9	2
K4IXC	FL	5	3
K5FF*	NM	42	14
W5FF*	NM	40	13
WB5LUA*	TX	33	12
W5RCI	MS	24	6
K5CM	OK	22	—
W5HN	TX	21	6
N4JS/5	MS	13	7
N5KW	OK	12	—
K5SW	OK	11	5
W5RCI	MS	10	5
K5JL	OK	7	4
W5NZS	OK	4	2
WA5VJB	TX	5	3
WB6NMT*		10	6
W6WSQ		6	4
K7NII*	AZ	16	11
W7JF	MT	8	5
W7CNK	WA	6	3
K7ICW	NV	4	2
WB8BKC*	MI	28	9
WA8TXT	OH	20	10
W8IDU	MI	15	7
K8AXU	OH	12	7
K8HWW	MI	11	7
WB8PAT	OH	8	6
K9MRI*	IN	34	9
K9HMB*	IL	23	10
WB9SNR	IL	22	9
K9XY*	WI	19	10
K9KFR	IN	11	6
KB9NM	WI	5	4
KAØY*	IA	32	11
WØPW*	CO	20	8
KØDAS	IA	16	7
KØALL	ND	14	7
KØTLM	MO	5	2
WAØNOK	MO	5	2
WAØQLP	SD	4	2
KCØW	ND	3	1
VE1UT		4	1
VE2YU		8	3
VE2DFO		7	8
VE2HW		5	2
VE3EMS		37	13
VE3DSS		13	7
VE3AIB		10	12
XE2BC*		2	3

*Indicates some contact via EME.
— Indicates information not furnished.

Strays

DUTCH CW MAGAZINE AVAILABLE

☐ Dutch or Dutch-speaking CW enthusiasts may be interested in *Morsum Magnificat*, a quarterly magazine containing information on the history of Morse code, all types of keyers, commentaries and other CW-related topics. A year's subscription is $10, sent to M. Hellemons, PAØBFN, Editor, Holleweg 187, 4623 XD Bergen Op Zoom, Holland.

QST congratulates...

☐ Colin Fraser, 9Y4TP (VP4CF), on receiving a plaque from the President of Trinidad & Tobago in commemoration of his having established the first Morse code Amateur Radio contact from that country in 1932.

☐ Ron Melzer, WA6FHY/8, of Dayton, Ohio, on being ordained a United Methodist minister and also on being named the new director of United Methodist Television of Dayton.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

Further Information on the Periscope Antenna

Last month, a periscope antenna system using an elliptical plane reflector was described. In practice, a rectangular reflector is more common. A rectangular reflector with sides equal in length to the major and minor axes of the ellipse will, in fact, normally give a slight gain increase. In the far field region, the gain will be proportional to the area of the reflector. To use the figure shown last month with a rectangular reflector (Fig. 2), R^2 may be replaced by A/π, where A is the projected area of the reflector. The antenna pattern depends in a complicated way on the system parameters (spacing and size of the elements), but Table 1 this month gives an approximation of what to expect. R is the radius of the projected circular area of the elliptical reflector (equal to the minor axis radius), and b is the length of the side of the projected square area of the rectangular reflector (equal to the length of the short side of the rectangle).

Table 1
Radiation Patterns of Periscope Antenna Systems

	Elliptical Reflector	*Rectangular Reflector*
3-dB beamwidth, deg	60 • λ/2R	52 • λ/b
6-dB beamwidth, deg	82 • λ/2R	68 • λ/b
First minimum, deg from axis	73 • λ/2R	58 • λ/b
First maximum, deg from axis	95 • λ/2R	84 • λ/b
Second minimum, deg from axis	130 • λ/2R	116 • λ/b
Second maximum, deg from axis	156 • λ/2R	142 • λ/b
Third minimum, deg from axis	185 • λ/2R	174 • λ/b

[Editor's Note: The dimension 2R, the projected diameter of the plane reflector, was incorrectly shown in Fig. 1 last month. Fig. 2 shows the correct 2R. The dimension labeled 2R in Fig. 1 is, in fact, the major diameter of the elliptical reflector and should thus be 2.82R.]

24-GHz GUNNPLEXERS

Gunnplexers for 24 GHz should soon be available to amateurs. The Microwave Associates MA-87820 has been announced. It is, to quote the MA specifications, "a frequency modulated Gunn diode oscillator with a Shottky mixer diode mounted in a waveguide structure. This is a commercial-grade product specially designed to operate in the amateur 24-GHz band. This product is similar to the MA-87127 series Gunnplexer designed for X-Band."

Electrical specifications are

Frequency	24.125 GHz
Mechanical tuning	± 50 MHz
Electronic tuning	60 MHz min.
Operating voltage (Gunn)	6.0 V ± 1.5 V (factory set)
Operating current (Gunn)	650 mA max.
Operating voltage (Varactor)	0-15 V
Frequency stability	500 kHz/° C max.
N.F. (SSB into 1-dB preamp)	12 dB max.
Power output	25 mW typical; 20 mW min.

In addition, Advanced Receiver Research (P.O. Box 1242, Burlington, CT 06013) hopes to have units in stock by the time this column appears. The price of a pair of Gunnplexers is expected to be in the $500-$600 range.

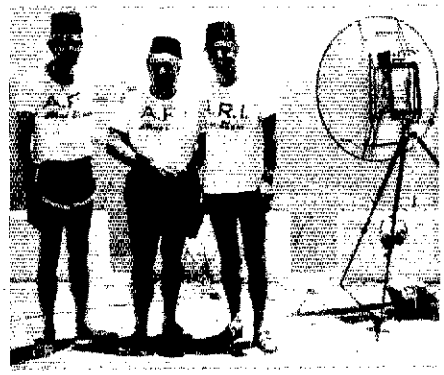
MORE 10-GHz RAIN SCATTER

The use of rain-scatter propagation on 10 GHz has been mentioned before in this column. Another example is reported on a contact between G4MBS and G3KEU. G3KEU was unable to copy signals when beaming directly at G4MBS because of a local obstruction; however, when beaming 180 degrees away, he was able to copy a signal scattered off a raincloud. Both stations were using narrowband systems. This mode of propagation is always worth trying for those equipped to use it. (from *RSGB Microwave Newsletter*)

MORE INFORMATION ON THE NEW 10-GHz WORLD RECORD

As reported in October 1983 New Frontier, IØSNY set several new world records on 10 GHz and a new European record on 1296 MHz. More details of the expedition and several photographs have now become available from IØSNY, and these are reproduced here. One correction is that the 1296-MHz contact between IØSNY/EA9 and I8TUS/8 was over a 1914-km path, not 1963 km, as previously reported.

On 10 GHz, a 50-mW Gunnplexer was used with a 30-MHz IF and 200-kHz bandwidth. A 1-meter-diameter parabolic dish was used as the antenna. On 1296 MHz, a Kenwood TS-700G was used to drive a Microwave Modules transverter. A 40-W amplifier using a 3CX100 tube was used on transmit. The antenna was a 20-element Yagi. Taking part in the expedition were IØSNY, IØKBL, IØRSC and EA5RK. Assisting in Spanish Morocco were EA9GK, EA9LT, EA9LV, EA9HG, EC9GI, CN8BC and CN8CC.



IØKBL, IØRSC and IØSNY (l-r) in Ceuta. The 10-GHz antenna is shown on the right.

IØSNY (2nd from right) with local amateurs in Tetuan, Morocco.

IØSNY at the operating position in Ceuta. The 1296 transverter and amplifier are visible to the right.

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	Oct. 1982, p. 46
Board Standing Committees (Minute 42)	June 1983, p. 55
Call Sign Assignment System	June 1983, p. 61
Club Competition Rules	Jan. 1984, p. 80
FCC Exam Schedule	Jan. 1984, p. 69
License Renewal Information	Jan. 1984, p. 61
Major ARRL Operating Events and Conventions — 1984	Jan. 1984, p. 52
Novice Roundup Announcement	Jan. 1984, p. 79
Pending Dockets	Jan. 1984, p. 60
QSL Bureaus Incoming	Dec. 1983, p. 74
Outgoing	Sept. 1983, p. 71
QST Abbreviations List	Jan. 1984, p. 53
Reciprocal Operating Countries	Nov. 1983, p. 71
Section Emergency Coordinators	Oct. 1983, p. 95
Third-Party-Traffic Countries	Oct. 1983, p. 91
U.S. Amateur Frequency and Mode Allocations	Jan. 1984, p. 51

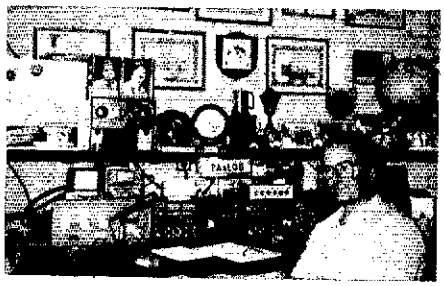
*103 Division Ave., Millington, NJ 07946

IARU News

Conducted By Richard L. Baldwin, W1RU
President, IARU

Picture This!

At the risk of being compared to *Life* magazine, this month we bring you a variety of photographs that have come our way over the past few months.

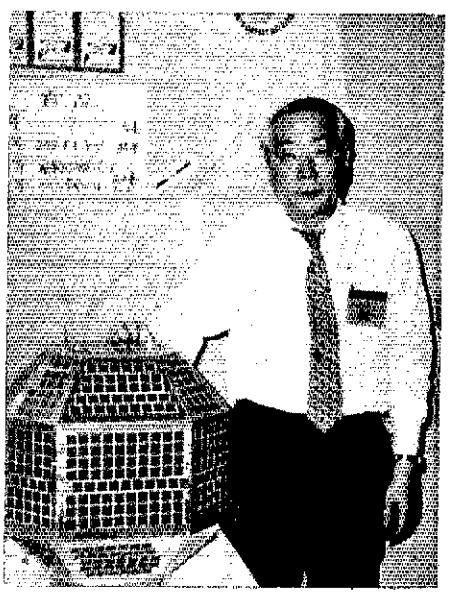


Lou v.d. Nadort, PA0LOU, Chairman of IARU Region 1 and member of the IARU Administrative Council, at his home station.

All of these fellows are (or were) presidents of Region 2 IARU associations. Kneeling, left to right, HK3DEU (LCRA), CP5EC (RCB), HK5ASF (LCRA), YN1FI (CREN), and 9Y4NP (TTARS). Standing: HI8LC (RCD), YV5BPG (Region 2), LU9CN (RCA), the late W4KFC (ARRL), HK4BHC (LCRA), YV5EC (RCV), OA4AV (RCP), HP1RD (LPRA) and CE3GF (RCC). This photo was taken by Jose Ahumada, LU2DX, at the airport in Cali, Colombia, where some of the more daring of the spectators (including a W1RU) were given rides in a two-seat ultra-light plane (you know, one of those motorized hang-gliders).

During a recent meeting of the IARU Administrative Council, Michael Owen, VK3KI; Masa Fujioka, JM1UXU; and Eric Godsmark, G5CO, ponder a point. G5CO serves as secretary of IARU Region 1, while JM1UXU is the secretary of Region 3. VK3KI is a long-time director of the IARU Region 3 Association.

The present officers of the Deutscher Amateur Radio Club, of the Federal Republic of Germany, include President Philipp Lessig, DK3LP; First Vice President Karl Taddey, DL1PE; and Second Vice President Dieter Henke, DJ8BQ.



Shozo Hara, JA1AN, president of the Japan Amateur Radio League, shows off a model of the Japanese amateur satellite JAS-1, which is expected to be launched in the not-too-distant future.

← A recent visitor to ARRL/IARU Hq. in Newington was Walcott Benjamin, EL2BA. A member of the IARU Region 1 Executive Committee, Ben participated in the World Amateur Radio International Conference held in Tokyo last fall.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1AAU, David J. Chesnut, East Dedham, MA
W1BEU, Daniel E. Giroux, Winslow, ME
W1BNN, John M. Murray, Sr., Bloomfield, CT
K1BQB, Mildred W. Doe, Bellows Falls, VT
W1COX, Raymond O. Mulno, Lowell, MA
KA1FVT, Robert P. Sullivan, Monson, MA
WA1JAI, Robert F. Montgomery, Stoughton, MA
W1JJA, Chester A. Bailey, Norwood, MA
W1MW, Manson E. Wood, Wakefield, MA
W1US, Thomas B. Cave, Harwich, MA
W1WWA, Francis M. Carey, East Longmeadow, MA
*W2AOS, Charles E. Biele, Myrtle Beach, SC
W2COO, William H. Seibert, Syracuse, NY
K2DDD, Benjamin A. DeMeo, Flushing, NY
KA2EHP, Howard J. McElroy, Southampton, NY
WB2FBM, Joseph J. Caccamese, Lodi, NJ
K2IFW, James R. Fallon, Sayville, NY
WA2JSU, John V. Krane, S. River, NJ
KA2KKX, Seymour A. Cottler, Cranbury, NJ
WA2RFP, Douglas P. Robertson, Staatsburg, NY
WA2SNW, Arthur M. Prairie, Plattsburg, NY
N3ADU, Dale Champ, Loysburg, PA
W3AGJ, Americus Molinara, Hatboro, PA
W3ALS, John J. Oetjen, Shohola, PA
W3ENA, James H. Creutz, Chambersburg, PA
K3KNO, Joseph Kessock, Frackville, PA
WB3LFC, Lena G. Mossburg, Frederick, MD
W3LHX, Vernon L. Stahl, Greensburg, PA
W3SPJ, Andrew D. Barlow, Ellicott City, MD
W3ZUX, Robert M. Horner, Chambersburg, PA
W4AAY, Francis A. Saxon, Augusta, GA
W4CYS, Cosby B. Taylor, Livingston, TN
K4DBY, Benjamin Klein, Hollywood, FL
K4EJI, Robert J. Sweeney, Fort Lauderdale, FL
KE4EO, J. D. Weatherly, Lobelville, TN
W4ESQ, Robert T. Brown, Sr., Ooltewah, TN
K4FAW, Daniel J. Davis, Jesup, GA
W4GLL, Louis F. Busler, Jr., Memphis, TN
*K4IGB, Walter C. Lockhart, III, Forrest City, AR
K4JZB, Robert F. Zimmer, Bayonet Point, FL
WA4LAL, Hilmer B. Petersen, Gainesville, FL
K4NTT, Walter W. Hinely, Savannah, GA
WA4OCH, Al Tomaszewski, Jensen Beach, FL
W4PKH, James E. Dwyer, Largo, FL
W4VTJ, Jay H. Bronson, Lantana, FL
KE4XS, Brian J. Jefcik, Sorrento, FL
W5FQZ, Kenneth C. Cain, El Paso, TX
N5FR, Maurice R. Teis, Ketchum, OK
W5FRX, James E. Lewis, Austin, TX
W5ISP, Reginald O. Barney, Shreveport, LA
K5QH, Julius M. Fernandez, Franklin, LA
KA5QYA, Nina U. Redman, Bandera, TX
W5STY, Victor J. Soukup, Sarasota, FL
W5VEW, Carl L. Hoban, Mountain Home, AR
K5WSH, Paul J. Blackman, Farmington, NM
W6BAM, James F. Mehren, Grass Valley, CA
N6EIY, Edgar F. Marsh, Redding, CA
K6GHT, Thomas J. Davenport, Bakersfield, CA
W6KB, Lloyd E. Martin, Salinas, CA
*W6KXO, Matthew L. Pimentel, Selma, CA
W6LUB, Michael M. Elliott, San Diego, CA
WB6MCL, James R. "Gus" Justice, Arcadia, CA
W6QG, Raymond H. Bloemer, Santa Ana, CA
W6TBZ, Reuel E. Cowden, Nice, CA
K6TSM, Herman S. Marston, Whittier, CA
K6UQ, John B. Pomeroy, Inglewood, CA
W6UQY, Edward E. McQuade, Manhattan Beach, CA
W6YPM, Erwin A. Rasmussen, Redwood City, CA
KA7AGJ, Albert E. Smith, Tacoma, WA
N7CZV, Francis B. Hodgon, Tacoma, WA
W7EJD, Fred Reid, Jr., Seattle, WA
WB7EZP, Estella B. Mitchell, Tacoma, WA
W7MH, Earle J. Gerdon, Seattle, WA
K7MNK, Lewis W. Kilbourn, St. Helens, OR
W7MWX, Kenneth L. Pearson, Skull Valley, AZ
WA7UXT, John C. Mevius, Sun City, AZ
*WA7WWV, Helmer W. Malstrom, Bothell, WA
K8EXP, David C. Cunningham, Sr., Willowick, OH
K8JPZ, Sheldon N. Klein, West Bloomfield, MI
K8KRH, Edward L. O'Brien, Mansfield, OH
W8LM, William H. Cooney, Ashtabula, OH
KD8Y, John L. Marshall, Crown City, OH
K8YOU, Steve Antonoff, Jr., Poland, OH
WB9ANM, Henry A. Loeschner, Ft. Wayne, IN
W9BFV, Benjamin F. Sherman, Beaver Dam, WI
WA9BLI, Frederick A. Bounds, Belvidere, IL
WA9DHC, John F. Martin, North Riverside, IL
W9GRK, Fred C. Maier, West Allis, WI
WA9GYF, Gerald L. Von Klein, La Crosse, WI
K9HDL, Charles A. Spielman, Eau Claire, WI
K9KXA, Mas Seo, Chicago, IL
W9MKY, Malcolm E. Houghton, Wales, WI
W9NPR, Arnold S. Minskey, Wautoma, WI
W9NVY, Robert J. Peavler, Kirksville, MO
K9VJV, George Karpin, Des Plaines, IL
K9VLG, Frank Yurek, Elk Grove Village, IL
WB9YPZ, Patricia J. Caldwell, Rhinelander, WI
W9ZRA, Lowen G. Rhodes, Sr., Ft. Wayne, IN
WDØBCU, Lee R. Andrews, Liberal, KS
WØHVA, Harold A. Wengel, Minot, ND
WØIK, Charles J. Webster, Minneapolis, MN
WØQIG, Albert J. Holmen, Two Harbors, MN
KL7IQP, John A. Arsenault, Kenai, AK
VE2AIZ, Roger Charbonneau, St-Hyacinthe, PQ
VE3HMJ, Herbert C. Warren, Brockville, ON
VE6CJU, Clifford A. Houssian, Calgary, AB
VE6JO, John L. Janssen, Jr., Olds, AB
VE7BFW, Samuel Hart, Vancouver, BC
VE7EXK, Robert C. Hack, North Bend, BC
DL7AP, Fritz Peuckert, Berlin, West Germany
F3CA, Louis Botton, Mezin, France
F8AA, Andre Riss, Boulogne sur Mer, France
F8EX, Jean Denimal, Juvisy sur Orge, France
F8OB, Jean Tiffeneau, Villefranche, France
VK4DC, K. Khan, Brisbane, Australia

*Life Member

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be 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 1934

☐ Voice operators have been taking their lumps for poor operating techniques and transmitter adjustment. The Editor says telegraphers also could use considerable improvement, particularly in their fists, and suggests practice by keying an audio oscillator in synchronism with tape transmissions from W1MK and other stations.

☐ Along the same line, W9UZ describes his setup for "slip" recording — a pen on a moving tape which makes an outline of received code. Fred shows a number of examples of sending he randomly intercepted on the air, criticizing the poorer ones (usually choppy dots) and suggesting better bug adjustments.

☐ W9CXX of Collins Radio has designed a coupling unit to make any antenna take power on any band, tho he doesn't label it a pi network. A two-wire system is also described.

☐ George Grammer says the 3-band, 3-tube rig in *QST* a couple of years ago was very popular, but now needs updating. He replaces the '10 oscillator with a '47 pentode, and uses a split-stator condenser in the output to provide a more stable neutralization procedure.

☐ Do we really understand what actually happens when we go through the tuning procedure of meter peaks and dips in oscillator, final and antenna circuit? We will if we absorb W3LW's step-by-step analysis.

☐ W1BXC's bridge rectifier with four '66s gave all kinds of hash and signal "bloops" until he installed a swinging choke and other remedies.

☐ Lt. Harris of the Mass. Institute of Technology flew a light plane with 56-Mc. gear to 18,000 feet a number of mornings last November, and now lists 108 Ws contacted during the experiment.

☐ The 'phone rig at W7VS is low power (pair of '46s final) but has such careful design and construction and resultant first-rate signal that his approach is worth attention by all of us.

☐ Furthering interest in and the need for better frequency measurement, W8ALK has built a unit with a 100-kc. tunable oscillator and 10-kc. multivibrator, settable to WWV or a local broadcast station for calibration purposes.

☐ The 1933 Navy Day message from NAA and NPG was copied by nearly 400 amateurs, including W2JE on the *Panama* off the West Coast. W9SU (now W7UU) topped the honor roll of best copiers.

☐ W9AA keeps on frequency with his crystals in a temperature controlled oven using an aquarium heater.

25 Years Ago

February 1959

☐ League officials have been working for two years in preparation for the 1959 world radio conference. No fund drive or dues assessment is required here, as in some other countries, to finance the project. The service is one of many provided by the League, and the Editor points out that anyone not a member is getting a free ride.

☐ Transistors are no longer purely experimental, and W2TGP has built a fully solid-state superhet for five bands.

☐ TVI remains a problem, especially for the Novice. W1ICP outlines the best answer — a simple low-pass filter, this one in a coffee can. Shielding and bypassing are also needed.

☐ The DX contest is coming up this month; with two 48-hour periods of maximum operating time, it is a far cry from the 9-day marathon of yesteryear.

☐ The hula hoop is in lots of discard piles, so W1CUT wound one spirally with 16 feet of #24 wire, fed with coax through a small capacitor, and finds it performs well on 10 meters.

☐ W5JXM uses a dual-purpose 12AX7 with relays to handle fast break-in and receiving muting. W3OFU avoids relays in his differential keying circuit by using VR tubes for muting.

☐ Lots of us have 10-meter beams. WØANY suggests a simple loading trap so they will perform on 15 meters as well.

☐ Maritime-mobile operators can now use any band between 7 and 148 Mc. when on the high seas within Region II — roughly, N. and S. America.

☐ W4AO and W4LTU continue their treatise on new thresholds in u.h.f. communication. "Pump" and "idler" frequencies are among the techniques explained.

☐ ZS6AQQ helped lots of us to a new country by a trip to operate in ZS9 — rare Bechuanaland.

☐ The Montreal A.R.C. fooled participants in its hidden transmitter hunt by dressing a male ham as a woman, complete with large handbag carrying the little rig and the antenna sewn in his skirt.

☐ Delivering messages to addressees often unfamiliar with ham radio requires some special techniques. W3TN outlines some that work well for him.

☐ Handsome-looking transmitter design by W1TS, a half-kw self-contained unit using a 7094 output tube. A remote unit contains the v.f.o.

☐ The Grand Junction (Colo.) club provided excellent communications for the 196-mile speedboat race on the Green and Colorado rivers. — *W1RW*

YL News and Views

Conducted By Jean Peacor,* K1IJV

The Feeding and Grooming of the Long-Distance Contester

[Editor's Note: Joan Gibson, KG1F, placed first in the phone portion of the 1983 YL/OM Contest. She agreed to share her contest strategy by writing a guest editorial. This year's YL/OM Contest fast approaches (in February). Read on, give it a try, and make this contest the greatest ever.]

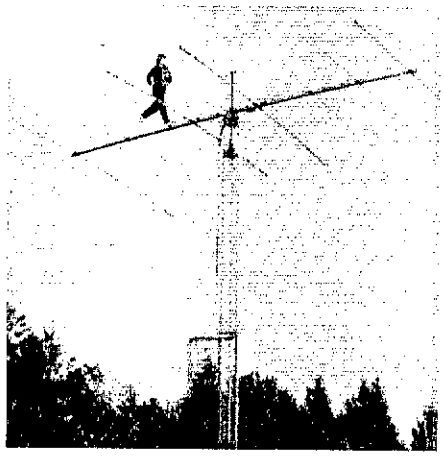
One of the reasons Amateur Radio attracts so many different types of people is the hobby's many facets. Whether you are a devoted traffic handler, a weekend builder, a daily ragchewer or the self-appointed "slick fist of forty," our hobby holds infinite fascinations and challenges for each of us. While some may bemoan, "Oh, no, not *another* contest," there are many hams who eagerly don their contesting finery, lay in a supply of throat lozenges and appropriate libations, load up, power up and go for what a friend of mine calls "The Ultimate Fix." Let's face it, is there a better way to get rid of pent-up aggressions and at the same time legitimately excuse oneself from weekend chores than to join the galloping pack of barking dogs? To the revengeful strains of "beware cuz I'm bigger and louder than last year," big-gun contesters slug it out for the brass ring while others set out to top last year's score. Medium guns and water pistols will consider themselves the winner if they work an elusive JT. Some of us pea shooters would do a cartwheel just to find Alaska on 40 meters and wind up 5BWAS. Whatever the goal, whatever the result, contesting is for many amateurs just one more marvelous exciting aspect of ham radio.

Contesting is basically a test of station performance combined with operating skills. Winning a contest or even scoring high cannot be gained with a seat-of-the-pants attitude. In order to get respectable results, the serious contester must plan and prepare.

The first consideration is station equipment, and knowing and accepting who and what you are. If bigger is better, then few of us can ever be best. Some of us have to buy groceries, send the kid off to college and pay taxes. So, monos up 200 feet, fixed arrays, rotatables for 75, backup rigs for the backups and brute-force linears in cool but ready reserve simply aren't in the budget or even the crystal ball.

The lack of such pipe-dream stations should not deter any amateur from contest participation — whether you file a competitive log or just spend a few hours giving out QSO points. A good reliable rig (is there really such a beast?), an assortment of wires and perhaps a beam, combined with good operating skills and the brain of a fox, can produce some surprising and rather satisfying results. There are many successful contesters who plow around the bands with 100 watts or less and some very enviable operating expertise. So, by all means, take stock of who you are and what you have to work with and prepare a strategy accordingly. The most sophisticated and elaborate stations with fog horn signals may burn up the band and elbow the rest of us away to a 10-kc arm's length, but

*Country Club Dr., Monson, MA 01057



Joan Gibson, KG1F, jogging across the bands. *(photo courtesy KG1F)*

if they don't have good operating skills and a sound knowledge of propagation, then chalk them off to weekend QRM.

How does one acquire contest skills? Simply by operating, practice and more practice. The fledgling can learn a great deal by perusing the bands during a contest. At one time or another, most of us are faced with the arduous task of breaking a pileup, particularly if we are in pursuit of DXCC or the Honor Roll. Every contest has its share of pileups. Much has been written concerning the techniques for breaking through pileups, but the only good method is the one that works, particularly on the first or second try. It takes careful listening to determine the rare one's operating style and how to be heard through the multitudes. The sly fox will psych all this out and score if he asks himself a few questions. Is the station responding to my call area? If not, will propagation shift in my favor? Does he like unusual phonetics? Are tailenders the successful ones? Do I have to be an eardrum-breaking 60 over to get his attention? There's probably nothing wrong with your signal. It's just that there are some operators who hear *loud only;* these stations never appear very high on the result charts, either. Will mentioning my QTH make his ears perk up? Hey, don't cringe! In one DX contest, I used my state to attract the attention of an S79. He came back to me on the first call because he used to live in this state many years ago and the magic two-syllable word did the trick. Call it a stroke of luck, but it worked — and that's what counts. And, aren't we all deserving of that one shining moment of smug satisfaction once in a while? Intelligent analysis with a touch of craftiness will many times bring results, and that in itself helps to smooth out the endless frustration of breaking pileups.

The key to working my own pileup combines a variety of techniques with what is needed at a specific time and still keep an ever-watchful ear to changing band conditions. If the pile sounds thick and deep, I may work through the top layer as fast as possible. Once the strong signals thin out, I can take more time and log a combination of medium and weak signals. When a weak signal sneaks through, I tend to work him right away, as he just may be that juicy new multiplier. I try to avoid back-to-back working of too many stations in the same call district. Too many times I've been on the other side of the pileup when the station I'm trying to work is 5 9 plus to me, yet he works two dozen 9-landers in succession. I QSY elsewhere. That's why I try to vary the call districts so as to hint to those stations still on ice that I do indeed hear their area and hope they will hang on a bit longer.

During last year's YL/OM Phone Contest band conditions were not optimum, but I did gamble on one band and its less-than-spectacular opening to Europe. The pileups were many, the multipliers came in rapidly, and end results were well worth it. While Europe and Africa were rolling in, the U.S. was very strong off the back, but I had to concentrate on DX stations to boost QSO value. No doubt I lost many U.S. stations in the process, but with only a few hours remaining in the contest and already a respectable number of QSOs logged, every new multiplier became the icing on the cake.

To make a serious run in any contest, one does need a thorough understanding of how each band changes during a 24-hour period, as well as the general conditions for a specific contest period. Knowing propagation helps to eliminate the useless and time-wasting needle-in-the-haystack approach. To get a feel for what conditions may be like during a specific contest weekend, chart out what you hear on the bands you intend to use for (ideally) 30 days prior to the firing of the starting gun. Listen to each band at different times of day and night, note both unusual openings and predictable skips, study the published propagation charts, and listen to forecast bulletins. Careful attention to the gathering of detailed data will, in the end, take a lot of the guesswork out of where to be and when.

The serious contester knows that band conditions and the right propagation can turn a whispering water pistol on 20 meters into a threatening cannon on 10 meters. When 10 is wide open, don't we all sound like high-powered megaphones? So, in a major contest, if you aren't loud enough to maintain a calling frequency and must resort to a search-and-pounce technique, keep an ear peeled to 10 and 15 meters.

What type of dupe sheet is most efficient? How can logging be accomplished faster? When is the best time to take required rest breaks? What types of food will produce the energy required for the long hauls? The questions are many; the answers as esoteric as the individual amateurs who willingly supply them. Personally, I could care less about food when I'm contesting. The most gourmet tidbit looks about as appetizing as Andean Condor Moussaka, and I rely on my nerve endings to propel me.

Contesting does have its place in Amateur Radio. For die-hard contesters, it's great sporting fun. What does it feel like to suit up for a contest simply to quench a competitive thirst and then, in the end, win the Gold Cup? Ah, the feeling is nonpareil . . . every bit as exciting and mind boggling as *jogging across the boom of ole TH7 Elephant Ears.*

In Training

Conducted By Jonathan Towle,* WB1DNL

INCENTIVE TO UPGRADE: NOVICE TO GENERAL

Every year, more and more people become radio amateurs. Recent statistics from the FCC indicate that during fiscal 1983, 18,744 Novice licenses were issued. This is a sizable number. But what happens to those Novices? The same statistics also show that 9129 Novices were lost during the same period. What then can we do to reduce the number of people that drop out of Amateur Radio?

There are several ways to get started in Amateur Radio — through a local instructor, a local club, a continuing-education program or self-study. All are effective methods when used with training materials that stress fundamentals and develop them into useful conclusions that can be used to solve real problems.

Whatever route a person decides to follow will determine how they will react to Amateur Radio in the future. If the method provides the incentive necessary to keep a person interested in Amateur Radio, then perhaps the dropout rate will decline.

The most popular incentives are the new privileges that come with an upgraded ticket. And the most popular ticket is the General class. Just as the Novice license provides the foundation for the General license, the General builds a structure from basic radio theory for those amateurs who will go on to more specialized forms of communications. The General class license requires code proficiency of 13 WPM and a general knowledge of rules, regulations, theory and operating practices.

Thirteen words per minutes doesn't sound too fast at home when you are relaxed, but may sound like 100 WPM when you hear it on exam day. We suggest you work your code speed up to about 15 to 18 WPM. While working on the code, you should spend some time sending, too. Don't move up to a keyer until you are comfortable sending with a straight key. You can improve your rhythm by sending series of dits or dahs, alternating dits and dahs and individual characters.

Practice sessions listening to code tapes or W1AW transmissions are a proven way of increasing code speed. Instructors should set goals for students, keeping in mind that there is a common learning plateau around 19 WPM. This need not be a problem if the instructor foresees the plateau and helps the student with additional code practice. It is sometimes helpful to send the characters faster than they would normally be sent and then lengthen the spaces to slow down to the desired speed. Instructors should not send characters too fast when starting with this technique. It takes time to learn to recognize the sound of a character.

Code practice should include both straight and random text — straight text because that's what you will hear when you take the exam, and random text to help you to break the habit of anticipating the next character. If you find you are making mistakes when you copy straight text, try closing your eyes and concentrating on the sound of the characters. Unless you have a fantastic memory, you should also practice writing down the characters as you copy. We encourage short practice sessions — 20 to 30 minutes — as frequently as is practical. A study marathon just before the test won't be of much help.

The FCC recently released PR Bulletin 1035B, which contains 500 General class questions. These questions can be used along with the Element 3 syllabus as a study guide. Don't try to memorize the answers. Do look at each question and make sure you understand what they mean. Use your study time to find the correct answers to the problems you are having trouble with, or discuss the problems in class. Learn the formulas that will be used on the exam and solve some sample problems. The PR Bulletin is subject to change, so again, don't rely on memorization.

When you go the examination, try to relax and enjoy the experience. You'll get a little nervous — everyone does. Don't get so upset, however, that you can't think straight. Make sure you are well-rested and that you get to the exam with some time to spare.

Take your time with the written portion of the test. You don't have to be the first one in the room to finish. Read the questions carefully before you attempt to answer. Sometimes it's a good idea to read all the questions on the exam before you start to answer any of them. Do the questions you know first. If you get stuck on one, skip it and go to the next. If the question involves a complex calculation you may want to skip it, also. After going through the exam once, go back to the questions you skipped. If they still seem impossible, take a look at the answers. Sometimes you can find the correct answer by eliminating all the wrong answers. If all else fails, guess. That's right, guess. If you don't answer the question it is definitely wrong, but if you guess right, you'll get credit.

Many people have trouble remembering equations. When you get your exam papers, write down all the formulas you think you may need — Ohm's Law, the power law, resistor and capacitor equations, reactance, impedance, etc. These are all simple, but may get "lost in the noise" if you wait until you need them.

The ARRL offers training materials to both individual students and instructors. The *Radio Amateur's License Manual* is the main text for anyone preparing for the Technician/General examination. *The FCC Rule Book* provides an in-depth discussion of Part 97. For a general reference book, we suggest *The Radio Amateur's Handbook*. For the 13-WPM code test, the League offers the *ARRL Code Kit*. This package contains two cassette tapes that take the student from 5 to 15 WPM. W1AW code practice at 13 and 15 WPM and the code bulletins at 18 WPM are also good ways to improve your copy.

Let's see if we can reduce the number of people that lose interest in Amateur Radio. If you have suggestions for helping others to upgrade that you would like to share, please drop a note to the Training Branch. We're always eager for new ideas.

*ARRL Training Program Manager

Special Events

Conducted by Edith Holsopple*, KA1KRQ

Vernon, British Columbia: North Okanagan RAC will operate 2100Z to 2400Z daily *Feb. 1 to Feb. 12* during the winter carnival. Look for operation in the general portion of the bands about 50 kHz up from lower band edge. A certificate is available for contacts with three Vernon-area stations or one contact with club station VE7NOR. Awards via NORAC, P.O. Box 1706, Vernon, BC V1T 8C3.

Monterey, California: The Naval Postgraduate School ARC will operate K6LY/6, from 1600Z until 0100Z daily from *Feb. 2 to Feb. 5* from the Pebble Beach Golf Course during the Bing Crosby Golf Tournament. Frequencies: phone - 7.250 14.300 21.400; CW 7.050 14.050 21.050. Special QSL card available via Don Inbody, AD6K, 1147 Leahy, Monterey, CA 93940.

Houghton, Michigan: Michigan Technological University ARC and the Copper Country RAA will operate from 0000Z *Feb. 2* through 2400Z *Feb. 8* during the winter carnival. Frequencies: RTTY-3.630 7.090 14.095; CW-3.705 7.085 14.085 21.085 28.185; phone-3.930 7.285 14.305 21.385 28.685. A certificate is available for one QSO with any participating station in the Copper Country. Send data to: Howard Junkin, N8FHF, 106 W. South Ave., Houghton, MI 49931.

Benicia, California: Benicia ARC will operate KE6IA and N6HOA from 1800Z *Feb. 11* to 0100Z *Feb. 12* from the oldest capital building in California to commemorate the 3rd capital during California's 101st anniversary. Operation will be in the General phone portion of 40 and 20 meters. Send QSL for special certificate to Robert R. Toomas, N6HOA, 233 Baker St., Benicia, CA 94510.

Valentine, Indiana: Fort Wayne RC will operate "The Valentine Station," W9TE, on *Feb. 12*. Phone frequencies 7.280 14.285 21.385. Certificate via P.O. Box 15127, Fort Wayne, IN 46885.

Utica, New York: The Utica ARC will operate K2IQ from 1700Z *Feb. 11* until 2200Z *Feb. 12* to commemorate its 50th anniversary. Phone frequencies will be 25 kHz down from the upper edge of the General class phone bands on 40, 20 and 15 meters. There will also be operation on CW for Novices on 7.125. Certificate for QSL and QSO data to: K2IQ, P.O. Box 71, Utica, NY 13503.

Beaverton, Oregon: Oregon Tualatin Valley will operate KA7HJT, K7RXV and K7JF from 1700Z *Feb. 12* until 0300Z *Feb. 13* to celebrate Valentine's Day and Oregon's 125th anniversary of statehood. Phone frequencies will be: 14.280 21.360 28.510. Certificate for QSL to *Callbook* address of station worked.

Hialeah, Florida: The America RC will sponsor its second International DX Contest from 0500Z *Feb. 18* until 0500Z *Feb. 20* on both CW and phone on 10, 15, 20 and 40 meters. Work three Radio Club DX members to earn the Silver QSL Award. Send QSL and QSO data to: America RC QSO Contest, P.O. Box 3576, Hialeah, FL 33013.

Iowa City, Iowa: The University of Iowa ARC will operate club station, WØIO, from 1800Z *Feb. 25* until 0100Z *Feb. 26* to commemorate the founding of The University of Iowa. Phone frequencies will be: 7.245 14.270 21.370. A certificate is available for a QSL and QSO data to: Bill Bishop, NØEBA, 704 Slater, Iowa City, IA 52242.

Cuba, New York: Allegany Highlands ARC will operate WB2TBT from the Hiawatha Boy Scout District Ice Camp on the ice of Cuba Lake from 1300Z *Feb. 25* to 1700Z *Feb. 26*. Frequencies: CW-7.125 14.060 21.060; phone-lower 25 kHz of the General class phone bands on 80, 40, 20 and 15 meters. Certificates for QSL to WB2TBT, 7 Grace St., Cuba, NY 14727.

Note: The deadline for *receipt* of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by March 15 to make the May issue. For the convenience of those wishing to operate, please be sure that the *name* of the sponsoring organization, the *location, dates, times, frequencies* and *call signs* of the special events station are included.

*Communications Assistant, ARRL

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Moved and Seconded . . .

MINUTES OF CRRL BOARD MEETING No. 6, 1983 NOVEMBER 20

1) Pursuant to due notice, the Board of Directors of the Canadian Radio Relay League, Inc., met by conference telephone call at 1303 EST on 1983 November 20. Present were President Tom Atkins, VE3CDM, in the chair; Vice President and Secretary Harry MacLean, VE3GRO; and Directors William Kremer, VE7CSD, George Spencer, VE6AW, Raymond Perrin, VE3FN, Albert Daemen, VE2IJ, and Andy McLellan, VE1ASJ. Also present but without vote were Counsel Robert Benson, Q.C., VE2VW, Honorary Vice President Noel Eaton, VE3CJ, and ARRL President Victor Clark, W4KFC.

2) President Atkins welcomed everyone to the meeting and called for a moment of silence in memory of those amateurs who had passed away.

3) It was agreed to follow the agenda that had been mailed. On motion of Mr. Perrin, seconded by Mr. Daemen, the Board VOTED to adopt the minutes published for CRRL Board Meeting No. 5.

4) President Atkins reported on his participation in the IARU Region 2 Conference held in Cali, Colombia, in June. Vice President MacLean reported on the status of the CRRL Headquarters office in London, Ontario, and on recent work with DOC concerning TRC-24 and the DOC examination questions bank. Each director then reported on his activities: travel, visits to clubs and new projects.

5) Counsel Benson reported on ongoing efforts to obtain a second-class permit to facilitate mailing *QST* from Canada. Canada Post had denied the original application and a subsequent appeal on the grounds that *QST* was deficient in "scientific content." Counsel Benson reported that there would soon be a decision on the CARL trademark problem. CARF, the Canadian Amateur Radio Federation, had registered the trademark, which stands for "Canadian Amateur Radio League" and a diamond logo that was similar to the logo used by CRRL. Finally, he reported on legal assistance given to amateurs in Vancouver, Saskatoon and Côte St-Luc. All cases seemed to be proceeding satisfactorily.

6) The Board discussed the CRRL "Five-Year Plan." Some of its provisions were already in effect. The term "Canadian Division" was being eliminated in *QST* and other League publications in favour of "CRRL" or "Canada." Section Manager elections were being conducted wholly in Canada. In the coming year, CRRL would develop an affiliated-club program. Provisions would be made in the 1984 CRRL budget for one full-time employee (or equivalent in part-time employees) and rental of office and storage space. The ARRL Constitution would be amended so the CRRL President automatically became the ARRL Canadian Director (at present the reverse is true) and election for this office would be conducted wholly in Canada. Additional changes in coming years would bring record keeping and accounting functions to Canada. CRRL members would always receive *QST*, and through CRRL continue to support and have access to many ARRL services. On motion of Mr. Kremer, seconded by Mr. McLellan, the Board VOTED to adopt the "Five-Year Plan."

7) The Board then discussed the QSL bureau system. Many amateurs remain unaware that the incoming QSL bureaus in the provinces and territories are part of a Canadian League system. On motion of Mr. Perrin, seconded by Mr. Daemen, the Board VOTED that the official names for incoming QSL bureaus in Canada become the "CRRL (insert appropriate call-sign prefix) Incoming QSL Bureau," and that arrangements be made with the ARRL Membership Services Department to have expense accounts for all such bureaus handled through CRRL.

8) The Board then discussed a request from CANAD-X, the Canadian DX Association, to have CRRL assume sponsorship of its annual Can-Am Contest. CRRL sponsorship would give the contest more visibility and ensure greater participation. CANAD-X would do the administrative work for CRRL. On motion of Mr. Spencer, seconded by Mr. Daemen, the Board VOTED to sponsor the contest which would henceforth be called the CRRL Can-Am Contest.

9) The Board then discussed numerous requests from Canadian amateurs to reinstate RTTY privileges on at least part of the 7.05-7.1 MHz portion of the 40-metre band, and also to permit operation other than A3 or F3 on the new 902-928 MHz band. On motion of Mr. MacLean, seconded by Mr. Perrin, the Board VOTED to honour these requests and instructed the secretary to prepare submissions to DOC on these matters.

10) During the course of the meeting, the Board also discussed the following, with no formal action being taken at the time:

a) alternatives to obtaining a second-class mailing permit for *QST*;

b) the CRRL News Service: the time and expense involved is definitely justified;

c) CRRL budgets: 1984 would be another year for constraint;

d) possibility of establishing a CRRL Foundation to promote CRRL objectives along educational and humanitarian lines;

e) revised training materials to conform with DOC's new TRC-24: these would be available early in 1984; French versions were possible;

f) the CRRL Volunteer Counsel Program;

g) the National ARES Program: this program is well under way under the leadership of Jack Strangleman, VE3GV; it deserves every support;

h) section status of amateurs in VY1 and VE8;

i) continuing work with CCTA, the Canadian Cable Television Association: Mr. Perrin acknowledged the interest and co-operation shown by CARF Director Leigh Hawkes, VE1ZN, in this work;

j) a possible response to U.S. phone band expansion on 10, 15 and 80 metres: Canadian amateurs are concerned; those who have contacted CRRL favour Canadian expansion, particularly on 80 metres;

k) plans for the Pope's visit to Canada: Mr. Daemen had obtained a special call sign for the event; plans were underway to have the Pope communicate via Amateur Radio; there was a possibility of a postage stamp linking the Pope's visit and Amateur Radio; and

l) plans to hold a CRRL National Convention in conjunction with an annual Radio Society of Ontario Convention in London, Ontario, on 1985 September 27-29: all indications were that it *would* happen.

11) Finally, on motion of Mr. Perrin, seconded by Mr. Spencer, the Board VOTED to endorse all actions taken by the CRRL Executive Committee since the last Board meeting. There being no further business, the Board adjourned at 1557 EST. Total time of meeting: 2 hours, 54 minutes.

Respectfully submitted,
H. J. MacLean, VE3GRO
Secretary

SECTION MANAGER ELECTION NOTICE

To all CRRL members in the Manitoba Section: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. The name of the incumbent is listed on page 8 of this *QST*. A petition, to be valid, must contain the signatures of five or more full League members residing in the Manitoba Section. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on the petition*. It is advisable to have more than five signatures.

Petition forms (CD-129-C) are available from the CRRL Headquarters office, but are not required. The following form is suggested:

(place and date)

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

We, the undersigned full members of the League residing in the Manitoba Section hereby nominate . . . as Section Manager for this section for the next two-year term of office. (Signatures . . . Calls . . . Addresses, including postal codes.)

The Section Manager candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur holding a Canadian Amateur certificate immediately prior to the receipt of petition at the CRRL Headquarters office.

Petitions must be received at the CRRL Headquarters office on or before 5:30 P.M., Eastern Local Time, March 9, 1984. If more than one valid petition is received, a balloted election will take place. Ballots will be mailed from the CRRL Headquarters office on or before April 2, 1984. Returns will be counted on May 22, 1984. A Section Manager elected as a result of this procedure will take offlce on July 1, 1984, and serve for two years.

If only one valid petition is received, the person nominated will be declared elected without opposition.

If no petitions are received by the specified closing date, the Manitoba Section will be resolicited in July 1984 *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 the advice of the CRRL Board.

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

Harry MacLean, VE3GRO
CRRL Secretary

SECTION MANAGER ELECTION RESULTS

The following was nominated and elected without ballot for a two-year term of office beginning on 1984 April 01: Maritimes-Newfoundland Section — Donald Welling, VE1WF.

NOTES FROM ALL OVER

☐ Mac English, VE4TB, of Neepawa, Manitoba, was recently honoured with a League Certificate of Merit. Mac helped found the Manitoba Evening Phone Net 35 years ago and has been serving others through the net ever since.

☐ Maritime-Newfoundland Section Manager Don Welling, VE1WF, represented CRRL at the CARF Symposium held in Halifax on October 15. Areas of discussion included Amateur Exams and Recruitment, Spectrum Planning and Management, Interference and Regs, and Emergency Communication. Among the recommendations: delay implementation of the revised, new TRC-24 until June to accommodate Amateur Radio courses now in progress; no-code licence for Canada beyond the present Digital Amateur licence; no new blocks of letters for Canadian call signs; and elimination of phone subbands for Canadian amateurs. This would allow Canadian amateurs to operate phone anywhere on HF bands, governed only by "gentlemen's agreement." (In the January 1983 CRRL Survey, 67% of those who responded opposed such a move, 14% supported it and 19% were not sure.) Early returns from a CRRL mailing to Canadian clubs indicate this is not a popular option as a response to impending U.S. phone-band expansion on 10, 15 and 80 metres.

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

[Attention 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 (Jensen Beach) — Feb. 25: The Martin County ARA has scheduled its annual free outdoor hamfest and swapmeet for Sat., Feb. 25, from 8 A.M. to 4 P.M., at Langford Park, Rte. 707. Swap table and tailgate space. Bring your own table. Playground for the kids, food, drink and desserts available throughout the day. Further information from MCARA, P.O. Box 1091, Stuart, FL 33495. Talk-in on 146.46/7.06.

†**Florida (Fort Myers) — March 3:** The City of Palms Hamfest, sponsored by the Fort Myers ARC, Inc., will be held at the Riverfront Ramada Inn, 2220 West First St., Sat., March 3, from 8 A.M. to 6 P.M. Admission is $3. New equipment dealers, swap shops, forums, contests. Talk-in on 28/88. Further information from David Fox, KA8CXQ, P.O. Box 1131, Tice, FL 33905, tel. 813-656-0856.

†**Iowa (Davenport) — Feb. 26:** The Davenport RAC, Inc. will hold its 13th annual hamfest on Sun., Feb. 26, from 8 A.M. to 4 P.M., at the Davenport Masonic Temple, Hwy. 61, Brady St. and 7th St. Advance tickets are $2, at the door $3. Table rental is $7 each; $2 additional charge for electrical hook-up. Talk-in on 28/88. Table reservations and advance tickets available from: Dave Johannsen, WBØFBP, 2131 Myrtle St., Davenport, IA 52804, tel. 319-323-4204.

Indiana (LaPorte) — Feb. 26: The LaPorte ARC, Inc. will hold its Winter Hamfest on Sun., Feb. 26, at the Civic Auditorium, beginning at 7 A.M. Chicago time. Admission is $2.50 and there are 180 tables, 8 feet long, available by reservation for $2 each. S.a.s.e. for tables, tickets or info to LPARC, P.O. Box 30, LaPorte, IN 46350. Talk-in on 52 simplex. Attention sellers: We hire strong young backs to move you in fast and easy. Bring everything! LaPorte is 45 miles SE of Chicago on I-80.

Kentucky (Flatwoods) — Feb. 11: River Cities ARA of Ashland will hold its annual HAMORAMA at the VFW Lodge in Flatwoods, Sat., Feb. 11, 8 A.M. to 5 P.M. Admission $1, table rental available. Talk-in on 34/94 and 52 simplex. Directions: U.S. 23 North of Ashland to KY 207, on left at first traffic light. Snack bar, refreshments, plenty of parking. For info, write RCARA, P.O. Box 612, Ashland, KY 41101, tel. 606-836-4116.

Kentucky (Glasgow) — Feb. 25: The annual Glasgow Swapfest will be held on Sat., Feb. 25 from 8 A.M. (Central time) until everyone leaves. This popular event takes place at the Glasgow Flea Market Bldg., 2 miles south of Glasgow off Hwy. 31E. Large heated building with free parking. No meetings or forums. Large flea market. Admission is $2 per person and no extra charge for exhibitors. One free table per exhibitor with extra tables available at $3 each. Talk-in on 34/94 or 63/03. Additional information from WA4JZO, 121 Adairland Ct., Glasgow, KY 42141.

†**Louisiana (Lafayette) — March 10-11:** Acadiana Hamfest '84, sponsored by the Acadiana ARA, Inc., will be held on Sat., March 10 from 9 A.M. to 5 P.M. and Sun., March 11 from 9 A.M. to 1:30 P.M. Headquarters: Holidome, Lafayette. Admission is $2, children under 12 free. Forums, flea market, commercial dealers, ladies' activities and tour of Acadiana, recreational activities. Talk-in on 82/22. For information, contact Dave Pierce, Rte. 2, Box 625, Sunset, LA 70584. For reservations, call the Holidome, tel. 318-237-5113.

Louisiana (Ruston) — Feb. 19: The Ruston ARC will hold its annual Hamfest-Swap and Shop, Sun. Feb. 19, 9 A.M. to 2 P.M., in the Ruston Civic Center. Refreshments available, courtesy of University Ham Club. Free parking, free admission and free tables — first-come, first-served. Dealers may reserve tables by calling K5LVZ, tel. 318-255-7835. Talk-in on 72/12.

Massachusetts (Norwood) — Feb. 25: The Norwood ARC will hold its annual flea market, Sat., Feb. 25, at a new location, Norwood Jr. High South, Washington St. Plenty of free parking as well as facilities for the handicapped. Dealer tables $8 before Feb. 20, $10 thereafter. Admission $1. For further information or to reserve a table contact: Ed Lajoie, K1CB, 20 Hemlock St., Norwood, MA 02062, or call 617-762-5184.

†**Michigan (Livonia) — March 4:** The Livonia ARC presents its 14th Annual Swap 'n Shop on Sun., March 4, from 8 A.M. to 4 P.M., at Churchill High School. Plenty of tables, refreshments and free parking. Talk-in on 144.75/5.35 and 52. Reserved table space of 12-foot minimum available. For further information, send s.a.s.e. (4×9) to Nell Coffin, WA8GWL, c/o Livonia ARC, P.O. Box 2111, Livonia, MI 48151.

†**Minnesota (Robbinsdale) — Feb. 25:** The Robbinsdale ARC will sponsor "Mid-winter Madness" at the Totino-Grace High School on Feb. 25, from 9 A.M. to 3 P.M. Admission is $3 in advance, $4 at the door. Programs, seminars, DX forum, movies. Floor space for commercial vendors and flea market has been tripled. This event will be attended by most major computer and amateur retailers in upper midwest. Talk-in on 147.60/00 and 147.99/39. Information from Bob Zeidlik, WAØSUA, 5933 Decauter Ave. N., Minneapolis, MN 55428, tel. 612-533-7354.

†**Missouri (Kansas City) — Feb. 19:** The Mid-America F.M. Assn. hamfest will be held at the Missouri National Guard Armory Feb. 19. No admission charge. For further information, contact Bob Atkeisson, WØAT, 403 Palomino Circle, Raymore, MO 64083, tel. 816-331-6033.

New Jersey (Morris Plains) — March 2: The Splitrock ARA will hold its annual auction on Friday, March 2, at the VFW Post, located on Mt. Tabor Rd., Rte. 53, between the Morris Plains train station and Warner-Lambert. Doors open at 7 P.M. and auction begins at 8 P.M. Talk-in on 385/985 and 52.

†**New York (Melville) — Feb. 19:** "LIMARC Indoor Hamfair '84," sponsored by the Long Island Mobile ARC, will be held on Feb. 19, at the Electrician's Hall, 41 Pinelawn Rd., from 9 A.M. to 4 P.M. Table reservations are $10 each, payable in advance, to Bob Reed, WB2DIN, 2980 Valentine Pl., Wantagh, NY 11793. Buyers' admission is $3. Food and refreshments available. Talk-in on 25/85 and 52 simplex. For additional information, contact Al Flapan, WA2FBQ, at 516-796-2965 or Hank Wener, WB1ALW, at 516-484-4322.

New York (Horseheads) — Feb. 25: The Rookies Mid-Winter Hamfest will be held on Feb. 25 from 9 A.M. to 5 P.M. at the N.Y.S. Armory. Food service available. Talk-in on 147.36.

†**North Carolina (Elkin) — Feb. 19:** Elkin Winter Hamfest, sponsored by the Briarpatch ARC and Foothills ARC, will be held at the Elkin National Guard Armory on Feb. 19, from 8 A.M. to 4 P.M. Admission is $3. Lunch will be served on site. Talk-in on 69/09 and 144.77/145.37. Further information from Tommy Lineberry, WD4BTF, 516 Fries Rd., Galax, VA 24333, tel. (VA) 703-236-8424, and George Reeves, WD4BMG, Rte. 6, Box 412, N. Wilkesboro, NC 28659, tel. (NC) 919-670-2803.

†**Ohio (Mansfield) — Feb. 12:** The Intercity ARC and Mansfield ASER, Inc., will sponsor a hamfest at Fairhaven Hall, Richland Co. Fairgrounds, Sun., Feb. 12, 8 A.M. to 5 P.M. Auction and flea market in large, modern, heated buildings. Tickets $2 in advance and $3 at the door. Tables $5 in advance and $6 at the door. Half tables available. Talk-in on 34/94. For additional information or advanced tickets/tables, send s.a.s.e. to Dean Wrasse, KB8MG, 1094 Beal Rd., Mansfield, OH 44905 or tel. 419-589-2415.

†**Ohio (Akron) — Feb. 26:** The Cuyahoga Falls ARC 30th annual Electronic Equipment Auction and Hamfest will be held on Sun., Feb. 26, at North High School, from 8 A.M. to 4 P.M. Tickets are $2.50 in advance, $3 at the door. Sellers may bring your own tables, or some available for $2. Advanced table reservations advised. S.a.s.e. for orders and reservations, please. Plenty of room for buyers and sellers — over 32,000 sq. ft. Easy access from Tallmadge Ave. off ramp of North Expressway (Rte. 8). Talk-in on 87/27. Details from CFARC, P.O. Box 6, Cuyahoga Falls, OH 44222 or tel. 216-923-3830 (K8JSL). Table reservations may be made by phone and will be held until 9 A.M.

Pennsylvania (Lancaster) — Feb. 19: The 1984 Lancaster Hamfest, sponsored by SERCOM, Inc. and the Red Rose Repeater Assn., will be held Sun., Feb. 19, at the Guernsey Sales Pavillion at U.S. Rte. 30 and U.S. Rte. 896, from 8 A.M. to 4 P.M. Dealer setup at 6 A.M. Table fees (includes table): commercial (main hall) $15; noncommercial (rear annex) $6. General admission $3 for all hams and dealer personnel. Tailgating free with general admission, if weather permits. Talk-in on 146.61 and 147.015. Send reservations to Hamfest Committee, P.O. Box 6082, Lancaster, PA 17603. Please make checks payable to SERCOM, Inc.

†**Virginia (Vienna) — Feb. 26:** The Vienna Wireless Society, Inc. "Winterfest," will be held at the Vienna Community Center on Sun., Feb. 26. Admission is $4. For further information, contact Earl B. Hohbein, 4602 Lawn Ct., Fairfax, VA 22032, tel. 703-425-7660.

†**West Virginia (Fayetteville) — Feb. 26:** The Plateau ARA 6th Annual Hamfest will be held at the Fayetteville High School, Sun., Feb. 26, beginning at 9 A.M. Admission is $3, children under 12 free. Flea market, exhibitors, tailgaters, hot food and drinks. Talk-in on 146.79 and 52 simplex. Further information from John Witt, W8OQC, 135 Daniels St., Fayetteville, WV 25840, tel. 304-574-0532 or 574-1176.

Wisconsin (Minong) — Feb. 19: The Wild Rivers ARC will hold their midwinter swapfest at the Minong Village Hall on Sun., Feb. 19, from 10 A.M. to 3 P.M. Admission $3; tables $1. Talk-in on 21/81 and 52. For more information, contact Bob Paulik, K9HPR, P.O. Box 68, Cable, WI 54821.

Wisconsin (Milwaukee) — March 3: The Milwaukee School of Engineering ARC (W9HHX), will sponsor a hamfest on Sat., March 3, at the MSOE in the Roy W. Johnson building cafeteria. It is located on the southwest corner of the intersection of N. Milwaukee St. and E. Juneau Ave. (downtown Milwaukee). Starting time is 8 A.M. (snow or shine) and admission is $2 at the door. No advance tickets. Tables are $3 each, first come-first served. Talk-in on 19/79. For more information call 414-277-7251.

†ARRL Hamfest

*Convention/Travel Coordinator, ARRL

Notes

QST will list your hamfest in its monthly Hamfest Calendar, free of charge. There are certain guidelines, however.

Hamfests will be listed only once. If the event

will occur before the 10th of the month, it will be listed in the previous month's *QST*. If it will occur on or after the 10th, it will be listed in that month's *QST*. The deadline for receipt at ARRL hq. of hamfest information is the 15th of the second month preceding publication.

In other words, if your hamfest will occur on May 5, the information must be in our hands by February 15 (preferably sooner) to make the deadline for the April issue. If your event will occur on May 12, it should get to Hq. by March 15 for the May issue.

We will acknowledge all information received at Hq. for the Hamfest Calendar with a postcard stating the date of publication. If you do not receive an acknowledgment within two weeks, your letter may never have arrived at Hq., so send us a duplicate copy.

Oh, yes. The Hamfest Calendar is separate from the hamfest section of the Ham Ads. See the first page of the Ham Ads section in this issue for more information. — *Marge Tenney, WB1FSN*

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.

Coming Conventions

February 25-26, 1984
Ohio State, Sharonville (Cincinnati)
March 10-11, 1984
Florida State, Orlando
March 17-18, 1984
North Carolina State, Charlotte
March 30-April 1
Midwest Division, Kearney, Nebraska
April 14-15
Mississippi State, Jackson

ARRL NATIONAL CONVENTIONS
July 20-22, 1984
New York, New York
October 4-6, 1985
Louisville, Kentucky
September 5-7, 1986
San Diego, California

OHIO STATE CONVENTION
February 25-26, Sharonville (Cincinnati)

There is no better cure for cabin fever than the 4th Annual Ohio State Convention, Cincinnati ARRL '84. Two days of forums, meetings, vendor exhibits, women's program, flea market — indoors at Great Oaks Career Development Campus, 3254 E. Kemper Rd., Sharonville (Cincinnati). Hospitality suite Friday and Saturday nights. Wouff Hong, banquet Saturday night. Banquet speaker: Bruce Humphrys, KØHR, Director, Handi-Ham System. ARRL Vice President Larry Price, W4RA, will head the League contingent. Forums: 10-10 International, VHF/UHF and Baluns, Computers in the Shack, Soldering Techniques, Cellular Systems, ARRL, QRP, Volunteer Examiner Program, Modifying Gear for the Handicapped, Public Service, Tower Legality. FCC examinations given if Volunteer Examiner Program is operational. The $5 admission includes convention awards. The $13.50 banquet fee includes banquet awards. *Make banquet reservations by February 18.* Flea market spaces (ham and electronics items only): $4 each, two days. Bring your own tables. Women's program: Instructions/demonstrations on quilting, cake decorating, caligraphy, more. Talk-in: 146.07/67, 146.16/76, 146.28/88, 222.46/4.06. For information/reservations: Cincinnati ARRL '84, P.O. Box 11300, Cincinnati, OH 45211. Vendor inquiries to: John Haungs, WA8STX, 10615 Thornview Dr., Cincinnati, OH 45241, tel. 513-825-8234. Accompanied children under 12 free. Doors open 9 a.m. daily.

Strays

HAM EXHIBITS IN ENGLAND

☐ Planning to visit London? If so, be sure to include the Science Museum in Kensington in your itinerary. You'll find among the exhibits early wireless equipment used by Marconi, wartime service gear and demonstration station GB2SM. Also, moored close to the Tower of London is the *HMS Belfast*, now a floating museum housing Royal Navy ARS station G4HMS. — *F. Allan Herridge, G3IDG, Hampshire, England*

I would like to get in touch with...

☐ anyone with information on Masonic hams' contributions to Amateur Radio. Michael Preissman, KC2UD, 901 Newark Ave., Mays Landing, NJ 08330.

☐ anyone who attended ARM school at North Island or Memphis in early 1943, or served with Fleet Air Wing Ten or any of its Black Cat squadrons in 1944. Bill Gibson, 4699 Hubbard Creek Rd., Umpqua, OR 97486.

QST congratulates...

☐ Jon Whitney, WA2YRO, of Schenectady, New York, on being named Teacher of the Year by the South Colonie School District.

☐ Albert L. Russell, W8SO, of Ann Arbor, Michigan, on receiving the Distinguished Service Award of the American Association of Public Health Dentists.

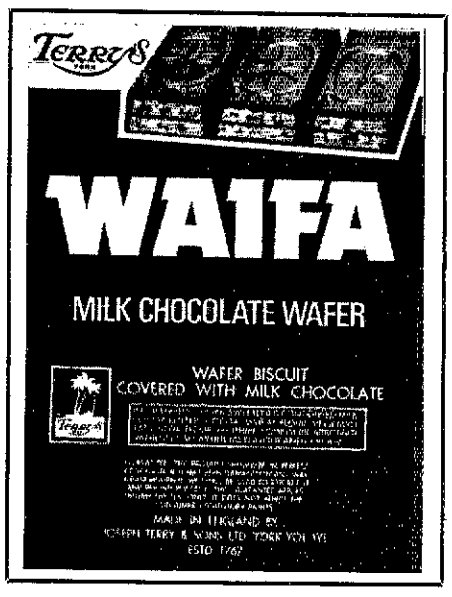
☐ James Slattery, W9DRL, of Glenview, Illinois, on receiving the George Heller Memorial Gold Card from the American Federation of Television and Radio Artists for distinguished service to AFTRA and its members.

☐ Roy D. Rosner, K4YV, of Reston, Virginia, on being named Vice President for Telecommunications Systems and Architecture at GTE Telenet Communications Corp.

☐ AA4FG, of New Port Richey, Florida, on having the Fred K. Marchman Vocational Center in West Pasco named in his honor.

☐ George M. Winford, KL7VZ, of Fairbanks, Alaska, on being named Distinguished Magazine Advisor for four-year institutions by College Media Advisors.

☐ Joseph Zelle, W8FAZ, of Cleveland, Ohio, on receiving a citation for outstanding service in religious broadcasting from National Religious Broadcasters.



While in England recently, Allen Schmidt, WBØPBN, of Edina, Minnesota, was delighted to find that the English are so excited about ham radio they are issuing U.S. 2 × 2 call signs on their candy wrappers. Looks like WBØPBN has a good jump on his "worked all candy bars" award!

Hams in Upper Saddle River, New Jersey, needn't worry about Amateur Radio going unnoticed in their town. They keep electing hams as mayor! Outgoing Mayor Orlando "Dit" Panfile, K2BZZ (right), passed the "handheld baton" to Merle Worster, W2HTW, who became mayor on January 1. *(W2SEN photo)*

Correspondence

Conducted By Peter R. O'Dell,* KB1N

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

VICTOR C. CLARK, W4KFC

[Almost immediately after word came of the sudden death of ARRL President Vic Clark on November 25, cables and letters began pouring in to ARRL/ IARU Hq. in Newington. The condolence letters that follow are but a representative sample of those we received. — Ed.]

☐ Have just heard the very sad news about Vic Clark which must have come as a shock to you all. Please convey our sincere condolences to Vic's wife and family.

It was evident, even after a few months as President, that Vic Clark was going to make an impact on Amateur Radio, both in the USA and on the international scene. He will be remembered for many fine achievements and the moving words of his editorial, "Team Spirit." Vic's loss to your organisation and to the world of Amateur Radio will create a vacuum which will be difficult to fill. In some small way the Society hopes that its donation to the ARRL Foundation will preserve the memory of Vic Clark and the ideals in Amateur Radio for which he stood. — *David A. Evans, G3OUF, General Manager, Radio Society of Great Britain*

☐ Stunned to hear of sudden death of President Vic Clark. On behalf of all of us from Region 3 Assn., wish to express condolences to all members of ARRL. — *David Rankin, 9V1RH, Chairman, IARU Region 3 Assn.*

☐ Please accept the sincere condolences of everyone in Region 1 on the death of Vic Clark. He was much respected and loved, and will be missed by us all. — *C. Eric Godsmark, G5CO, Secretary, Region 1, IARU*

☐ It is a great regret to learn of the sudden death of your President, Victor C. Clark, W4KFC, because I clearly remember him being full of life. His passing is indeed a great personal loss not only for ARRL but also for all the Amateur Radio community in the world. On behalf of the IARU Region 3 Assn., I offer my sincere sympathy to ARRL and his family. — *Masayoshi Fujioka, JM1UXU, Secretary, IARU Region 3 Assn.*

☐ It is a great regret to learn of the sudden death of your President, Victor C. Clark, W4KFC, because his remarkable activity as chairman at the WARIC in Tokyo last September is so vivid in our memories. His passing is also a great loss for all amateur fraternity in the world. On behalf of JARL, I express my sincere sympathy to ARRL and his family. — *Shozo Hara, JA1AN, President, JARL*

☐ Amateur Radio throughout the world has suffered a great loss by the death of Vic Clark, W4KFC. It was our privilege to be associated with Vic in the international field over a number of years. Our deepest sympathy at this tragic loss. — *Michael Owen, VK3KI and David Wardlaw, VK3ADW, IARU Liaison Officers, Wireless Institute of Australia*

☐ To the sudden death of ARRL President Victor C. Clark I express for myself and the DARC my sincere sympathy. In the last years I had the privilege to become a close friend to Vic and therefore I can understand the terrible blow that ARRL has to bear. Please pass my sympathy to Vic's family. — *Phillip Lessig, DK3LP, President, Deutscher Amateur Radio Club*

☐ Most distressed to learn of the passing of Victor Clark, W4KFC, President to the ARRL. Please convey condolences to his family and radio amateur friends from South African amateurs. — *U. W. Dehning, ZS1UD, President, South African Radio League*

☐ On behalf of the Board of Directors of the Radio Club de Chile and myself, we wish to express our deepest sympathy in relation to the unexpected death of President Victor Clark, W4KFC. Vic was not only a very good friend, but also an extraordinary amateur and hard-working leader. His death is a great loss to the world amateur fraternity. — *Rogelio Gomez Fernandez, President, Radio Club de Chile*

☐ On behalf of Region 2, with which he had such a long and fruitful relationship, and on behalf of my family and myself, please convey to the family of our esteemed friend Vic Clark, as well as to all ARRL Directors and Officers, our deepest expressions of sympathy at such an unexpected and irreparable loss. Together with so many throughout the Americas, we regret with great sorrow that Vic is no more among us. — *Pedro Seidemann, YV5BPG, President, IARU Region 2*

☐ Sorry to hear news of passing of W4KFC. Please extend our condolences to the family. — *Don MacKay, ZL3RW, President, NZART*

☐ All of us here at Yaesu Musen Co. would like to extend our deepest sympathy on the death of your President, Mr. Victor C. Clark. He was a gentleman in the truest sense of the word and I doubt if there are many men who possess his vitality, intelligence and high regard for others in such great quantities. We shall sincerely miss him. — *S. Hasegawa, President, Yaesu Musen, Tokyo, Japan*

☐ Hamdom lost a talented and able leader with the passing of Vic Clark, W4KFC. To those of us who met him briefly on the air, his crisp CW was music to our ears. — *Lester D. Timmerman, W8TKW*

☐ I was saddened to learn of the passing of ARRL President Vic Clark. Amateur Radio operators and the Commission have suffered a great loss. It was my pleasure to have known and worked with Vic. His vast knowledge and untiring dedication to Amateur Radio will be sorely missed. His contributions as an Amateur Radio operator and as an official of the League set high standards for which all amateur operators can be justly proud. I will miss his personal advice, which I held in great esteem. His accomplishments will continue to serve the amateur community for many years to come. — *Robert S. Foosaner, Chief, Private Radio Bureau, FCC*

☐ I would like, on behalf of the Officers and Directors of our Federation, to express our deep regret at the death of Vic Clark, late President of the American Radio Relay League, Inc. Please convey our sympathy to his family and associates. — *Don Slater, VE3BID, President, CARF, Kingston, Ontario*

☐ It is with regret that we heard the sad news of the death of ARRL President Victor C. Clark. Please convey our deep sympathy to members of his family; his contribution to Amateur Radio will be missed. — *R. R. C. Frost, VS6BQ, President, Hong Kong Amateur Radio Transmitting Society*

☐ I am so saddened by the passing of Vic Clark, W4KFC. He was a close friend, a wonderful amateur and so dedicated to the Service. I really treasured his friendship. I personally feel lost, and as if something has been taken from me. Amateur Radio has lost one of the "greats" and his image can never be replaced. We pass this way but once in our life and we who have been dedicated to Amateur Radio will feel the loss of Vic not being with us any longer the most. — *Col. Ronald F. Martin, W6ZF*

☐ Please accept with deep regret of the staff and all members of ARI on the death of Vic Clark. — *Rosario Vollero, I8KRV, President, ARI*

☐ We at the Commission were all greatly saddened to learn of Vic's death this past weekend. He was a good friend and I will personally miss him a great deal. Vic's tenure as President of the League signaled a great strengthening of that organization. Vic performed invaluable public service to this agency and to the Government of the United States. It was my pleasure to know him and to work with him. — *James C. McKinney, Chief, Mass Media Bureau, FCC*

☐ Our deepest sympathy in connection with the sudden passing of your President, Victor C. Clark, W4KFC. — *Stein Barlaug, LA4ND, President, Norsk Radio Relae Liga*

☐ Very sorry to hear the sad news of the death of your President, Victor C. Clark. Please accept our sincere condolences. — *Kazuyoshi Ishizaka, President, Trio-Kenwood Corp., Tokyo, Japan*

☐ Please accept our sincere condolences on behalf of the Amateur Radio Society of India to you on your loss. — *M. G. Karnik, VU2CK, President, ARSI, New Delhi, India*

☐ We are shocked and saddened to hear of the untimely passing of Vic Clark. We, as you, will miss him, and we ask that you please convey our deepest sympathy and condolences to his family and friends. — *Jim Gray, W1XU, on behalf of the staff of* 73

☐ It is with deep regret that the IARC heard of the passing of ARRL President Vic Clark, W4KFC. The loss of your President will be sadly felt by the League's membership. To us, here in Geneva, Vic was a familiar figure, especially during the many weeks he spent in our city attending WARC '79, where he contributed to the success of the conference for the Amateur Service. Personally, I am losing a good friend and one of my godfathers in FOC. — *Ted Robinson, F8RU, President, International Amateur Radio Club, Geneva, Switzerland*

*Public Information Coordinator, ARRL

On Line

Conducted By Stan Horzepa,* WA1LOU

Packet Radio — The Software Approach

Every month or so, this fellow up near Chautauqua Lake sends me an envelope. He also sends envelopes to other members of the packet radio world. When we open the envelopes and examine the contents, we are usually impressed.

The fellow is Bob Richardson, W4UCH, and the contents of the envelopes are the results of his efforts to emulate packet radio hardware in software. With the TRS-80® Models I and III microcomputers, Bob's efforts have been fruitful (refer to Bob's Technical Correspondence on page 53 of Feb. 1983 *QST*).

TNC in Software

Bob has written three books: *Synchronous Packet Radio Using the Software Approach, Volumes I-III,* which document the Z80 assembly-language programs he has written that perform the function of the terminal node controller (TNC), the key hardware component of a packet radio station. Each volume presents a different version of the TNC. Volume I contains the Vancouver Area Digital Communication Group's (VADCG) modified IBM synchronous data link control (SDLC) TNC protocol. Volume II proffers the modified AX.25 high level data link control (HDLC) TNC Protocol that was presented at the Second ARRL Amateur Radio Networking Conference in San Francisco on March 19, 1983. Volume III presents an advanced version of the VADCG SDLC protocol that has added features and niceties not included in the Volume I version.

Bob's books include both the object code and the annotated source code for the TNC software. Users may enter the source code into a TRS-80 microcomputer and use an assembler program to convert it into the object code that can be run on their computer, or they may obtain the programs ready-to-run on diskette from the author.

Minimal Hardware Requirements

Volume I describes the minimal hardware requirements of the software approach: a port zero encoder/decoder and a modem. The port zero encoder/decoder interfaces the TRS-80 to the modem, while the modem interfaces the encoder/decoder (and TRS-80) to the radio equipment.

The encoder/decoder is based on the Telesis VAR/80 port zero encoder/decoder, and the modem is designed around the inexpensive EXAR 2206 modulator and 2211 demodulator chips. Both units may be homebuilt using the descriptions presented in Volume I; however, if you do not wish to build the hardware, sources for the port zero encoder/decoder and modem are included.

If you are a TRS-80 Model I/III owner and are getting into packet radio, you might well consider the software approach rather than the hardware route. Write Bob for more information at Richcraft Engineering, Ltd., Drawer 1065, 1 Wahmeda Industrial Park, Chautauqua, NY 14722.

*75 Kreger Dr., Wolcott, CT 06716

The wizard of Chautauqua, W4UCH, is smiling because he has tamed another terminal node controller with his TRS-80 Model I microcomputer.

[Ed. Note: The performance of the 2211 demodulator on noise-prone and fade-prone circuits at greater than 600 bauds may not be reliable. More sophisticated circuitry will be required for satisfactory weak-signal operation, such as through AMSAT-OSCAR 10.]

PX: Hardware and Software Interfacing

A lot of folks write to me asking how to hook up their computer to their radio equipment in order to send and receive CW and RTTY. Well, this month's installment of PX will try to provide some answers to that universal question. Each of the following software solutions includes hardware information as well.

Tom Zeltwanger, KG3V, has submitted a beautiful program for the Commodore 64 computer (with an RS-232-C interface) that allows it to send and receive RTTY at 60- or 100-WPM Baudot or 110- or 300-baud ASCII. Request program number 29.

Richard Regent, K9GDF, proffers a simple 19-line program for the Apple II + that permits it to receive 60-WPM RTTY. Request program number 30.

Rod Lewis, W0EO, provides us with a transmit-and-receive program for the VIC-20 that emulates the W9AV CW QSO robot as described in July 1981 *QST*. Request program number 36.

To obtain a listing of any of these programs, send an s.a.s.e. (preferably no. 10, business-size) with 37 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Use a separate s.a.s.e. for each program request and write the catalog number of the desired program at the lower left-hand corner of the envelope. Please do not send correspondence other than PX program requests to Dept. PX at ARRL Hq.

A5: A SPECIAL-INTEREST PUBLICATION

A5 Amateur Television Magazine is a monthly devoted to both fast-scan (FSTV) and slow-scan (SSTV) ham TV. If you are involved in either TV mode, you know that computers proliferate, and A5 covers the TV-computer connection well. For example, a recent issue describes SSTV and facsimile applications using a TRS-80 Color Computer; the SSTV program requires no interfacing!

If you would like a look-see, WBØQCD will send you a sample issue in exchange for two s.a.s.e.'s. Write to Mike in care of QCD Publications, Inc., P.O. Box H, Lowden, IA 52255.

KAYPRO ON RTTY?

Eric Koch, KA7OAH, owns a Kaypro computer and would like to use it to send and receive RTTY. If anyone can assist Eric, please contact him at P.O. Box 555, Clackamas, OR 97015.

Strays

I would like to get in touch with...

☐ other newsletter editors interested in starting an HF net. Marty Brett, WB6TNC, P.O. Box 654, Carmichael, CA 95608.

☐ anyone with a manual for the CIR ASTRO 200 or a parts list for the Edgecom System 3000A. Jim Fyles, WBØCZI, 820 El Paso Blvd., Denver, CO 80221.

☐ other amateurs who are farmers. Ernest Leiner, DJ4QH, Weinberg, 2949 Wangerland 1, Fed. Rep. of Germany.

☐ any hams who are graduates of the U.S. Navy Aviation Radioman Training School at Millington (Memphis), Tennessee. Raymond Marcaurelle, W1YRO, 237 Eastern Ave., Gloucester, MA 01930.

☐ any amateurs interested in joining a VIC-20/Commodore 64 computer net at 2000Z Sundays on 7.260 MHz. B. John Luker, WB7QBC, P.O. Box 824, Green River, WY 82935.

☐ any amateurs interested in becoming a national coordinator of International Amateur Radio Hosts, particularly for *Argentina and countries in Asia and* Africa. Luiz Rodrigues da Cruz, Rua Valdemar N Carneiro Monteiro 780-602, Boa Viagem, 50000 Recife, PE, Brazil.

Operating News

Conducted By John F. Lindholm,* W1XX

Midnight Special Results

These contest results represent the efforts of the "early morning faithful," those participants who lost some sleep to prowl the bands for a little friendly competition in the two most recent ARRL Midnight Specials. Despite the late (early) hours and the low-key contest announcement, these mini contests have developed quite a following and provide enough action on the bands to keep a top-notch operator busy for the entire two-hour period.

The big drawing card for the Midnight Specials seems to be that the short time period allotted for the competition condenses the activity and allows an operator with other commitments a chance to go "full bore," spend the entire contest period on the air and possibly turn in a top score for the effort.

The July Effort

The 1983 ARRL July Midnight Special was held from 0300-0500Z on July 24. The first hour was on 40-meter CW, while the second hour happened on the 80-meter phone band. The linescores for the top-scoring participants shows the call, total number of QSOs, 40-meter CW QSOs, 80-meter phone QSOs and state. All participants who sent in an s.a.s.e. received the complete results in the mail.

KA1R	91-	53-	38-	MA
K1VUT	84-	33-	31-	MA
W2YV (KQ2M, opr)	177-	83-	94-	NY
K2AU (N1EE, opr)	141-	68-	73-	NY
KZ2S	135-	55-	80-	NJ
K3LR	236-	100-	136-	PA
W3TS	96-	35-	61-	PA
K4WJR	170-	83-	87-	SC
K2SD	165-	70-	95-	NC
NZ4K	146-	88-	58-	KY
NO4R	134-	58-	76-	KY
NM4M	128-	54-	74-	KY
W5VUX	123-	34-	89-	GA
W5JW	186-	110-	76-	NM
N5XA	115-	74-	31-	MS
N5DDO	106-	69-	37-	TX
AJ6V	82-	62-	20-	CA
K6CSL	33-	22-	11-	CA
K7WA	54-	48-	6-	WA
KW8N	195-	70-	125-	OH
W8LT (K3JT, opr)	93-	39-	54-	OH
K8ZO	163-	80-	83-	IL
KG9N	153-	61-	92-	IL
WB9JKI	133-	68-	65-	IL
WAØAVL	125-	55-	70-	IL
WAØVOX	52-	7-	45-	MN
WAØWWW	41-	21-	20-	MN

Soapbox

The exchange was too complicated. Let's have something simpler next time (N1EE). Several stations did not confirm receipt of my information and were transmitting again before I finished. They are not recorded in my log for that reason (KW2J). This was the first contest that I've ever worked from my home QTH (WA3KZR). I almost missed this one. My keyer went out before the contest and I had to borrow one. I got back home at 0301Z (N5DDO). Competition in this mini-contest is hot. The big kilowatts abound and there is hardly enough time for them to run out of each other to work (K6CSL).

November: A 160 Feast

The latest running of a Midnight Special was a "Top Band" affair, held 0400-0600 Z November 13. The first hour was spent on 160-meter CW and the second hour on 160-meter phone. The listings for the top scorers show call total number of QSOs, 160-meter CW QSOs, 160-meter phone QSOs and state:

W1WEF	148-	58-	90-	CT
W1XX	123-	56-	67-	CT
K1NA	122-	59-	63-	MA
KC1U	107-	0-	107-	CT
K2EK	184-	76-	108-	NY
K1ZM	150-	65-	85-	NY
W2CRS	111-	47-	64-	NY
W3TS	150-	53-	97-	PA
WB3CAC	112-	43-	69-	PA
KD4NI	176-	66-	110-	VA
NF4F	104-	44-	60-	TN
KB5UL	48-	20-	28-	TX
N5AFV	40-	12-	28-	OK
N7CKD	51-	23-	28-	WA
KW8N	197-	77-	120-	OH
KB8FJ	169-	55-	114-	WV
KU8E	98-	28-	70-	OH
W8FN	96-	55-	41-	OH
W8LT (K3JT, N8CJD, WB8PHI, WD8LXX, oprs.)	181-	77-	104-	OH
W9TG	133-	63-	70-	IN
KS9O	131-	48-	83-	IL
K9BG	112-	56-	56-	IL
WAØTKJ	84-	48-	38-	KS

Soapbox

Couldn't find a clear spot to call CQ. All contacts were in the search mode. Hope you run another 160-meter Midnight Special next November (K3IXD). Fun contest! We need more like it (WA2KOK). Conditions here would have been great except for local storm activity. Even the two receiving loops didn't help the cause much as the storm activity seemed to be a 360° system (N7CKD). My first contest ever on 160. I see why they call it the "Gentleman's Band." Had enjoyable QSOs after the Special. Loved it! (WBØBHF). For the next Midnight Special, let's have two hours of CW on 80 meters (N4UZ). These short contests are a good way to maintain operator proficiency and give the "medium gun" a chance to feel like a "big gun" operator (WB3CAC).

Keep an eye on the Contest Corral column in *QST* for word of future Midnight Specials. — *Edith Holsopple, KA1KRQ*

*Communications Manager, ARRL

W1AW Schedule

February 1, 1984 — April 29, 1984 **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; TTh: 2100; Sn: 0300, 2100
	Fast Code Practice	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300: Sn: 0000
	CW Bulletins	Dy: 0100, 0400; MTWThF: 1500, 2200
	Teleprinter Bulletins	Dy: 0200, 0500, 2300; MTWThF: 1600
	Voice Bulletins	Dy: 0230, 0530
EST	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 10 P.M.; TTh: 4 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	CW Bulletins	Dy: 8 P.M., 11 P.M.; MTWThF: 10 A.M., 5 P.M.
	Teleprinter Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 9 P.M.; TTh: 3 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	CW Bulletins	Dy: 7 P.M., 10 P.M.; MTWThF: 9 A.M.; 4 P.M.
	Teleprinter Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
PST	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 7 P.M.; TTh: 1 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	CW Bulletins	Dy: 5 P.M., 8 P.M.; MTWThF: 7 A.M.; 2 P.M.
	Teleprinter Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

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 1983 *QST*, pages 9 and 81" 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 81.

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.

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 145.972 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 8:30 A.M. to 1 A.M. EST and on Saturday and Sunday from 5:30 P.M. to 1 A.M. 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 P.M. 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 20 and April 20.

Club Corner

Conducted By Sally O'Dell,* KB1O

HAM IN SPACE

The STS-9 Space Shuttle *Columbia* has landed. NASA and Amateur Radio have completed a successful mission together. Many of us talked (or listened) to a ham in space.

The publicity from this event is tremendous, but what does this have to do with clubs? Here is a way to increase your club membership. Start a class, now. The preliminary publicity is complete. The press covered STS-9 so thoroughly that *everyone* knows *something* about it. All you have to do is the local legwork.

The first step is deciding that your club needs more new hams and the majority of your club members are willing to work toward this goal. One method that can help you reach this goal is a display or demonstration. Malls all over the country are encouraging hams to present Amateur Radio to the public. With in-person contacts, you can explain what it takes to become a ham. Interested folks will show up at your classes to discover what you are so enthusiastic about.

Where will this class be taught? While some of the club is busy setting up the display, your training corps should be preparing for the class. You will need a meeting room. Sometimes a class/meeting room seems out of reach. Here are some suggestions in locating one. If you try all of the following, one may produce the results you are looking for: A school (elementary through college), union hall, church basement, Red Cross meeting room, community center, civil defense hall, *your* place of employment where the meeting room is unused at night, or the local mall meeting room. Many of these rooms may be rent-free for a good cause.

Is the display (demonstration) the only place to advertise? No. At the same time, your class should be listed in your local newspaper. You might suggest to the press that the class is a ham radio follow-up on the STS-9 mission. In addition, advertising flyers should be placed at your local ham or electronics store. The flyer should announce the class time, date and location. If possible, list a contact person or phone number. Some clubs use an answering machine for 24-hour coverage and return calls later.

All of these suggestions require dedicated club members with some free time to help. The display will probably need to be covered over a weekend. The class will need one or more instructors with time to devote each week to a class. All club members should contribute time in the area where they function best.

We are entering a new age of Amateur Radio communications and ham clubs must be ready to pick up where Dr. Owen Garriott left off. We are on a stepping stone to the future and ham radio is ready.

*Club Program Manager, ARRL

Midwest Division Assistant Director Max Otto, WØLFF presented a plaque to the Iowa City (Iowa) Amateur Radio Club to commemorate the club's 50 years of affiliation with the ARRL. Receiving the plaque is Robert Lehman, KFØD, President, and James Boorman, KBØII, Vice President. Otto is a charter member of the club, which was formed in February 1933 and became affiliated with the League the following May.

SSC Kudos and Contacts

Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Blue Ridge Amateur Radio Society
c/o P.O. Box 10321
Federal Station
Greenville, SC 29607
Club membership — 125

Butler County Amateur Radio Association, Inc.
c/o P.O. Box 1787
Butler, PA 16001
Club membership — 76

Central Kansas Amateur Radio Club, Inc.
c/o 827 Merrill
Salina, KS 67401
Club membership — 58

Cherryville Repeater Association, Inc.
c/o Box 336
Quakertown, NJ 08868
Club membership — 69

Lake Monroe Amateur Radio Society, Inc.
c/o 441 Maitland Ave.
Altamonte Springs, FL
Club membership — 108

Amateur Satellite Program News

Conducted By Bernie Glassmeyer,* W9KDR

W5LFL MAKES AMATEUR RADIO HISTORY

The "Event of the Decade" has come to pass with the successful operation by Dr. Owen Garriott, W5LFL of his Amateur Radio station aboard the space shuttle *Columbia*. This event was a result of years of planning by AMSAT and ARRL. With the approval of NASA in April 1983 the gears were shifted to full speed, the whole operation was the most positive project this writer has ever been involved with. Much of the credit goes to Owen Garriott himself. His energy was felt by everyone who came in contact with him. His leadership united the forces who joined to work together to make this Amateur Radio dream a reality. See page 11 of this issue for an exclusive interview with W5LFL on his historic flight.

Satellite Experimenter's Handbook

This long-awaited ARRL publication is now available from ARRL or one of its many book dealers. The handbook has 13 chapters and is divided into three parts. Part I contains a history of Amateur Radio satellites. Part II is tutorial information for those getting started in satellite communications. Part III contains reference material for serious experimenters.

Whether you're a beginner, an experienced satellite enthusiast, a teacher or a scientist, you'll find *The Satellite Experimenter's Handbook* to be indispensable. Copies are $10 U.S., $11 in Canada and elsewhere.

Project OSCAR Calendar

The 1984 orbital prediction calendar is now available from Project OSCAR. It contains equatorial crossing time and longitude of each orbit for RADIOs 5, 6, 7 and 8. AMSAT-OSCAR 10 data gives the apogee subsatellite point of each orbit.

A minimum donation of $10 is requested for each calendar mailed first class to the U.S., Canada or Mexico. For those living elsewhere, a $12 donation is requested. Mail your order to: Project OSCAR Inc., P.O. Box 1136, Los Altos, CA 94022.

Software Book

AMSAT Headquarters announces the availability of a computer software booklet by Bob Diersing, N5AHD, of the AMSAT Software Exchange. Entitled "Using Microcomputer Programs for Radio Amateur Satellite Orbital Prediction," the booklet is designed primarily for Radio Shack, IBM PC and CP/M-Based S-100 bus microcomputers. It contains chapters on Keplerian elements, A-O-10 orbit loading, and updating and running your programs. It also contains complete program listings for many of the popular micros.

The booklet is available from AMSAT Hq., P.O. Box 27, Washington, DC 20044. The price is $8.50 for AMSAT members, or $5 when ordering software. For nonmembers the price is $10 alone or $5 when purchasing software. (from *ASR* 67, Dec. 12, 1983).

Next Ham in Space Designated

NASA has announced that astronaut Tony England, WØORE, will fly on a Space Shuttle mission scheduled for March 1985. During a meeting about a year ago, Tony mentioned that he had some ideas about operating on his assigned flight. Now that we (ARRL/AMSAT) have completed our first Space Shuttle Amateur Radio operation aboard STS-9, it may be possible to get NASA approval for another experiment. Some of the experiments discussed were: (1) GAS (Get Away Special) — a radio placed in a container and carried in the cargo bay. This type of experiment could be operated by remote control from the crew's quarters. (2) Beacons — The Marshall Space Flight Center Amateur Radio Club has received permission from NASA for a 70-cm beacon; details will be announced in this column next month. (3) Manipulator Arm experiments — Tony explained that it may be possible to attach a transponder repeater or beacon to the arm. (4) Link-up with AMSAT OSCAR-10 — Desired for the STS-9 mission by Owen Garriott, time did not permit a 70-cm radio to be built. This will probably become a goal for the next mission.

NASA may be very receptive to proposals for Amateur Radio experiments on future Space Shuttle missions if we present our proposals in a professional manner. Let's all make a resolution for 1984 to work hard to maintain the image of Amateur Radio. The team of people who made the STS-9 mission work are now planning the next steps for "mission 2." With your support and cooperation Amateur Radio operators can make a significant contribution to the citizens of the world and maintain its pioneering role in communications.

UoSAT-1 QSL Cards and UoSAT-B Stickers

At long last, the UoSAT-1 (UoSAT-OSCAR 9) QSL cards are available from the University of Surrey. The UoSAT team requests that you send an s.a.s.e. or IRC with each request to: University of Surrey, Department of Electrical Engineering, Guilford, Surrey, England.

A number of colored UoSAT-2 vinyl stickers have been produced. These stickers may be requested by sending your QSL card with a second IRC or similar donation to cover printing costs. (thanks to Martin Sweeting, G3YJO)

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $22 ($30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ AMSAT Membership is available for $24 per year; $26 outside North America. Life Membership is $600. Subscription to six issues of *Orbit* magazine each year is inseparable from membership. Write to or call AMSAT Headquarters, P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

*Satellite Program Manager, ARRL

Results, 1983 IARU Radiosport Championship

By Edith Holsopple,* KA1KRQ and Bill Jennings,** K1WJ

"Lucky Number Seven." The contest weekend of July 9-10, 1983 played host to the seventh running of the IARU Radiosport Championship. And "lucky" it was according to the statistics gleaned from the contest logs of the 1416 (up from 1363 in 1982) participants. Lucky that there was no repeat of the solar flares that made the "bread and butter" bands, 20 and 15 meters, next to useless for more than half of the 1982 contest. Average propagation conditions were a welcomed change. The big numbers of QSOs and a healthy multiplier total were waiting for those operators who were willing to put in the time and make the effort. As usual, strategy in looking to the low bands for those needed multipliers made a big difference to those seeking to make a world-class score — often the difference between a top score and second place.

As expected, ten meters as a reliable source of many multipliers and a healthy number of QSOs has gone the way of the sunspots — down. Even so, there were a few surprises to be found on 10. Taking the time to scan 10 meters, work a few "locals" and grab a zone multiplier or two paid off when it came time to tally the score.

The difference between the 1982 and the 1983 contests becomes quite clear in comparing the Top World Scores boxes. In each of the four categories, the average score is up in every case. It took at least a 300 kilopoint score increase over scores posted in 1982 to make the 1983 top scores listings.

CW, as usual, attracted the largest number of participants — 496 — with the breakdown of the other entry categories as follows: mixed mode — 264; phone — 342; multiop — 136; check logs — 178. These are basically the same proportions and numbers as those of the '82 Radiosport.

The seventh IARU Radiosport Championship boasted some other highlights and notable occurrences, too. With his successful 1983 effort, LU8DQ has been at the top of the CW heap,

*Communications Assistant, ARRL

AB3A/4X broke the two-million-point barrier, and came in eighth for worldwide multiop.

Top W/VE Scores

Mixed		*CW*	
W2RQ (KQ2M)	1,359,660	WA8YVR	1,044,956
N8II	1,133,040	KRØY	1,027,653
KL7Y	1,039,390	K8NZ	838,737
KZ5M	1,030,400	K6LL	746,120
N6ND	1,009,750	W3GM	707,854
AA5B	860,310	WØWP	666,468
KD4FX	805,980	WD8AUB	553,850
KA1R	723,786	KBØG	548,421
N2RM (KM3T)	594,495	KS8S (W8FN)	532,532
N5DDO	568,290	N9NB/4	451,369
Phone		*Multiop*	
N5AU (WB5VZL)	1,292,544	NA5R	2,461,090
K6HNZ	1,005,218	N4WW	2,190,592
K5DX	844,336	W5XZ	2,044,440
KØVUW	743,860	AH6BK	1,992,872
N4ZC (N5TR)	552,558	AD8I	1,358,088
KC2ME	491,328	K7NHV	1,306,902
N4UH	463,104	K5QY	1,249,204
W8KKF	352,992	N4UM	1,039,716
KE4SG	341,253	KYØ6	1,000,964
K9CLO	291,264	NL7P	990,899

Top World Scores

Mixed		*CW*	
LZ2HE	2,075,413	LU8DQ	1,676,010
W2RQ (KQ2M)	1,359,660	EL2AE (K2LE)	1,432,800
UQ2GDQ	1,282,896	HZ1AB (K5KU)	1,395,264
CX7BY	1,181,224	UA1DZ	1,184,700
N8II	1,133,040	WA8YVR	1,044,956
UB5AAF	1,112,973	G3FXB	1,042,705
OK2FD	1,081,600	KRØY	1,027,653
KL7Y	1,039,390	OH8PF	1,015,056
KZ5M	1,030,400	HH2VP	917,112
N6ND	1,009,750	UW3HV	852,278
Phone		*Multiop*	
LZ2AB	1,426,138	UK9AAN	3,048,144
UR2QD	1,370,965	UK2PCR	2,825,425
UB5FDF	1,306,730	4J4F	2,798,877
N5AU (WB5VZL)	1,292,544	HG5A	2,740,881
UQ2GFN	1,256,478	HG6V	2,479,362
LU1BR	1,088,618	NA5R	2,461,090
OH6AM (OH6LK)	1,039,395	UKØAMM	2,392,830
DL8PC	1,010,018	AB3A/4X	2,375,423
K6HNZ	1,005,218	UK5IBB	2,213,190
JG1ZUY (JH7PKU)	900,456	N4WW	2,190,592

KE4SG pulled in a decent score operating phone from GA.

K2LE opr. of EL2AE scored second worldwide in CW from Liberia.

Mary Louisa, daughter of EA4AXW, concentrates on developing good listening techniques.

W4YOK/C6A operated from the Holiday Inn on Paradise Isle, Nassau.

TO6HOY knew how to play it cool.

worldwide, every year since the Radiosport Championship began in 1977. Seven world bests — Good show! UA1DZ has also been a world leader in his chosen class in each of the seven contests — five world class finishes in the mixed-mode category for the first five years, then changing to CW-only in 1982 and 1983 for world class finishes in that category also. Well done! G3FXB and K6LL are two more calls that don't seem strange appearing in the top scores listings. Each of these operators has been outstanding in his chosen entry category over the years.

The IARU Radiosport Championship is not merely about individual achievements. The very essence of the contest and the very spirit of the IARU itself provide for a friendly competition that embodies all of the goodwill and camaraderie of radio amateurs sharing a common experience in international communication.

The 1983 IARU activity may have been the last in its present format; the Radiosport Championship may have served its purpose of enhancing worldwide IARU activities. Now may be the proper time to entertain other, more innovative, ways to meet those objectives of international goodwill. Thus, an informal IARU study group is now reviewing possible alternate plans for a new IARU activity for the weekend of July 14-15. Let's see what they come up with.

Congratulations to all of those participants who over the years have made the Radiosport such a success.

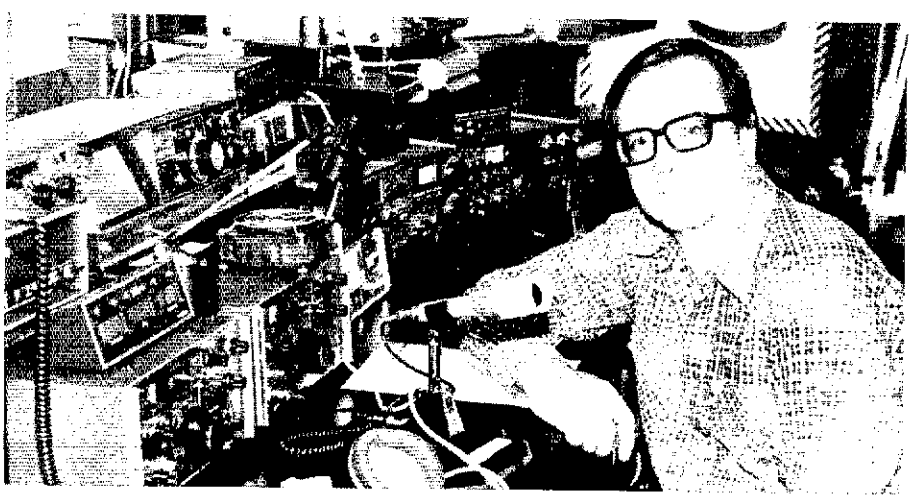
SOAPBOX

There was very good 20-meter band propagation (JH7DNO). Ten meters was stinko. I couldn't get anything at all. Eighty, on the other hand, was open but vacant. I can't figure out what everybody had against 80-meter CW! (EA4AXW). This year's contest was a winner. I had a great time and experienced some of the oddest propagation. I worked KC4AAA with my beam pointed north! (AL7EN). There was no propagation to N.A. or S.A. on 28 MHz (JF1EQA). My friend JP1DYZ made more contacts than I. His rig is really wonderful! (JA6-9330). My low score reflects maximum effort with very low emergency power under the absolute worst conditions of propagation and interference. A major disaster in AK could be served by this QRP configuration (KL7DG). This had to be the first contest where Murphy didn't show his face all weekend. Maybe that's why the Europeans were so loud out west (WA7UEC). We wish that QSOs via RS or OSCAR could be included in contest rules in the near future (UKØAMM). You can be sure that when IARU Radiosport weekend comes up, the sun comes through the clouds and the family wants to go to the beach. Of course they insist on yours truly to come along. I hope for rain next year (SM2CEW). It gave me a new country (PA3BTH). Because of natural band-to-band differences and incomparable propagation, there should be separate band classifications, especially for satellite operation (SP9DH). I'm very happy with my first IARU contest (YO7FO). I want challenge next year (JA3UCO). I was very surprised to work more than 1000 stations in just 19 hours! There were nice conditions on 40 and 20 meters and also 80 meters, with one CE8, but 10 meters was very poor (HB9CSA). I enjoyed working in the contest except for the bad propagation to the Americas. I hope to participate in this contest again (JM1IFB). Good contest, but too large in spectrum! Try single band for next one (YO3KWJ). Thanks for the beautiful contest weekend. Unfortunately there was low activity from many ITU zones (UA3AGW). We had beautiful shortskip conditions on 10 meters from southern Germany the week before the contest, but the coming weekend, the band closed nearly totally . . . (DL8MBS). With my 9 watts I was like a mosquito among giants, but my squeak was heard by several JAs and even one statesider (UA4CIF). I was happy to work all six continents in my first international contest (Y63UG). The conditions on 20 meters were FB, but 10 was completely dead on Sunday. I spent 36 hours in 35° C weather in my shack, HI (OK2FD). The best propagation was Sunday evening (OK1HH). I'm looking for DX activity on 160 meters during the contests (WA9CBD). I very much enjoyed the contest. Ten, 40 and 80 meter bands were practically closed all the time. Conditions were excellent on 15 meters, and working it was a pleasure (HI8GB). Murphy really set me up in this one! Having started the contest with no amplifier and no low-band antenna, I got an amp on Saturday morning and an 80-m dipole up on Saturday night. Just when I thought I was set, my rig broke, and put me QRT for the rest of the weekend! (N9NB/4). About 2 weeks before the contest, I started to get TVI, RF in the shack and phone interference even while I ran low power. Saturday night our neighbors called with TVI. I changed amps and even took down a new 4-el 15-meter beam making its debut, but it didn't help. I got back on at 10:30 local and to try and catch up and save some off time for Sunday afternoon, I decided to operate all night. I was able to keep a decent JA rate going on 20 and work stateside and add multipliers on 40 and 80. There were no major solar disturbances and I managed to raise my points per QSO to approximately 3.45. I really enjoy Radiosport (N5DDO). Chronology of bizarre contest: 2353 Fri., amp relay cord shorts; 0008 Sat., TS-830 fuse blows; 0015, 15-m beam 90° off calibration; 0027, contest starts; 0145, 20-m beam 135° off. Working Europe with beam west; 0215, 15-m rotator jams west; 0330, 20-m rotator jams west; 0415, both direction indicators dead; 0630, KR2N convinces me not to quit; 1045, futility and despair with both beams jammed west; 1400, W2RQ helps unjam rotators; 1415, beam direction by "dead reckoning," 1430, all hell breaks loose (KQ2M opr W2RQ).

Feedback

Please see page 83 of February 1983 *QST* for the following corrections to the 1982 IARU Radiosport Championship.

The first-place mixed-mode score in the Kansas Sec-



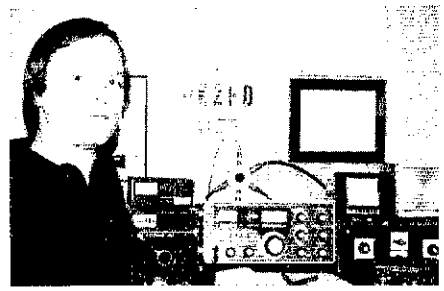
KC3EK led the phone score in the MDC area.

tion belongs to WBØYJT, not WBØJYT.

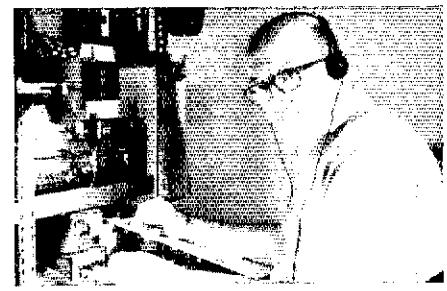
In Zone 18, OZ1CTK should have been listed as the top CW-only score in Denmark, not the top phone-only score. KA3HIE was listed in the Eastern Pennsylvania Section, but is really from Western PA.

Scores

Scores are listed by ITU zone, then by country within that zone. The line score (example — KL7Y 1,039,390-2312-110-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.



OK2FD from Czechoslovakia came in seventh worldwide for mixed mode.



EA4AXW sent CW with his left hand while writing with his right hand.

ZONE 1

ALASKA

KL7Y	1,039,390-	2312-	110-	A
KL7IU	140,454-	638-	51-	C
AL7EN	40,425-	296-	33-	C
KL7NL	3016-	59-	13-	C
NL7P (+ AL7S DN,H,KA9FUS, WL7E)	990,899-	2652-	91-	D
KL7CQ (AL7EJ,KL7s AP,HFQ,OY, SK,SL,VC,VS,ZO,ZP,NL7s BE,BI, WL7D,WL7J,oprs)	301,125-	1246-	55-	D

ZONE 2

ALBERTA

VE6XS	21,170-	188-	29-	C

ALASKA

KL7PK	5180-	102-	14-	B
KL7DG	39-	5-	3-	B

BRITISH COLUMBIA

VE7AAQ	125,223-	442-	67-	A
VE7CNQ	70,290-	418-	45-	B
VE7IQ	38,844-	297-	36-	B

ZONE 3

MANITOBA

VE4AEX	59,262-	340-	51-	B
VE4CCC	132,990-	613-	62-	C

ZONE 4

QUEBEC

VE2DPO	38,874-	303-	38-	B
CY2PD	16,840-	120-	35-	C

ONTARIO

VE3MQY	53,284-	319-	44-	A
VE3NBE	70,780-	314-	58-	B
VE2WA/3	24,820-	156-	34-	B
KB2XP/VE3	13,052-	122-	26-	C
VE4ALO/3	4680-	101-	13-	C

ZONE 5

W6

EAST BAY

WB6FCR	220,836-	768-	77-	A
N6GRM	7959-	113-	21-	A
KS6Q	2250-	70-	10-	A
NI6D	25,296-	234-	34-	B
W6DNY	14,592-	182-	24-	B
K6CSL	14,190-	154-	30-	B

LOS ANGELES

WB6HEW	448,715-	1467-	85-	A
K6EID	182,185-	586-	83-	A
AI6Z	188,722-	615-	74-	A
KE6B	180,200-	743-	68-	B
W6CN	116,550-	611-	70-	C
WB6NNV	26,180-	131-	44-	C
WA6YCL	11,424-	118-	28-	C
W6NXB	290-	20-	5-	C

ORANGE

AI6E	152,760-	574-	76-	A
WA6JAH	449,190-	1068-	105-	B
NI6W	59,228-	286-	52-	B
AA6DP	8421-	119-	21-	B
KE6VY	4641-	113-	13-	B
W6RPD	12,565-	80-	35-	C
W6TMD (+ KB6UF,NC6U,NN6U)	676,874-	1485-	121-	D

SACRAMENTO VALLEY

N6JM	7587-	63-	27-	B
N6WR	47,171-	349-	43-	C
N6GQA	17,368-	196-	26-	C
N6GJC	7300-	76-	25-	C
K6SG	6846-	86-	21-	C

SAN DIEGO

N6ND	1,009,750-	2048-	125-	A

SAN FRANCISCO

W6MSN	78,880-	300-	68-	A
KB6ZA	59,785-	305-	55-	A
WA6LLY	3995-	63-	17-	A

SAN JOAQUIN VALLEY

WD6FLB	40,590-	258-	45-	C

SANTA BARBARA

W7CB/6	147,628-	536-	68-	A
W2KVA	125,292-	626-	53-	A
WA6FGV	102,790-	605-	38-	A
N6HK	15,540-	140-	30-	B
AA4Q/6	4416-	86-	16-	B
KD6LB	43,240-	256-	47-	C
KD6CN	3225-	61-	15-	C
W6BHZ (KF6CU,N6GAL,WA6ZXN, oprs.)	140,616-	545-	72-	D

SANTA CLARA VALLEY

N6UW	55,998-	312-	51-	A
KF6AM	153,920-	647-	65-	B
N6MG	90,020-	364-	70-	B
KE6PQ	57,288-	256-	56-	B
W6ISQ	1020-	29-	15-	B
WA6HAD	992-	34-	8-	B
K6HNZ	1,005,218-	1852-	142-	C
KD6PY	60,711-	292-	59-	C

W7

ARIZONA

KN7N	156,130-	609-	70-	A
K8LL	746,120-	1721-	115-	B
KC7V	14,391-	141-	27-	B
WA7NXL	12,180-	133-	28-	B
KU7A	14,384-	150-	29-	C

IDAHO

KD7EJ	1708-	42-	14-	C
K7NHV (+ AA6RX,N6TR)	1,306,902-	2549-	134-	D

MONTANA

KA7HWB	17,365-	262-	23-	C

NEVADA

WB7VVH	15,159-	145-	31-	C
WA7UEC (+ KW7W,KY7N,N7FEQ, WA7HVU,WB7SUY)	351,203-	1325-	73-	D

OREGON

WA7OEM	102,186-	484-	63-	A
W7YAQ	218,218-	642-	91-	B
W7TC	101,520-	522-	54-	B
K7KJM	99,481-	479-	53-	B
AD7T	27,864-	129-	56-	B
WB7EEI	174,708-	663-	69-	C
N7EXM	16,800-	178-	28-	C
W6YVK/7	1485-	23-	15-	C
W7XN (multiop)	91,830-	424-	55-	D

UTAH

KU7J	10,101-	161-	21-	B
N7BHC	69,812-	389-	62-	C

WASHINGTON

KO7G	27,240-	300-	30-	B
AG7M	34,380-	336-	30-	C

WYOMING

NC7O	1800-	42-	15-	B

ZONE 7

W5

ARKANSAS

KM5G	58,461-	422-	39-	B
W5EIJ	22,848-	146-	42-	C

LOUISIANA

W5WG	101,308-	446-	62-	A
K5KLA	115,700-	560-	50-	B
K5PR	66,240-	452-	40-	B
N5BMD	60,958-	354-	49-	C
W5XZ (+ K5GO,W6MJ)	2,044,440-	3060-	162-	D

MISSISSIPPI

WB2JAF/5	28,116-	250-	33-	A
N1CLS/5	648-	21-	8-	A
N5XA	171,110-	650-	71-	B
KK5K	12,320-	219-	22-	B

NEW MEXICO

AA5B	860,310-	2197-	110-	A

NORTHERN TEXAS

KD5RO	84,915-	417-	51-	A
KM5X (K5ZD,opr)	208,722-	631-	86-	B
W5UDA	94,714-	408-	58-	B
NF5P	47,476-	288-	44-	B
N5AU (WB5VZL,opr.)	1,292,544-	2573-	132-	C
N5EYF	7850-	88-	25-	C
K5QY (+ AF5K,K5MR,N5RZ)	1,249,204-	2650-	121-	D

OKLAHOMA

W5AS	34,290-	360-	30-	B

SOUTHERN TEXAS

KZ5M	1,030,400-	2114-	128-	A
N5DDO	568,290-	1743-	95-	A
KC5CP	112,448-	500-	64-	A
KX5L	35,120-	305-	40-	A
WD5BEP	5250-	76-	21-	A
W5PWG	117,714-	513-	69-	B
W5ASP	17,688-	219-	24-	B
W5NR	9520-	100-	20-	B
K5DX	844,336-	1975-	113-	C
WA5IYX	56,430-	286-	57-	C
W5UFA	29,561-	212-	41-	C
NA5R (+ K5s GA,GN,LZO,RC,KG5U, KN5H,N5EA,WB8NFY)	2,461,090-	3663-	170-	D
KB5FU (+ KY5A,WB5WHR)	834,493-	2197-	107-	D

W8

COLORADO

AC0S	80,650-	461-	50-	B
KB0ST	4968-	62-	18-	B
W0SG	522-	18-	9-	B
KC0WP	32,184-	302-	36-	C
KA0FPJ	2646-	51-	18-	C
KY0S (+ KB9YO,N9NC,N0EBM WB7QAE)	1,000,964-	2361-	116-	D
KA0FXH (+ KT0F)	4914-	104-	18-	D

IOWA

W0WP	656,468-	1619-	99-	B
K0CF	78,318-	320-	57-	B
KZ0C	179,830-	686-	70-	C
W0PPF	40,506-	274-	43-	C
K0AAR(K0s AUU,TFT,KA0ODC,KC0s KY,XU,KN0O,N0CSK,WA0KGD, WB0s IBT,TEU,WXH,YOW, oprs.)	83,886-	345-	62-	D
N0EEN(+ KA0GOA,KA0HKO,N0DIZ)	48,105-	397-	45-	D

KANSAS

KA0GDS	24,140-	229-	34-	A
KB0G	548,421-	1555-	93-	B
WA0TKJ	266,252-	977-	82-	B
N0BLD	100,815-	489-	65-	C
WB0YJT	43,472-	320-	44-	C
N0CBG	2232-	40-	18-	C
AC0E(+ N0s BXW,GPC)	36,504-	303-	36-	D

MINNESOTA

N0BSH	152,796-	523-	84-	A
W0RXL	4598-	47-	22-	C

MISSOURI

KM0L	422,432-	1291-	88-	A
KR0Y	1,027,653-	2076-	121-	B
KJ0V	43,130-	329-	38-	B
K0RWL	23,712-	242-	26-	B
K0SI	8667-	99-	27-	B
K0VUW	743,880-	1674-	130-	C
AC0N	193,161-	810-	67-	C
KA0IQR	48,458-	221-	58-	C

NEBRASKA

AK0G	83,096-	498-	52-	A
K0SCM	38,610-	251-	45-	A
K0SW	28,440-	164-	45-	B
W0OLL	3480-	135-	24-	C

ZONE 8

W1

CONNECTICUT

WA1FCN	199,680-	681-	78-	A
AK1B	126,893-	743-	43-	A
K1KI	85,884-	394-	51-	A
KA1EUQ	84,130-	603-	47-	A
AA2Z	32,799-	251-	29-	A
WB1FNK	1911-	47-	13-	A
K1EFI	85,428-	368-	54-	B
W1VH	47,196-	268-	46-	B
W1CNU	2158-	36-	13-	B
KA1YR	152,869-	666-	59-	C
WA1LOU	59,517-	295-	51-	C
KA1YP	29,216-	200-	44-	C
K1NGD	12,060-	106-	30-	C
WB9IHH	504-	72-	7-	C

EASTERN MASSACHUSETTS

KA1R	723,786-	1623-	114-	A
K1XM	171,988-	572-	73-	A
N1RC	147,183-	578-	71-	B
W1IHN	130,508-	532-	59-	B
WA8AXH	76,538-	463-	49-	B
W1FM	69,972-	383-	51-	B
KB2R	33,432-	245-	42-	B
KQ1F	18,088-	130-	38-	B
W1OPJ	4080-	72-	20-	B
W1BET	531-	13-	9-	B
KB1GN	20,808-	144-	36-	C
W1YO	575-	23-	5-	C

MAINE

K1SA	190,960-	610-	70-	B
WB1GLH	27,510-	260-	35-	B
N1AFC	33,264-	493-	22-	C

NEW HAMPSHIRE

K1NH	40,420-	194-	47-	A
KA1X	5928-	72-	19-	A
W1END	57,558-	238-	53-	B
WA1NPZ	64,014-	370-	47-	C
K1UGU (+ AG1C)	306,180-	807-	65-	D

RHODE ISLAND

KN1I	98,802-	515-	58-	A
W1GL	359,916-	992-	89-	B
K1MXO	159,608-	674-	71-	B
KA1GQW	20,910-	240-	30-	B

WESTERN MASSACHUSETTS

KA1ETR	36,085-	349-	35-	A
AI1S	379,432-	1038-	86-	B
WB1HIH	101,657-	565-	59-	B
W1DAJ1	48,544-	290-	37-	B
KR1R	208,550-	1186-	51-	C
WA1ZAM	203,634-	749-	81-	C
N1SR	5424-	92-	24-	C
N1CKW	2310-	49-	14-	C

W2

EASTERN NEW YORK

K2SHZ	173,095-	687-	65-	A
NA2N	130,585-	531-	61-	A
N2JJ	66,060-	332-	65-	A
K2MN	9585-	83-	27-	A
W2XL	353,832-	1019-	92-	B
N2CAP	339,480-	922-	92-	B
N2AZS	84,873-	497-	57-	B
W2DW	23,521-	147-	43-	B
K2POF	70,125-	420-	55-	C
KA2EAY	19,437-	164-	33-	C
KB2MG (+ KA2MNJ,N2EDN)	344,000-	1065-	86-	D

NEW YORK CITY — L.I.

KA2AEV	213,684-	774-	88-	A
W2GKZ	79,886-	350-	59-	A
K2SX	110,960-	444-	75-	B
N2DMO	7458-	104-	22-	B
KZ2V	36,824-	268-	32-	C
KS2G	23,925-	207-	33-	C

NORTHERN NEW JERSEY

W2RQ (KQ2M, opr.)	1,358,660-	2556-	124-	A
WA2PID	73,856-	359-	64-	A
KO2O	34,668-	222-	36-	A
KC2XF	90,858-	504-	57-	B
AA2U	34,720-	381-	40-	B
N2BNC	101,106-	427-	69-	C
WB2DND	11,200-	84-	32-	C
KB2ZQ	1850-	37-	10-	C
KD2I (+ WB2TSY)	352,086-	1087-	101-	D
KC2TA (+ WB2QOK)	135,147-	721-	57-	D

SOUTHERN NEW JERSEY

N2IT	7837-	131-	17-	B
KC2ME	491,328-	1461-	96-	C
WA2JSG	34,112-	266-	41-	C

WESTERN NEW YORK

NA2Q	4518-	75-	18-A
W2FTY	146,069-	489-	77-B
W2FUI	65,431-	328-	59-B
KW2J	56,154-	228-	49-B
W2AWF	10,962-	86-	29-B

W3

DELAWARE

K3WGR	13,090-	116-	34-B
AC3T (+ KA3B,N3s AYE,DIP,DLW)	206,208-	921-	64-D

EASTERN PENNSYLVANIA

N2RM (KM3T, opr.)	594,495-1745-		99-A
W3ARK	143,520-	474-	69-A
K3ND	21,982-	92-	58-A
W3GM	707,854-1720-		98-B
N3AOT	9766-	142-	19-B
N3CZR	4432-	77-	16-B
WB3HYX	65,300-	344-	50-C
K3DYX	32,144-	224-	41-C
WB3CQN	7776-	72-	24-C
K3GQ (+ KA3DSW, N3s CHL,CIX WB3s EPW,FPA,FYL)	290,850-1061-		75-D

MARYLAND — D.C.

KI3L	183,797-	563-	71-A
WA3VPL	65,372-	328-	59-A
K3TW	37,392-	261-	41-A
W3FQE	6624-	82-	16-A
W4KM	186-	9-	6-A
WB8IOJ	53,800-	304-	50-B
NA5E/3	43,104-	306-	48-B
NN3SI (W4KM, opr.)	1950-	34-	15-B
KC3EK	133,635-	671-	59-C
K3VY	34,074-	171-	54-C
W3MSN	3107-	51-	13-C

WESTERN PENNSYLVANIA

K3UA	203,796-	659-	81-A
KG3B	90,840-	448-	60-A
N8DH/3	102,245-	434-	65-B
KA3HIE	47,900-	308-	50-B
W3KYN	2912-	40-	16-B

W4

ALABAMA

NE4L	342,063-1173-		81-B
KF4VV	8310-	120-	30-B
WD4PZN	78,590-	433-	58-B

GEORGIA

W4GLS	79,947-	401-	63-A
WI4R	35,278-	155-	62-A
WB4MBN	24,072-	242-	34-B
KE4SG	341,253-1265-		81-C
KD4W	197,374-	807-	83-C
N4BFA	130,060-	598-	70-C

KENTUCKY

WA4QMQ	91,575-	479-	55-A
KF4AV	34,086-	280-	39-A
KA4JMZ	43,008-	288-	48-B
N4GYY	9604-	124-	26-C
KA4TAY (+ NO4R)	57,120-	263-	42-D

NORTH CAROLINA

N4AYJ	66,636-	404-	54-A
N4EUU	50,922-	306-	54-A
K4PB	132,894-	560-	69-B
K4HF	2790-	64-	15-B
N4ZC (N5TR, opr.)	552,558-1414-114-C		
N4UH	463,104-1289-		96-C
KF4HK	242,128-	998-	74-C
WD4AVY	164,864-	753-	64-C

NORTHERN FLORIDA

KD4FX	805,980-1968-114-A		
W4OV	125,800-	374-	85-B
AC5R	34,317-	233-	41-B
WC4E	9724-	186-	22-B
NO4J	160,992-	893-	48-C
W4WKQ	110,336-	530-	64-C
WB5YLT	73,408-	413-	64-C
WA4MOJ	62,448-	379-	48-C
N4WW (+ AA4NA,N4SA,NX4N, WA4SVO)	2,190,592-3428-172-D		

SOUTHERN FLORIDA

W4BAA	35,000-	145-	56-A
N9NB/4	451,369-1104-101-B		
WB4TDH	397,410-1177-		78-B
WD4AHZ	99,594-	557-	54-B
W4BV	65,682-	164-	89-B
K4JUN	650-	14-	13-B
K8UNP	200,560-	714-	80-C
WK4F	32,160-	162-	48-C
N4UM (+ N4BP,WA4YWE)	1,039,716-2680-108-D		
K1ZX (+ net)	372,109-1195-		89-D

TENNESSEE

K4OAQ	186,048-	780-	78-B
K4XO	2190-	30-	15-B
N4FNB	28,525-	261-	35-C
N4BSN	4356-	40-	22-C

VIRGINIA

K4FPF	149,340-	529-	76-A
WA8CFE	31,236-	256-	38-A
K4LHB	8357-	143-	13-A
K4PQL	389,940-1013-		97-B
WC4B	200,550-	802-	75-B
W3HHG	59,192-	328-	49-B
W4XD	44,419-	327-	43-B
N4MM	166,374-	608-	78-C
KB8CI/4	103,309-	507-	59-C
K4WHN	59,125-	311-	55-C
KA4RVS	47,396-	341-	41-C
K1EFS/4	32,188-	155-	52-C
W4KMS	12,168-	128-	26-C

W8

MICHIGAN

AC8Y	464,628-1360-		93-A
KS8Q	103,149-	439-	73-A
WA8YVR	1,044,956-2010-127-B		
KQ8J	109,272-	542-	58-B
K8SIA	57,684-	293-	46-B
N8EA	47,700-	292-	50-B
K8DU	36,834-	268-	42-B
W8UVZ	16,068-	200-	26-B
WB8GUS	52,311-	275-	53-C
KM8V	19,145-	215-	35-C
WA8MTX (KA8LAR,KD8DA,KM8Y, W8YZ,WB8SEZ,WD8QKJ, oprs.)	73,505-	360-	61-D

OHIO

W8LT (K3JT, opr.)	392,260-1122-110-A		
KZ8Y	177,562-	545-	77-A
N8BJQ	157,725-	601-	75-A
N8TN	58,854-	376-	51-A
W8UPH	41,560-	313-	40-A
KA8OUT	15,312-	134-	29-A
KA8PPJ	15,262-	211-	26-A
K8NZ	838,737-1781-123-B		
WD8AUB	553,650-1537-		95-B
KS8S (W8FN, opr)	532,532-1434-		91-B
KW8J	182,910-	755-	67-B
N8BC	120,006-	465-	59-B
KJ8I	95,408-	414-	67-B
KY8F	64,973-	454-	43-B
KQ8X	49,020-	285-	38-B
W8KKF	352,992-1098-		96-C
KC8JH	179,280-	800-	72-C
WD8MCH	24,414-	168-	39-C
W8IMZ	19,008-	134-	32-C
N8EBA	18,042-	158-	31-C
KI8O	2340-	50-	15-C
W8VPV (KD8GC,opr)	1131-	39-	13-C
K8HF	608-	16-	8-C
AD8I (+ K8EM,KU8E,WD8IXE)	1,358,088-2468-142-D		
WB8KKI (+ KC8ZH)	376,508-1271-		86-D
WD8LLD (+ KA8NUV)	366,357-1145-		87-D

WEST VIRGINIA

N8II	1,133,040-2305-120-A		
WA8YTM	107,334-	528-	67-B
KB8FJ	49,236-	301-	44-B
W8VEN	42,734-	275-	46-C
WD8CZA	7080-	100-	20-C

W9

ILLINOIS

WB9JKI	392,238-1248-		99-A
KK9A	33,304-	250-	46-A
WD9DGE	25,992-	258-	36-A
WA9MRU	18,184-	168-	38-A
K9MFI	342,313-1013-		97-B
WD9DBC	172,830-	843-	61-B
WD9HMQ	92,340-	577-	60-C
KB8AC	46,976-	280-	64-C
KR9G	31,188-	110-	64-C
K9SD (+ K9s BGL,DZY,HWU,K0PFU, KC9GL,KD9M,WB9CIA)	813,562-1938-127-D		

INDIANA

KC8FC	67,600-	356-	50-A
W9XD	58,968-	364-	54-A
WD9BDP	48,720-	335-	48-B
K9VGB/9	46,384-	324-	52-B
WB9POH	23,219-	194-	31-B
K9CLO	291,264-1020-		82-C
N9BUC	67,560-	372-	60-C
N8DHX	11,700-	170-	30-C
WD9EME	10,023-	75-	39-C
WB9IWN	7201-	109-	19-C

WISCONSIN

KC9Q	159,929-	623-	77-A
KB9S	174,600-	738-	72-B
K9GDF	152-	14-	4-B
KC9L	69,046-	416-	46-C

ZONE 9

MARITIMES-NEWFOUNDLAND

VO1CA	20,880-	170-	30-A
VE1FH	348,300-1126-		75-B
CY1CEG	276,960-	846-	80-B
VO1QST (VO1AW,opr.)	89,964-	404-	51-B
VE1CJK	2222-	48-	11-B
VO1QU	18,720-	244-	20-C
VE1OC	12,847-	99-	29-C

ST.PIERRE & MIQUELON

FP0HOQ (NS4M,opr)	665,847-1863-		91-B
FP8HSW (K8AQM,KB8HW,KC8KQ, WB4HRE,WD8CRY,WD9INF,oprs)	601,992-1831-		81-D

ZONE 10

MEXICO

XE1VV	75,764-	485-	47-A
XE1OX	297,990-1003-		90-C
XE1VIC	50,400-	470-	30-C

ZONE 11

DOMINICAN REPUBLIC

HI8LC	16,682-	250-	19-B
HI8GB	202,918-	814-	71-C
HI3AMF	74,268-	617-	36-C

BAHAMAS

C6ADV	1336-	110-	4-A
W4YOK/C6A	192,960-	915-	60-B

HAITI

HH2VP	917,112-2281-103-B		
HH2WL	169,904-	854-	56-C

ST. MAARTEN

K2KTT/PJ7	38,475-	229-	45-C

GUANTANAMO BAY

KG4CD	215,016-	995-	62-A

NETHERLANDS ANTILLES

W1AEL/PJ4	55,100-	296-	38-B

COSTA RICA

TI2LO	38,356-	247-	43-C

BELIZE

V3TV	53,798-	426-	37-C

MONTSERRAT

VP2MM	204,134-1102-		49-B

ZONE 12

BOLIVIA

CP5MP	22,167-	203-	27-C

COLOMBIA

HK3NBB	702,372-2148-		66-A

SURINAM

PZ5JR (+ PZ5RC)	418,840-1141-		74-D

ZONE 13

BRAZIL

PS7KM	42,874-	259-	34-C

ZONE 14

ARGENTINA

LU8DQ	1,676,010-2445-138-B		
LU1EWL	164,190-	514-	65-B
LU9ABD	14,308-	117-	28-B
LU1BR	1,088,618-2059-107-C		
LU9A	122,268-	545-	46-C
LU6EM	35,204-	281-	26-C
LU4B	3294-	39-	18-C

URUGUAY

CX7BY	1,181,224-1924-124-A		

PARAGUAY

ZP5XCA	189-	7-	7-B

ZONE 15

BRAZIL

PY2ERA	27,993-	133-	43-B
PY1ZFO	16,250-	127-	26-B
PY1AJK	10,200-	67-	24-B
PY3BC	1800-	30-	12-B
PP2ZDD	726,480-1629-		90-C
PY1NEZ	78,128-	418-	38-C
PY3JC	50,949-	37-	C
PY1OQ	45,000-	229-	40-C

ZONE 16

NORWAY

LA9HW	208,975-	971-	65-A
LA6LBA	1710-	24-	15-A
LA4DCA	656-	22-	8-A
LA7SI	7587-	71-	23-B
LA9ZV	51,822-	254-	53-C
LA8DY	40,053-	283-	39-C
LA2TO	33,792-	359-	33-C
LA1XDA	9849-	128-	21-C
LA9CQ	8500-	92-	25-C
LA2AD	6363-	78-	21-C
LA2CBA	5032-	80-	17-C
LA9WBA	4686-	96-	17-C
LA1DBA	4540-	67-	20-C
LA6SCA	1000-	37-	8-C

FINLAND

OH3WS/4	184,905-	823-	59-A
OH6MW	70,932-	492-	46-A
OH2JG	56,492-	440-	29-A
OH8PF	1,015,056-2153-114-B		
OH3NM	35,952-	240-	42-B
OH3BU	27,104-	260-	32-B
OH5VE	14,256-	132-	27-B
OH7EU	4600-	50-	23-B
OH9UW	3234-	65-	14-B
OH6AM (OH6LK,opr)	1,039,395-2317-105-C		
OH1AF (OH1CH,OH1CN,OH1EH, OH1HS,OH1KA,oprs)	1,234,888-2824-112-D		
OH2AA (OH2s BIF,BJG,JA,oprs)	947,462-2515-		86-D

ALAND ISLANDS

K8MFO/OH0	1,201,122-2574-118-B		

DENMARK

OZ7JZ	71,655-	337-	51-A
OZ6EI	19,304-	125-	38-A
OZ7BW	40,664-	192-	46-B
OZ1DYU	28,077-	137-	49-B
OZ5PA	5832-	54-	27-B
OZ4HW	5283-	69-	19-B
OZ8ZB	2275-	49-	13-B
OZ2E	1836-	30-	17-B
OZ8E	1661-	37-	11-B
OZ5EV	47,096-	297-	56-C
OZ1APA	20,925-	115-	45-C
OZ1CFV	12,276-	112-	31-C
OZ1ASP	12,120-	122-	30-C
OZ1ACB	4242-	60-	21-C
OZ8T	3700-	49-	20-C
OZ1DYI	259-	11-	7-C

SWEDEN

SM5BMB	64,800-	268-	54-A
SM5ARL	59,550-	341-	50-A
SM5BAX	139,432-	572-	58-B
SM7LAZ/6	100,740-	475-	60-B
SM1BVQ	100,688-	400-	62-B
SM2CEW	50,457-	374-	33-B
SM5RE	35,373-	253-	39-B
SM6DED	26,825-	249-	29-B
SM6BDS	24,309-	159-	37-B
SM5LRM	13,350-	124-	25-B
SM6NWL	5100-	64-	20-B
SM2LWU	212,341-1025-		59-C
SM7KIL	39,872-	324-	28-C
SM7HSP	13,630-	124-	29-C
SM0MML	747-	19-	9-C

ZONE 19

EUROPEAN R.S.F.S.R

UA1ZCZ	396,440-1153-		88-A
UA1NBF	126,880-	672-	61-A
UA1DZ	1,184,700-2184-132-B		
UK1AFA (UA1-169-20-26,opr)	112,980-	940-	30-B
UA1ODR	33,976-	301-	31-B
UA1CAX	247,786-	836-	77-C
UW1BM	34,151-	285-	37-C
UK1AAW (UA1AZA, UA3s DPX, VIM, oprs.)	446,042-1471-		83-D
EK1O (3oprs)	27,030-	608-	30-D

ZONE 20

ASIATIC R.S.F.S.R.

UA9XAB	293,406-	842-	79-A
UA9COC	227,073-	77-	B
UA9XS	24,707-	168-	31-B
UK9XAA (UA9s XDG,XDM,XWT, UA9-000-200, oprs)	276,458-	964-	62-D
UK9CDG (EZ9s CAA,CBT,UA9CPL, oprs)	264,960-	902-	64-D
UK4WAE/U9G (UA4WBJ, UA4WCE,oprs)	113,114-	529-	46-D

ZONE 21

ASIATIC R.S.F.S.R.

UK9JAE (UA9s JBS,JBY, UA9-162-111,oprs)	356,700-1003-		82-D

ZONE 23

ASIATIC R.S.F.S.R.

UA0QBB	20,667-	624-	11-C
UK0QBE	7704-	98-	18-C
UK0QAH (UA0s QDL,QWN,RP,oprs)	371,185-1356-		61-D

ZONE 27

REPUBLIC OF IRELAND

EI7CC	36,192-	256-	39-B
EI7DJ (EI6AB,EI6AK,EI8AU,oprs)	102,870-	570-	54-D

FRANCE

F6BEE	235,683-	617-	87-A
F9BB	34,357-	175-	47-B
TO8TM	18,772-	128-	38-B
TO6HOY	52,364-	287-	52-C
F6EXQ	7871-	127-	17-C

ENGLAND

G5CFJ (K8PU,opr)	101,834-	429-	59-A
G4OKN	37,512-	284-	36-A
G3XTT	26,444-	148-	52-A
G3FXB	1,042,705-2013-115-B		
G3SXW	76,797-	302-	69-B
G3TXF	54,431-	259-	53-B
G4MVA	34,419-	291-	33-B
G2AJB	9780-	123-	20-B
G4FVK	45,250-	251-	50-C

SCOTLAND

GM8SQ	1644-	37-	12-B
GM5EFU	25,648-	254-	28-C
GM4/N7BUP	3040-	48-	16-C

GUERNSEY

GU4/DL4BBQ	42,168-	270-	42-B

WALES

GW8GT (GW3s,KYA,NJW,NWS, OAY,GW4S,BKG,BLE,oprs)	2,122,568-4016-116-D		

LUXEMBOURG

LX1YZ 4326- 42- 21-B
LX0WCY (LX1RK,opr) 23,120- 160- 40-C

BELGIUM

ON5WL 58,502- 358- 47-A
ON4FD 507,104-1387- 92-B
ON4XG 85,434- 391- 58-B
ON7LB 44,547- 353- 31-B
ON4KST 102,028- 514- 46-C
ON5CZ 19,749- 195- 29-C
ON4JJ 14,588- 127- 28-C
ON4ADG 6656- 105- 16-C
ON4ARB (ON1AJY,ON1BDH, ON4AJR,ON4ALC,ON4APS,ON7OS, ON7XC,ON7XI,oprs) 463,245-1312- 89-D
ON4AEN (ON5HT,ON6NF,ON7JI, oprs) 301,920- 925- 80-D

THE NETHERLANDS

PA3BVT 18,528- 159- 32-A
PA0YN 4646- 52- 23-A
PA3AMA 1078- 32- 11-A
PA3BTH 27,972- 206- 37-B
PA0DIN 16,902- 81- 54-B
PA3BLU 14,297- 121- 29-B
PA0LKR 4675- 79- 17-B
PA3BDK 1600- 44- 10-B
PA3ABA 11,832- 104- 29-C
PA0KHS(PA3s ABA, ADJ,AWN,CKK, PA0OUO,PD0MEO,oprs) 809,966-1624- 94-D

ZONE 28

FEDERAL REPUBLIC OF GERMANY

DL8MBS 159,470- 700- 74-A
DL9LAI 21,600- 275- 24-A
DF9JZ 4907- 72- 19-A
DL1TH 106,260- 455- 69-B
DF3QN 44,290- 252- 43-B
DL4AAE 33,480-1080- 31-B
DJ5GG 22,872- 188- 26-B
DJ2XP 9597- 109- 21-B
DL1ZQ 7291- 91- 23-B
DL1AM 3780- 44- 21-B
DL8PC 1,010,018-2146-103-C
DL2YAK 3029- 59- 13-C
DL9MMA 2912- 70- 13-C
DL4MCE 1560- 36- 15-C
DF2RG 715- 20- 11-C
DL9NBH (+ SM6LRR) 1692- 47- 9-D

HUNGARY

HA8IT 382,680-1237- 90-A
HA5BY 195,051- 742- 79-A
HA8EK 417,872-1197- 98-B
HG19HB 395,180-1184- 89-B
HA5LZ 206,591- 674- 77-B
HA7RB 159,060- 623- 66-B
HA5KFZ 79,174- 650- 31-B
HA6NW 58,551- 501- 29-B
HA7UJ 22,365- 197- 35-B
HA5FA 19,807- 157- 29-B
HA6NL 19,193- 379- 17-B
HA9PR 180- 18- 2-C
HG5A (HA5s FM,FN,GF,JI,MK,ML, OM,UA,WE,HA7RY,HA7SU,oprs) 2,740,881-4469-143-D
HG6V (6 oprs) 2,479,302-4217-147-D
HG6N (HA6s ND,NF,NN,NQ,NY,ON, OQ,oprs) 2,010,164-4092-116-D
HG1Z (6 oprs) 804,825-1893-105-D
HA3KNA (HA3s NS,OG + 3 oprs) 737,400-1795-100-D
HA8KZC (HA8s, UI,ZC,VF,UB,oprs) 373,968-1333- 84-D
HA5KKB (3 oprs) 315,120-1052- 78-D
HA8KVK (4 oprs) 300,812-1002- 78-D
HA5KFL (6 oprs) 208,838- 834- 67-D
HA3KGS (HA3s HI,HJ, oprs) 48,384- 328- 48-D

SWITZERLAND

HB9CSA 323,831-1059- 71-A
HB9ZY 78,366- 231- 74-A
HB9DX 34,839- 211- 47-B
HB9BPP 12,050- 100- 25-B
HB9QA 1044- 27- 12-B
HB9BVV 47,568- 311- 48-C

ITALY

I2UIY 331,650-1197- 66-A
IK2ASH 12,325- 133- 25-A
I2VXY 627,476-1479-103-B
I2JIN 46,605- 311- 39-B
I8ZUT 35,483- 271- 37-B
IK1CJT 27,478- 341- 22-B
IO2MQP 98,124- 483- 52-C
IK1BBC 43,418- 387- 34-C
I4CSP 38,070- 177- 54-C
I8ZLW 29,205- 285- 33-C
IK0AKG 4284- 52- 17-C

BULGARIA

LZ2HE 2,075,413-3430-137-A
LZ1KWS 120,798- 605- 54-A
LZ1KAU 20,460- 204- 33-A
LZ1WY 10,360- 161- 20-A
LZ2SL 5,642- 101- 18-B
LZ2AB 1,426,138-2192-161-C
LZ1KOZ 141,440- 662- 68-C
LZ1HA 6608- 99- 16-C
LZ2QW 120- 14- 4-C
LZ1KDP (3 oprs) 623,064-1598-104-D
LZ2KAF (3 oprs) 30,820- 408- 23-D

AUSTRIA

OE1ZES 18,864- 162- 38-A
OE7SHI 29,840- 310- 26-B

CZECHOSLOVAKIA

OK2FD 1,081,800-1957-128-A
OK2RU 557,535-1492- 93-A
OK3CFP 183,750- 679- 75-A
OK3FON 162,110- 465- 86-A
OK1AJN 160,992- 558- 78-A
OK3CPN/P 110,832- 601- 48-A
OK2ABU 96,045- 434- 57-A
OK1KZ 87,840- 460- 60-A
OK1EP 71,760- 248- 65-A
OK1TW 37,479- 283- 31-A
OK2BLD 19,082- 152- 29-A
OK1VMA 17,120- 159- 32-A
OK1AJY 15,183- 219- 21-A
OK3CQD 9962- 76- 34-A
OK3KNS 6441- 118- 19-A
OK2KVI 3472- 79- 16-A
OK2BHV 696,348-1684-116-B
OK1AVD 456,120-1299- 90-B
OK1ZP 152,252- 531- 68-B
OK2QX 93,940- 354- 70-B
OK1MZO 54,390- 305- 49-B
OK2BFN 46,228- 519- 28-B
OK1AWC 42,000- 207- 48-B
OK2BGR 29,125- 257- 25-B
OK3CES 21,315- 169- 35-B
OK2BEM 19,710- 157- 30-B
OK1DRQ 19,481- 283- 23-B
OK1GS 19,297- 205- 23-B
OK3RXA/P 15,174- 252- 18-B
OK2PBG 14,167- 99- 31-B
OK1MAA 8820- 130- 21-B
OK2BBQ 4905- 80- 15-B
OK3CEI. 2952- 157- 8-B
OK1MSB 2646- 41- 14-B
OK1AYQ 2590- 51- 14-B
OK1DZD 2112- 57- 11-B
OK2HI 1176- 63- 8-B
OL6BID 380- 42- 5-B
OL8COS 332- 41- 4-B
OL6BFB 235- 25- 5-B
OL7BEH 225- 25- 5-B
OK2BWM 48- 4- 4-B
OK2BQU 27- 3- 3-B
OK3CFA 447,780-1137-102-C
OK1MSN 228,965- 419-115-C
OK2BQL 100,465- 393- 71-C
OK3CRH 80,136- 451- 56-C
OK2JK 67,824- 532- 38-C
OK2BSA 12,936- 214- 21-C
OK2PDA 630- 28- 7-C
OK1KRG (OK1s ADS,ALW,DWA, oprs) 2,136,217-3753-131-D
OK1KSO (multiop) 1,993,460-3058-140-D
OK3KJF(OK3CPW,OK3-27-269, OL8CRA, oprs) 229,284- 669- 99-D
OK3KEX (OK3ZAZ,OK3-17780, OK3-26928,oprs) 175,054- 692- 73-D
OK3KXR (OK3-27-618,OK3-27-053, oprs) 172,914- 600- 69-D
OK3KTY (OK3s CAF,CUW,OL8CLB, oprs) 133,875- 608- 63-D
OK1KRQ (OK1s DLF, ORQ, oprs) 77,120- 321- 64-D
OK1KLX (OK1s DCF,DKC,DLX,MIK, oprs) 64,386- 334- 49-D
OK1ONC (multiop) 61,506- 374- 51-D
OK2KYC 55,809- 299- 53-D

POLAND

SP7AWA 52,584- 282- 56-A
SP7KTE 7304- 78- 22-A
SP7AW 6838- 69- 26-A
SP5LM 5022- 75- 18-A
SP3HC 42,789- 236- 51-B
SP9FZC 37,089- 265- 39-B
SP2GUB 30,581- 273- 53-B
SP6FER 29,995- 223- 35-B
SP2FF 23,083- 167- 41-B
SP6BYF 10,592- 87- 32-B
SP6EMI 1251- 57- 9-B
SP9DH 784- 28- 8-B
SP9ZD 155- 7- 5-B
SP1GHW 57,057- 379- 57-C
SP1DTG 19,203- 189- 37-C
SP1CHV 14,340- 251- 20-C
SP7DZA 13,986- 116- 37-C
SP5QU 11,634- 188- 21-C
SP6GPJ 10,480- 176- 20-C
SP6CZ 8096- 77- 32-C
SP9ALM 6468- 74- 21-C

RUMANIA

YO9HP 156,450- 705- 70-A
YO7DQ 75,980- 311- 60-A
YO8UO 65,376- 372- 48-A
YO8BSE 60,904- 363- 46-A
YO5AFP 29,560- 231- 40-A
YO6KEC (YO6EX,opr) 23,994- 207- 31-A
YO2GZ 17,952- 124- 32-A
YO5BEU 8992- 260- 16-A
YO5CEA 3058- 150- 7-A
YO3CD 78,991- 644- 43-B
YO5AVP 77,760- 404- 54-B
YO7FO 47,008- 440- 38-B
YO3JG 35,492- 259- 38-B
YO8EZ 32,513- 295- 41-B
YO8FR 31,017- 432- 21-B
YO3CRA 16,744- 295- 23-B
YO3CR 16,132- 126- 37-B
YO3RF 11,563- 81- 31-B
YO4BEW 9756- 166- 18-B
YO4BEX 4880- 80- 15-B
YO8GF 747- 21- 9-B
YO3KWJ (YO3JW,opr) 235,592- 838- 72-C
YO6KEI (YO6AWR,opr) 210,338- 866- 56-C
YO9HT 38,472- 255- 42-C
YO7ARZ 28,242- 227- 37-C
YO8CEV 875- 59- 7-C
YO2BZV 805- 55- 7-C
YO9CUF 486- 31- 6-C
YO5KLK (YO5AXI,YO5BET,oprs) 136,944- 601- 72-D
YO6KED (YO6BTY,YO6UG,oprs) 104- 30- 2-D
YO8KOD (+ YO8DDP) 42,120- 496- 36-D

YUGOSLAVIA

YU2DG 766,146-1770-112-A
YU3TSR 281,050-1139- 55-A
YU1ZZ 88,452- 517- 52-A
YU4VEF 27,306- 212- 41-A
YU3HAM 17,556- 259- 19-A
YU7SF 128,160- 548- 72-B
YU7PXT 84,702- 426- 57-B
YU7MAR 63,510- 552- 29-B
YU7AF 53,679- 432- 29-B
YU7ORQ 47,880- 261- 56-B
YU7FN 46,904- 282- 44-B
YU4YA 320,310- 906- 90-B
YU4EBL (YU4S,VFF,WCW,WRR, oprs) 1,795,500-3122-133-D

GERMAN DEMOCRATIC REPUBLIC

Y87XL 190,965- 505- 87-A
Y37UF 147,534- 721- 67-A
Y38YE 69,797- 308- 59-A
Y38UFJ 58,671- 337- 53-A
Y71RR 56,168- 299- 56-A
Y48UF 49,336- 232- 56-A
Y63UG 43,472- 282- 52-A
Y21XC 43,296- 222- 48-A
Y24YH 34,240- 305- 40-A
Y22TO 38,190- 325- 30-A
Y24QF/A 30,975- 238- 35-A
Y45SA 29,834- 291- 33-A
Y57SM 23,200- 241- 25-A
Y57ZL 23,144- 137- 44-A
Y22HF 22,040- 131- 40-A
Y22WF 19,604- 167- 29-A
Y58WN 19,516- 180- 34-A
Y27GL 18,592- 155- 28-A
Y22RK 13,944- 581- 24-A
Y37ZO 13,015- 147- 19-A
Y32LK 12,400- 137- 25-A
Y30FTL 11,934- 127- 27-A
Y41VM 11,000- 123- 22-A
Y38UE 10,933- 90- 29-A
Y62QN 6878- 91- 18-A
Y34UF 4902- 75- 19-A
Y53ZF 3744- 86- 12-A
Y62XG 1070- 29- 10-A
Y32ZA 1024- 29- 8-A
Y72VL 1020- 35- 10-A
Y47ZA 890- 27- 10-A
Y26BL 245- 7- 7-A
Y51UE 432,408-1350- 86-B
Y25XA/A 358,815-1150- 85-B
Y53TA 167,608- 775- 73-B
Y25NN 150,449- 604- 71-B
Y53UN 106,848- 651- 53-B
Y56ZA 77,888 366- 64-B
Y71SH 50,388- 313- 52-B
Y26BH 45,771- 226- 57-B
Y43VA 44,924- 288- 44-B
Y30BUB 44,720- 270- 43-B
Y24IF/P 32,640- 238- 40-B
Y54SL 27,400- 207- 40-B
Y57ZM 26,539- 255- 23-B
Y33YA 18,865- 120- 35-B
Y64YG 17,134- 184- 26-B
Y24LA 13,472- 119- 32-B
Y23UH 8800- 152- 20-B
Y64UH 7704- 101- 24-B
Y22DK 7034- 129- 19-B
Y30AZB 6460- 83- 23-B
Y27IL 5968- 90- 19-B
Y30BPM 5100- 92- 15-B
Y30AMF/A 4313- 76- 19-B
Y29BM (OK1HH,opr) 3360- 50- 15-B
Y39PA 2670- 50- 15-B
Y24VF 2240- 40- 14-B
Y22OB 2208- 42- 12-B
Y30AXM/A 1819- 33- 17-B
Y30AXO 1470- 31- 14-B
Y30CTL 846- 28- 9-B
Y39YM 784- 28- 8-B
Y23HN 768- 30- 8-B
Y30AHF/A 720- 20- 10-B
Y23RJ 693- 37- 7-B
Y48LN 656- 20- 8-B
Y49ZL/P 240- 8- 8-B
Y54TA 162,191- 700- 59-C
Y54XA 58,644- 356- 37-C
Y58ZA 52,728- 401- 39-C
Y47XF 52,500- 315- 50-C
Y42XA 32,496- 224- 48-C
Y54VA 25,194- 300- 19-C
Y32OC 20,956- 231- 31-C
Y36WN 10,136- 112- 28-C
Y21WF 7250- 122- 25-C
Y24UL 6918- 90- 19-C
Y44WA 3210- 84- 15-C
Y32PH 2448- 50- 16-C
Y35TA 1716- 51- 11-C
Y24PE 1410- 53- 10-C
Y87PL 1160- 42- 10-C
Y32XG 1024- 41- 8-C
Y34WH 624- 24- 8-C
Y32KK 609- 36- 7-C
Y69VG 544- 22- 8-C
Y62YA 540- 18- 9-C
Y22OO 288- 12- 8-C
Y26DO 45- 5- 3-C
Y41LE 40- 10- 2-C
Y33ZL (multiop) 585,310-1533-110-D
Y43ZI (+ Y43VI) 298,590- 983- 74-D
Y47ZN (Y47s,LN,XN,YN,oprs) 240,239- 900- 79-D
Y36ZM (+ Y36VM) 228,305- 809- 77-D

ZONE 29

EUROPEAN R.F.S.F.R.

UA3DUF 470,016-1167- 96-A
UA3AAH 101,775- 459- 59-A
UV3DN 85,063- 672- 37-A
UA3DTD 41,895- 225- 45-A
UA3DIN 38,211- 297- 47-A
UA6AYR 35,964- 116- 74-A
UA4FDE 19,522- 127- 43-A
UA6AKT 1197- 28- 19-A
UW3HV 852,278-1789-119-B
UA3EAL 730,840-1575-115-B
UA3DCG 396,396-1240- 91-B
UA6LFX 330,479-1009- 87-B
UW3UO 303,974-1061- 82-B
UA3QBP 295,191- 941- 87-B
UA3DRT 117,078- 605- 57-B
UA3DQS 74,380- 446- 55-B
UA4AGP 68,612- 403- 52-B
UW3GL 53,240- 278- 55-B
UA6LDF 49,569- 479- 39-B
UA4ACA 44,032- 210- 64-B
UA4NED 42,090- 419- 30-B
UA3AGW 40,890- 343- 30-B
UA3AGF 36,034- 301- 43-B
UA3TDK 35,892- 281- 36-B
UA4CCB 35,613- 381- 27-B
UA4CJJ 35,386- 404- 26-B
UA3RDH 33,794- 158- 61-B
UW3MW 33,014- 333- 34-B
UA3QBX 30,053- 197- 41-B
UA4MX 26,460- 260- 28-B
UA3YAO 25,480- 200- 40-B
UA3JC 23,324- 211- 28-B
UK1ADK (UA1-169-888,opr) 23,322- 323- 23-B
UA6LAK 15,428- 222- 19-B
UA4CDY 13,464- 148- 24-B
UA1CE 11,784- 126- 24-B
UA4ALI 7623- 123- 21-B
UA4CIF 2558- 87- 12-B
UK6GAA 1432- 61- 8-B
UA3IAK 636- 25- 12-B
UA1DF 504- 18- 7-B
UA6ALL 851,672-1760-116-C
UW1AE 205,221- 840- 67-C
UA4CO 74,304- 358- 54-C
UK3DDC (RA3DSY,opr) 329- 11- 7-C
4J4F (UA3AMB,UA4s,FAZ,FBL, FCM,FCR,FDE,FDS,FER,oprs) 2,798,877-4350-159-D
UK6LAA (UA6s LBQ,LCT,LD,LFA, LIK,LDX,UW6s,LZ,MA,MW,NF, oprs) 2,027,360-3105-160-D
UK6LAZ (UA6s,AUN,LIG,UA6-158s, 252,1066,1078,1135,oprs) 1,546,504-2426-158-D
UK6LTA (UA6s LAM,LWD,LZQ, UA6-158s 678,686,688,oprs) 765,429-1693-127-D
UK3ABT (EZ3s,ABO,DBC,RA3ADR, UA3s AQW,DWQ,UA3-142-911,oprs) 605,537-1728-103-D
UK6AAJ (UA6-191s 622,657,663, 664,oprs) 513,416-1343-106-D
UK3DBV (UA3-142s 1752,1778, 1771,oprs) 295,272-1131- 72-D
UK3GAZ (UA3s GDJ,GGQ,oprs) 249,128-1015- 76-D
UK3XWW (UA3XBJ,UA3-127s,15,56, oprs) 222,388-1250- 53-D
U3EKB (UA3s EDK,EDQ,EDF, UA3-147s 229,231,282 oprs) 133,276- 835- 52-D
UK6LAZ (UA6s BEB,BEN,UA6-150 1078,oprs) 105,700- 731- 35-D

KALININGRADSK

UA2EC 143,418- 467- 82-B
UA2FFC 154,770- 811- 55-C
UK2FAA (UA2s FCW,FCZ,FEM, FEW,FFJ,oprs) 1,451,742-2682-131-D
UK2FAS (UA2DC,EZ2,FAB,UA2-125 5743,oprs) 37,323- 445- 33-D

UKRAINE

UB5AAF 1,112,973-1975-139-A
UB5GBD 687,460-1531-115-A
UB5ICS 340,758- 910- 99-A
UB5UKW 267,285- 849-103-A
UB5MLP 231,896- 890- 82-A
UY5TE 150,147- 681- 67-A
UB5IPJ 49,612- 273- 41-A
UB5MDD 20,460- 305- 20-A
UB5ZDF 16,422- 252- 21-A
UB5CE 267,812- 723- 92-B
UB5BZ 227,328- 853- 74-B
UB5CBA 116,450- 784- 50-B
UB5RCA 89,400- 522- 50-B
UB5TAB 87,980- 347- 60-B
UB5LIE 68,704- 404- 44-B
UB5QKQ 62,477- 333- 48-B
UT5YF 59,508- 320- 58-B
UB5VAW 56,544- 311- 48-B
UB5DW 52,073- 282- 43-B
UB5QGD 47,124- 403- 36-B
UT5RW 47,120- 395- 40-B
UB5SG 46,950- 241- 50-B
UB5TR 46,512- 320- 48-B
UB5IAN 46,200- 332- 42-B
UT5EH 42,192- 333- 36-B
UB5QAP 36,394- 282- 31-B
UB5UGO 32,872- 150- 56-B
UB5QJA 31,392- 274- 36-B
UB5EPV 31,120- 159- 80-B
UB5ZA 29,628- 299- 38-B
UB5KBV 27,780- 205- 40-B
UB5ZFR 24,696- 309- 24-B
UB5ZFW 24,650- 325- 50-B
UB5VAS 22,368- 296- 24-B
UB5IOD 20,930- 270- 23-B
UB5QIS 19,292- 288- 26-B
UB5MMF 17,934- 290- 21-B
UB5EEP 17,280- 255- 20-B
UB5MPD 15,572- 142- 34-B
UB5VK 15,543- 134- 33-B
UY5WA 12,369- 181- 19-B
UB5UBY 12,232- 139- 22-B
UB5WCX 10,336- 92- 34-B
UB5EKQ 8910- 110- 22-B
UB5QIP 6678- 106- 18-B
UB5ULX 3653- 123- 13-B
UB5KBY 1218- 54- 8-B
UB5FDF 1,306,730-2247-149-C
UB5VAZ 258,222-1019- 74-C
UY5XE 119,070- 501- 70-C
UB5UAB 40,803- 353- 29-C
UB5MFR 30,849- 252- 39-C
UB5QCK 9018- 101- 27-C
UB5ULM 270- 20- 6-C
UK5IBB (UB5s,IHO,IOK,UB5-673s 1151,1277,2877,oprs) 2,213,190-3851-135-D
UK5MAF (UB5s ,MDC,MEI,MLX, MMM, MNY,MSQ,MUV,oprs) 1,771,815-3328-123-D
UK5MCO UB5s MDN,MPN,MRO, MTS,MTV,oprs) 745,080-1735-105-D
UK5IZZ (UB5s IEP,IHF,IIF,UB5-873-3131,oprs) 292,658-1030- 86-D
UK5ZBW (UB5ZFG,UB5-069s 524, 559,oprs) 285,338-1112- 72-D
UK5IAI (EZ5IJS,EZ5IUK,UB5INT, oprs) 217,465-1003- 81-D
UK5QBE (UB5-864s,1353,1444, oprs) 67,296- 385- 48-D
UK5EAE (2 oprs) 58,466- 351- 46-D
UK5HAB (EZ5HBD,UB5-871-73,oprs) 52,164- 339- 42-D

UK5DAA (UB5s,DBC,DCW,oprs)
45,623- 334- 43-D
UK5ICX (EZ7AAJ,UB5-073s 3745, 3825,oprs)
41,514- 330- 37-D
UK5OAR (3 oprs)
41,468- 535- 28-D

LATVIA

UQ2GDQ 1,282,896-2212-144-A
UQ2GLW 46,530- 359- 47-A
UQ2GFN 1,256,478-2536-122-C

WHITE R.S.S.R.

UC2DQ 115,640- 476- 70-A
UK2WBC 7605- 113- 19-A
UC2BA 1022- 17- 14-A
UC2WAZ 142,844- 602- 67-B
UC2WBL 118,940- 441- 76-B
UC2SE 101,568- 436- 69-B
UC2AFF 51,435- 362- 45-B
UC2ACT 46,585- 269- 55-B
UC2WBJ 22,044- 266- 22-B
UC2AHQ 8975- 160- 25-B
UC2AFZ 3216- 83- 16-B
UC2AHY 2171- 59- 13-C
UK2AAW (UC2s ACE,ACF,ACU, CFG, oprs)
870,390-2372- 95-D
UK2OAM (UC2s OBB,OCN,OEA, oprs) 117,130- 732- 53-D
UK2AAG (UC2-089-756,UC2-099-498,UA9FAJ,oprs)
60,420- 436- 57-D
UK2AAP (3 oprs)
23,424- 170- 32-D

MOLDAVIA

UO5OWN 88,682- 422- 58-A
UO5OWC 88,074- 519- 54-B
UK5OAA (UO5s OAO,OHD,OHH, OHI,OHK,OIE,ZEO,oprs.)
735,456-1990- 96-D

LITHUANIA

UP2BBF 62,820- 435- 45-A
UP2BJQ 48,877- 383- 37-A
UP2BEI 114,798- 523- 57-B
UP2BB 42,084- 350- 36-B
UP2BKP 18,081- 317- 21-B
UP2BEW 9858- 147- 22-B
UP2PBW 63,240- 328- 60-C
UP2DM 39,587- 313- 31-C
UP2AV 25,937- 243- 37-C
UK2PCR (RP2BFU,UP2s,BBT,BCR, BCT,BDF,BFI,BFN,BFL,BJK,BNC, OU,UP2-038s,726,1849,1859, 1541,oprs)
2,826,425-3772-175-D
UU2M (UA3ADG,UP2s, BAS,BAW BBM,BIJ,BIL,BMC,PX,UP2-038-892,UP2-038-1052,oprs)
1,353,439-2751-127-D

ARMENIA

UG8GDS 10,605- 177- 15-A
UG8GAF 273,280- 985- 56-B
UG6GDS 1209- 35- 13-B

GEORGIA

UF6FCZ 3861- 91- 13-B
UF6FFF 5- 1- 1-C

ESTONIA

UR2RKS 114,582- 717- 39-B
UR2RND 19,236- 295- 26-B
UR2OD 1,370,865-2622-127-C
UR2RKB 3294- 122- 9-C
UR2TBG 21- 7- 1-C

ZONE 30

ASIATIC R.S.F.S.R.

UA9CKC 600,210-1385- 95-A
UA9MBK 155,445- 340- 43-A
UA9CBO 54,132- 306- 39-A
UA9FW 120,200- 543- 50-B
UA9FGJ 106,515- 513- 45-B
UA9CBR 64,435- 293- 49-B
UA9AJM 41,661- 343- 27-B
UA9AU 14,490- 107- 30-B
UA9FAR 13,169- 221- 13-B
UA9FAT 407,340-1399- 60-C
UA9CFC 40,920- 300- 31-C
UA9CMS 2955- 41- 15-C
UK9AAN (UA9s,ACZ,AIS,AKI,AOA, UA9-165-937,oprs)
3,048,144-3762-176-D
UK9FER (UA9s,FAL,FAR,FDW,FGO, FKM,UA9-148-121,oprs)
987,322-1926-109-D
UK9MAR (UA9s,MDH,MRA,UA9-146-19,oprs)
266,858-1097- 58-D
UK9SAA (2oprs.)
40,528- 268- 34-D
UK9CFR (UA9CGL,UA9CID, UA9-23871,oprs)
2268- 44- 12-D

EUROPEAN RUSSIAN S.F.S.R.

UA4HLX 137,150- 702- 50-B
UK4WAB (4oprs)
1,054,944-2238-111-D

KAZAKH

UL7IBZ 126,172- 642- 44-B
UL7AAS 84,864- 484- 39-B
UK7PAL (UL7s PAE,PAO,PAZ,PBY, PCZ,UL7-023-434,oprs)
2,053,976-3239-152-D

TURKOMAN

UH8EAD 77,704- 408- 44-B
UH8HCN 24,612- 197- 28-B

UZBEK

UI8BI 353,004-1269- 69-B

ZONE 31

ASIATIC R.S.F.S.R.

UA9YBO 1400- 32- 10-A
RA9AUD 459- 21- 9-C
UK9UDD (UA9s, UEL,UNN,UPL,oprs)
268,432- 894- 76-D
UK9UCZ (UA9UPS,UA9-138-178, UA9-138-528,oprs)
83,094- 583- 33-D

KAZAKH

UL7QF 756,900-1783-100-A
UL7PFH 22,792- 188- 28-B

KIRGHIZ

UM8MDX 128,420- 558- 49-A
UM8MCY 36,621- 220- 39-B
UM8MBA 25,478- 360- 18-B
UM8MKF 78,120- 723- 28-C
UK8QBA (UM8s,QAD,QAN,UM8-036-1, oprs)
5550- 126- 15-D

ZONE 32

ASIATIC R.S.F.S.R.

UA8SAU 619,654-1488- 98-A
UA8AG 65,856- 268- 56-B
UA8BL 63,882- 562- 27-B
UK8AMM(UA8s,AAK,ADR,UA8-183-729,oprs)
2,392,830-3293-165-D
UK8AAB(UA8s,AFO,AGI,UA8s-183s 114,239,336,396oprs)
433,947-1409- 79-D

ZONE 33

ASIATIC R.S.F.S.R.

UA8JAD 79,662- 388- 51-B

ZONE 34

ASIATIC R.S.F.S.R.

UA8ICO 8484- 112- 21-A
UA8LFR 18,910- 146- 31-B
UA8LEC 11,808- 153- 18-C

ZONE 35

ASIATIC R.S.F.S.R.

UA8ZDD 177,980- 707- 55-C
UK8ZAH(3 oprs)
2076- 46- 12-D

ZONE 36

CANARY ISLANDS

EA8AGF 24,395- 287- 17-B
EA8AKN 47,502- 328- 29-C
EA8TE 23,952- 200- 24-C
EA8ADY 2220- 37- 12-C

MADEIRA ISLAND

CT3BM 14,400- 600- 24-C

ZONE 37

PORTUGAL

CT1CBW 8415- 153- 15-B

SPAIN

EA2CR 51,480- 259- 52-A
EA4AXW 329,265-1008- 81-B
EA2ALW 153,328- 657- 56-B
EA3BOW 53,576- 313- 43-B
EA3AQS 43,214- 389- 31-B
EA4AYD 3795- 52- 15-B
EA1CIM 125,346- 685- 39-C
EA1BIM 42,714- 255- 42-C
EA2AX 39,880- 273- 40-C
EA7ECT 37,354- 271- 38-C
EA1AWW 35,460- 211- 45-C
EA4HD 32,775- 147- 57-C
EA7CWA 32,637- 317- 23-C
EA4ZO 12,175- 135- 25-C
EA2SN 10,933- 92- 29-C
EA5CIT 6825- 78- 25-C
EA3DXD 6740- 109- 20-C
EA5DIT 2610- 50- 15-C
EA3BUK 1440- 45- 9-C
EA7CEC (+ EA7s CFW,TH,EC7CIZ)
1,210,835-2506-115-D

BALEARIC ISLANDS

EA6RCM 24,080- 225- 28-A
EA6DA 48,720- 344- 42-C
EA6GP 29,540- 238- 35-C

ZONE 39

SAUDI ARABIA

HZ1AB (K5KU,opr.)
1,395,264-2806-104-B

ISRAEL

AB3A/4X (+ 4X6DX,4X6FR)
2,375,423-3863-131-D

ZONE 44

KOREA

HL1ABR 96,348- 989- 31-C
HL4XM 74,182- 716- 29-C
HL1ACW 34,992- 630- 18-C
HL1QT 13,454- 313- 14-C

ZONE 45

JAPAN

JH7DNO 535,116-1490- 76-A
JH8JYV 215,168- 564- 82-A
JF1EQA 166,835- 507- 69-A
JA3AA 129,940- 428- 73-A
JH6TRP 93,288- 386- 52-A
JH1KLN 87,180- 345- 60-A
JF2EZA 80,346- 407- 42-A
JH1MTR 65,772- 262- 58-A
JA1QZC 64,080- 226- 60-A
JA7DOT 61,380- 299- 44-A
JA8BMS/1 56,100- 319- 51-A
JF1EEK 30,348- 269- 36-A
JR7CDL 27,126- 184- 33-A
JA1BUI 26,356- 180- 44-A
JA8YES(JH8USD,opr)
22,645- 157- 35-A
JA6AZH 16,884- 143- 28-A
JH8WGN 10,005- 91- 29-A
JF3NTS 9990- 100- 27-A
JA8GZ 9396- 90- 27-A
JE7DOT 7350- 80- 21-A
JA7EDZ 7279- 75- 29-A
JF1OPL 1430- 38- 11-A
JA8DNS 1298- 24- 11-A
JL1EJO 770- 47- 10-A
JA8GTO 385- 11- 7-A
JP1DYZ 531,117-1425- 81-B
JH8LFE 487,377-1268- 81-B
JA8DAI 392,847- 933- 91-B
JA1HGY 341,936-1028- 71-B
JA9CWJ 230,608- 882- 71-B
JA1YWX (JA6-933B,opr)
192,477- 545- 83-B
JA8CGJ 190,808- 622- 68-B
JA1GTF 149,247- 455- 69-B
JH7WKQ 133,782- 513- 66-B
JR3ODV 127,710- 427- 66-B
JH6TDJ 95,407- 575- 41-B
JA4MES 75,452- 313- 52-B
JR4ISK 65,208- 322- 57-B
JH3JYS 49,720- 305- 40-B
JA8KSD 48,488- 260- 38-B
JR3WXA 47,644- 258- 43-B
JA2DN 39,109- 221- 37-B
JH2JEV 37,635- 235- 39-B
JA3UCO 35,607- 257- 33-B
JA1OP 34,119- 145- 51-B
JA7EC 24,605- 127- 41-B
JR3XEX 23,828- 230- 22-B
JH6ECK 18,259- 130- 31-B
JH7BDS 16,830- 127- 30-B
JR3BOT 15,840- 182- 20-B
JG3NKP 15,158- 129- 26-B
JA7KM 14,075- 115- 25-B
JA3EEM 12,480- 112- 40-B
JA1BNW 11,293- 101- 23-B
JI1PCN 11,191- 137- 19-B
JA1BN 10,944- 84- 24-B
JA2KPV 8799- 91- 21-B
JN1ENK 7258- 119- 19-B
JH5OXF 5896- 82- 22-B
JA2SAP/1 5640- 79- 16-B
JA7TJ 5346- 69- 18-B
JA8CAQ 5336- 50- 23-B
JA2EJI 5280- 71- 16-B
JA1KEG 4560- 60- 19-B
JA6GGD 1694- 42- 11-B
JA1OYB 627- 17- 11-B
JH7RZW 3- 1- 1-B
JG1ZUY (JH7PKU,opr.)
900,587-1892-102-C
JA2APA 595,826-1620- 77-C
JH3DPB 250,743-1004- 53-C
JA1YCL (JH8DUG,opr)
152,700- 637- 60-C
JR1WHW 117,936- 494- 54-C
JA8VHI 94,592- 349- 64-C
JR4RHK 68,770- 362- 65-C
JA2BNN 46,096- 271- 43-C
JM1MGP 41,572- 322- 38-C
JI3IFY 34,498- 186- 47-C
JA8TPE 32,745- 304- 37-C
JF2IGP 25,143- 273- 29-C
JH1UUT 22,410- 257- 30-C
JA6EFT 18,090- 170- 27-C
JO1LDY 14,202- 172- 27-C
JA6QDU 12,844- 103- 29-C
JF6QVK 11,780- 341- 20-C
JA7RXU 11,718- 120- 21-C
JA8AD 10,668- 106- 21-C
JL1KCO 9680- 105- 22-C
JL1EJU 9252- 140- 18-C
JG2VMN 7942- 87- 22-C
JR3QIB 7790- 94- 19-C
JA5EPE 7194- 72- 22-C
JP1HDK 6385- 81- 19-C
JK3FXN 6084- 87- 18-C
JG2NOS 5909- 91- 19-C
JM1IFB 5850- 71- 18-C
JA1IT 5072- 65- 18-C
JA1LOM 4693- 51- 19-C
JE7CEG 4248- 41- 24-C
JA1AAT 4180- 48- 19-C
JA1DCO 3471- 57- 13-C
JE1GZB 2414- 30- 17-C
JF6NKV 2380- 267- 7-C
JI3JQQ 2171- 37- 13-C
JI3IDG 1392- 38- 12-C
JE7MLJ 975- 27- 15-C
JE7VEI 890- 23- 10-C
JI3QPN 682- 16- 11-C
JH1FJK 608- 16- 8-C
JA1AAV 210- 7- 6-C
JO1JKH 138- 7- 6-C
JA5DDJ/5 80- 8- 4-C
JA4PA 80- 4- 4-C
JA9YBA (JA9s,LNJ,OTX,QCE, QWJ,VBW,VDA,JH8CAZ,oprs)
1,301,776-2507-112-D
JA7YAA (JE7HLZ,JH7CUO,JH9CEN, JJ1MVV,oprs)
623,457-1813- 81-D
JA3YDS (JG3HFE,JI3XZA,JJ3PZZ, JK3FCW,JE4FZR,JR8CNR,oprs)
436,744-1102- 88-D
JH3YJM (JA3s, BAG,QGI,XGF, JI3AFL,JK3QZU,oprs)
421,596-1139- 84-D
JA6YAI (JE8s,MQW,UWI,JH6VLF, JH8FKC,JR6s,EZE,KKT,oprs)
407,280-1342- 80-D
JA7YCQ (JH7UGG,JR7MZC,oprs)
168,980- 611- 68-D
JA6YDH (JE6s PSL,VFJ,JG1TAW JR6s GHN,QHK,QPB,PKJ,oprs)
195,908- 746- 67-D
JA6YEL (JE6VQY,JH6DOG,oprs)
83,616- 408- 52-D
JA7YFB (JH7MXO,JJ1GXY, JR7JVO,oprs)
30,072- 256- 28-D
JA7ZWD (JA7s,EOS,HQK,NZE,oprs)
5526- 69- 18-D

ZONE 46

LIBERIA

EL2AE (K2LE,opr)
1,432,800-2522-113-B

ZONE 50

REPUBLIC OF PHILIPPINES

DU1TV 33,300- 230- 25-C

ZONE 54

INDONESIA

YB2CR 607,902-1730- 71-C
YB2BSF 169,880-1100- 31-C

ZONE 55

AUSTRALIA

VK4VU 136,728- 764- 36-C

ZONE 57

REPUBLIC OF SOUTH AFRICA

ZS1CT 14,096- 177- 16-B

ZONE 58

AUSTRALIA

VK6NCW (+ VK6NSD)
154,635- 807- 39-D

ZONE 59

AUSTRALIA

VK2BQQ 158,200- 469- 70-B
VK3AEW 80,808- 301- 56-B
VK2AYD 51,000- 211- 51-B
VK3FY 8474- 92- 19-C
VK2WU (+ VK2s CIA,CK,NYA)
1,384,254-2653-106-D

ZONE 60

NEW ZEALAND

ZM2RY 99,351- 329- 83-B
ZM2BR 63,591- 303- 41-B
ZL1AIZ 10,868- 81- 28-B

ZONE 61

HAWAII

KH6CP 52,575- 267- 43-A
KH6IJ 4575- 61- 15-B
AH6EK 9492- 112- 21-C
AH6BK (+ N6TU,WH6B)
1,992,872-3042-133-D

ZONE 64

GUAM

WD5BJT/KH2
11,135- 134- 17-C

ZONE 69

ANTARCTICA

4K1B (UA6LHK,opr.)
175,248- 495- 72-B

Checklogs

5N6SKD,CT1AIU,EA3JC,EA4CFZ, EA5AEN, EA5CVN,F9XE,HA1ZG, HA3KMA,HA8KAZ,JA6FYM, KA0NNF,KB3ZS,LA1AA,LA8CJ, LZ1GD,LZ1IA,LZ1KHY,N2BXV, N2DZI,OH6SU,OK1AD,OK1DMP, OK1US,OK2FD, OK2KTE, OK3CQR,ON5FL,OZ1FGG,OZ3Q, OZ4ZT,PA0LIE,PA6PHK,PA8PUR, PA8TV,PA9UR,PA2DXY,PA3BWQ, PA3CNY, PY2NGL,SM5APS, SM6AYM,SP2UU,SP3XR,SP6BEN, SP8GSC,TU4AT,UA0CCW,UA6LCZ, UA0SLN,UA9SLP,UA1WAP, UA1ZCP,UA3ACJ, UA3AGL, UA3AJU,UA3ALS,UA3DFV, UA3DJG, UA3DNV,UA3DUF, UA3MDX,UA3TAM,UA3VA, UA3VAQ,UA3VEF,UA3XBY, UA4FDD,UA4NDJ, UA4PNP, UA4QK,UA4SBF,UA4YAT, UA4YAZ, UA6AJG,UA6AKI, UA6ARP,UA6AUW, UA6BJZ, UA6HNJ,UA6LUE,UA8LZR, UA6WS,UA9YCK,UA9AFG, UA9COJ,UA9QAQ,UA9WFU, UA9XSQ,UA9YAR,UA9YBR, UB5AEU,UB5AEZ, UB5EF,UB5EU, UB5FDG,UB5FFV,UB5GAY, UB5HBT,UB5IPD,UB5MDP, UB5MGZ,UB5SBM,UB5UEG, UB5UYR,UB5VAA,UB5WBY, UB5ZEQ, UC2LBE,UG6-864-146, UK9SAV, UK1QAQ,UK1ZAA, UK2FAG,UK3AGB, UK3DDC, UK3RAE,UK4CBL,UK5EDI, UK5LBJ,UK5UDX,UK5VBW, UK9ADA, UK9AEC,UK9HAC, UL7EAH,UL7GBP, UL7PBI, UM8MAZ,UM8MMM,UP2NO, UR2RCU,UT5HP,UV3MM,UW3RR, UW3UO,UW4NP,UW8QE,UY5GG, VE3LKR, W2LPV,W5KH,W9YDP, WB9GOB,WB9ZPY,WD9CIJ, Y2-16835/G,Y22TD,Y24BH,Y24WL, Y25GH/A,Y25TO, Y28HO/P,Y26JD, Y26MH,Y26SO, Y26WM/A,Y2FHL, Y38ACF/S, Y38ADC,Y38AIC, Y38RM,Y33UO,Y33VL,Y35VM, Y38YK,Y42YG, Y43VI,Y44ZI/P, Y49RF,Y5IWO, Y63ZA,Y83GST, YL5MG,YO2ADQ, YO3QK, YO7AOT,YU7RS772

ARRL International DX Contest Awards Program

The list below shows all of the plaques that will be awarded in the 1984 ARRL International DX Contest. The sponsors as of December 23 are shown next to the plaque name. Several plaques still need sponsors, so if you are interested in sponsoring one of these awards, contact the Contest Branch at ARRL Hq. for details. The list of sponsored plaques may change before you read this because of *QST* lead time, so please call or write for a list of what is available before sending any money. We salute those clubs and individuals who have helped to make the DX Contest awards program a success for the past five years!

5T5CJ (left) receives his plaque and congratulations from IARC President F8RU, for making the top African single-operator CW score in the 1981 ARRL International DX Contest.

W/VE Phone

Single Operator

All Bands	
1.8 MHz	Butch Greve, W9EWC, Memorial Plaque-Alfred Laun, K3ZO
3.5 MHz	Lance Johnson Engineering, KØCS
7 MHz	Dave Thompson, K4JRB/K5MDX
14 MHz	
21 MHz	John Allyn, W7XR
28 MHz	
QRP	Rochester DX Club, KZ2E

Multioperator

Single Transmitter	Jeff Maass, K8ND
Two Transmitter	George Taft, W8UVZ
Unlimited	Buffalo Area DX Club, W2RR

W/VE CW

Single Operator

All Bands	
1.8 MHz	W1TX Memorial Trophy
3.5 MHz	Northern Illinois DX Assn.
7 MHz	
14 MHz	Neenah-Menasha ARC
21 MHz	Carl Luetzelschwab, K9LA
28 MHz	Mike Badolato, W5MYA
QRP	Hollywood ARC

Multioperator

Single Transmitter	Jeff Maass, K8ND
Two Transmitter	George Taft, W8UVZ
Unlimited	Colorado Contest Conspiracy

DX Phone

Single Operator

World	
Africa	
Asia	Acadiana DX Assn.
Europe	Murphy's Marauders
North America	Chod Harris, VP2ML
Oceania	
South America	Carl L. Smith, WØBWJ
1.8 MHz	
3.5 MHz	Robert Peterson, W3YY
7 MHz	
14 MHz	Don C. Wallace, W6AM
21 MHz	Albert E. Snyder Memorial-W3KLG, G. A. Steward, K3ND
28 MHz	Mike Badolato, W5MYA
QRP	Gerald Griffin, W8MEP/5

Multiop-Single Transmitter

World	Delta DX Assn.
Africa	David Vogel, NL7P
Asia	
Europe	Metro DX Club
North America	Nick G. Lash, K9KLR
Oceania	Carl L. Smith, WØBWJ
South America	

Multiop-Two Transmitter

World	
Africa	
Asia	
Europe	
North America	
South America	

Multiop-Unlimited

World	Gloucester County ARC
Africa	
Asia	
Europe	Tom & Joy Middleton, WB4CKY
North America	Megahertz Manor Maniacs
Oceania	Dale Meyers, W4BIM/3D2DM
South America	

DX CW

Single Operator

World	
Africa	San Diego DX Club
Asia	Alamo DX Amigos
Europe	Clarke Greene, K1JX
North America	
Oceania	
South America	E. Eugene Davis Jr., W6NMA, Memorial
1.8 MHz	
3.5 MHz	Mad River Radio Club
7 MHz	Kansas DX Assn.
14 MHz	Bencher, Inc.
21 MHz	Southern New England DX Assn.
28 MHz	
QRP	Rochester DX Club-Marlis Cartwright

Multiop-Single Transmitter

World	John Brosnahan, WØUN and George Schultz, WØUA
Africa	
Asia	
Europe	
North America	Tom Taormina, K5RC
Oceania	
South America	

Multiop-Two Transmitter

World	Tom Frenaye, K1KI
Africa	
Asia	
Europe	
North America	Dennis McAlpine, K2SX
Oceania	
South America	

Multiop-Unlimited

World	
Africa	
Asia	Martha D. and Charles J. Ellis
Europe	W2PV-James Lawson Memorial — Schenectady, ARA
North America	
Oceania	
South America	

Special

Single Operator

W/VE Highest Combined Total Multiplier (both modes)	*The DX Bulletin*
Japan Combined Score	Northern California Contest Club
W/VE Operator (combined)	National Contest Journal
W/VE Low Power (CW)	Wireless Institute of the Northeast
W/VE Low Power (phone)	Rochester DX Assn.
Great Lakes Division (CW)	Livonia ARC
Great Lakes Division (phone)	Livonia ARC
California (phone)	Dave Bell, W6AQ
Texas (CW)	Dennis Motschenbacher, KZ5M
Texas (phone)	North Texas Contest Club
Caribbean Resident (phone)	Arturo Gigante, HI8GB
Japan (CW)	Randy Thompson, K5ZD and Tom Morrison, K5TM
Japan (phone)	Western Washington DX Club
Israel (CW)	Martin Hart, N6WW
Israel (phone)	Martin Hart, N6WW
Scandinavia (either mode)	John Lindholm, W1XX
World All Band-S/O	Edward C.Tletz (W5OSH) Danny Weil, ex-VP2VB
Zero Call Area (CW)	Eastern Iowa DX Assn.
USSR All-Band (phone)	W1DA, KB1FK, K1KI, WA2VUY, KD4PP, NC5K, K5VWW, KM7E WD8CRY, WØZV
USSR All-Band (CW)	W1DA, K1KI, NR4V, NC5K, K5VWW, W6ISQ, K7NW, SVØAA, KØBJ, WØZV
World Total QSOs (combined CW and phone)	Dick Spenceley, KV4AA, Memorial-Edward C. Tletz (W5OSH) and Danny Weil, ex-VP2VB

Multioperator

Caribbean Multi-Single (cw)	The YASME Foundation
Caribbean Multi-Single (phone)	Mike Badolato, W5MYA
Most Improved Club (points per entry)	Steve Place, WB1EYI
Multi-Multi World (combined score)	W2PV-James Lawson Memorial-Schenectady ARA
W/VE Club Unlimited (50+ entries)	ARRL
Medium (fewer than 50 entries)	ARRL
Local (3-10 entries; live within 20 miles)	ARRL

Public Service

Conducted By Robert J. Halprin,* K1XA

Ohio Combination Promotes Preparedness

In Ohio, it is referred to as the Great Blizzard of '78. The storm with its overwhelming snowfall and devastating winds left stranded motorists, households and communities isolated from utility and other vital services for days. The National Guard, American Red Cross, Disaster Services Agency, and many more local and state organizations and agencies mobilized to deal with the crisis. In many cases, the only communications into some areas or between the agencies involved was provided by Amateur Radio operators.

When a tornado wrought havoc in the town of Cardington in 1980, damage assessment, aid to injured or displaced persons and coordination of relief operations was facilitated by the assistance of a number of Amateur Radio Emergency Services groups. Coordination of the various agencies involved, requests for supplies and equipment, and welfare and damage assessment reports depended on the availability of reliable Amateur Radio communications.

One group of amateurs noticeably evident in these instances, and many others in Ohio, has been the ARRL Central Ohio Amateur Radio Emergency Service (COARES). The COARES is in an enviable position when it is called upon to provide emergency communication service for disaster relief or similar efforts. With an active roster of over 125 volunteers, COARES can provide almost a weekly opportunity for its members to exercise those skills needed in an emergency situation. Communication of administrative information, liaison with emergency medical personnel, installation of portable net control stations or linked portable repeater systems — all activities potentially useful in a disaster situation — are commonplace to this group. Perhaps more significant is the experience to anticipate who in authority should have a communicator assigned to him or her continuously. That is one thing weekly exercises requiring liaison with various community organizations and services has highlighted.

COARES has a history of years of service to Columbus and Central Ohio. Over the years, involvement in American Youth's Hostel's Annual Bicycle Tour of the Scioto River Valley, support for the annual Sunriser 500 Road Rally, communications for the local Cancer Society Treasure Hunt and assistance with a number of other community activities is typical of the COARES deep commitment to the community. In September 1980 the First Aid Service Corps (FASC) formed as an adjunct to the Safety Services Office of the Columbus Area Chapter of the American Red Cross; it was then that things really got out of hand.

It was recognized at the outset that FASC could not function effectively without communications. Past association between the Red Cross and COARES in first aid activities had shown the exemplary suitability of hams as the eyes and ears for first aid teams. In the 1980-1981 season, as requests for first aid or communications at various community events increased, the leadership of both FASC and COARES recognized their relationship was not, and could not be, one of casual convenience. In the broad spectrum of events where assistance was requested, it was obvious that the majority of activities required the services of both organizations.

The result of the close relationship that developed between the groups is, perhaps, the most unusual and notable facet of COARES operations. A good working relationship between and ARES group and local disaster services agency or civil defense group is fairly commonplace across the country. However, disasters or disaster drills are not, for the most part, a weekly occurrence. As a safety and first aid operation, COARES and FASC are, indeed, involved almost on a weekly basis, sometimes with up to four events in one weekend.

This consistent level of activity presents each member of the two groups with ample opportunity to learn to work well with the whole group, to become familiar with each other's operational preferences and foibles, to become aware of the capabilities and limitations of the available equipment, and to interact with the authorities and the public. The overwhelming personnel needs of a busy weekend demand a communications channel between leadership and the rank-and-file members of both groups which has become, of necessity, quite sophisticated. In essence it is an enviable disaster-preparedness training opportunity. Mobilization for an emergency can be initiated within minutes of a request.

Over the past three years, the activities of COARES has grown to include over 50 community-service events a year. By far, the majority of these events consist of relatively short 1- to 10-mile runs. It should be fairly obvious that the communication needs of a 1-mile run would be considerably different from those of a 10-mile run. Perhaps not so obvious would be the special consideration required by the size of the field — from hundreds to thousands of runners. Weather, terrain and even the organizer's experience are factors that must be considered in planning communications for a run. The COARES planners do it all on an almost weekly basis.

Of special interest in the runs covered, the Hyatt Mile and Corporate Challenge Events might be considered. Although the Corporate Challenge also includes a number of longer distance runs and relays, both events involve a 1-mile sprint through the center of the city on High Street, the city's main north-south artery.

In addition to the 2-meter administrative and medical net repeater, the use of a 220-MHz simplex net provides information for the electronic timers. The use of multiple nets for various events has become commonplace with COARES. It is often desirable to provide a separate 220-MHz net for communication of first aid information once a unit has been requested and dispatched on a 2-meter administrative net.

The multiple net experience was most informative this year in the Columbus Bank One Marathon. This is without a doubt COARES's most intense annual event. With over 65 volunteer communicators in support of administration, welfare, media information and a first aid contingent exceeding 70 medical personnel, just getting each ham located and operational is an accomplishment reflecting months of planning and preparation. Each ham's performance during 6 to 8 hours of sometimes frantic activity extending over large areas of the city unquestionably demonstrates the high level of emergency preparedness resulting from COARES's constant involvement in practical communications.

Originally planned for the Marathon were these nets: 147.06+ on the new ARES repeater as runner welfare and administrative net; 147.09+ for coordination and dispatch of medical personnel; and 147.15+ for timing and runner-number media reports. Administrative and medical net controls were located on the second floor of the State Office Tower overlooking the start/finish line with the medical net repeater on the OSU Campus linked to net control on 220 MHz to avoid desense problems.

An unexpected and unforseeable combination of circumstances involving the simultaneous use of all three repeaters caused a continuous degradation of the medical net repeater performance during the first half of the Marathon, finally forcing the net to transfer to 146.235+ MHz with medical groups in the finish area on 146.46 simplex.

Although the alternate repeater provided less than desirable coverage, with the effort and *experience* of the hams involved, it proved to be adequate. This versatility is most significant when it is realized that the welfare of a number of runners was critically dependent on these communications.

In addition to the three voice nets, the last two years has seen the increased use of amateur television. This year, two cameras provided views of the course and the 4500 runners to net control and announcement booth monitors. The Columbus Marathon is indeed a local Amateur Radio event.

For those who prefer bicycles to running shoes, the annual Tour of the Scioto River Valley (TOSRV), a two-day, 210-mile scenic round trip between Columbus and Portsmouth, is possibly the world's longest annual first aid set-up — with Amateur Radio communications, naturally. Three 2-meter repeaters with 220-MHz links between Columbus, Chillicothe and Portsmouth provide overall communications. Most of the first aid teams and many of the other operators also carry 220-MHz gear for "chatter."

The same type of repeater system, 2 meters linked on 220 MHz, with additional use of 220 MHz for chatter is in evidence in the annual Sunriser 500 Forest Road Rally. Over the years, repeaters in Columbus, Chillicothe, Portsmouth and Zaleski State Forest — on top of a fire tower, powered by a portable generator — have been the communications backbone of this event.

The rally itself consists of about 60 cars with driver and navigator covering much of Southern Ohio on a course combining timed (legal speed) road transits and forest road or logging trail stages where speed takes precedence over contact with the ground.

Of note are the amateurs in lead and fast sweep cars. Strapped in and sitting on a battery case, or if they are very lucky a back seat,

*Deputy Communications Manager, ARRL

cramped under a roll cage in a rally car intended for two persons of questionable sanity (a very fast driver and a hopefully faster navigator), the ham must operate with incredible road noise levels and, with hard wired ignition, an impossible level of electrical noise. It might be hard to say which of the three in the car is craziest.

That image may serve to highlight the real heart of the Central Ohio Amateur Radio Emergency Services. Whether on an annual community service training event or in a disaster situation, the outstanding performance of COARES as an organization is predicated on the outstanding performance of the individuals who donate their time and services to make it all work. There are about 20 hams with the necessary first aid training to be members of FASC as well as communicators. Some members specialize in equipment set-up or maintenance. There is a continual effort to train more net control operators. And the list goes on.

These are people from all walks of life: engineers, students, housewives, retirees, factory workers, and so on. They all share an interest in ham radio and a commitment to their community that makes them and the Central Ohio Amateur Radio Emergency Service something very special. — *John F. Hickey, N8ECY, Columbus, Ohio*

HAMS TO THE RESCUE

The impending low pressure system in the Bay of Bengal was causing great concern throughout India. After its formation, the depression steadily moved toward the Indian coast, heading for Andhra Pradesh province. The alert was given, and citizens were being evacuated as a precautionary measure. Hams were maintaining a 24-hour watch on the developments, prepared and ready to go at a moment's notice. Government authorities were previously appraised of our activities and our usefulness, by several demonstrations, Simulated Emergency Tests, and so forth. They were glad that Amateur Radio was an available resource.

On the evening of September 4, 1983, the storm struck over a vast area. Heavy torrential rains (30 cm a day, which is in itself a record) lashed the coast of Andhra Pradesh, inundating many areas. Many people were killed, and property damage was extensive. Roads and telecommunications facilities were cut off, and breaches in reservoirs made it impossible to provide relief to many localities.

The provincial government requisitioned helicopters from the Indian Air Force. They were deployed to take men and material to the marooned villages. Amateur Radio operators assisted in these relief efforts. VU2RM coordinated many of these transportation needs. VU2AWL and VU2EA manned the amateur station at the port town of Visakhapatnam for 14 hours a day during the emergency. The Control Center for the operation was established at the Secretariat of the Andhra Pradesh government. Hundreds of messages were handled from various stations: VU2WC, VU2ALI and VU2RBI were airlifted to Nizamabad, VU2KHK was mobile and was later joined by VU2ALI (after winding up the operations at Nizamabad when the normal telecommunications channels were restored), VU2SU, VU2AAP, VU2FAX, VU2KTY, VU2POY and others were in constant communication with the Control Center.

Many government officials were very impressed with Amateur Radio capabilities, and a number of them expressed the desire to join the Amateur Radio fraternity themselves! The Magistrate of Kakinada is planning the purchase of some amateur equipment and starting a radio club at his official residence to encourage interest in ham radio.

Other organizations such as the police, fire service and air force were also favorably impressed with Amateur Radio, particularly the portability and compactness of our equipment. In all, we used 10 HF transceivers and 20 VHF transceivers (including handhelds).

Rich tributes were paid to Amateur Radio; our services were recognized by government authorities, and the news media gave us widespread publicity. All India Radio reportedly gave Amateur Radio a big boost during their most popular program, *Spotlight*.

My sincere thanks to all the amateurs who participated in the emergency. Our special gratitude goes to the Principal Secretary, Department of Revenue, the Commissioner of Relief Operations, and other officials of the Nizamabad, Vijayawada, Kakinada and Visakhapatnam districts who gave Amateur Radio operators the opportunity to prove our worth. — *Anil Ray, SMØMFC/VU, Secretary, Hyderabad Radio Amateurs*

Ali, VU2ALI, operated from a mobile communications center near Kakinada. *(VU2KHK photo)*

COMMUNICATIONS SERVICE OF THE MONTH

ARRL Southern Florida Section Emergency Coordinator Manny Papandreas, W4SS, and Richard Zaretsky, WB2VGL, filed this report which augments the comprehensive *QST* coverage of the Grenada emergency (December 1983, pp. 66-69, 80).

The scenario of the Grenada invasion, as far as South Florida was concerned, started at pre-dawn hour of 5 A.M., October 25, when WB2VGL made a phone call to WA2HOC, asking if his station was in operating condition. WB2VGL explained that his rig, although new and just out of the box, had to be returned to the distributor for "adjustments" and it was imperative that contact with the Island of Grenada be made immediately. WB2VGL has close ties to the St. George's University School of Medicine through their offices in Bay Shore, New York. At approximately 5:20 A.M., contact was established with KA2ORK/J3 at the Grand Anse campus of the University. Contact was also made via land line to the Bay Shore office of the University.

Sometime near 7 A.M., WB2VGL realized the magnitude of what was taking place and began to look for a station that had more capabilities for what was to come. Not that WA2HOC's station wasn't first class, but such things as telephone lines, linears and duplication of equipment in case of failure had to be taken into account. A hurry up call on 2 meters was answered by HK3QB/W4, offering the use of his station. It was quickly accepted. For the next 36 hours all hell broke loose. The phone link with Bay Shore was reestablished and kept open during the entire operation.

At approximately 9 A.M. WB2VGL asked for a backup station in the area, just in case. W4SS responded and a 2-meter link between the two stations was set up. All capabilities of the first station were duplicated and ready to go instantly. This proved valuable later on.

Various net control stations were designated at various times depending on propagation. The net started on 20 meters was shifted to 15, back to 20, then to 40 and back to 20.

At 0001Z on the 26th, Net Control Stations KØIND and K4DMK at Key West obtained special authorization to transfer the net out of the American amateur phone bands. This was done to minimize interference.

At about 1500Z on the 25th, it was learned that W4PPC had activated his International Assistance and Traffic Net on 14.303 MHz and all health-and-welfare traffic was diverted to that frequency. The main concern was the welfare of the students at St. George's University of Medicine.

Some observations as SEC of Southern Florida are in order. The discipline of the nets was outstanding. The net controls are to be commended. The operators in Grenada did an outstanding job under the most trying conditions. There aren't enough words of praise in the book for KA2ORK. A special thanks also goes to all amateurs who just listened and waited to be called on.

In an operation such as this or disaster networks there is a need for the NCS to be scattered geographically. As in the case with Grenada, when there was deliberate jamming, because of propagation, the signal strength of the jammer and the sending station can vary. Another point to consider: When WB2VGL had traffic for Grenada and the NCS was to the North, it required him to swing the beam in his direction in order to be heard. By keeping W4SS's beam pointed North, a quick call on 2 meters from WB2VGL advising 'SS he had traffic enabled 'SS to break the net for 'VGL. Many times propagation was better at one station than the other. The second station can carry on communications during periods of distractions from the ever-present media, and there were many of these.

Richard Zaretsky, WB2VGL (left) and Antonio Correa, HK3QB/W4, work at keeping a phone patch open between Mark Barettella, KA2ORK/J3 (on Grenada) and St. George's University School of Medicine Bay Shore, New York campus during the Grenada invasion (see December 1983 *QST*, p. 66). This link provided much valuable information about the status of students on the island, much to the relief of the family and friends of the isolated students. *(photo courtesy HK3QB/W4)*

Important Lessons Learned

1) Principal stations must not be net control.

2) Media Control: Seek to direct to one station *not* involved with vital traffic.

3) It is imperative to have separate frequencies for emergency traffic and health and welfare traffic.

4) Limited use of relay stations. Establish exactly who is to relay to whom during the entire operation. Their operation should be limited to this function. Use VHF links where possible.

5) Exclude all unauthorized stations for net by announcements such as "All stations listening, please do *not* break net. If we need your location we will call for it." — *W4SS and WB2VGL*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For November, 42 SEC reports were received, denoting a total ARES membership of 22,288. Sections reporting were: AB, AZ, CO, CT, DE, EMA, ENY, IN, IA, KS, KY, LA, MI, MN, MS, MO, NE, NV, NH, NLI, NC, NFL, NTX, OH, OK, ON, PAC, RI, SV, SDG, SJV, SC, SD, SFL, TN, VA, WA, WV, WMA, WNY, WPA and WI.

NATIONAL TRAFFIC SYSTEM

November Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	30	1395	46.5	.978	90.6	
CAN	30	1167	38.9	.917	100.0	
PAN*	60	1033	17.2	.585	100.0	
Region Nets						
1RN	56	588	10.5	.447	84.2	100.0
2RN	60	500	8.3	.378	87.0	100.0
3RN	30	253	8.4	.502	96.7	100.0
4RN	60	828	13.8	.516	79.0	100.0
RN5	60	817	13.6	.448	98.4	100.0
RN6	60	683	11.4	.416	98.3	100.0
RN7						100.0
8RN	60	482	8.0	.408	98.3	96.7
9RN	59	539	9.1	.377	100.0	100.0
TEN	60	656	10.9	.463	88.3	100.0
ECN						46.7
TWN	60	363	6.1	.323		100.0
TCC						
TCC Eastern	116[1]	861				
TCC Central	79[1]	563				
TCC Pacific	101[1]	639				
Cycle Four						
Area Nets						
EAN	30	2210	73.7	1.881	95.0	

CAN	30	1058	35.3	1.063	100.0	
PAN	30	1481	49.4	1.130	98.9	
Region Nets						
1RN						96.7
2RN	90	868	9.6	.575	95.1	93.3
3RN	60	375	6.3	.647	100.0	96.7
4RN						96.7
RN5	60	675	11.3	.581	95.7	100.0
RN6	60	904	15.1	.663	100.0	100.0
RN7	60	615	10.3	.721	97.6	100.0
8RN	55	423	7.7	.409	88.0	96.7
9RN	59	502	8.5	.525	99.2	100.0
TEN	60	381	6.4	.411	86.3	100.0
ECN						90.0
TWN	57	508	8.9	.401	89.0	96.7
TCC						
TCC Eastern	114[1]	748				
TCC Central	53[1]	398				
TCC Pacific	114[1]	1202				
Sections[2]	7496	34,971	4.7			
Summary	8832	57,299	6.5			
Record	8300	66,257	18.4			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (266): APSN ATN (AB), AENB AEND AENK AENN AENR AENW AENY AENZ ATNM EAARES WAEN (AL), ACN ATEN HARC (AZ), BCEN (BC), NCN NCTN SCN/1 SCN/2 SCN/V VHF RTTY (CA), DEPN DTN SEN (DE), BEN CRTN DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN LCEN NFPN PEN PRVAN QFN SEFTN SPARC SVTN SWFTN TPTN (FL), CGVN GCN GSBN GSN GTN NWGFM (GA), CIARES ICN ITEN PCARES TLCN (IA), ILN ISN ITN (IL), ICN ITN QIN (IN), BEN CRT CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 4ARES 5ARES 7ARES 11ARES CARN KNTN KRN KSN KTN KYN KYPON MKPN NKARC PAEWTN TSTMN WTEN (KY), LAN (LA), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN (MA/RI), MEPN MMN MTN WRIN (MB), MDD (MD/DE), AEN CMEN MPSN OXRACES PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MNAMWXN MSN MPSN MSSN PAW (MN), CARL CMEN SARN HBN JCAN LOCW LORN MEOW MON MOSSB PHD RARBN SARN STARN (MO), MMN MSBN MSN MTN MNRAN (MS), CN CSN (NC/SC), CEN CMN CNCTN PCTN (NC), BVARES CC2MN EN2MARES MNARES NCHN NCW NE40 NE75 NE160 NMPN NSN PVTMN SBARES TCARES WNN (NE), GSFM GSPN NHN (NH), JSARS MCN NJM NJN NJPN NJSN NJVN OBTTN SJVN TCETN (NJ), NSN (NV), CDN CNTYN EPN HCAT&E HVN NCVTN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN SDN WDN (NY), ALERT BN BNR BRTN BSSN COARES HCARES LCNWOARES MCTN ONN O6MN OSN OSSN (OH), CARA NWOTN OLZ ONON OTN OTWN STN (OK), KTN OLN OPN OSN OSND OSN2 (ON), BSN ORARES OSN PDXARES PTTN SOFM (OR), NWPATMTN WPA WPA2MTN WPAPTN (PA), PTN (PAC), QSN (PQ), GPD2MN LC2MN SCNTN SCSSBN (SC), SDEEN SDN SDSMEN SDTIN SDWXN WCEN (SD), TNCW TNPN TNVN TSRN (TN), DFW NET TEX TSN TTN (TX), BUN (UT), VTN (VT), EWTN NTN NWSSBN PSTS WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVARN WVFN WVMDN WVN WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

1	2	3	4	5
Cycle Two				
TCC Eastern	120	96.7	1678	861
TCC Central	90	87.8	1178	563
TCC Pacific	120	84.2	1488	639
Summary	330	89.6	4344	2063
Cycle Four				
TCC Eastern	150	93.3	1488	742
TCC Central	60	88.3	843	398
TCC Pacific	122	93.4	2398	1202
Summary	332	91.7	4729	2342

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (November) *Cycle Two* — Eastern Area (AF8V, Director) — N3ADU AA4AT N1BHH WA4CCK KA8CPS K1EIC WD4FTK KA1GBS VE3GOL WB3GZU KO2H WA2HEB WB1HIH KB2HM VE3HTL WD8LRT W1NJM K8OZ W8PMJ W8QHB W1QYY KB3UD AF8V AK1W N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) — N5AMH N5AMK WA5BHF K5BNH W5CTZ N5DFO N4FOD W6FRC NG5G KW9J W4JL WA4JTE W9JUJ K5KJN W5KLV KA4MZY WB9NVN WB4OXE KA4SAA KB5UL WF4X WB5YDD. Pacific Area (W0HXB, Director) — KT6A WA7CBN VE8CHK N7CSP N0CXI KU6D WD5ESV KD7EY KB7FE W7GHT W0HXB KM6I W5JOV KR7L KB0MB K0OVK K6OWA WA0OYI KF7R ND5T W7TGU K8UYK WB7WOW K6YBV KM7Z. *Cycle Four* — Eastern Area (W2CS, Director) — VE3AWE W3BBN KI3C WA4CCK W2CS W1EFW W2FR KB3FW W2GKZ VE3GOL WB3GZU KB2HM W1ISO KN1K AH2M W1NJM W8PMJ W1QYY WB4PNY W3PQ W2RQ K3RZR WA2SPL KB3UD W4UQ AF8V VE1WF W2XD N8XX K4ZK. Central Area (K5GM, Director) — W0AM W9CXY K0EZ W5GHP K5GM W0HI K5OAF W5RB N5TC W5TFB K5TL WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — AD0A KN7B K0BN KA7CPT KC0Z W7DZX W6EOT W7EP W7GHT N2IC W5JOV W7LG W7LYA WB7NHR W0OGH N5SJ ND5T WA7TEH W5UH W7VSE W6VZT WA7WIB VE6ZK.

Public Service Honor Roll November 1983

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. 5; (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.

208
WB7WOW
162
K7VW
152
W2AHV
150
WA4QXT
143
W1EOF
141
KA3DLY
139
KM9B
133
KA1GBS
WB2MCO
130
KC9CJ
129
KB0Z
128
WF4Y
124
W9YCV
123
AG2R
119
WF4X
118
WA2FJJ
WB2EAG
116
KW9J
K4JST
115
WB3GZU
WB0TED
N1BGW
114
WB2KLF
AL7W
WD8LRT
113
N2XJ
W7VSE
KS7I
K7GXZ
WD8MIO
112
WA4PFK
AF8V
WB4WYG
111
K4ZK
W2MTA
KA4AMC
WB2UVB
110
KB5W
KA0EPY
WB1GXZ
109
KB2HM
WB1HIH
N4PL
N4FQD
108
WB2VUK
WD8RHU
KU0G
N4GHI
107
W2VY
KC0UJ
KD7ME
106
N5AMK
KA0ARP
WB0ZEN
K2ZM
105
KC2QQ
KA1BHT
KB7FE
104
KK1E
KC5NN
W0OYH
WA4JDH
WA4CCK
103
KB0MB
KK3F
KF8J
102
W1PUO
KC3Y
KA4SAA
WB2ZCM
101
KQ3T
W4ANK
W0KJZ
KZ8Q
VE3BDM
WD4CNQ
KR4V
WD4ALY
WA2HFB
100
KA4GUS
W5KLV
W3YVQ
WB4RUJ
99
KT9I
98
W6VOM
W7GHT
AK1W
KC2TF
97
K2VX
WB2IDS
96
NI6A
WA0TFC
KA4GFU
KB4WT
KA5HDT
95
WB5YDD
KB3UD
KA1T
N8EVC
94
WA4EIC
KX7W
WB2RBA
KA2BHR
N5DKW
AG9G
93
N3COY
K3JL
N1ARI
KA4MTX
W0FRC
KO7V
92
KY4U
K4VWK
K1CB
91
W6INH
W2AET
WB2OWO
K8KQJ
KA8CPS
KB4OZ
W4CK8
90
NW4R
W1RWG
KI1M
W2BIW
W5CTZ
W3VA
WB8WKQ
VE3DPO
KA1EXJ
89
KA1AVU
WA1YNZ
W2PKY
WA3WIY
K3ZJJ
WA4LXP
KA0BWM
88
K6UYK
N5TC
87
WD4AWN
WB1GLH
KA3EJG
KD7MW
N6AWH
WB4WII
K4KDJ
86
K5OAF
KD5FR
W7LG
KA9IKR
85
KJ3E
KJ3T
VE3GT
WA4YPQ
K4IWW
W0KK
K0DKM
84
N5BFU
83
AD7G
WB6QBZ
KB5UL
KA8GJV
WB4YQP
KB9X
82
ND2S
KB4LB
KA9HPQ
VE2CU
KA4BCM
81
N2ELW
KS5V
AI6E
KA8NCR
80
KX7T
N0EEH
VE3GOL
N1ER
79
K7LCA
W8UE
WB8MTD
AA4AT
78
WB2GHN
W1TN
W2KB
N9BDL
WB4AID
WA9BXB
77
WD8OUO
76
KT6D
KA3GJT
VE3WM
K8JDI
WD4HBP
N4GDT
KU4W
75
KA2OIW
KL7IJG
N7BGW
WB8SYA
N8CW
WA4RNP
K3CR
N1AJJ
NN4I
74
W2XD
K1JHC
W2ZOJ
KB8GT
WB0SUM
VE3KK
WB2OMZ
WB5NCM
73
W9NXG
72
WB2OHR
WB3KJT
KT5Y
71
N1BJW
KA0KWM
KA0BCB
WA2ARC
70
K4ZN
KG9B
KA1EPO
WA2KOJ
69
W4FMZ
W6CPB
AK2E
N0CFS
WA4EYU
KA1BBU
68
KA6BNW
KA8PQH
WB4HRR
K0SI
AI0O
67
N2EBA
WA3UNX
KA4BBA
W1KX
KC3DW
66
W3DKX
W2GJ
WA8DHB
VE2EDO
KP4DJ
65
K6AGD
K3NTD
WB6DOB
WA6QCA
KD2BE
KA5AZK
WB4TZR
W4HON
W0OUD
WD4OCW
64
KY2P
WB5CIC
W0IKT
KR7L
WA8HGH
KA3DTE
63
WD4KBW
W7LNE
K4WJR
KA2DQA
WB1ABQ
KC0OO
WD8KBW
N8DSU
WA4JTE
KB4OG
W1AF
62
KF7R
W9DM
K9EHP
W8EK
KS2G
61
WB0HOX
KD9K
WD4PBF
WD4BSC
K0PCK
60
N5EZQ
KA8MEB
KB2WI
KA1GWE
WB9IHH
KA4SKV
NW4A
WA0SCP
WB5LBR
59
N5EZM/T
58
WB8NHV/T
53
KA1KML/N
KA6HJK/T
49
N5FDL/T
40
KA8GGZ/T

Brass Pounders League November 1983

BPL Medallions (see April 1979 *QST*, page 77) have been awarded to the following amateurs since last month's listing: KA1BBU AA4AT.

The BPL is open to all amateurs in the United States, Canada and U.S. 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 standard ARRL form.

1	2	3	4	5	6
W3CUL	794	1116	1491	112	3513
N0BQP	0	1505	164	882	2585
KA9CPA	47	1279	159	831	2316
WA0HJZ	0	786	24	490	1295
W1EOF	1	453	554	47	1055
KA1GBS	6	480	496	37	1019
K8NCV	26	468	482	12	988
W9JUJ	0	440	471	2	913
WA4JDH	1	457	426	3	887
W3VR	289	209	346	37	881
K6UYK	141	295	264	10	770
WB5YDD	7	414	290	31	742
N4PL	80	274	320	55	728
KB0MB	146	190	325	40	701
W7VSE	4	357	316	24	701
W0FPT	0	389	0	296	685
W7DZX	20	331	320	6	677
WD8MIO	50	309	227	33	619
AA4AT	12	298	304	1	615
W3ATQ	2	302	293	5	602
W4NFK	16	271	285	10	582
KW9J	36	223	297	15	571
AA4FG	208	79	255	24	566
WF4X	11	273	254	26	564
N1NH	77	213	267	2	559
WB7WOW	10	211	255	82	558
W5DAD	12	264	264	12	552
KB5W	7	237	296	9	549
WB1GXZ	17	233	285	9	544
WF4Y	125	154	218	24	521
K0JAN	0	302	30	186	518
WB2IDS	42	213	217	43	515
WB8WKQ	1	246	251	15	513
W8PMJ	3	269	230	2	504
KC0UJ	121	127	220	35	503

BPL for 100 or more originations plus deliveries:

K1BZD	170
WA9BXB	146
WB2UVB	131
KH6B	123
KV8Q	101
K3NPX (Oct.)	121

Multioperator stations:

WD4IIO	156
K4KDJ	102

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (November 1983)

1	2	3	4
Amateur Radio Telegraph Society	30	457	286
Central Gulf Coast Hurricane	30	193	2409
Clearing House	29	127	324
Early Bird	30	1072	467
Emplre Slow Speed	30	103	405
Golden Bear	31	133	2002
IMRA	28	754	1563
International Assistance & Traffic	30	192	
Mission Trail	30	330	1050
North American SSB Traffic	26	254	148
Vermont Sideband	26	175	564
West Coast Slow Speed	31	99	444
75-Meter ISSB	30	503	1175
7290 Traffic	46	1065	3582

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple*, KA1KRQ

FEBRUARY

Jan. 26-Feb. 6

Novice Roundup, Jan. *QST*, page 79.

1

West Coast Qualifying Run, 10-35 wpm, at 0500Z Feb. 2 (9 P.M. PST Feb. 1). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

4-5

Arizona QSO Party, Jan. QST, page 87.

Golden Jubilee Contest, sponsored by the Liga de Amadores Brasileiros de Radio Emissao — LABRE, from 1500Z Feb. 4 to 1500Z Feb. 5. Brazilian stations work anyone, everyone work Brazilian states, territories and islands. Entry categories are (a) Single operator, all bands or single band. (b) Multioperator, single transmitter, all bands. Exchange RS(T) plus a QSO number starting with 001. QSOs with DX stations count 6 points on 160, 80 and 40 meters; 2 points on 20, 15 and 10. QSOs with other Brazilian stations — 2 points on 160, 80 and 40; 1 point on 20, 15, and 10. Work each station once per band. Multipliers are the different prefixes worked. Portable stations without district number count for the 10th area. The final multiplier is the sum of multipliers worked on each band. Total QSO points times the sum of the multiplier on that band for the single-band competition. For all bands score, total the QSO points from all bands times the final multiplier. Use a separate log for each band. Mail logs by Mar. 31 to LABRE, "Golden Jubilee Contest" Committee, P.O. Box 07-0004, 70.000 — Brasilia (DF), Brazil.

New Hampshire QSO Party, Jan. *QST*, page 87.

Vermont QSO Party, Jan. *QST*, page 88.

Zero District QSO Party, Jan. *QST*, page 88.

YU WW DX Contest, Jan. *QST*, page 88.

VE1 Contest, phone, Jan. *QST*, page 87.

7

W1AW Qualifying Run, 10-40, at 0300Z Feb. 8 (10 P.M. EST Feb. 7). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Feb. 1 listing for more details.

11-12

North American Sprint, Jan. *QST*, page 88.

PACC Contest, sponsored by VERON, from 1400Z Feb. 11 to 1700Z Feb. 12. Bands 1.8 to 29.7 MHz, modes CW and sideband. Categories are single op, multi-op and SWL. Exchange RS(T) + QSO no. starting with 001. Dutch stations give RS(T) + province (GR FR DR OV GD UT YP NH ZH ZL NB LB). Each QSO with PA/PB/PI confirmed counts 1 point. Work each station once per band. Multiplier is 1 per province per band; maximum 72. Final score is the sum of QSO points of all bands times the final multiplier. Use a multiplier column and insert multiplier only if it is a new one. Sign log for observations of contest rules. Awards. Send logs before March 31 to PAØINA, F.Th.Oosthoek, P.O. Box 499, 4600 AL Bergen op Zoom, The Netherlands.

Two-Land QSO Party, sponsored by the Gloucester Co. ARC, from 2100Z Feb. 11 to 0300Z Feb. 12. Single ops operate 24 hours max. Multiops may use entire 30 hours. Work stations once per band and mode. Work mobiles and portables as they change county. NY and NJ stations may work each other for credit. Exchange signal report and QTH (State and county for NY/NJ stations; state, province or country for others). Suggested frequencies: CW — 1.805 and 60 kHz up from lower band edges; phone — 3.900 7.230 14.280 21.355 28.600; Novice — 25 kHz up from lower band edge. Count 2 points per phone QSO and 3 points per CW QSO. NY/NJ stations multiply by total states/provinces/countries/NY/NJ counties worked per band; others multiply by total NY/NJ counties worked per band (83 max./band). Awards. Mail entries by Mar. 20 (include large s.a.s.e. for results) to Dennis Sandole, WB2GES, 301 Portsmouth Rd., Cherry Hill, NJ 08034.

18-19

YL-ISSB-Commo-System 1984 QSO Parties, sponsored by Rick, KØRDJ, and Minnie, NAØV, Connolly, phone from 0000Z Feb. 18 to 2359Z Feb. 19. (CW is from 0001Z March 17 to 2359Z March 18.) Frequencies are the General portion of all bands. Send all logs, summary sheets and comments to Rick and Minnie Connolly, KØRDJ/NAØV, Star Rte. 1, Crocker, MO 65452, by June 1.

ARRL International DX Contest, CW, Dec. *QST*, page 95.

18-26

Roman Castles International Contest, sponsored by A.R.I. Radio Club in Albano Laziale (Roma) Italy from 0001Z Feb. 18 until 2300Z Feb. 26. Single op only. Modes are CW, SSB and RTTY. Work each station only once per day. The exchange is RS(T) and QSO no. beginning with 001. Score 1 point for Italy and Mediterranean states (7X, EA, EA6, 5B4, F, FC, SV, SU, ZB, 4X, YU, OD, 9H, CN, 3A, YK, 3V8, TA). Score 2 points for Europe, and 3 points for all others. Separate modes for CW and SSB. Mail logs before Mar. 15 to the Award Manager IØYKN, Nuccio MEOLI, P.O. Box 10 — 00119, Ostia Antica, Roma, Italy.

22

W1AW Qualifying Run, 10-35 wpm at 2100Z (4 P.M. EST) Feb. 22. See Feb. 7 listing for more details.

25

RTTY World Championship Contest, sponsored by the RTTY Journal and *73* Magazine, Feb. 25 from 0000Z-2400Z. The same station may be worked once on each band. Single op stations are limited to 16 hours maximum. Off times are no less than 30 minutes each. Single operator and multi-signal only. Entry categories are single band or all band (10-80 meters). Stations within the U.S. and Canada must send RST and state, province/territory. All others transmit RST and consecutive QSO number. Count 5 QSO points for contacts with W/VE stations located within the continental U.S. and Canada; 10 QSO points for all other contacts. One multiplier for each of the 48 states, Canadian Provinces/Territories and DX worked on each band. Score equals total QSO points times total multipliers. Log by band. Use official forms. Entries must be postmarked by April 15. Send s.a.s.e. to RTTY World Championship Contest c/o The RTTY Journal, P.O. Box RY, Cardiff, CA 92007.

25-26

French Contest, phone, Jan. *QST*, page 87.

UBA Trophy Contest, phone, Jan. *QST*, page 87.

CQWW 160-Meter Contest, phone, Jan. *QST*, page 87.

29

West Coast Qualifying Run, 10-35 wpm at 0500 March 1 (9 P.M. PST, Feb. 29). See Feb. 1 listing for more details.

MARCH

3-4

ARRL International DX Contest, phone, Dec. *QST*, page 95.

7

W1AW Qualifying Run, 10-35 wpm, at 0300Z March 8 (10 P.M. EST March 7). See Feb. 8 listing for more details.

10-11

IARS/CHC International Contest, CW, sponsored by the International Amateur Radio Society and Certificate Hunters, from 0000Z March 10 until 2400Z March 11. Phone is from 0000Z March 17 until 2400Z March 18. Frequencies are CW: 70 kHz from the bottom of the band. (Phone frequencies are 3.960, 7.260, 14.300, 21.360 and 28.600.) The exchange is a signal report, IARS and/or CHC, no., and state/province/country. Work stations once per band, no repeater or cross mode. Multiply QSOs times countries times IARS/CHC members worked. A member of both divisions counts as 2 multipliers. Awards. Log date/time (UTC), station worked, exchanges sent and received, points claimed and final score. Include check sheet for more than 100 QSOs. Mail by June 1 to Ted Melinosky, K1BV, 525 Foster St., South Windsor, CT 06074. send large s.a.s.e. for results.

10-12

Virginia State QSO Party, sponsored by the Sterling Park ARC from 1800Z March 10 to 1200Z March 12. The exchange is the QSO no. 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 QSO. 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 the no. 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 new 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 sub-bands. Phone frequencies are 3.930, 7.230, 14.285, 21.375, and anywhere on 160 meters except the DX windows. Follow ARRL Standard Contest logging guidelines. Mail logs by April 15 to Virginia QSO Party, c/o Ken Harrigan, KB2LT, 2 Darus Ct., Sterling Park, VA 22170.

11-12

Wisconsin QSO Party, sponsored by the West Allis RAC from 1800Z March 11 until 0100Z March 12. CW and phone stations may be worked once per mode on each band. The exchange is RS(T) and county for WI stations and RS(T) and state/province for all others. Suggested frequencies for CW: 3.560, 7.050, 14.060; and for phone: 3.990, 7.290, 14.290 kHz. Phone contacts count 1 point, CW QSOs count 2 points. WI stations multiply QSO points × (WI counties + states + provinces). Others multiply QSO points × WI counties. WI mobiles add 500 bonus points for each county that you operate from, excluding your home county. A minimum of 15 QSOs per county is required to qualify. Logs must include operating times (UTC), call, RS(T), state, WI county, mode and score summary. Include a dupe sheet for more than 100 QSOs. Awards. Postmark entries by April 15 and send to Wisconsin QSO Party, c/o West Allis Radio Amateur Club, P.O. Box 1072, Milwaukee, WI 53201.

17-18

YL ISSB, CW, Commo-System QSO Party

IARS/CHC International Contest, Phone

Kentucky QSO Party

Spring QRP CW Activity Weekend

Bermuda Contest

Tennessee QSO Party

22

W1AW Qualifying Run

24-26

B.A.R.T.G. Spring RTTY Contest

24-25

CQ WW WPX Contest, phone.

*Communications Assistant, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. A/SM: VE6AMM. STM/DEC/NM (APSN & ATN): VE6ABC. Results of gov't-sponsored registration of ham volunteers to assist in emergency communications has reached a total of 440, but only an average of 18 check into the training net held on Tues at 7:30 P.M. on 3750 kHz. This ratio causes one to wonder, but not if you have been in this business for long. Perhaps the answer is that we are so geared to filling out gov't forms we do it automatically. No doubt the highlight of the month is the STS-9/W5LFL skeds. Traffic: VE6CHK 276, VE6ABC 49, VE6YW 6, VE6BKP 3, VE6BP 1, VE6SU 1.

BRITISH COLUMBIA: SM, H. E. Savage, VE7FB — Section Net Certificates for annual checking into the BCEN went to VE7BNI QNI 364, 7DKY QNI 362, 7CTJ QNI 335, 7CDF QNI 268. Twenty awards were made down to fifty QNI for the year of 1983. Officers for Burnaby ARC 1983, VE7CSD, pres.; VE7CYO, v.p.; VE7CZN, secy. Officers for Vancouver ARC VE7BBA, pres.; VE7CVD, v.p.; VE7FHO, secy. Sure would like to hear from the other clubs. Have lost count of our snow birds but we know VE7CB 7BY 7LL have gone south. Traffic: VE7BNI 220, VE7CDF 151, VE7FB 49, VE7EDN 47.

MANITOBA: SM, Peter Guenther, VE4PG — A/SM: AJE. SEC: HK. STM: OO. NMs: VJ TE NM IX. Seems like a lot of operators are looking forward to the shuttle contacts. VE4DT is now handling the swap and shop on Wed. and Sun. evenings. There is good participation on the CW net. A number of new stations are showing up very regularly. ARES is gearing up for the across Canada test. Activity on all nets increasing. MTN QNI 259, QTC 49, sess. 30. MEPN QNI 1299, QTC 20, sess. 30. WRIN QNI 306, QTC 1, sess. 9. MMN QNI 559, QTC 37, sess. 30. Traffic: VE4IX 36, VE4TE 33, VE4RO 32, VE4PG 28, VE4AAD 20, VE4JA 19, VE4AJE 18, VE4OO 13, VE4ALO 9, VE4BI 6, VE4FK 5, VE4DS 4, VE4DT 4, VE4LB 4, VE4MG 3, VE4AGT 2, VE4CF 2, VE4HK 2, VE4NE 2, VE4NM 1.

MARITIME/NEWFOUNDLAND: SM, D. R. Welling, VE1WF — ASM: VO1FG. NMs: VO1JN VE1WF. Need volunteers to fill most other appointments. Silent Key VE1BY. VE1PD carries Teleconference Radio Net; next date is March 1. FARC exec: 1CGV, pres.; 1CGZ, v.p.; 3NET/1 secy/treas. MAARC exec: 1BOT, pres.; 1CDV, v.p.; 1CKW, secy.; 1BX, treas. Congrats to all. VE1BXM is now a Justice of the Peace. VE1TL moved to Ottawa. New white caners in Moncton area VE1CKZ and VE1CKR. VE1CER/AK4L had successful SS CW operation in Saint John area. APN: 30 sess., QNI 127, QTC 89, time 265 mins. Traffic: VE1WF 451, VE1BKM 55, VE1XF 20, VE1BXA 12, VE1ALU 8, VE1BPM 6.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. TC: VE3EGO. The STS-9 mission was an unqualified success as far as Amateur Radio was concerned. The publicity generated for Amateur Radio was tremendous and it was the talk of all on the bands. Hope you were able to work W5LFL. Congrats to VE3AJN who played a role in providing communications during the recent Grenada crisis. Her call, along with a number of US amateurs, was entered in the *Congressional Record* during a commendation for Amateur Radio operators by Senator Barry Goldwater, K7UGA. As many know, her OM is VE3GNW, and together they are active in traffic work and put out a good signal from Kemptville. Their son is VE3IDL. New EC appts: VE3LCZ replacing VE3EFX for Bruce Co.; VE3MOR, Dryden District. VE3BJP VE3CT and VE3KE have become Silent Keys. VE3CDS piled up a good score in the "Sweepstakes," working 68 out of 74 Sections. VE3LFX VE3NLB and VE3MCC have their Advanced. The history of the Welland Co. ARC was included with other similar documents and sealed in a time capsule buried underground on the Port Golborne museum property, to be opened 150 years from now. The Ontario Trilliums have started a QSL Bureau Net on 3,755 Wed. nights at 1800 hours local. VE3LDU and VE3KSG set up an HF and VHF demonstration for the Ingersol Lions Club. VE3MNI doing a good job as an OBS on repeater VE3KBR. VE3BUO and VE3GFN are newcomers on RTTY. VE3FOI, TOA editor, is the proud owner of a VIC-20. VE3LDW has indicated that the Oxford Net will be re-activated on Mondays at 1930 hours local on repeater VE3OHR. Windsor ARC advises their Rose City Award is back — work five Windsor stations. Traffic: VE3KK 230, VE3GOL 186, VE3CYR 121, VE3DPO 114, VE3GT 110, VE3HGJ 109, VE3GFN 89, VE3BDM 69, VE3FGU 60, VE3JSM 58, VE3AJN 50, VE3KXB 47, VE3WM 42, VE3AWE 29, VE3BVG 28, VE3KCZ 27, VE3WG 22, VE3EHL 20, VE3WV 17, VE3EWD 16, VE3DZK 12, VE3BAJ 7, VE3MPF 7.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. PIO: VE2YW. BM: VE2ALE. TC: VE2ED. NMs: VE2EDO VE2FSA. Astronaut Dr. Owen Garriott, W5LFL in STS-9 space shuttle was heard with a loud signal in our section. VE2SH has been elected president of MARC. *QST* on tape is always available to handicapped amateurs from your SM. With regret, I have to report the passing of VE2IZ and VE2ECB. Un nouvel amateur de la Mauricie bienvenue a VE2GZG. Un repeteur tres actif est VE2TA, avec une section de francais le mardi, section sur l'ordinateur le lundi et marche aux puces le mercredi. Traffic: VE2EDO 82, VE2EC 48, VE2BP 48, VE2CU 47, VE2EKC 23, VE2FFE 13. (Oct.) VE2CU 42.

SASKATCHEWAN: SM, W.C. Munday, VE5WM — SEC: VE5RP. STM: VE5HG. TC: VE5GF. NMs: VE5AFA VE5BAF VE5EX VE5HG VE5NJ VE5OI. Members of the Moose Jaw ARC and the Regina ARA were recipients of a United Way Winner's Circle certificate for providing a valuable communications network for the "Arms Around Regina" project. The Southwest ARC, Swift Current, will host the 1984 hamfest commencing Friday June 30. VE5BD became a Silent Key on Nov. 19th. He will be missed on the airwaves and sincere sympathy is extended to his wife and family. Traffic: VE5ADZ 27, VE5AAT 17, VE5AEJ 9, VE5WM 3.

ATLANTIC DIVISION

DELAWARE: SM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: K3JL WA3WIY W3DKX. The Delaware QSO Party was held on Nov. 12-13. Didn't know so many still needed Del. Over half the ones I worked needed a card. K3PFW WA3ZBI and K3JL attempted contacts with W5LFL on a set up at Del. Tech. Wilmington repeater 146.73 has installed a new machine. Sounds great with good coverage. DARC will be needing a new Field Day site. If you know of one, please inform the club. DTN QNI 457, QTC 53, 22 sess. DEPN QNI 67, QTC 7, 4 sess. SEN QNI 61, QTC 4, 5 sess. Traffic: W3PQ 129, W3QQ 68, W3DKX 51, WA3WIY 42, K3JL 34, WB3DUG 23, W2AGR 10, WA3ZBI 10, WA3PWT 9, K3ZXP 8, W3WD 3. (Oct.) W3PQ 163.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DEC: AA3C K3QXC KB3LR KB3UD N3AIA N3BFL W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 PM DY	527	217	30
EPA	3610	7/10 PM DY	410	202	60
PTTN	3610	6:30 PM DY	277	125	30

Local and VHF nets reporting (QNI/QTC/sess): D3ARES 125/19/4; D6ARES 35/7/4; CCARES 28/1/5; CSESN 45/0/4; LCARES 66/22/9; PWAARES 60/0/4; LCARES (Oct) 75/13/8. OO reports: N3DNB W3FAF W3GTN W3KEK. OBS reports: K3EBZ W3CL W3VA. PSHR reports: K3NTD KA3DLY KA3EJG KA3GJT KB3UD N3COY N3BSK/3 W3VA WA3JRL WB3FKP. I have appointed W3AMQ as Public Information Officer (PIO) for the section. Any one needing info please contact him. PTTN welcomes N3AVF. K3MW sporting a new Ten Tec 2591 HT. Murgas ARC reports 7 students from their Novice class passed their exams and are now awaiting call signs. Upgrades: WB3AJK to E: KA3DXN N3DEK N3DHK N3DIG to A; KA3IDD KA3JPX N3DCF to G; KA3KJC KA3LBG to T. Congrats to all. New officers for 1984: PennMar RC WA2CRK, pres.; KA3GUZ, v.p.; W3BC6, treas.; York ARC W3EDO, pres.; N3BQB, v.p.; W3AMQ, secy.; WA3SRE treas.; WB3LJS, asst. secy. Hill Top TA. WA3ZWX, pres.; K3COA, v.p.; K3COA, v.p.; WB3ERZ, secy.; K3DCU, treas.; WB3EWA, asst. secy.; W3CXE received ARRL 50-year membership plaque from W3ABC, Atlantic Div. Director, at recent meeting of the Lebanon Valley Society of Radio Amateurs. N3AIA, DEC D10, reports TMI drill an excellent group effort by RACES/ARES members and others and that York Co. EC scored highly. Over 50 formal QTC were handled during the drill. W3ILG informs us that his XYL is WB3FUR, one son KA3IDD just upgraded to Gen and other son (8 yrs) is studying for Novice. Ham family? New officers for 1984 Mobile Sixers RC: WB3BDP, pres.; KA3FVB, v.p.; K3RTU, secy.; KN3W, treas.; WA3KFT, editor. WB3FKP QRL with new job at Tobyhanna Army Depot. It was very gratifying to hear and see the vast amount of publicity the various clubs, groups and individual ham ops of the section received from the radio, TV stations and newspapers concerning the Grenada and STS-9 events. Traffic: N3COY 333, KB3UD 216, W3IPX 209, KA3DLY 197, N3AIW 172, WB8KPE 117, W3AQN 75, N3CD 66, K3NTD 64, W3VA 49, KA3EJG 48, KA3GJT 47, W3TWV 35, W3CL 19, N3DKC 15, WB3FKP 13, WA3CKA 12, WB3FVJ 12, K3QCX 12, W3ADE 11, WB3CAI 11, AF3Z 11, N2BSK/3 9, W3FAF 9, N3CMC 6, N3AKQ 3, N3DMB 2, K3EBZ 2.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — KA3R finds some on the wrong side of the band edge: W3MSN 51-½ years active, has a new batch of antennas with low SWR 160 thru 2 meters. KJ3E enjoys his new plaything a 2-meter handheld. Dyed in the wool CW op W3CDO finds phone a little rough. W3ZNW has fun with his keyboard. KC3D was a dude ranch vacationeer this month. KB3WL says winter comes early in the mountains. W3OYY has given up on snow. KC3DW has some sneaky leaky RF problems. W3LDD is on the flat curve with DX activity. W3FZV manged to squeeze in the SS. WB3KJT is a busy granddad. KC3Y is doing more than his share. WB3BFK is looking forward to the return of W3DFW. KK3F is getting serious about a beam. WB3GZU's busy ham days are on weekends. N3QA has the east side of the bay covered. KA3EWV is all businesslike with his keyboard. K3NNI has plenty of space for antennas. W3YVQ now has an eastern shore county active in RACES. KC3AV has upped the MSN activity. W3UT has help on MDD these days. W3DQI says the Laurel club into much activity — a special event station, and SS from WV. KJ3T is upping her traffic count. WA3VPL is finding fun on the MSN. N3IT is an early morning net operator. Don't forget our stalwarts: PIO KB3DBN, STM WB3GZU, ACC KA3DRO, SEC WA3TAI. With the nets (Net/Manager sessions/traffic/QNI average): MDC PON/W3OYY 4/12/16; WR PON/WB3BFK 22/52/15. PON's 1700 local 3905 kHz. WC 2-Mtr/KC3DW 5/0/13.4; MSN/KC3AV 30/110/9.1; 1930 local 3717 kHz. MEPN/WB3GZU 31/196/36.2 1800 local 3920 kHz. 100% KC3DW others WB3BFK W3BRZ W3DKX K3KBR W3LDD KB3WL and W3YVQ. The newsletters and bulletins from GARC, FAR, Laurel ARC, So. Md. ARC, PVRC and the Columbia ARC indicate big plans for Christmas. Good luck to all. Traffic: WB3GZU 479, KC3DW 288, KJ3E 168, KC3Y 148, W3FA 145, WB3KJT 121, KK3F 117, KJ3T 101, KC3AV 84, W3YVQ 71, N3QA 63, K3NNI 58, KA3EWV 57, W3UT 56, N3IT 46, KB3WL 33, WB3BFK 21, WA3VPL 18, W3DQI 17, W3LDD 16, W3FZV 13, W3ZNW 9, KC3D 4.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2NE. STM: WA2HEB. SGL: W2XQ. BM: WB2UVB. TC: W2IJX. PIO: WB2RVE. ACC: K2IXE. Congrats to Jim Eckersley, K2IXE of Forked River, who was scheduled to receive his 50-year ARRL membership plaque from Director Turnbull on January 17 at an ARRL forum hosted by the Jersey Shore ARS in Toms River. Further congrats to him on becoming our section's Affiliated Club Coordinator. In this position he will be corresponding regularly with each club and encouraging non-affiliated clubs to join the fraternity. Also, K2IXE will help coordinate the testing opportunities expected to be created by the Volunteer Examiner program and will serve as a hamfest advisor for those who request it. K2IXE's address is: 10 Hollywood Blvd. South, Forked River 08731. Our TC, W2IJX, is now developing some simple design/construction projects, which are geared for newcomers to "homebrewing," not just to newcomers to Amateur Radio. If you or your club is interested, he would love to hear from you. QU next month: 73. Traffic: WB2UVB 322, WA2HEB 183, WA2CUW 110, WB2JCE 79, KA2CQX 21, KA2ANJ 15, KC2PB 15, WA2MGV 10.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — ACC: N2EH. BM: W2GLH. OO/RFI: W2AET. PIO: WA2PUU. SEC: W2BCH. SGL: KO2X. STM: W2ZOJ. TC: K2QR. DEC: WA2AIV KA2BHR WB3CUF KB2KW WB2NAO. NOVICE CLASSES: Owego-WA2SZY; Ithaca/Tompkins ARC-KC2YF; Syracuse-NA2C.

Net	Freq.	Time/Day	TRAFICDATA
NARASEN	75/15	0930/Sn	—
NYS/1*	3677	1000/Dy	304-193-30
Mike Farad	3925	1300/M-S	172-076-25
THIN	3913	1600/Sn	044-000-04
NYPON*	3913	1700/Dy	827-404-30
NYSPTEN	3925	1800/Dy	657-068-30
ESS	3590	1800/Dy	405-103-30
OCTEN*	34/94	1830/Dy	516-063-29
Q Net	31/91	1830/Dy	—
STAR/E*	99/39	1830/Dy	—
WDN/E*	04/64	1830/Dy	578-124-30
Blue Line	93/33	1900/Dy	380-028-30
NYS/4*	3677	1900/Dy	495-242-30
JCARCN	10/70	2000/Dy	—
OARC Net	25/85	2000/W	057-000-05
VHF THIN	04/64	2000/T	084-000-05
BRVRN	055/655	2100/Dy	—
CNYTN*	90/30 +	2115/Dy	478-087-30
STAR/L*	99/39	2130/Dy	—
WDN/L*	04/64	2130/Dy	615-161-30
NYS/5*	3677	2200/Dy	386-362-20

*NTS. TRAFICDATA QNI-QSP-QND. QNET (October) 342-004-31. BPL: WB2IDS. PSHR: W2AET KA2BHR KA2DQA WA2FJJ W2GJ WB2IDS WA2KOJ W2MTA WB2OWO KC2QQ WB2RBA ND2S W2ZOJ. SKYWARN: interested? See WA2AIV Batavia or K2AGT N2AGO N2BQV Central or KB2KW Southern. Fifth Annual Valentines Radiogram Massacre at Syracuse/SU WA2SDY. WA2FKY is chairman of Ham-O-Rama '84. OFFICERS: Drumlins KC2GZ KD2CQ KX2T N2DIT; Elmira ARA KA2OIJ KA3EQU WB2FXK KD2DR. Meet W5LFL at ARRL National in New York July 19-21. W5LFL big signal was not a "bogey," your antenna and his had a mutual coverage of 1700 kilometers radius! Meet the gang at Rochester May 18-19 to swap tales about the tall one that did/didn't get away. Lewis Co. ARES going strong-WA2OEP. Central District ARES encouraging operations and mapping repeater coverage-KA2BHR. Emergency Coordinators still needed in several counties, contact W2BCH for information — UNCLE JIM NEEDS YOU! EC, Assistant EC, NCS, Operator, Planner or other — UNCLE JIM NEEDS YOU! RECHECK: If you read this send a note or a radio-gram to W2MTA, include any comments or suggestions; What do you want to see in this column? Goodbye Vic Clark, we shall miss your steady hand and your steady fist; Amateur Radio is the better for your good efforts. GB VCC and GB CR. Traffic: WB2IDS 515, WB2OWO 372, WA2FJJ 354, W2ZOJ 269, WA2HSB 258, W2MTA 258, KC2QQ 229, VE2FMO 191, WB2QIX 180, W2AET 170, ND2S 164, W2FR 136, KG2D 134, KA2BHR 132, WA2KOJ 118, W2GJ 114, WB2RBA 86, K2GXT 52, KB2KW 43, W2UYE 42, KA2DQA 39, KA2DBD 37, N2ABA 31, WB2PID 30, WA2RXO 29, AF2K 23, KA2QIK 23, KA2HRS 20, WB2KCT 18, K2IUT 12, W2PHQ 12, N2ARD 10, WB2NAO 8, WA2OEP 7, K2RN 7, K2VR 2. (Oct.) W2GJ 154, KC2XD 20.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. SGL: W3OKN. TC: W3FE. BM: WN3VAW.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	432	211	30	3585	7 P/D
WPAPTN	655	130	30	3983	6 P/D
WPA2MTN	471	120	30	146.28/88	8 P/D
NWPA2MTN	485	6	31	145.13/53	1400Z (Oct)

It is with sorrow I must announce the following Silent Keys: W3ENA W3ZUX W3LHX N3ADU. N3ADU was the Net Manager for the WPAPTN which he helped to bring to a high level of efficiency and smooth operation. He was BPL almost every month. We will miss him very much as he was always there when needed. The 1984 officers for the Steel City ARC are AK3J, pres.; WA3VDR, v.p.; WB3EML, rec. secy.; WA3FWA, treas.; W3UUH, corres. secy. The K3SYJ/R repeater has been moved from Monroeville to Greensburg and is now the property of the Foothills ARC using the club call W3LWW/R still on 147.18/78. The Irwin Area ARC repeater I/O has been changed from 146.925/325 in/out to 325/925 in/out. The students from Thiel made their annual walk from Greenville to Pittsburgh collecting along the way for Childrens Hospital amateurs along the route provided communications for the walk keeping the groups in constant touch. They collected over $25,000. What a fine bunch. Sorry I can't acknowledge all the SET reports; too many to list. Please REPORT ANY Public Service activity to Hq and SEC AB3Q. Traffic: AC3N 315, W3EGK 182, KQ3T 181, K3CR 174, WB3HWB 87, WA3GNT 81, WA3UNX 81, K3NPW 68, WD8PUH/3 68, K3QM 63, W3RUL 54, K3SMB 53, W3OKN 49, N3FM 44, W3NGO 41, KN3B 37, W3MML 29, N3QYV 25, W3KUN 23, W3KMZ 19, K3VQV 19, WB3DBW 18, K3LTV 17, WB3GUK 16, WB3DNF 14, KC3JO 11, W3SN 7, KB3DT 6, K3HCT 6, WA3GMF 4, N3KB 3, KA3COX 2, W3TTN 2, W3LOD 1. (Oct.) K3NPX 325, KA3CNP 102, WA3JZE 96, KA3DJO 83, N3ALL 82, WA3KQA 28, KB3YC 28, KA3FYE 28, WB3GUK 2.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq.	Times (Z Win)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	639	230	60
ITN	3705	0100Dy	258	78	30
ILPN	3915	2230 Dy (X Sn)	630	108	30
NCPN	3915	1300 Dy (X Sn)	498	67	—
NCPN	7270	1815 Dy (X Sn)	253	115	—
IEN	3940	1500 Sn	121	2	4

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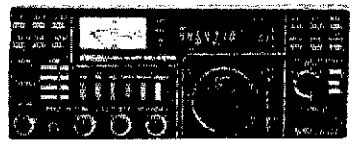

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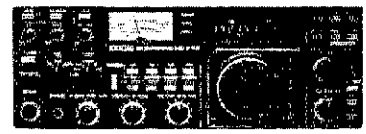

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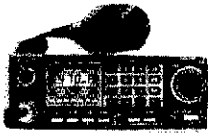

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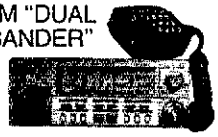

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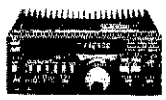

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76PA	$2395	$1695	78	$3495	$2480
76CA	$2695	$1930	374A	$2595	$1860

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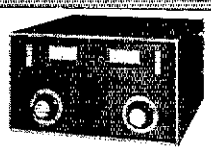

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ARES	3915	2230	1+3 Sn	44	0	2	
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Illinois was represented 100% to D9RN by stations W9HOT WB9QDN WB9NVN K9EHP WA9BXB KW9J W9HLX W9HKG and K9AZS. Illinois was represented 98% to 9RN by stations K9AZS N9DR K9GMZ W9HBI W9INZ KW9J KW9L WB9NVN W9NXG KA9OZJ K9PNG K9QEW K9SW and N9TN. D9RN was represented 100% to CAND. Illinois stations were K9EHP WB9NVN KW9J W9NXG and W9HOT. WB9CWE reports that the Logan Co. ARC now holds meetings the 2nd Wednesday of each month at the Public Library. All area hams are invited. PIO WD9EED is doing well in recruiting PIAs throughout the state. If you have a talent for writing, or contacts in the media, why not drop him a line? WELCOME ABOARD to new PIAs WB9PQO and KD9EHI CONGRATS to both WA9BXB and KW9J on making BPL this month!! W9DBO sends along that he was causing some TVI to a nearby set, but discovered that it was the TV rather than his rig that was at fault. He gave the neighbor a filter that cleared up the trouble. W9LNQ is trying to get active on 160 and says that a long wire seems to give best results from his location. Hats off to Williamson Co. ARES and their leader EC KV9L on their recent agreement with State of Illinois Emergency Services and Disaster Agency (ESDA). They have agreed to equip and man a communications bus owned and maintained by ESDA for use in the southern third of Illinois. They realize the magnitude of the task and are counting on support from other ARES units in the service area. To work on this and other cooperative ventures between ARES units in southern Illinois EC KV9L convened a meeting of other ECs and interested parties from the area on the 28th. SM WD9EBQ attended this meeting, and the representation and flow of constructive ideas was impressive for a first meeting of this type. Another meeting is planned for January. Area wide meetings such as the one described are a good opportunity to get to know ARES and NTS counterparts from nearby areas for the sharing of ideas and resources, as well as planning for coverage of nearby areas where an active unit does not exist. It is my hope that other parts of the section will pick up on this idea and sponsor similar meetings. Remember to keep the section cabinet (calls at top of this column) informed so that those who are able can attend. 73 de WD9EBQ. Traffic: KW9J 571, WA9BXB 341, W9JJU 316, W9NXG 222, W9HLX 188, W9HOT 135, KB9X 119, K9QEW 82, WA9SHE 61, W9RJW 44, KD9K 42, KA9FEZ 41, K9AZS 39, K9EHP 30, W9QBH 28, W9KR 26, KN9BAM 23, W9TCO 22, N9TN 22, KA9OZJ 19, N9DR 17, W9HBI 17, WD9EED 16, K9CMO 15, KA9NBH 15, W9DBO 14, KD9EH 14, W9VEY/M 12, WD9CJB 10, N9DIX 9, WA9HQW 8, K9WMP 8, WD9HZF 6, W9LNQ 6, K9SW 5, WB9WGD 4.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZOE. STM: W9JUJ. OO/RFI: KJ9G. SGL: WA9VQQ. PIO: K9DIY. SDXC: N9MM. BM: KC9TA. SRC: N9WB. ACC: K9TUS. SOC: W9OBF. TC: WD9ADB. SHC: WA9FUD. NMs: ITN W9QYY; QIN KJ9J; ICN KA9CZD; IRN (Indiana RTTY Net) KB9SU; VHF W9PMT; IWN KA9ERC.

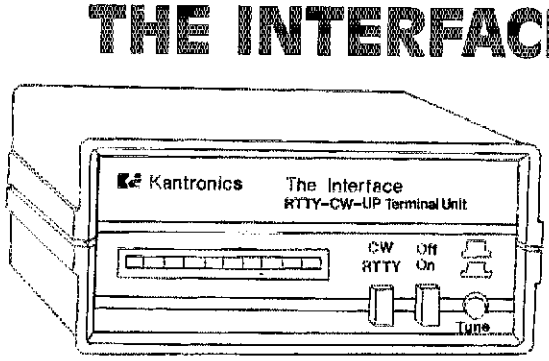
Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3099	407	2533	90
QIN	3656	1430/0100/0400	736	327	1810	89
ICN	3708	0015	80	19	562	20
IRN	3629	0000	242	27	1680	30
IWN	3910	1310	1849	14	315	30
IWN	VHF	Kokomo	1129	12	315	30
IWN	VHF	Bloomington	1175	5	315	30

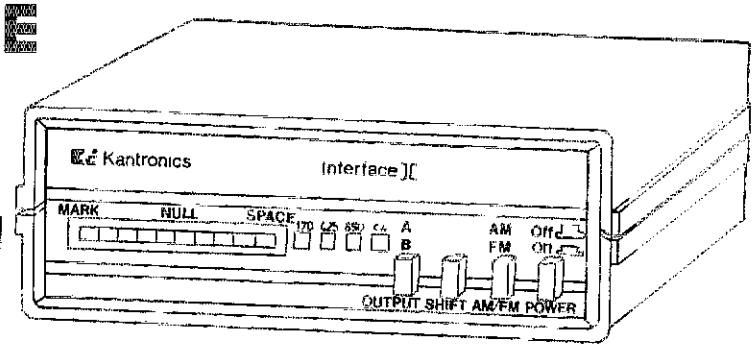
Hoosier VHF nets: QNI 7122 QTC 237 QTR 6691, bulletins 76 sessions 88 for 22 nets. Cycle 4 9RN 100% QTC 502 QTR 956 in 59 sessions. IN stns. N9AEI W9CSJ W9EI W9FC KJ9J W9JUJ WA9QCF W9QLW, W9TG WB9UYU K9WWJ W9XD. D9RN 100% 539 messages in 1431 minutes. IN stns. K9CGS W9URQ W9JUJ W9PRD KB9NR WB9MIK. CAND 1167 messages in 30 sessions D9RN 100%. IN stns W9PRD W9URQ W8JUJ. KM9B received a Special Service Award from the National Weather Service. WB0HTP, Area Manager of the state of Indiana for NWS, presented KM9B with the award. KM9B has been relaying approximately 150 rainfall reports daily to NWS since October 1980. All the information given to the NWS by used for flood forecasting and agricultural advisories. The Amateur Radio operators also provide severe storm and winter storm information. KM9B is an important part of all of this. WA9OKK of Anderson deserves special thanks for his extra effort for the WET Net. WA9OKK collects early bird reports from 5:30 A.M. till the net at 8:10. This month he had 450 checkins in 4950 minutes. A special thanks to WD9HII for his PIA efforts during STS-9. He arranged 3 TV stations interview, 5 news interviews, 2 newspapers with 4 articles and 1 radio interview. Even with all the publicity I am amazed at the number of operators transmitting on 145.55 and their attitude about it. N7BBW's article on lightning in the *News and Views* of the Clark Co. ARC was very good. W9TIZ is another very well versed on lightning and an excellent speaker. Traffic: W9JUJ 913, KJ9J 221, W9EI 157, W9QYY 135, W9URQ 123, KM9B 81, WB9UYU 75, N9HZ 72, WA9QCF 61, N9AEI 58, W9JZV 54, W9PMT 51, W9UMH 45, K89HH 44, AB9A 43, K9DCX 39, N9AST 36, KA9LAU 34, KW9D 32, W9PRD 31, WD9DWD 24, N9DHX 24, WD9HII 24, WB9AWI 22, KC9QX 22, K9WWJ 21, N9CQS 19, KA9EIV 16, WB9OZZ 15, WD9GET 12, KK9N 12, WA9OKK 12, K9OUP 10, KC9TA 10, WD9CIV 9, K9CGS 8, K9GBR 8, W9RTH 8, W9DKP 7, W9ZGC 7, K9DIY 5, W9XD 4, W9BDP 3, WD9EXI 3, W9UPI 3, K9SBW 2, WB9AJY 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1200Z QNI 1410, QTC 1555 WD9IID. BEN 3985 1800Z QNI 758, QTC 194 WB9ESM. WSBN 3985 2330Z QNI (Oct. 991, QTC 260) QNI 1040, QTC 398 K9ANV. WNN 3723 0000Z QNI 182, QTC 24 KA9HPO. WSSN 3645 0030Z QNI 187, QTC 63 KC9CJ. WIN-E 3662 0100Z QNI 449, QTC 191 W9YCV. WIN-L 3662 0400Z QNI 248, QTC 147 K9LGU. XPO 3925 1831Z QNI 243, QTC 26 WA9YVC. NWTN .34/.94 0030Z QNI 426, QTC 47 N9BDL. Gr. Bay .72/.12 Thur. 0245Z QNI 20, QTC 0 WB9NRK. WCWTN .31/.91 0030Z QNI 506, QTC 31 N9AUG. KA9NPO & KA9NPP have Advanced. KA9HPQ has Extra. Sorry to report W9MKY K9HDL & W9BFV as Silent Keys. AE9H and XYI are proud parents of new harmonic Jennifer Marie; Congrats. I need someone to take the position as Affiliated Club Coordinator. WA9POV wishes to resign; anyone interested please contact me. New Novice Watertown area KA9QPH. WD9GRH is now N9EFU (KE9C's mom). KA9OJH is now N9EFX. PIO has informed me of the following PIAs: WA9BZW N9DAD N9CPC KA9FOZ. Remember to use ARRL numbered radiograms whenever possible. WNA meeting on the air was well attended. Mark your calendars for next Sept. 15, WNA picnic; details later. Are you a WNA booster? Contact KC9CJ. Different local newspapers (Media) throughout the state were in contact with hams about the shuttle. Nice going. Traffic: KA9CPA 2316, W9CXY 241, KC9CJ 231, W9YCV 202, W9CBE 197,

Blueprint for Success

THE INTERFACE





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K9GDF 197, WD9IID 191, WA9WYS 164, KC9KQ 135, K9FHI 128, KA9BHL 125, W9UCL 125, W9IEM 109, N9AUG 101, N9BDL 95, WB9ICH 91, K9UTQ 90, K9AKG 89, WB9ESM 86, KA9OBP 86, W9LDO 80, W9SO 74, AG9G 73, N9CRO 72, KA9HPQ 72, KG9B 65, W9DND 62, WB9YPY 57, N9BCX 45, WB9JGA 42, KA9IKR 41, K9SAO 40, K9VSO 40, WB9JSW 39, KY9V 38, N9BGE 37, KB9NG 36, WB9NRK 36, K9BED 34, WD9BKT 34, WA9ZTY 31, W9IHW 27, K9JPS 27, KA9AFB 26, WB9WNA 23, W9FDY 22, N9DCF 20, KN9P 16, KY9P 16, W9UW 16, KA9BHK 8, WB8RGE 8, KB9FM 7, KA9NOT 5. (Oct.) W9DND 33, KA9NOT 16.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — SEC: KAØARP. STM: KDØCI. Hello again! First of all, I want to congratulate all the clubs in our section for the various roles they play in the promotion of Amateur Radio. Some examples are the various interviews on broadcast radio and TV, the setting up of Novice classes and so on. I think it is part of our hobby to promote Amateur Radio as much as possible. The recent flight of W5LFL into space and the Grenada crisis have certainly given hams a lot of well deserved promotion also. My thanks to WAØSUA for the following information: The Annual Mid-Winter Madness sponsored by the Robbinsdale ARC will be held on Sat., Feb. 25th at the Totino-Grace Catholic Church located at 1350 Gardena Ave NE in Fridley. There will be nearly three times the room at this location and the building is easily accessable for all. A shuttle service will be provided for those desiring to fly into either the Anoka or Crystal airports. The festivities will run from 9 til 3 and the talk-in frequencies will be 147.60/.00 and 146.52. For more info, contact WAØSUA at 533-7354. I hope to see you there! Net news: The Piconet is still looking for some volunteer net controls. If you'd like to try an hour sometime, contact WØHZU or WAØTFC. My congrats to WDØBGS and to KAØJUX who recently had record QNI on the MSPN/E and MNAMWXNT respectively. It's great to see the activity. Thanks to all of you who participate. I regret to report two Silent Keys; WØEJN and WØBE. Our sympathies to their families. Finally, I hope all of you had a chance to listen for the space shuttle or perhaps even contact it. It certainly was an event worth listening for! Net mgrs: MSN/1 WØEHI; MSN/2 KAØEPY, MSSN WBØWXU; MSPN/N KAØJUX; MSPN/E KCØUJ; MNAMWXNT WDØBAC; Piconet WØHZU.

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	298	125	30
MSN/2	3885	10:00P	242	54	30
MSSN	3710	7:00P	116	19	25
MSPN/N	3945	12:05P	658	77	30
MSPN/E	3929	5:30P	1319	307	30
MNAMWXNT	3929	6:15P	754	536	29
Piconet	3925	Daily	2909	270	26

Traffic: KBØMB 701, KCØUJ 503, KT9I 444, WAØTFC 432, KAØARP 270, WØEHI 213, KAØJUX 206, WØHZU 204, KDØCI 173, KAØEPY 143, KAØCIR 106, WAØONE 102, WDØCGM 75, WBØHOX 69, NØCLS 60, KØCSE 60, WØOJH 60, WDØHDD 56, KTØR 54, KAØKWM 50, KCØNL 44, KØOGI 40, NØJP 29, WØMFW 28, NØEXP 26, KDØKK 19, WØKYG 19, KZØH 12, KAØAJF 9, W9DM 8, WBØLRK 8, KXØV 8, NØEYR 7, KN9U 5. (Oct.) NØJP 24, WØGRW 20.

NORTH DAKOTA: SM, Dean R. Summers, KCØC — Congrats to Theodore Roosevelt ARC, Dickinson, first Special Service Club status applied for and approved by ARRL. KBØCH was active and got publicity in the *Grafton Record* for Grenada incident. He also went south for the winter. NØEKB working on his machine at Beulah 147.09/69. New call: KDØLC. Lots listened and tried to work W5LFL. Everyone generated good local publicity. Many others I probably missed. Hope you all got on the tape. Wishing everyone a nice Christmas; Happy New Year to all. Grand Forks has had their hamfest and computer fair. TRARC Xmas party had music by WØBHF. Sept. *ARR Flyer* had good tips on being a good ham. Goose River 78 QNI, 2 QTC, DATA 289 QNI, 23 QTC. Traffic: KAØFSM 48, WØCDO 40.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — SGL: NBØD. STM: WØKJZ. SEC: WØYMB. BM: NØCFS. TC: KØAS. OO/RFI: KCØOO. ACC: WBØPWA. We all will miss Vic Clark, W4KFC, very much. He made all the difference in the world. Without his immediate inspiration and enthusiasm, it will be tough sledding. But we will push on with the fresh new ideas he generously gave all amateurs. Think of Vic whenever you are operating CW, DX or the Sweepstakes, and especially Straight Key Night. ARRL Novice Roundup is here already. Help out a new ham. Congrats to all of the newly elected division and section leaders. Get together with your EC this week to formulate an even better EC plan for your area. Look what this winter has brought us already! Can you believe this? NTS TEN and DTEN liaison stations were KØFRE WØKJZ KCØOO WBØLTV WBØSUM KCØAF and WBØKWX. PSHR: WØKJZ NØEEH WBØSUM NØCFS KCØOO. Traffic: WØKJZ 161, WØDVB 53, WBØLTV 50, NØCFS 43, WBØKWX 43, KCØOO 29, WBØSUM 21, NØEEH 17, WØYMB 15, NBØD 9, KAØHMI 8. Miscellaneous Messages (reports for nets or WX messages sent in non-ARRL message format): WØMZI 732, KCØAF 589, WØZWL 370, WØHOJ 166, KØAIE 108, WAØUEN 69, WAØVRE 65, WBØOMF 28, W7UDB 26, WAØBZD 25, WBØYDG 23, KCØOO 18, NBØD 8.

DELTA DIVISION

ARKANSAS: SM, Joel Harrison, WB5IGF — SEC: N5BPU. STM: AE5L. ACC: AD5M. TC: W5FD. SGL: W5LCI. KC5CE has resigned as manager of the Razorback net owing to health reasons. He did an outstanding job and is to be highly commended for the hard work he put into it. The Metropolitan ARC has submitted a Special Service Club application which has been approved by AD5M and myself and has been forwarded to Director W5CH. Clubs who are affiliated with ARRL or interested in info should contact AD5M. The spring storms are just around the corner. Make sure your emergency systems are operative. Hope everyone has recovered from the holiday season. Traffic: AE5L 87, W9OK 86, WD5FCE 78, KA5DFT 42, W5UAU 37, WB5IGF 32, K5BIL 25, W5TUM 23, W4AZJ 16, W5RXU 13, W5KL 10, W5RWJ 4.

LOUISIANA: SM, John Meyer, N5JM — SEC: WA4MUW. PIO: KO5R. ACC: K5DPG. SGL: KD5SL. The new officers for 1984 at CLARC are KB5CX, pres.; KD5YU, v.p.; WD5JBX, treas.; KA5HCJ, secv.; K5KTV, dir. At GNOARC, the new faces are K5FH, pres.; WB5NHX, v.p.; WB5YRE, secv.; KE5GA, treas.; WD5HQC, EC; WD5IAA, dir. The OOTC has reelected W5CB W5FMO and K5KR as officers for the coming year. Best wishes to all! A farewell and tnx to W5GHP for his good work as STM. As your new Vice Director look for him on the nets and at all hamfests. A warm welcome to your new Section Manager, K5KR, who takes over on April 1st and looks forward to hearing from everyone. KO5R and others report W5LFL Q-5 copy on their hand-helds and mobile rigs; guess antenna height

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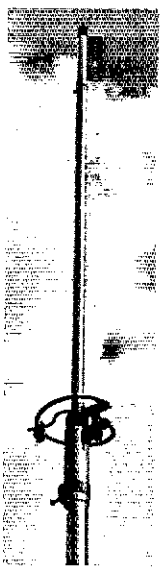

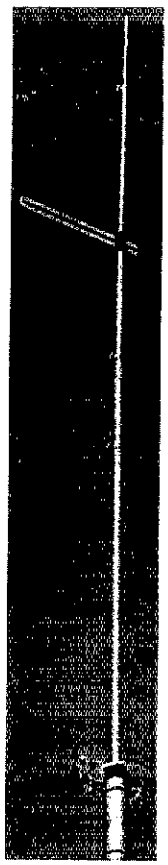

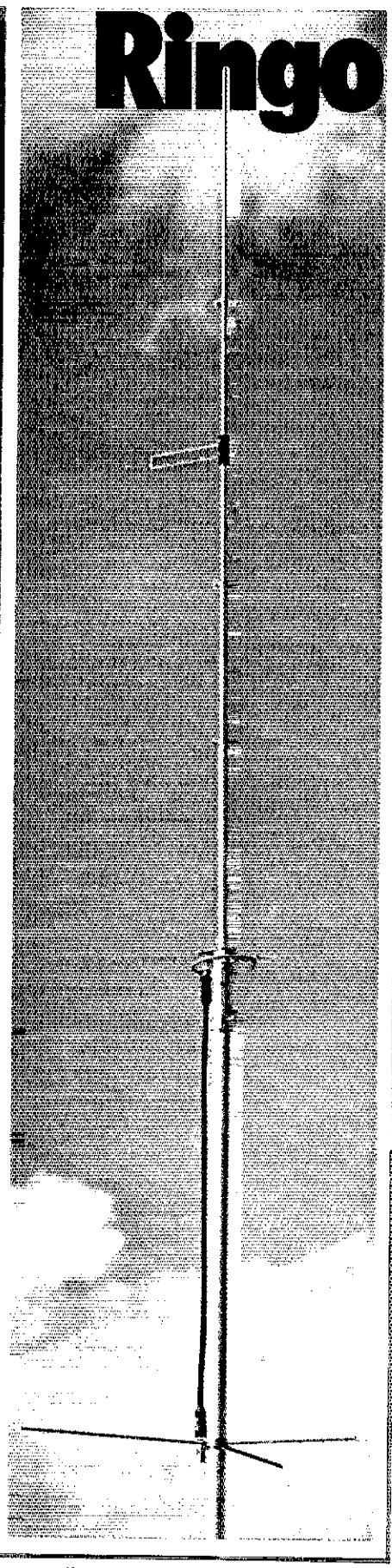

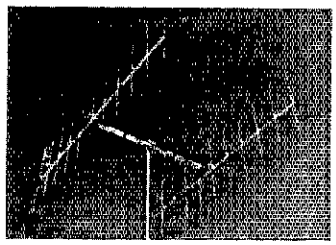

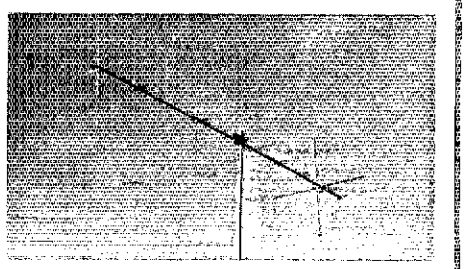

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AR-220	220-225 MHz
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A147-22	145.5-148 MHz	22 Element
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A449-11	440-450 MHz	11 Element

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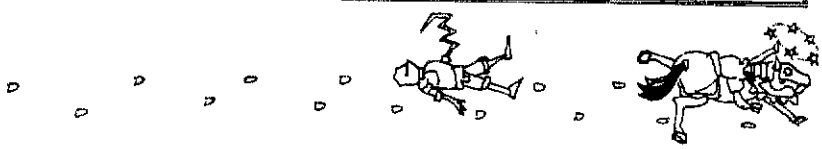

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is important after all! It's marathon time again with BRARC and GNOARC "running" 26 miles of 2-meter help. KC5SF/4 has taken up surfing at Boca Raton, FL.

Net	Freq.	Time	Mgr
LTN	3910	6:30 P.M. Dy	N5ANH
LAN	3615	7 & 10 P.M. Dy	N5BFV
LSN	3703	7:30 P.M. Dy	WA5ANV
LEN	3910	8 P.M. M	KA5PFB
CCTN	146.01/61	6:45 P.M. M-F	GNOARC

Traffic: KA5HDT 152, N5BFV 133, K5TL 89, W5GHP 78, WB5NCM 31, N5ANH 24, WB5LBR 20, KC5SF 14.

MISSISSIPPI: SM, Tom Hammack, W4WLF — Congrats to W5CH on reelection as division director. Also to N5AMK who was asked by ARRL Hq. to accept appointment as director of Central Area TCC (cycle two). AE5H is sending bulletins to Jackson and Vicksburg nets. WA5DVV is sending bulletins on RTTY (baudot & ASCII) on MWF at 2100 CST on 7095 ± kHz QRM and on 147.98 MHz. He also has a "mailbox" set up. Contact him for operation details.

Net	Sess.	QNI	QTC	NM
CAND	30	DRN5 100%	1167	W5KLV
MMN	30	410	1167	WB5RMW
MSBN	30	2438	92	N5DSK
MSN	22	77	14	KD5TY
MTN	30	153	53	
RACES/ARES	3	85	3	N5AMK
DRN5	60	MS 98%	817	WB5YDD
RN5	30	57	16	KB5W

Traffic: KB5W 549, N5AMK 470, K5OAF 289, KT5Z 73, AE5H 69, N5EZQ 50, W5LSG 28, N5DDV 21.

TENNESSEE: SM, John C. Brown, NO4Q — ASM & ACC: WA4GLS. STM: NG4J. SEC: WA4GZQ. TC: W4HHK. OO/RFI: W9FZW. SGL: WA4GZZ. PIO: WK4V. You will note there are some new calls in the section staff. The guidance rendered by K4YOL and K4TKQ are greatly appreciated and will be very much missed in the operation of the section. They asked to be replaced; that was no easy job, but the knowledge being added by the new STM and SEC will be a great help. So all are requested to assist and to welcome the replacements. It can be said without hesitation that traffic management is not anything new to NG4J. Certificates of Merit were awarded to the retiring SEC and STM for their fine services. The activity of the section as well as the country at large was really humming to get individual calls on the tape of the astronaut in space. The sad activity of some failing to comply with the instructions of not calling on the downlink may have caused many to not hear their calls. TSN Honor Roll for last two months show W4DDK NG4J K9IMI/4 for both months and KA4FLV and KA4ZNU for one month. Congrats to all for fine work. A net certificate was awarded to WB4YSN. A continuing fine job to those who made the section a 98% participation in the DRN5 net. Section traffic was a bit light for our usual but fine nevertheless: phone net - sess. 88, QNI 3769, QTC 143; VHF - sess. 96, QNI 2150, QTC 587; CW - sess. 60, QNI 368, QTC 111; RTTY - sess. 31, QNI 76, QTC 3. The various section staff members are looking for help as ORS, OO, EC and the like. How about filling out a Form CD-187 and sending it to the responsible section staff member. It has been indicated to the public that some of the state officials wish to make a drastic change to the method by which we get out auto plates at the regular price. A proposal is in the making to charge an EXTRA $25 for our call plates. Make your views known to your state representative or state senator post haste. Traffic: K4WWQ 94, W4DDK 68, WD4GYT 37, KA4BSG 27, WB4YPO 25, W4MRD 15, W4PFP 15, K4WOP 15, K4YOL 15, W4TYV 12, NN4S 10, N4FXB 9, KI4V 8, W4PSN 6, K4UMW 6, W4EWR 3.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Sloan, KA4GFU — SEC: WA4JAV. STM: KA4BCM. OO/RFI: N4GD. BM: WA4AGH. PIO: K4TAJ. ACC: W4OYI.

KRN	3959	1130Z	WD4IUW	470	30
MKPN	3959	1330Z	KA4SAA	1118	143
KTN	3959	0000Z	KA4SKV	1168	120
KYN	3600	0100Z	WD4IYI	184	67
KSN	3600	0330Z	KZ8Q	173	57
KNTN	3727	0000Z	KB4OZ	361	77

KYPON 55, 6; CARN 104, 11; NKARC 32, 0; PAEWTN 168, 14; TSTMN 581, 56; WTEN 36, 2; 4ARES 36, 2; 5ARES 86, 8; 7ARES 28, 0; 11ARES 68, 8. River Cities ARA Annual HAM-A-RAMA is Feb. 11 at Ashland, KY QSO Party March 17-18. Contact WM4N for details. Traffic: WA4JTE 273, KA4SAA 155, WD4IYI 146, KA4BCM 88, KA4MZY 88, KB4OZ 70, W4WQV 61, K4MHL 60, WD4RWU 59, WD4BSC 40, KA4SKV 35, KA4MTX 34, WA4YPQ 32, WA4EBN 27, N4GD 25, KA4GFU 25, WK4D 23, NW4A 22, K4HOE 17, WA4NOG 16, WA4JAV 15, WA4AVV 12, WD4IXS 12, N4HZT 10, WD4PBF 7, WB4APC 5, WD4COF 5, KA4GBZ 5.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: WB8BGY. BM: KZ8V.

Net	Freq.	Time/Day	QNI	Tfc	Sess.
MITN*	3953	1900 Dy	707	401	30
QMN*	3683	1800 Dy**	1107	343	90
MACS*	3953	1100 Dy**	616	229	30
GLETN	3932	2100 Dy	904	113	30
UPN*	3922	1700 Dy	694	93	34
MNN*	3722	1730 Dy**	260	56	58
WSSBN	3935	1900 Dy	852	41	30
TASYL	3922	1900 M	6	1	1
VHF Nets		9 RPTS	709	22	68

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn, 1300, ARES net Sn, 3932, 1730. Traffic Workshop Sn, 3953, 1600. ARRL Info Net Wed., 3953, 1745. 3932 is MI HF emer. freq. Silent Key, with deep regret: W8PDP. Many thanks for a good job well done to K8JH, retired for personal reasons from the OO/RFI Coord. appt. as of Jan. 1. The post (as of this writing) remains vacant, but I hope to have it filled soon. The high point of our recent family vacation over east was a day spent visiting Hq. Although I have had years of correspondence and telephoning with the folks in Newington, I found I didn't know very much about the operation after all. For this reason alone I would recommend the trip to anyone, and in addition their hospitality is superb. They make their visitors feel truly welcome. I am proud of the MI amateurs for the job they did on publicity for the STS-9 space mission. Have you worked KC4AAA lately? Behind the mike or key could very well be the Copper Country's own WD8ANC, on duty at the Amundsen-Scott station in the Antarctic. BPL: WB8WKQ. Traffic: WB8WKQ 513, AF8V 425, KA8CPS 378, KA8OWN 321, W8QHB 259, WD8RHU 223, WD8LRT 203, W8UE 186, WB8MTD 177, KB8GT 145, WD8MJB 123, WA8DHB 116, KA8NCR 97, K8GXV 89, N8BNC 78, K8OCP 68, K8EQO 67, W8IHX 66, K8KQJ 65, WD8EIB 59, WB8SIW 56, N8EBG 55, WB8SYA 49, K8UPE 49, W8SCW 43, W8VIZ 43, WD8OUO 31, K8ZJU 29, N8CNY

28, W8JXJ 25, KV8U 24, W8YIQ 24, N8DSW 23, WB8YWA 23, KA8JCL 21, W8CUP 18, KI8Q 18, KR8Q 18, WB8TTA 18, KA8PQH 17, K8DD 13, KT8G 8, WB8YRY 8, K8MJK 7, KA8PQO 7, KA8SSU 7, WB8DJS 6, W8TBP 6, KB8TD 6, N8EOI 4, W8YZ 4, WB8HSN 3, KA8AMX 1, N8EBN 1.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: KB8MU.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	440	265	59	6:45/10 P.M.	3.577
BNR	354	144	30	6:00 P.M.	3.605
BSSN	395	212	55	9:45 A/7:15 P	3.927
ONN	105	28	29	6:30 P.M.	3.708
OSN	263	111	30	6:10 P.M.	3.577
OSSBN	2293	912	90	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	124	69	28	6:45 A.M.	3.577
O6MN	—	—	—	9:00 P.M.	50.160

This is almost my last opportunity to toss out a reminder that the Cincinnati ARRL Ohio State Convention is just a month away (as you receive this copy of *QST*). Remember, Feb. 25 & 26. Don't miss it! When contemplating the number of volunteer hours that go into an affair of that sort, most of us would rather shrug and pop another flip-top. Fortunately, we still have folks like K8JE and WA8SSI and all the others on the Convention committee who are willing to grind through to the end that we can all enjoy the fruits of their efforts. So, here's a great big "thank you" from me. And I'm sure the Cincy folks would be glad to hear a word of gratitude when you're enjoying the convention! And, yes, here's another commercial for Public Service. (I knew you could see it coming.) Like the hamfest and convention chairmen, most of us have the same problem with our volunteer activities: too little appreciation and too many gripes. But I think that most of those for whom we labor are just thoughtless. So when you've labored long and thanklessly for your city, county, municipal parade, or your club, and no thanks come, just shrug like most of us do, and come back for the next project. Please! After all, we're in this for the satisfaction, not the pay or glory. And if you have a real problem in your barrel, remember that 99% of those apples started out fresh, so it behooves you to ignore the 1% and focus on the good ones. Club elections: Portage ARC WD8MPV, pres.; KX8V, v.p.; KJ3O, secy/treas.; KC8VX, radio officer; KJ3O, editor. Upgrades to Extra: NG8A KB8DB K8EJM KC8RQ. Congrats to all!

Local Nets	QNI	QTC	Sess.
ALERT	78	18	5
BRTN	233	152	30
COARES	102	8	4
LCNWO	309	73	34
MASER	81	3	4
Medina Co.	270	40	30
NCTW	21	18	18
RAPA	70	1	5
TSRAC	1053	52	36
VWCEN	34	2	3

Traffic: K8NCV 998, WD8MIO 619, W8PMJ 504, K8OZ 485, K8JDI 421, WD8FKN 324, W8BO 306, W8EK 258, W8QZK 235, WB8KWD 193, WD8RIB 180, WB8DMF 167, W8UBR 167, AB8P 148, WA8HGH 142, KF8J 138, KV8Q 126, KA8MEB 111, W8SKP 108, KA8CGF 105, KA8GJV 102, WA8GMT 98, N8EES 96, WD8KBW 84, N8EVC 80, N8AUH 76, WD8RGP 72, K8YUW 66, W8CXM 64, N8DSU 63, K3RC 59, WD8IKC 46, K8TVG 46, N2NS 45, WA8SSI 43, N8CW 40, WB8MRL 37, K8AN 36, WA8HED 36, WD8AYH 34, WD8ODV 33, N8AEH 32, WB8YTD 28, NE8X 27, W8BHL 26, WB8MEK 25, WB8HHZ 23, KA8GGZ 21, WB8SRC 21, K8CKY 20, KA8MEB 19, WB8VOA 19, W8ZM 19, K8NJQ 18, W8RG 18, N8CGS 16, K8DL 15, WB8NHV 15, NC8Q 14, KA8GMF 13, WD8RGS 13, WB8QHV 12, WB8SIQ 12, K8VOY 10, W8FUP 9, WD9HDZ 8, W8MVE 7, WD8EKI 6, N8CGM 5, N8AJU 4, WB8NTR 4, W8OQL 3, W8LZE 1. (Oct.) W8UPD 43, KG8H 21, W8ZM 16, N2NS 12.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — SEC: AK2E. STM: WB2MCO. ACC & TC: N2BFG. BM: WB2EAG. SGL: KB2HQ. Congrats to KC2TF, new net manager EPN and TNX to AG2X. Club news: SARA has upgrades N2EKT N2KEU KD2AV WA2VUO and new member K2VKU. Rip Van Winkle ARS reports new officers KU2Q, pres.; KA2QYJ, v.p.; KA2MYJ, treas.; KW2D, secy. Silent Key WA2DWH. AARA has new member N2CEH. WARA had nice dinner middle of December. Orange Co. ARC has new officers WB2ENA, pres.; N3BAY, v.p.; N2AWI, secy.; KB2MK, treas.; WB2OEB, act. Overlook Mt. ARC has new officers NA2N, pres.; N2FS, v.p.; N2EIK, secy.; KA2QYL, treas.; KA2AHW K5AM K2HA, directors. WECA played Santa Claus to children at Blythedale Hospital. Net reports: ESS sess. 29, QNI 386, QTC 102; Schenectady ARES sess. 4, QNI 52, QTC 4; NYPON sess. 30, QNI 827, QTC 404; ATEN sess. 5, QNI 11, QTC 2; AESN sess. 4, QNI 49, QTC 4; NYS/M sess. 30, QNI 304, QTC 193; NYS sess. 60, QTC 706. EPN sess. 30, QTC 220; Ulster RACES sess. 3, QNI 52, QTC 3; SDN sess. 30, QNI 231, QTC 69. *Poughkeepsie Journal* had nice article on K2GBH and WA2KCL trying to contact W5LFL. AK2E reports W2NMF as Silent Key, also Linc Dixon from Olympic Torch Run. We all moum passing of W4KFC. Best wishes to all for this new year. PSHR: WB2MCO WB2EAG WB2VUK K2ZM WB2ZCM KC2TF W2BIW W2PKY K2ZVI WB2OHR AK2E. Traffic: WB2EAG 374, KC2TF 302, WB2MCO 264, K2ZM 207, WA2JBO 133, W2BIW 131, WB2VUK 124, WB2ZCM 116, W2PKY 95, K2ZVI 82, WA8MAZ 58, AA2Y 58, N2AWI 44, AK2E 42, WB2OHR 22, W2SWA 20, N2BFG 14.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2SUB. STM: K2GCE. ACC: WB2IAP. OO/RFI: NB2T. TC: W2JUP. PIO: W2IYX.

NLI CW*	3630	1900/2200	N2AKZ
NLIPN*	3928	1815	KS2G
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
ESS	3590	1800	W2WSS
NYS/M	3677	1000	WB2EAG
NYS	3677	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

*Denotes section net; all times are local; please try and help out by checking in whenever possible. Plan now to attend the ARRL National Convention, July 20-22 at the New York Statler. Dr. Owen Garlott, W5LFL, will be the guest speaker at the banquet. Please try to help out with the 1984 Special Olympics that will be held at Eisenhower Park, June 16-30, more details will be given out as they become available. W2LWB has stepped down as NM for NLI CW. N2AKZ will take over as NM. I want to thank W2LWB for a job well done. Congrats to the following stations upgrading from Novice to General: KA2SYL (now N2EPJ), KA2SNL KA2TAI KA2PBQ KA2PKZ. New members of Grumman ARC are W2ILP and KA2TDZ. The Gt. South Bay ARC had Curt Holsopple, K9CH, from the ARRL as a guest speaker at their Oct. meeting. WB2IAP has formed a committee to obtain and prepare radio gear for underprivileged hams. Officers for Radio Central are: WB2FXN, pres.; KA2MUM, v.p., KG2A, treas.; N2AWM, rec. secy.; WA2NOD, corr. secy.; W2GZA WB2QYN K2SGH KB2XL, dir. Radio Central also did its yearly "Talk to Santa via Amateur Radio." The club and the Rocky Point Post Office also dedicated an oil painted mural of RCA's Radio Central main transmitting building and, the post office also hand cancelled letters with a special postmark commemorating the 62nd anniv. of RCA's *HF transmitting station* in Rocky Point. New members of Larkfield ARC K2JM N2DAA WB2YJY & KC2YR. Traffic: W2AHV 197, K2GCE 55, WA2ARC 43, W2DBO 38, KS2G 15. (Oct.) W2AHV 287, W2DBO 64. (Sept.) W2AHV 198.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC AG2R N2BNB WB2RMJ WB2ANK WB2IQJ KY2D N2XJ W2PSU.

Net	Mgr.	Freq.	Time	Sess.	QNI	QSP
NJM	N2XJ	3695	1000 Dy	30	190	99
NJN/E	AG2R	3695	1900 Dy	30	362	214
NJN/L	AG2R	3695	2200 Dy	30	295	135
NJSN	WB2IQJ	3735	2230 Dy	30	—	—
NJPN	W2CC	3950	1800 Dy 0900 Sn	30 4	451	190
NJVN	WB2ANK	49/49	2230 Dy	30	255	111
TCEN	WB2RMJ	147.255	1930 Dy	30	—	—
OBTTN	KY2D	147.12	2000 Dy	30	—	—
NJRTTY	W2PSU	147.51	Autostart			

N2DXP is in the Beth Israel Hospital in Passaic with a stroke. KM2Y, of Middlesex NJ and a member of the Tri-County RA of Scotch Plains, has attained the rank of Eagle Scout. Ramapo Mts. ARC reports classes forming for Novices and Technicians wishing to upgrade. Contact K2IDH, who says classes are being held Wed. evenings at 1900 local time at Our Lady of Perpetual Help School, Franklin Ave., near High Mountain Road, Oakland, Room 107. Ramapo Valley Emergency Network (RAVEN) is looking for new members and anyone wishing to join please contact N2DZZ. Garden State ARC has the following new officers: KA2F, pres.; WB2CIF, v.p.; KD2CE, secy.; WB2KVC, treas.; W2OD N2DR, trustees; KE2V, chief engineer. Good luck to WB2RVL who heads for a tour of duty in the USN. He is a harmonic of WA2SSH. BARA has received word that it has been recognized as a Special Service Club. Mark Barattella, KA2ORK/J3 of Grenada fame, was guest speaker at the annual dinner meeting. The QCWA Northern New Jersey Chapter awarded W2SUE the Elmer of the year Award. CGNS! By the time you all are reading this, the Novice Roundup will be in full swing. A word of welcome to all Novices: Please join us on the New Jersey Slow Net on 3735 nitely where you can increase your code speed and learn all about traffic handling. N2XJ was awarded the W2SWE Memorial Award for outstanding contributions to traffic handling in all of New Jersey. K?2P was awarded the W2UEZ Rookie of the Year Award. Congrats to both of you fine operators! Traffic: KB2HM 353, N2XJ 330, W2VY 300, AG2R 292, K2VX 193, W2RQ 125, WB2KLF 99, KA2OIW 88, WD2GHN 63, KB2WI 61, KY2P 57, W2XD 55, W2KB 54, N2ELW 38, WB2ZEP 36, W2UH 31, W2CC 25, W2RRX 25, N2DZZ 18, KD2BE 12, N2EBA 9, KC2YG 8, W2ODV 6.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. BM: KØIIR. PIO: KBØZP. SGL: AKØQ. ACC: WBØQAM. TC: KØDAS: 1983 has been a good year for the Iowa Section and I wish to thank you all for increases in ARES activities, NTS totals, net participation. ARRL membership. 1984 will be better yet. Goals for 1984 include 15 more ECs, 20% higher NTS totals, 4 more SSCs, District ORS program, RTTY net, and a state convention, if you can and will help with any or all let me or other section officials know. Hope to be able to continue to help sponsor "Repeater In the Sky" project and will encourage technical projects under the direction of KØDAS. WE NEED YOUR HELP IN 1984!!!!!

Net	Freq.	Days	UTC	QNI	QTC	Sess.
ICN	3713	M-F	0100	160	78	22
TLCN	3560	Dy	0030-0400	476	145	60
75 M Phone	3970	M-S	1830-2330	2902	192	52
ITEN	3970	Sn	2230	73	12	4

Congrats to CVARC on receipt of Sheriff's Award. CVARC also placed 23/412 (2A) during FD, best in state. New Novices KAØRJF KAØRKH & KAØRQO (SEC XYL). Welcome to WBØTSG as new OBS-DSM had a very successful Operation Santa Claus (34th year). Gud statewide PR for W5LFL flight; nice going!!! Traffic: WAØAUX 466, WDØFWB 316, KØGP 128, WØYLS 105, WØSS 104, WDØGVY 95, WBØAVW 66, W4JL 59, WØBW 57, KQØI 50, NCØR 49, KØCY 44, WBØJFF 38, KAØJQG 34, WA4VWV 35, KCØSC 26, KAØADF 26, WØZTP 26, KA9GBG 17, NØEFG 9, KCØXL 6, KCØYI 4.

KANSAS: SM, Robert M. Summers, KØBXF — SEC: WØKL. STM: WØOYH. SGL: NØBLD. TC: KØEZ. BM: KØJDD. Comments were few this month on most of the report cards. WØAM really summed it up though!!! "COLD OUT HERE." KØKD hears the interloper on 7020 kHz or there-a-bouts, very strong A3J many evenings about 0300 GMT. Orbit 710 was good to WØPB WAØKDC WAØUQA WAØUHW, all of whom heard W5LFL. As of this date NOONE in this area has had confirmation of being heard though. Traffic net totals: KSBN QNI 1261, QTC 188 NM KAØCUF; KPN QNI 395, QTC 22, KAØCUF; KWN: 893/933/WAØLBB: KMWN 418/649/WAØLBB; CSTN 2029/158/WAØOMB; QKS 226/75/WBØZEN; QKS-SS 59/17/WØMYM. A big Kansas welcome to WA5RCO who has moved to Pittsburg. Another fine issue of the *Transceiver* (Topeka) was received, and along with it a note of the retirement of the Co-editors. I am sure the Topeka group are gonna miss NØDDX and NØCBG doing the honors each publication period from now on. The Johnson Co. ARC is planning to operate a special event station sometime in early spring with the club call WØERH. An activity such as this for all the clubs in Kansas would not hurt the membership and activities for 1984. Last but not least, congrats to the Central Kansas ARC on becoming the first SPECIAL SERVICE CLUB designated for Kansas. Traffic: WØFRC 433, WØFIR 180, WBØZEN 127, WØOYH 96, KSØJ 87, WØAM 70, WØFDJ 64, KØBXF 49, WØQMT 22, WØPB 17, WØMYM 16, WAØOWH 3.

MISSOURI: SM, Ben Smith, KØPCK — Club officers for 1984 of the Callaway AR League KCØMV, pres.; KSØB, v.p.; KSØM, secy/treas. Our sympathy to the families and friends of NØECM, WBØQPU and KAØNPR who became Silent Keys recently. The Jefferson Barracks ARC will hold their annual amateur auction March 9 at 7:30 P.M. at 5856 Gravois, St. Louis. The Kansas City office of National

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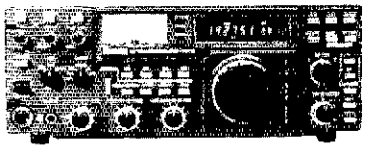

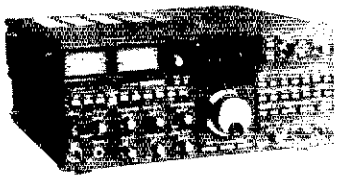

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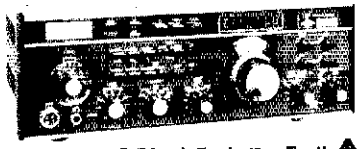
IC-R70, IC-751, IC-730, IC-745, IC-27A, IC-37A
IC-47A, IC-271A/H, IC-2KL, IC-471A, IC-290H, IC-120

YAESU



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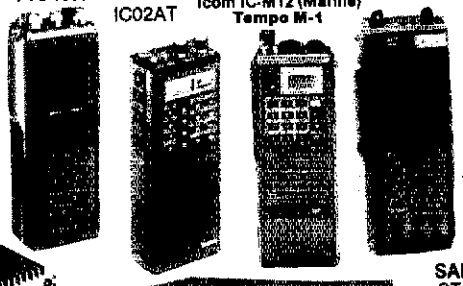
Tempo M-1



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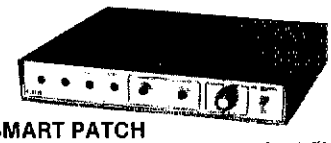

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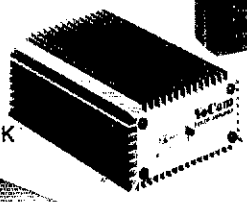

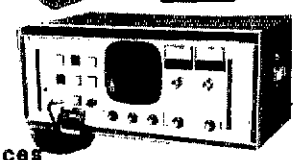

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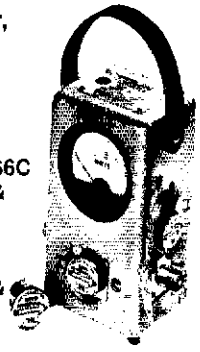

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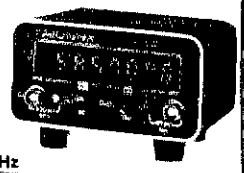

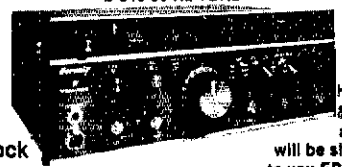

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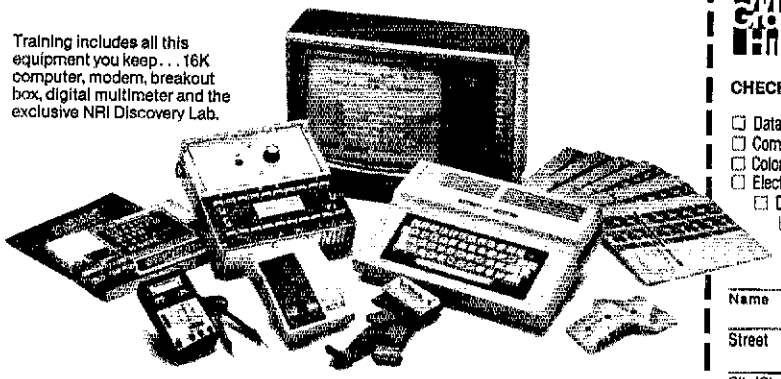

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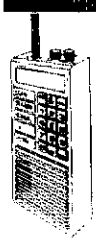

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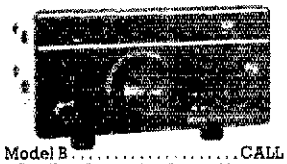

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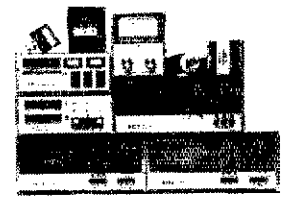

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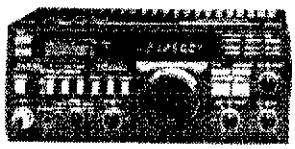

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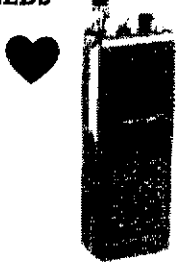

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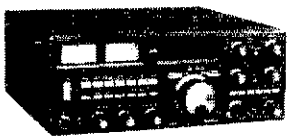

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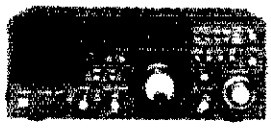

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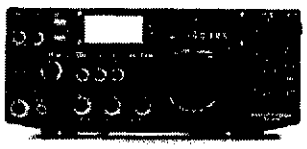

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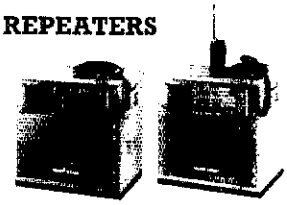

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This is a super linear for all purposes, the LA-1000 excelled during the Heard Island DX pedition with over 30,000 contacts. The rugged design lends itself to continual use during contests and users are even running it on RTTY at 500 watts input.

LA-1000A **$399.50***

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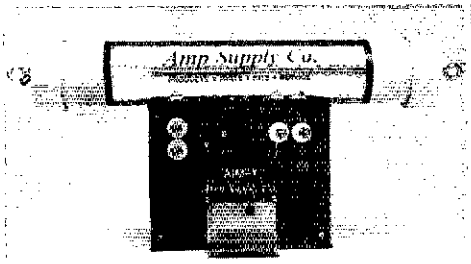

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- SWR max 2:1, 1.5:1 average
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- inverted V, inverted L, rombic, random wire or loop antennas
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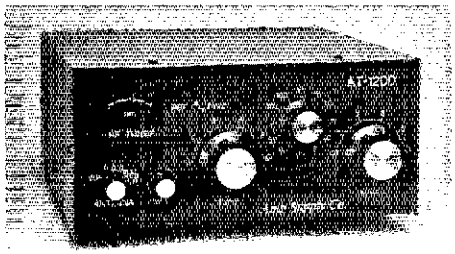
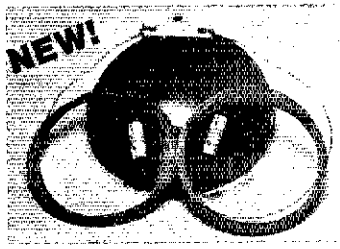


AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

AT-1200 ..... **$179.50***



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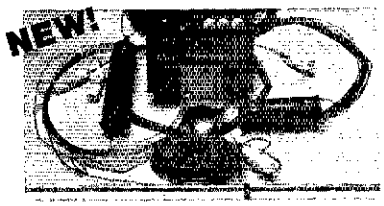
All Band Doublet **$39.50***
BL-1500 9:1, 5KW Pep Balun **$24.50***

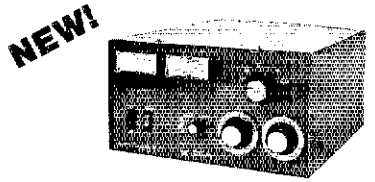


SAS-1 Sloper Antenna System

Another FIRST from AMP SUPPLY. The SAS-1 sloper matching and decoupling transformer. Simplify bolt the SAS-1 weather-proof box to the top of your tower, hook up the 50 ohm coax feed line and a 1/4 wave piece of antenna wire and you're ready to go. The SAS-1 takes all the pains out of sloper antenna systems. The SAS-1 covers 1.8-10.5 MHz., and handles 5KW PEP. Purchase the SAS-1 matching box separately or you may want the complete system ready to go on 160, 80, 40 and 30 meters. We offer a complete sloper system covering 160-30 meters complete with all elements, ground rod, insulators, nylon rope and ground radials. The sloper antenna covering all these bands is only 60 feet long. The sloper antenna is also available separately. Transform your entire tower into a dynamite low frequency antenna system with the SAS-1 sloper system.

SAS-1
Sloper Matching Network **$49.50***
SA-4 Sloper Antenna
160, 80, 40 and 30 Mtrs **$44.50***
SAS-1 and SA-4
Deluxe Sloper System **$99.50***

New Products



LK500ZA 2.5 KW AMPLIFIER

The all new Amp Supply LK-500ZA 2.5 KW Input Amplifier is the right amplifier, with the right features at the right price. The LK-500ZA is available in kit form or completely assembled and covers 160-15 meters. Two Eimac 3-500Z triodes in grounded grid are featured with a dual cooling system, one for the power supply and the other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world that sells for under $800.

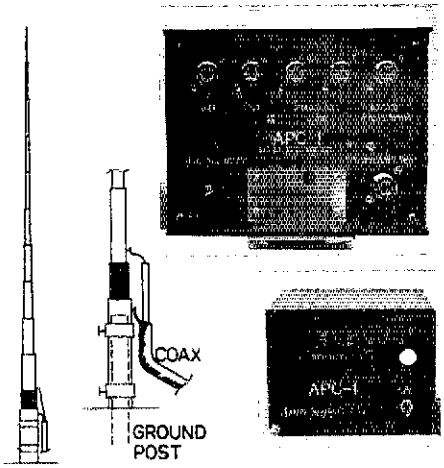
The Amp Supply LK-500Z!

- 2.5 KW SSB PEP Input: 1500 Output
- 1.5 KW Input CW :900 Output
- 1 KW SSTV, RTTY Input: 600 Output
- QSK Full Break-in CW
- 9" H x 15" W x 15" D
- 117/234 AC 50/60 Hz

LK-500ZA Kit **$679.50***

LK-500ZA
Wired and Tested **$799.50***

1500 Watt Output
All Mode with Hipersil Transformer .. **$999.50**



AEX-1, APC-1

The AEX-1 is a 33' self-supporting vertical full 1/4 wave on 40 meters (or any band). It is constructed of adjustable seamless aluminum, and will handle 4 KW.

The APC-1 is a two piece phasing control for verticals, dipoles or loops. The outside switching box and the indoor control system combine to eliminate all phasing guess work.

AEX-1 ..... **$79.50***
APC-1 ..... **$99.50***
APC-1 + 3 AEX-1 antennas .. **$299.50***
This combination provides complete 360 degree rotation.
80 Meter Add-on **$24.50***

*POSTPAID CONTINENTAL USA.

****Statement from K8KXK**

As founder and President of Amp Supply Co., I guarantee you'll be satisfied with our products. If you are not, write to me and I'll refund your money or replace your order.

Amp Supply Co.
2071 MIDWAY DRIVE
P.O. BOX 421
TWINSBURG, OHIO 44087
216—425-2010 TLX 980131 WDMR

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★ *Full Trade-in within 3 months on New Gear*
★ *Mastercard or VISA welcome - Call Today!*

AEA
MBA-RO Reader $149 v
CK-2 Contest keyer 89 m
MK-1 Memory keyer 39 f
AD-1 Auto dialer 39 f
ASTRON
RM-35M 25A ps, meter $109 w
COLLINS
75S-1 Ham Rcvr $179 m
75S-3 Ham Rcvr 269 mw
32S-1 Transmitter 179 mw
32S-3 Transmitter 329 m
312B-4 Station control 189 m
KWM-2 Xcvr/Waters rej 449 m
312B-5 PTO console 299 m
516F-2* AC supply 149 mwfc
*Not sold separately
516E-1 KWM-1 DC ps 59 m
MP-1 DC supply 49 m
PM-2 AC supply 125 m
DL-1 Dummy load 99 m
DENTRON
AT-3K Antenna tuner $169 m
GLA-1000B Linear 239 m
HF-ACS 10A nonreg ps 39 m
Clipperton V* 2m linear 199 m
*As-is. Pick-up only
DRAKE
SPR-4/NB/cal SW Rcvr $229 m
2C Ham Rcvr 119 w
R-4B Ham Rcvr 219 c
R-4C Ham Rcvr 269 mv
MS-4* Speaker 19 mtcve
*Sold with Rcvrs only
FL-250 250 Hz filter 35 v
FL-500 500 Hz filter 35 v
FL-1500 1.5 KHz filter 35 m
FL-4000 4 KHz filter 35 mv
R-7 SW Receiver 869 tc
R-7A SW Receiver 1099 e
SC-6 6m converter 59 f
T-4 Reciter 175 m
T-4XC Transmitter 269 mf
TR-4 Xcvr 225 fv
TR-4C Xcvr 269 fe
TR-4CW Xcvr 329 wfe
RV-4C Remote VFO 89 f
AC-3* AC supply 59 m
AC-4* AC supply 89 mwfve
*Not sold separately
TR-5 Xcvr 489 w
TR-7 Xcvr 750 mf
TR-7/fan/6 KHz filter 789 w
TR-7/300/500 Hz 799 m
TR-7/500 Hz/6 KHz 799 w
TR-7/NB/500 Hz filter 825 w
TR-7/300 Hz/1.8/6 KHz 825 m
TR-7/aux/500 Hz/1.8/6 849 m
TR-7/NB/500 Hz/1.8/6 875 m
TR-7/fan/NB/aux/3 filts 899 m
TR-7A/fan/1.8 KHz filter 1049 m
PS-7* Power supply 199 mwf
*Not sold separately
PS-75 Power supply 99 m
RV-7 Remote VFO 99 mw
SL-300 300 Hz filter 45 m
SL-500 500 Hz filter 45 v
SL-1800 1.8 KHz filter 45 v
AUX-7 Range prog board 29 m
L-4 Linear 599 m
7077 Desk mic 29 m
LA-7 Line amp 29 m
MN-4 Ant tuner 69 m
MN-7 Ant tuner 119 e
7000E Terminal 399 m
UV-3 3-band Xcvr/TTP 659 v
ESR-24 TVRO receiver 569 m
HAL
RVD-1002 Video conv $129 m
RKB-1 RTTY keyboard 59 m
KB-2100 Keyboard 119 m
DS-2000KSR Terminal 249 m
DS-3000KSR Term vers 2 499 m
DS-3000KSR Term vers 3 599 e
CWR-670 Rcv Telereader 269 mv
HY-GAIN/GALAXY
R-1530 SW receiver $369 m
IRL
FSK-1000 Demod w/keyer $299 f
ICOM
IC-701 Xcvr w/ps $529 m
IC-701 Xcvr only 429 mf
IC-701PS AC ps 99 c
IC-720 Xcvr 649 m
PS-15 Power supply 99 m
IC-740 Xcvr 679 w
IC-740/internal ps 749 m
IC-740/FM/FL-44/FL-45 799 f
PS-740 Internal ps 119 m
IC-730/EX-202/FL-44 599 m
IC-2KL Linear amp 999 f
AT-500 Auto ant tuner 299 e
RM-2 Microprocessor 69 m
IC-505 6m SSB port 299 e
IC-551 6m Xcvr 299 m
IC-551D 80w 6m Xcvr 469 f
PS-20 20A ps for 551D 159 f
IC-22S 2m FM Xcvr 119 mw
IC-202 2m SSB port 149 w
IC-211 2m Xcvr 349 m
IC-260A 2m Xcvr 269 w
AG-1 UHF preamp 59 m
HM-12 Hand mic 25 m
HM-14 Scan/TTP mic 29 m
JOHNSON
1 kw matchbox/SWR $149 f
KANTRONICS
Field Day II Reader $129 m
Mini-Reader Reader 149 w
KENWOOD
T-599A Transmitter $249 m
TS-120S Xcvr 389 f
TS-130S Xcvr 469 mf
TS-130S/CW filter 499 m
PS-30 20A ps 99 m
TS-130V 25w Xcvr 429 m
PS-20 4.5A ps for 130V 49 mw
DFC-230 Dig freq control 129 m
DFC-230 (new close-out) 169.95 all
AT-120 Ant tuner 69 m
AT-130 Ant tuner 99 w
TS-180S/DFC Xcvr 529 mw
TS-180S/DFC/CW filter 569 mf
VFO-180 Remote VFO 99 w
TS-520 Xcvr 449 mv
TS-520/CW filter 479 m
TS-520S Xcvr 469 mwfc
TS-520S/CW filter 499 f
TS-520SE Xcvr 449 mf
TS-530S Xcvr 499 mf
VFO-520 Remote VFO 99 m
AT-230 Ant tuner 129 m
SP-520 Speaker 19 m
SP-230 Spkr/audio filts 49 m
DG-5 Dig display 99 mfc
TS-820 Xcvr 489 f
TS-820S Xcvr 549 f
TS-820S/CW filter 599 m
TS-830S Xcvr 699 w
R-300 SW receiver 169 m
R-820 Ham receiver 499 v
R-820/YG-455C/CN 569 m
TS-700A 2m Xcvr 389 mc
TR-7800 2m FM Xcvr 219 v
TR-7850 2m FM Xcvr 269 v
TR-9000 2m Xcvr 289 m
TR-9130/TTP 2m Xcvr 369 f
TR-8400 440 FM Xcvr 299 m
KPS-7 6A power supply 59 w
MC-60A Desk mic 59 mv
MCM (Daiwa)
CNW-418 Ant tuner $129 f
AF-306 Audio filter 29 w
MFJ
200BX Calibrator $ 25 f
496 Super Keyboard II 229 mv
496/clock/loop module 259 m
901 Tuner 39 f
MACROTRONICS
TA-650 Interface/Apple $129 m
GA-650 Interface/Apple 129 m
MICROLOG
ACT-1 Terminal $499 mw
ACT-1/hi speed/batt bkup 599 m
MIDLAND
13-509 220 FM Xcvr $129 v
J.W. MILLER (Daiwa)
CNA-1001 Auto ant tuner $229 w
RF-660 Speech proc 59 w
NYE VIKING
MB-IV-01 Ant tuner $289 e
046-001 Phone patch 35 v
RCA
TC-1110 9" B & W monitor $ 89 m
REGENCY
HRT-2 2m FM HT $ 69 w
ROBOT
800H/800CH kit Term $449 c
SPECTRONICS
DD-1K Dig disp; Kenwood $ 69 m
STANDARD
C-7800 440 FM Xcvr $249 c
SWAN/CUBIC
Astro 150 Xcvr $449 m
Astro 102BX Xcvr 489 e
Astro 102BXA Xcvr 589 v
Astro 103 Xcvr 689 m
PSU-6 AC supply 119 e
PSU-6A AC supply 119 mv
1500Z Linear 399 v
TEMPO
AC/One ps; Tempo One $ 89 v
2020 Xcvr 389 w
VHF/One Plus 2m FM 149 w
S-4T/16 440 FM HT/TTP 189 m
TEN-TEC
505 Argonaut Xcvr $199 m
509 Argonaut Xcvr 249 mv
515 Argonaut Xcvr 299 m
574 Century/21 digital 289 w
525 Argosy Xcvr 349 f
525/calibrator 369 w
525/1.8/2.4 KHz filters 399 v
225 Power supply 89 f
Triton II Xcvr 299 f
540 Xcvr 299 m
240 160m converter 79 m
242 Remote VFO 99 m
244 Dig display 89 m
580 Delta Xcvr 429 v
283 Remote VFO 129 w
545 Omni A Xcvr 329 v
546 Omni D series B 429 mv
243 Remote VFO 119 m
252 Power supply 79 f
252G Power supply 79 m
252M/O Power supply 79 v
262G Power supply 89 f
207 Ammeter 9 m
234 Speech processor 69 m
247 Ant tuner 49 w
216 Desk mic 15 m
KR-20 Keyer 29 m
KR-50 Keyer 49 w
WILSON
YM-1000 Sat Rcvr $499 m
YAESU
FR-101S/FM det/FM filt $249 m
FL-101 Transmitter 249 m
FT-101 Xcvr 399 mw
FT-101B Xcvr 429 mf
FT-101E Xcvr 489 mc
FT-101EE Xcvr 469 f
FT-101EE/proc/CW filt 489 m
FT-101EX Xcvr 449 mf
FT-101Z/CW filt Xcvr 499 m
FT-101ZD Dig Xcvr 499 mf
FT-101ZD Mk II Xcvr 569 m
FT-101ZD/Mk II/CW filt 599 m
FV-101Z Remote VFO 99 m
SP-101P Spkr/patch 49 w
FT-301AD Dig Xcvr 389 m
FP-301 AC supply 99 mw
SP-120 Speaker 19 w
ERB Ext relay box 19 w
FT-901DM Xcvr 649 m
SP-901P Spkr/patch 49 m
FV-901DM Remote VFO 189 m
YR-901 Reader 289 mv
YK-901 Keyboard 89 m
FTV-901R Xvtr w/2m 269 m
FTV-901R w/2 & 6m 339 m
FT-107M Xcvr 489 mc
FP-107E External ps 99 c
SP-107P Spkr/patch 35 c
FV-107 Remote VFO 99 f
FTV-107R Xvtr w/6m/430 329 f
FT-707 Xcvr 459 m
FTV-707 Xvtr w/2m 159 mw
FT-77 Xcvr 429 w
FT-102 Xcvr 769 m
FC-102 Ant tuner 199 m
FT-980 Xcvr 1049 e
FT-ONE/4 filts/RAM/FM 1495 m
FRV-7700F Rcv VHF conv 89 f
FRG-7 SW Rcvr 169 m
FTV-250 2m Xvtr 149 f
FT-620B 6m Xcvr 289 mwf
FT-221R 2m Xcvr 329 mw
YC-221 Dig display 69 m
FT-225RD 2m Xcvr 489 f
FT-480R 2m Xcvr 329 w
FT-230R/TTP 2m FM Xcvr 229 f
FT-720RVH 2m FM Xcvr 179 e
720RU 440 FM module 129 me
S-72/E-72L/2 E-72S 89 e
S-72/E-72L Box/cable 69 m
FP-80 4.5A ps 69 w
FP-12 12A ps 89 f
YM-39 TTP mic 49 f
FT-207R 2m FM HT 149 w
FT-208R/TS-32 2m HT 249 m

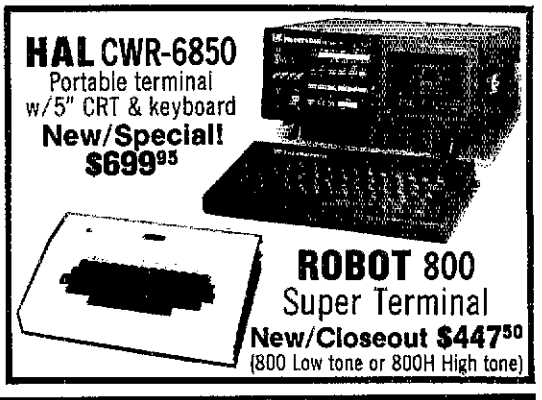
12-22-83

(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item; others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation. (3) Sometimes used gear is serviced **after** we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on **used** gear. (5) Used gear policies do not apply to New Equipment special, Closeouts, etc.

USED AES SHOP TEST EQUIPMENT

HEWLETT-PACKARD
608E 10-480MHz sig gen 1895
8640B .5-1024Mhz sig gen w/options 002/003 5895

SINGER-GERTSCH
FM-10CS w/RFM-10A, FIM-3 & ODM-1 4995
OAM-1 AM module for FM-10C 395

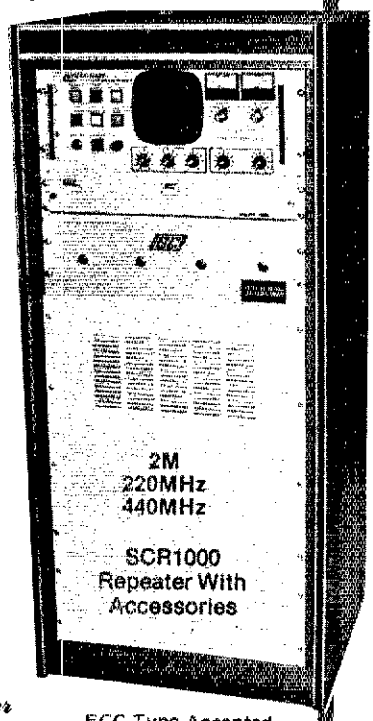


Location	Local Phone	Nationwide	In-State
m = Milwaukee, WI 53216; 4828 W. Fond du Lac Ave	(414) 442-4200	1-800-558-0411	1-800-242-5195
w = Wickliffe, OH 44092; 28940 Euclid Ave	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = Clearwater, FL 33515; 1898 Drew Street	(813) 461-4267		
v = Las Vegas, NV 89106; 1072 N. Rancho Drive	(702) 647-3114	1-800-634-6227	
e = Chicago, IL Erickson Communications (Associate)	(312) 631-5181		

MasterCard VISA

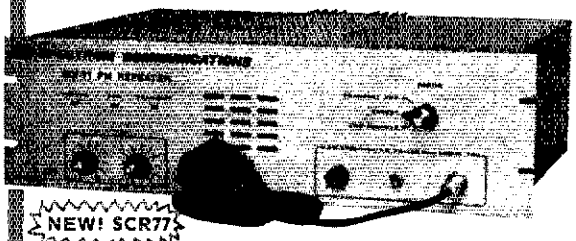
Spectrum Repeaters - Either "Super Deluxe" or "Basic" Units!

Spectrum now makes 2 lines of Repeaters – the world famous 'Super Deluxe' SCR1000 and our new Low Cost line of SCR77 Repeaters.



The New SCR77 Repeaters maintain the high quality of design, components and construction which have made Spectrum Repeaters well known *throughout the world* for years. However, all of the "bells and whistles" which you may not need or want have been eliminated — *at a large cost savings to you!* The SCR77 is a real "workhorse" basic machine designed for those who want excellent, super-reliable performance year after year — *but no frills!* ('PL', 12 Pole IF Filter, Rx Preselector, and a 30 to 40 Wt. Xmtr. are the only 'built-in' options available; but Autopatch, Remote Control, and other equipment can be connected via the rear panel jack.)

Of course, if you do want a full featured/Super Deluxe Repeater, with higher power [30-75 Wts.], and a full list of 'built-in' options, then you want our SCR1000 — *'The Ultimate in Repeaters'.* Available with: Full Autopatch/Reverse Patch/Land-Line Control; Touch Tone Control of various repeater functions; 'PL'; "Emergency Power ID"; various Tone & Timer Units, etc.



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Complete Line of Duplexers, Antennas, Cabinets, Cable, Repeater Boards, Transceivers, HTs, etc. also available. Amateur & Commercial.

FCC Type Accepted For Commercial Services

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HY-GAIN

TH7DXS	7 element tribander	420.00
TH5MK2S	5 element tribander	365.50
EX-14	4 element tribander	276.00
TH3JRS	3 element 750W PEP	172.50
18AVT/WBS	5 band trapped vert.	95.50
14AVQ/WBS	4 band trapped vert.	58.65
V2S	2 meter omnidirectional	38.00
V4S	70 cm. omnidirectional	48.50
HB-14Mag	2 meter mag mount	16.25
HB-144TLM	2 meter trunk mount	13.75
HG52SS	52 ft. Self Supp. Frt. Paid	923.00

HUSTLER

6BTV	6 band trapped vert.	132.25
5BTV	5 band trapped vert.	111.00
G7-144	2 meter vertical	112.50
MO 1,2	Mobile mast	19.50
RM 10,15	10 & 15 meter resonators (std.)	10.00
	(sup.)	15.25
RM 20	20 meter resonator (std.)	13.25
	(sup.)	18.50
RM 30	30 meter resonator (std.)	14.50
	(sup.)	N/A
RM 40	40 meter resonator (std.)	15.25
	(sup.)	21.00
RM 75, 80	75 & 80 meter resonator (std.)	16.00
	(sup.)	33.25
BM-1	Bumper Mount	15.25
SSM-1	Stainless Ball mt. w/spring	28.00
SSM-2	Stainless Ball mt.	16.00
SSM-3	Stainless spring	15.25
QD-1	Quick disconnect	12.75
SF-2	2 meter 5/8 wave	10.00
SFM	2 meter 5/8 wave mag. mt.	29.75

CUSHCRAFT

A-4	4 element tribander	279.00
A-3	3 element tribander	210.00
R-3	10, 15, 20 remote tuned vert.	265.00
AV-5	5 band trapped vert.	98.00
32-19	19 element 2 meter boomer	91.00
214B/FB	14 element 2 meter boomer	77.00
424B	24 element 70 cm boomer	77.00
416-TB	16 element OSCAR 435MHz	56.00
A144-10T	10 elemenet OSCAR 145.9MHz	49.00
ARX2B	2 meter vert. 5.5db gain	35.00
ARX-2	2 meter vert. 'ringo ranger'	28.00
AR-2	2 meter vert. 'ringo'	23.00

KLM

KT34A	4 element triband	312.00
KT34XA	6 element triband	456.00
2m-14C	2M satellite ant.	85.00
435-18C	70 cm satellite ant.	60.00
CS-2	Circularity switch	59.95
Ken-pro	Elevation Rotor	189.95

ANTENNA BANK

ANTENNAS — TOWERS ACCESSORIES

All prices subject to change without notice

TET

HB443DX	4 element 4 band beam	450.00
HB43SP	4 element tribander	239.95
HB33SP	3 element tribander	199.95
HB40NLZ	2 element 40 mtr	269.95
MV5BH	5 band verticle	79.95
MV4BHR	4 band vert. no radials required	99.95
5Q-22	2 mtr. Swiss Quad	69.95

MINI PRODUCTS

HQ-1	mini quad 6,10,15,20	148.30
B-24	mini beam 10,15,20	110.95
RK-3	third element kit for B-24	69.50

Orders Only

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NO COD—we ship UPS daily
Allow two weeks for delivery
Shipping cost is *NOT* included except where noted.
We reserve right to limit quantities
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THE ANTENNA BANK
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Vienna, VA 22180

ROHN

25G	10 ft. stacking sect.	48.30
25AG(2,3,4)	top sections	62.10
SB25G	short base section	20.65
AS25G	accessory shelf	10.85
45G	10 ft. stacking sect.	112.50
45AG(2,3,4)	top sections	122.85
SB45G	short base section	48.75
AS45G	accessory shelf	26.25
20G	10 ft. stacking section	32.45
20AG	top section	35.90
BX-48	self supporting 6 sq. ft.	231.79
HBX-48	self supporting 10 sq. ft.	287.70
HDBX-48	self supporting 18 sq. ft.	358.65
FK2548*	fold over freight paid	762.50
FK4544*	fold over freight paid	1,207.50

*10% higher west of Rockies

HY-GAIN ROTORS

HDR 300	25 sq. ft.	497.00
T2X	20 sq. ft.	261.60
Ham IV	15 sq. ft.	210.00
CD45II	8.5 sq. ft.	130.00

ALLIANCE

HD73	10.7 sq. ft. rotor	99.00
U-110	3 sq. ft. rotor	44.00

VAN GORDEN

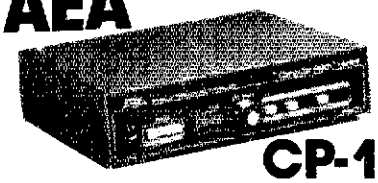
PD8010	80-10 meter dipole kit	32.50
PD4010	40-10 meter dipole kit	28.75
PD8040	80-40 meter dipole kit	30.00
SD80	80 meter shortened dipole	26.25
SD40	40 meter shortened dipole	23.75
W2AU	1:1 & 1:4 balun	14.75
W2AU	Center Insulator	7.95
W2AU	End Insulator	2.95
	Ceramic Strain Insulators	.35
	Ceramic End Insulators	.65

14 ga. stranded wire 50,75,100,150 ft. coils .06 per ft.
Amphenol PL-259 .97 ea. 10 for 9.00

COAX CABLES

RG213	Columbia 95% Shield	.30
RG8u	Columbia Superflex	.26
RG8x	Miniature 50 ohm	.14
RG213 or 8	with Amphenol connectors installed 50 ft.	19.99
	100 ft.	31.99
14 ga	Stranded	.06
14 ga	Copperweld	.10

AEA



CP-1

Computer Patch ™ Interface.
For computerized RTTY and CW operation.
Call for details.

$199.95

Call for YOUR Low Price!

ICOM

IC-740

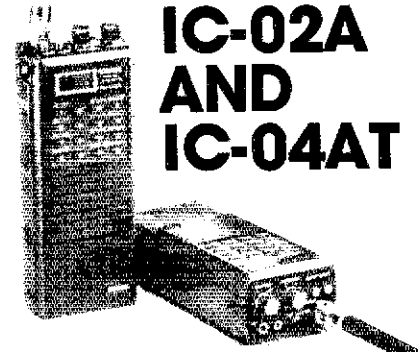
Includes hand mic and installed internal power supply!

PLUS $50 REBATE!

YOUR CLOSEOUT PRICE IS ONLY $919.95!

NEW

ICOM



IC-02A AND IC-04AT

New 3 watt full-featured 2M, and 440MHz handhelds! Scanning, 10 memories and programmable subaudible tones are just a few of the MANY features of these terrific new radios. AND THEY ARE COMPATIBLE WITH ALL ICOM HT ACCESSORIES!

Suggested Retail $349

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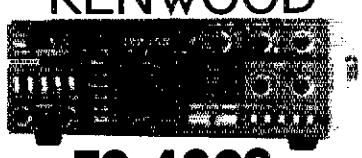

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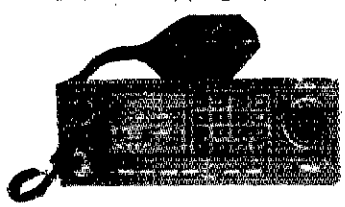

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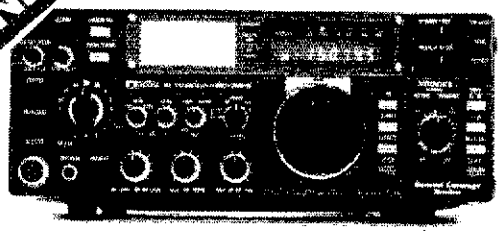

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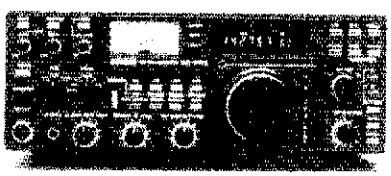

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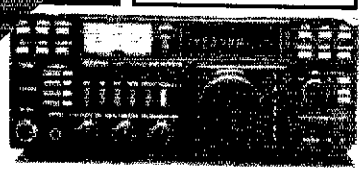

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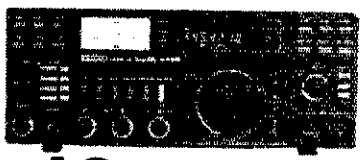

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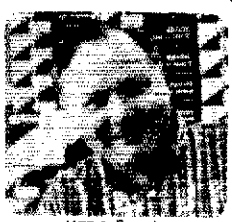

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Weather Service will conduct spotter training classes beginning in February. Spotter groups should contact NØELU for more information. WBØLRF, net manager of the C-P-R ARES Net, would like to have more check-ins from Platte and Ray Cos. The net meets on 145.43 at 8:00 P.M. Wed. The reason I have not been reporting 3 new section Field Appointments is because I have not been receiving applications for appointments. I am sure a lot of stations could qualify for ORS, we need more OBSs on local 2-meter nets. We have a shortage of OOs in the Missouri section and with the storm season approaching SEC WBØKUW would like to hear more from *people interested* in becoming DECs or ECs. A 220 MHz repeater is on the air in Columbia operating on 42/02.

Net	Sess.	QTC	QNI	Time	Freq.
MON	60	191	306	D700/945	3585
MOSSB	30	114	808	D600PM	3963
MEOW	30	42	488	D530PM	3963
HBN	22	31	438	M-F1205PM	7280
RARBN	27	25	431	D800PM	146.79
PHD	5	11	89	M900PM	146.43
CMEN	5	5	66	W900PM	146.76
IFN	4	3	44	M800PM	147.24
CRP	4	2	44	M800PM	135.43
STARN	4	0	251	M800PM	146.91
LORN	4	0	81	F900PM	146.73
SARN	5	1	59	Tu900PM	147.03
CARL	4	0	42	W830PM	146.52
LOCW	4	0	20	Tu800PM	28.1047
JCAN	5	0	65	W800PM	147.00

Traffic: WØBMA 236, KØPCK 187, KCØAS 161, AIØO 137, KØSI 136, WAØYJK 104, KT5Y 98, WØOUD 63, K2ONP 47, KØDSQ 39, KGØL 35, NØBLB 22, KUØG 18, WDØFLT 15. WØNUB 12, WAØKUH 10, KAØP 8, WBØHOP 7.

NEBRASKA: SM, Reynold Davis, KØGND — Some very nice front page newspaper coverage of Nebraska hams. WAØQWU and WBØGQM were featured in the Wahoo paper for their work with the CD van. KAØAEY KAØLDY and KMØS got page 1 attention in the Fremont paper. WBØYYE hit page 1 of the *Lincoln Journal* as he attempted STS-9. Congrats to new club officers WBØSIP, pres. of Blue Valley ARC & KØRJE, pres. of the Pioneer ARC. Don't forget to let me know your club's new officers. Net mgrs, pls note that you no longer need to mail CD-125 to HQ if the data is being reported to KAØBCB. Also, be sure your repeater mgrs file CD-258 monthly w/HQ or me. Traffic totals to be reported below must be in CD-210 format. Traffic: WØKK 142, KØDKM 122, WBØIED 121, WAØSCP 80, KAØBCB 52, KØIXY 27, NØDGM 15, KØGND 13, WAØBOK 11, KAØBWM 8, WAØOQX 8, KAØELI 7, WBØBQM 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — STM: K1EIC. SEC: K1WGO. OO/RFI: KA1ML. BM: KS1F. TC: W1HAD. ACC: N1AZF. SGL: K1AH. PIO: K1NGL.

Net	Freq.	Local time	QTC	QNI
CN	3640	1900/2000	269	335
CPN	3965	1800/1000 Sn	123	314
NVTN	28/88	2130	85	314
WCN	78/18	2030	188	414
RTN	13/73	2100	89	315

Upgrades: Extra-WA1LJP KA1GMG, Gen-KA1JTG. A BIG CONGRATS to: W1QV for his 60 yrs with the ARRL, W1BPY for his 50 yrs with the ARRL and KA1ML who again this year was cited as one of the top ten OOs. The Connecticut QSO Party will be held Mar 31-Apr 1. New CARA Officers: WA1VOP, pres.; N1ABY, v.p.; W1IDH, secy.; KM1L, treas. The KA1YE Beacon has moved to Rochester, NY, Grid-FN13-DAX. Thirty three new Novices courtesy of the Bethel Middle School ARC. Happy Valentine's Day. KA1BHT is having fun with his modified HW-8 on 30 meters. The FCC has announced that all Amateur Radio exams will require a 610 form 30 days in advance. No more walk-ins at field offices. The FCC is scheduled to visit Hartford only one time this year. Mark October on your calendar for upgrading to Adv or Extra. It appears that upgrading to Tech/Gen will be accomplished through the Volunteer Examiner Program, probably starting in the Spring. Under the new system all exam questions are public domain. The General/Tech questions have been released. Obtain your copy from the FCC; ask for PR Bulletin 1035B. This section mourns the death of our President Vic Clark, W4KFC. His long association with, and contributions to, the ARRL and our hobby will always be remembered. Is your club running any Novice or upgrade classes? If so, why not inform the ACC. TNX to the ICRC for carrying the Teleconferencing Net on AMSAT and the latest happenings of the STS-9 Shuttle Mission. With all the recent publicity that Amateur Radio has received, NOW is the time to follow it up with active recruitment for the hobby. Traffic: WB1GXZ 544, W1EFW 271, K1EIR 245, W1XX 135, K1UQE 129, KA1BHT 117, WA1HFE 84, KA1EGE 65, WB9IHH 65, W1BDN 45, K1EIC 42, KA1GWE 36, K1AQE 35, K3ZJJ 35, WB1ESJ 17, WA1WQG 10, W1CUH 5, W1QV 4.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. OO/RFI & BM: WA4STO. TC: KA1IU. PIO: WA1IDA. SGL: K1BCN.

Net	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	3.658	1900/2200/Dy	482	532
EMRIPN	3.959	1730/Dy	291	317
EM2MN	23/63	2000/Dy	398	182
NEEPN	3.945	0830/Sn	63	22
HHTN	04/64	2230/Dy	578	295
EMRISS	3.715	2030/Dy	165	80
CI2MN	045/645	1930/Dy	180	80

Our PIO WA1IDA managed to arrange a full hour talk show on Amateur Radio on WBZ Radio. Besides WA1IDA the other participants were WB8TDA and WA1AYS. They all did very well and we got a lot of good PR out of it. The host and his producer were both surprised with the interesting topic. As I write this the STS-9 mission is almost over, and I have to say that I was less than impressed with the antics of some on 145.55. I'm not sure who bugs me the most, those who chose to cause malicious interference, those who were ignorant that 55 was a downlink frequency and not an uplink frequency or the do-gooders who took great pride (all 100 of them in unison) at balling out the others. Consider one thing. What kind of impression do you think a non-ham would get about ham radio (and there were some listening) by listening to that junk? Greater Lawrence club members braved wind and rain to put up a dipole on the roof of the fire station. Falmouth club is the third Special Service Club in Eastern Mass., Congrats. Whitman club operated two stns on Thanksgiving Day from Plymouth. One made general contacts (about 500) on 40, 20 and 15 and the other handled about 140 radiograms for visitors. New Barnstable club officers W1HWD, pres.; W8ES, v.p.; K1KED, treas.; W2CAP, secy. Massasoit club planning a potluck supper.

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1200 Radio Club sponsored another great teleconference. Waltham ARA new newsletter editor is K1CE. The annual Christmas message fair done by the Wellesley club is moving to the Framingham Mall this year. STM KA1GBS gave a talk on traffic handling at the Norwood club. Framingham club had another successful flea market with 650 attendees. Quannapowitt club had WBZ personality and friend of Amateur Radio Bruce Schwoegler as a speaker. They are also celebrating their 35th anniversary. Traffic: KA1GBS 1019, K1BZD 481, N1BGW 414, KA1EXJ 350, N1AJJ 255, W1AF 252, N1ER 238, K1CB 187, N1BHH 179, KA1BBU 167, WA4STO 144, K9HI 100, KO1O 86, KA1EPO 75, KA1AMR 65, WA1DXT 65, N1BYS 62, W1CE 61, WB3FCC 42, WA1FNM 36, W1QLL 34, K1II 28, W1MJ 24, W1ZHC 20, K1LCQ 7, W1XA 3, K1OGF 2. (Oct.) W1CE 73.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. BM: W1JTH. TC: KQ1L. PIO: KA1TJ. SGL: K1NIT. OO/RFI Coord.: W1KX. ACC: KB1JF. Amateur ops who provided free messages for tourists rcvd good publicity in *Bangor Daily News*, N1BLZ & KA1AVU. Continue to get good reports on KK1A/Bethesda Naval Hosp. PSHR: AK1W W1RWG WA1YNZ KA1AVU WB1GLH KL7IJG N1BJW W1KX.

Net	Sess.	Checkins	Traffic
SGN	26	1088	212
PTN	52	515	188
AEN	5	73	2
CMEN	9	258	20
MPSN	4	67	1
RACES	4	41	3

Traffic: AK1W 279, WB1BYR 179, W1KX 138, W1ISO 114, KA1AVU 100, W1RWG 75, N1BLZ 73, WB1GLH 68, KL7IJG 56, N1BJW 51, W1JTH 47, W1BMX 44, WB1CBP 28, KA1TJ 28, W1VEH 24, WA1YNZ 18, N1BME 15, KB1JF 15, W1WCI 14, KA1FTL 10, W1OTQ 8, N1AZH 8, W1AHM 6, KA1ENL 3, KA1ENM 3, K1PV 3.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. As of Dec. 1, ex-SCM W1JB has 60 years of ham radio. Congrats. New asst. director N1CJP. AK1E retired as SEC. Thanks for the excellent job. Many NH stations heard working W5LFL/space shuttle Columbia. NH Teleprinters Net meets Friday at 1930 local time on 3620 kHz. N1CWB & KA1JOC now Advanced. Amherst RC new officers: KA1GAX, pres.; W1XC, v.p.; WA1HXH, treas.; N1BHD, secy. Traffic: N1NH 559, KK1E 416, N1CPX 220, KI1M 194, W1GUX 176, WB1CFP 127, W1TN 127, AK1E 108, K1PQV 97, N1AKS 84, K1OSM 73, W1ALE 63, WA1YZN 62, W1MHX 44, W1CUE 35, KA1HKB 33, KA1GOZ 32, KA1FKM 28, W1FYR 19, KA1HPO 15, K1OIQ 15, WB1BRE 12, W1LQQ 6, K1UQX 6, KA1HRH 2, KA1IIP 2, KS1S 2. (Oct.) WA1YZN 36, KA1HKB 18, N1ALM 11, WA1PEL 5.

RHODE ISLAND: SM Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. TD: AB1D. NM: WA1OSL RIEM2MTN. ACC: N1BEE. SGL: K1DA. New appts: KA1FPP ORS. Endorsements: N1RI ORS. RIEM2MTN 21 sess., 155 QNI, 70 QTC from NM WA1OSL. OSARG sponsored "Christmas is" tfc fair in W. Warwick, with KB1G KA1BAT KO1X KF1T KC1G KB1EM KA1EZH KA1KWU KA1EHR W1YNE W1EOF participating. EBAWA placed 2nd in New England in their class in Field Day. The EBAWA repeater is nearing completion. AB1D has new repeater on air from Sturdy Memorial Hosp. Hope Valley RA has changed its name to "Hope Valley ARA" to reflect organization's broader interests. Traffic: W1EOF 1055, KA1KML 234, WA1CRY 113, KB1G 80, KA1EHR 73, WA1CSO 40, KA1FPP 13.

VERMONT: SM, Reed A. Garfield WB1ABQ — STM: N1ARI. SEC: W1RNA. BM: AE1T. SGL: W1KRV. ACC: KA1AKI. Mildred Doe, K1BOB, is a Silent Key. Like her or not, she was prominent figure in VT Amateur Radio for a long while, and we'll all miss her. RIP Millie. We also mourn the passing of W4KFC. RIP Vic. Hope you all worked W5LFL, or at least heard him. I had good results from the "AMS-2064" tracking program. Glad we're finally getting some good antenna WX! Nets: VTN 30/148/80; VSBN 30/582/182; VFMTN 30/417/102; GMN 26/413/32; RFD 4/66/23; RFD (Oct.) 4/81/19; CVFMN 4/44/2. QTC: N1ARI 144, W1KRV 110, N1COB 74, AE1T 70, W1OAK 32, WB1ABQ 23.

WESTERN MASSACHUSETTS: SM, William J. Hall, W1JP — This is my swan song. Thanks to the amateurs in Western Mass for this most enjoyable experience serving as your Section Manager. Special praise is given to outgoing ACC W1YI who tirelessly kept me in touch with the clubs, providing items for this column. SEC WB1HIH gets special mention for his dedication to ARES and NTS and his successful save of the Mt. Greylock tower. Another star is given to NM WA1FCD, responsible for the rebirth of the W1PUO U. Mass. club station a year ago. Since then, W1PUO has become one of the top traffic handlers in the section. Last but not least to mention is our new SM, KA1T, who became active during my tenure. He is very capable and energetic and will represent us well. Others made many contributions, too numerous to mention here. Now some local items. K1IJV was featured in TV broadcasts covering the Grenada invasion. WB1EMN has 295 countries confirmed. KA1BRD has 48 states on 6M, and WA1RWU worked N9AV on 432 EME. The menu for lunch at a NoBARC work party in October was skunk and bread. WA1YWH was the chef. PSHR: WB1HIH W1PUO KA1T K1JHC. Traffic: KA1T 305, W1PUO 292, W1UD 172, WB1HIH 88, WA1YYW 84, W1JRA 82, K1IJV 59, W1JP 37, K1JHC 30, K1PUG 24, W1ZPB 16, WA1OPN 13, KB1W 13, W1SJV 6.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS, SGL: KL7LO. OO/RFI: AL7FL. W5AHO has applied for Volunteer Examiner Coordinator for Alaska. It is my understanding that this program will be implemented one class of license at a time. Starting with Technician class, then General class, etc. The FCC plans on testing quarterly until amateurs have taken over the whole testing program. Congrats goes to KL7MJ for his first EME contact with his new EME 2-meter station. Traffic: KL7BY 105, AL7FJ 31.

IDAHO: SM, Dennis L. Hall, KK7X — It is with a heavy heart that we learn of the passing of Vic Clark, W4KFC. Amateur Radio has lost one of its greatest assets. Congrats to those having the opportunity of working W5LFL. One report from southern Idaho has W7ID having a confirmed contact with W5LFL onboard the Columbia. S. Idaho listen on 145.33, 8 P.M. MST Sundays for current DX information. Hq has a new publication called "This is Amateur 'Ham' Radio," the objective of which is to inform elected and appointed officials at the city, state, and federal levels of the national resource available for emergency communications. Available from ARRL Hq for the asking. Each official in YOUR area should have a copy. Let us all work together to make 1984 a successful year

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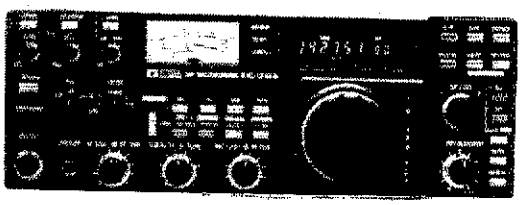

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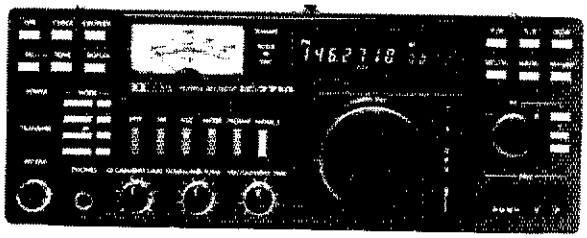

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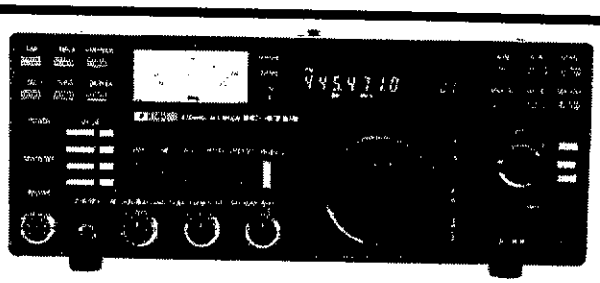

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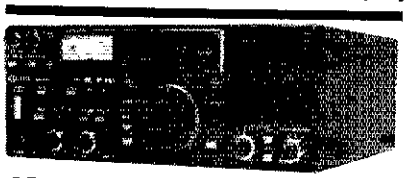

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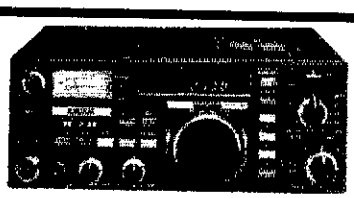

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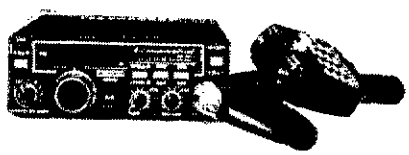

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Net	Freq.	Time	Sess	Qni	QTC
ICD	3990	7:10 A.M.	—	—	—
IMN	3835	8:00 P.M. Dy	22	215	104

Traffic: W7GHT 289, KA7GQP 88, N7DHM 10.

MONTANA: SM, Les Belyea, N7AIK — SEC: W7LR. STM: KF7R. PIO: WA7GQO. SGL: W7JMX. ACC: WB7TWG. TC: K0PP. BM: KB7SE. OO/RFI: KS7U. Forgot to mention last month that KE7X also made a clean sweep in last fall's "Sweepstakes" contest by working all 73 ARRL sections plus Yukon/NWT. I'm sure you know by now that W5LFL made contacts from Columbia with JY1 (the King), K7UGA (the Senator), also with W1AW, and his home town club station, W5HTK in Enid, OK, but did you know that the VERY FIRST station heard from his space location was here in Montana? WA1JXN from Frenchtown did it with his EME antenna system. Very FB as congrats. The Yellowstone ARC held their annual banquet in December, and selected as "Ham-of-the-Year" ACC WB7TWG; good choice. WB7ETT from Great Falls reports a 450-rptr in operation on the freq of 444.35 is working very well. Missoula has new 2M rptr freqs of 146.12/72, 30/90, and 36/96. Call change: KA7NNY is now N7FUB (XYL of the SM). PSHR: KF7R.

Net	Sess.	QNI	QTC	Mgr.
MTN	29	1378	109	KB7SE
IMN	22	215	104	K7JV/K7RX
BSN	12	192	4	WB7UTJ

Traffic: KF7R 94, N7AIK 45, KD7EG 44, WB7TNH 31, W7JMX 29, KB7SE 11.

OREGON: SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. UPGRADES: KA7RGH (Novice); KA7QFZ (Tech); N7FQO (Gen); N7DRP (Adv); KA7HWX (Extra). KA7PKT has a new Junior Operator (SON). W7LVN has been elected by QCWA to serve as secretary. W7TC was listed in the top ten Official Observer list by ARRL Hq. KA7CZG is the new manager for the Southern Oregon FM Net, relieving W7FDU who has held the position for several years. KN7B has been appointed as Director, Pacific Area Transcontinental Corps (cycle four), ARRL National Traffic System. Hearty congrats to every one of these active amateurs. New officers of the NW Shrine ARC are: K7QLC, pres.; W7YEM, v.p.; K7BCX, secy/treas. W7AMR at the Shrine Hospital in Portland helps the children through introduction to the world via Amateur Radio. Tune in at 1000 PST/PDT on Wednesdays at 14.328 MHz and help. Many, many Oregon stations were heard calling W5LFL/Columbia on 145.55 MHz since liftoff. Signals coming down were "A" number "one." The FCC has severely curtailed amateur examination schedules at the Portland office. Be sure and check well ahead of time for an appointment. OSN net total traffic 558. Traffic: W7VSE 701, KN7B 383, KX7W 225, W7ZB 169, AL7W 126, KX7T 115, N7BGW 36, W7LNE 16, K7TDX 10, W7LT 4. (Oct.) K7TDX 15.

WASHINGTON: SM, Joe Winter, WA7RWK —

Net.	Freq.	Time(Z)	QNI	QTC
EWTN	146.84	0130/0530	181	62
NTN	3970	2000	1080	56
NWSSBN	3945	0230	727	118
PSTS	145.33	0130/0630	162	102
WARTS	3970	0200	3013	209
WSN	3590	0245/0545	469	176

The STS-9 space flight, I believe, will be recorded as a historical event in ham radio and as a great success. To be involved in trying to contact "Columbia" and hear W5LFL loud & clear was a thrill for many of us. Earlier problems caused by hams unfamiliar with the procedures and some "cockpit" problems were all but eliminated in the Puget Sound area, "THANKS" to AMSAT Coord. KA7APJ with assists from N7BNJ WA7OEU K7NH W7JWJ W7CKZ et al. KA7APJ came forward to take the "heat" exercising patience and tact helping us all by airing comments and suggestions in an orderly manner. Jim & Larry gave info. on orbit times, beam hdgs. and proper operation etc. This info. was also relayed to Ea. Wa. on the Bethel Ridge rptr. We got a "lot of mileage" out of our PR "THANKS" to the hard work of PIO W7CKZ and his fine assts. Coverage was on every major TV sta. in the section as well as on nat'l wire serv., local newspapers & radio interviews. Much was learned in this experiment. Hopefully we will do it again and make it even better. I regret that our beloved Past Pres. Vic Clark, W4KFC, who played a major part in the project, could not participate owing to becoming a SK a few days before the launch. SEC W8IIH rpts changes in ARES appts. New ECs are N7ARR in Pend Orellie Co. & N7BES in Adams Co. KD7G is DEC for Dist. 4. Congrats & welcome. WA7BET resigned as Red Cross EC Western WA owing to leaving the state. N7BGG resigned as Red Cross EC Eastern WA to take a new PIO appt. Many thanks for your help and good luck, Clark Co. ARC has new meeting place at the new Salvation Army Bldg. at 1500 N.E. 112th Ave. in the Vancouver WA area. Ten CCARC mbrs provided comms for the 2nd annual "Walk & Knock" Food Drive sponsored by the Lions Clubs. West Seattle ARC elects '84 officers: NA7O, pres.; KA7PGP, v.p.; KE7E, secy.; K7JBZ, treas. Radio Club of Tacoma: W7OS was presented with Sociability Award inscribed "For making New and Old mbrs feel so welcome at RCT meetings. Thank you, Dr. Spike, N7AZN — N7BAA and All RCT members. The N.W. Shrine ARC elected K7QLC, pres.; W7YEM, v.p.; K7BCX, secy/treas. '85 NW8ARC members handled messages for the crippled and burned children in the Portland & Spokane Shriner's Hospitals. Traffic: W7DZX 677, WB7WOW 568, K7GXZ 298, KD7ME 289, KR7I 277, KS7I 267, W7LG 221, N7ANE 160, KD7MW 145, W7HNA 115, KR7F 101, WA7BDD 100, W7GB 85, N7AFY 80, K7GTP 52, N7DDP 47, W7IEU 44, W7LUP 33, K7AJT 12, KD7G 12, K7OXL 8, W7APS 6, KA7INX 4.

PACIFIC DIVISION

EAST BAY: SM, Bob Ballio, W8RGG — ASMs: W6ZF N6DHN. SEC: W6LKE. STM: NI6A. The single largest source of input to this column is the club newsletters I receive each month. The East Bay section is fortunate to have many fine clubs with excellent monthly publications. My hat is off to the editorial staffs of these clubs for their mostly unrecognized and unrewarded efforts. Next time you're at a club meeting be sure to acknowledge the efforts of these fine folks. LARK is on the move with N6DVY, pres.; NK6N, v.p.; KA6OOJ, secy/treas.; WA6TGF, activities; W6UZM KB6BD, dirs.; N6FKK, editor; WB6ALR KD6QM AA6F, staff; WB6BJB, PR; KA6GAV, historian. Their member W6NTU is a Silent Key and will be missed. EBARC is holding elections for new club officers. Their editor is N6DRT, and they welcomed new members KB6BGB & KB6CGX. MDARC is also holding elections. Their editor is WA6GON and they currently have 30 enrolled in their Novice and General classes. NBARA is another club holding elections. They presented a special 50-year ARRL award to ex-W6OUU. HARC welcomed new

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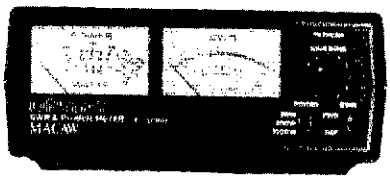

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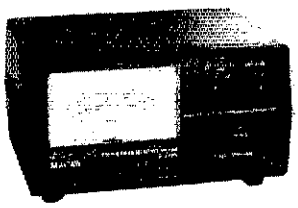

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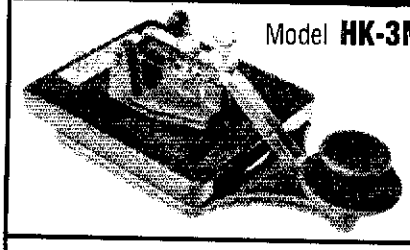

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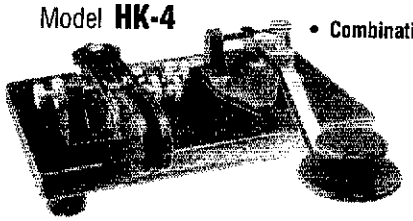

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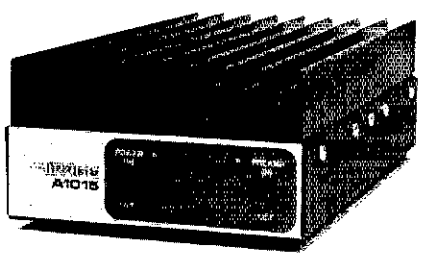

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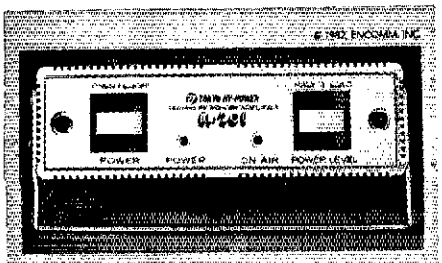

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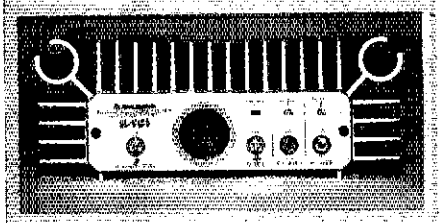

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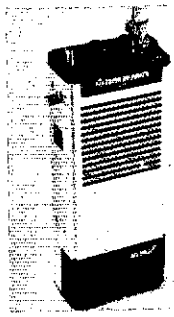

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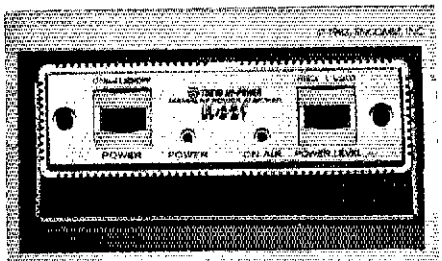

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Excellent for mobile use in snuggly fitted smaller cars, this little beauty can be stowed under the seat, out of sight and out of mind.

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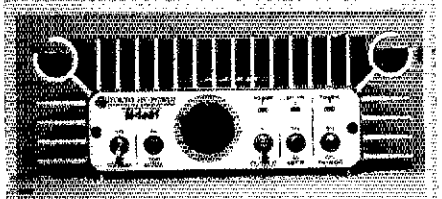
Meets or exceeds FCC specifications

TOKYO HY-POWER LABS, INC.

For catalog, send QSL card to
Department Q
2000 Avenue G, Suite 800, Plano, Texas 75074

All stated prices and specifications subject to change without notice or obligation.



HL-160V VHF AMPLIFIER — This is our big 160W 2 meter linear amplifier which can work with a radio of 10W or even 3W output. This setup is achieved with a pair of rugged VHF R.F. transistors, using highly reliable one-board construction, and with the HL-160V's built-in 12db MOS-FET preamp.

The HL-160V has convenient front panel controls and select switches, LED indicators and a very reliable RF wattmeter. This big amp works SSB, CW, FM and AM modes, and it has a true coaxial relay on the output side.

When you need the power, the HL-160V is the power you need. $349.95 Suggested Retail.

Meets or exceeds FCC specifications.

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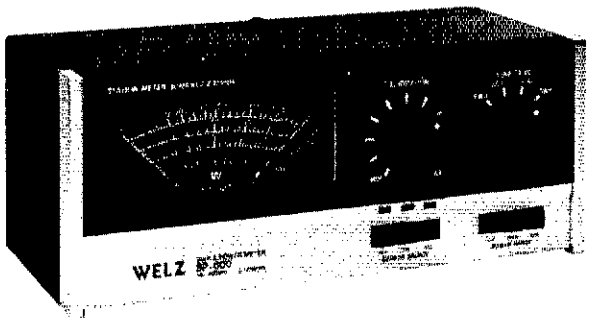
WELZ

SP-600



SP-600 Select 1 of 3 sensors by soft touch switch. Three wide bandwidth sensors cover 1.6-500MHz.
RS-1: 1.6-60MHz 0-2kW RS-2: 1.6-150MHz 0-200W RS-3: 130-500MHz 0-200W

SP-200 Two position antenna switch and indicators. Three power ranges to 1kW, 1.8-160MHz.

SP-400 Three band sensors (2m, 220, 450MHz), 10 percent accuracy, 0-150W CW, LED power range indicators.

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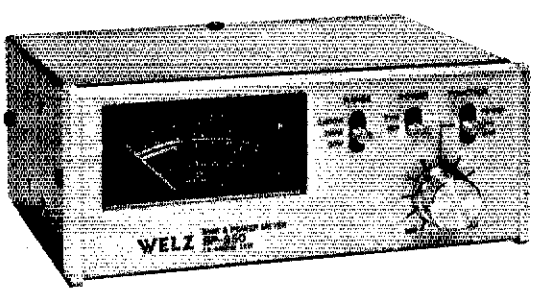
SP-250



SWR & POWER METERS

SP-250 Low-profile, economy 2kW wattmeter. 1.6-60MHz bandwidth. 3W SWR sensitivity. Three ranges. A Best Buy!

SP-15M 1.8-150MHz, 200 watt, low-profile wattmeter. VSWR, FWD PWR, REF PWR, 1.5W SWR sensitivity. Great for mobile HF.

SP-45M VHF-UHF to 100 watts. 3W sensitivity for SWR, 10 percent accuracy. All metal shielded construction.

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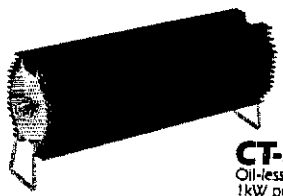
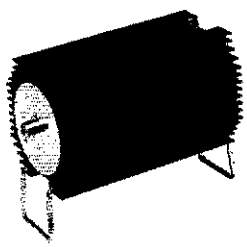
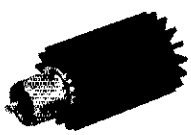
DUMMY LOADS



CT-300
Oil-less aircooled.
1kW peak for 3 min.,
300W avg. DC-250MHz

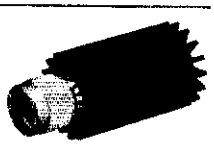
CT-150
Oil-less aircooled.
400W peak for 3 min.,
150W avg. DC-250MHz





CT-15A
50W peak, 15W avg.
SO-239 Screw-on dummy
DC-500MHz, VSWR<1:1.2

CT-15N
50W peak, 15W avg.,
Type N Dummy Load.
DC-500MHz, VSWR <1:1.1



SURGE SUPPRESSOR

CA-35A
Contains replaceable, chip-type surge voltage protector. Low loss, low VSWR. DC-500MHz, 350V breakdown.

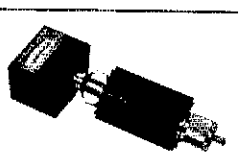
COAXIAL SWITCH

CH-20N
Two-way coaxial switch.
SO-239 type connector.
DC-900MHz, 1kW power.

TERMINATION POWER METERS

TP-05X
BNC connector.
5W talkie checker.
Field calibratable.
3W avg. Dummy Load.
1W center. 50-500MHz.

TP-25A
25 watt version of TP-05X for mobile use. Larger Dummy Load. 50-500MHz



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member WA6KUP and has established a new emergency net procedure for K6EAG/R. Traffic: NI6A 365, W6VOM 210, K6AGD 131, WB6DOB 57, K6APW 49, WB6UZX 28.

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: WB5VDV/7. STM: W7BS. RACES Emergency Coordinators ARRL: K7ZOK. USN MARS: WA7UEK. USA MARS: W7KFI. USAF MARS: W7BES. RACES NM: KC7JF. KA7EUA is looking for more weather reports on 3992 at 0600 local time. "Walter" WADAG computer is out of the hospital, thanks to KC7EE. N7RH and W7PBV appointed asst. directors by W6ZM. W7CX reports he was City Manager of San Francisco 1924/25 (SCM/SMs were known was City Managers in those good old days.) He has been an ARRL member 64 years and lost a 65-ft antenna pole in the last storm. KX7Q holds the ACC appointment for Reno area. N7EAG reports NNARA has 37 members, supports 146.13/73 and 146.31/91 repeaters near Winnemucca, Novice Class started as a result of many sign ups at their Radio Amateur Display at the Tri County Fair. Enclose a SASE with your QSL card to W5LFL, c/o ARRL Hq if you worked or heard W5LFL. Traffic: W7BS 50, W7BKQ 21, W7CX 7, W7PBV 5, WB6MXA/7 2.

PACIFIC: SM, Army Curtis, AH6P — STM: KH6HIJ. SEC: KH6B. ECs: Hawaii — AH6K; Kauai — KH6S; Maui — KH6H; Oahu — KH6NP; Guam — KG6JKV; Samoa — KH8AB. Aloha and hafa adai to all of the Pacific. Good response was noted to the earthquake on the Big Island of 11/16. Many stations came up on 7290 to offer help. FB! Maui ARC new officers are KH6HA, pres.; KH6MD, v.p.; KH6UU, secy.; KH6TS, treas.; WH6C, dir. Kauai ARC new officers are KH6S, pres.; KH6HU, v.p.; WH6ASY, secy.; KH6E, treas.; KH6JJC, activities. Congrats to all. AH6P KH6AT KH6HME and AH6J did a multi-single effort for the 160-Meter Contest with a 265-foot high vertical hung from a weather balloon. No new records, but sure was fun! Traffic: KH6B 250, KH6HIJ 101, KH6S 47, KH6RQ 32, W6ORS 2.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — SEC: WA6ZUD. STM: KY6O. SGL: WB6WFG. It's old news, but I can't let the first of December 1983 go by without commenting on what a wonderful Amateur Radio event the W5LFL Space Shuttle mission has been. I hope you enjoyed it too. New ECs: El Dorado Co. KA6GHI; Yuba/Sutter Co. KE6LW. Club newsletter editors, are you receiving the monthly news page from me? If not, write for details and sample. North Hills ARC looking for greater participation in emergency comm. unit. Your club interested? Contact NM6T for info. Do you have news you're not sharing? Please pass it on (CLUB NEWSLETTERS INCLUDED) so we can let others know. Traffic: N6CVF 51, WB6SRQ 15, N6AUB 11, WA6ZUD 5.

SAN FRANCISCO: SM, Bob Smith, NA6T — Mendocino Co. has a new club — Ukiah ARC with the first meeting in Jan; see WA6WTT for info. The section was full of Xmas parties with all clubs active. Don't forget that FCC exams in SF are by APPT. ONLY in 1984 with reservations made days in ADVANCE ONLY!! MARC participated in the Disaster Awareness Exposition at the Civic Center with an operating Amateur Radio station at the Civic Center. SET in Humboldt Co. was a huge success with good comments from all the affected government offices — tnx to KE6LF and his group of volunteers. The new Red Cross AR station in SF is taking shape. Things needed to date are: volunteers, money, equipment. See KE6CD qtr N6DAM if you have spares of the above. W6DTV, the EC for Sonoma Co., has been attending the NVOAD conferences within the Pacific Division representing the ARRL. He has been able to show other volunteer organizations how Amateur Radio can help in disasters and civil emergencies. VOMARC needs Sonoma area amateurs to help with the information of the City Disaster Plan; see W6TWQ for information.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. WA6AXB and KB6CEI are Silent Keys. New officers of the Kings ARC are K6RGZ, pres.; N6HYU, v.p.; N6DTZ, secy.; WB6ZXB, treas. The club meets the 3rd Thursday in Armona. The Fresno Chapter of 10-X meets Tuesdays at 2000 hours on 28.845 MHz. The chapter head is WD6AIY and the certificate manager is K6PKO. New officers of the Stockton ARC are N6OZ, pres.; WB6OIV, v.p.; WA6KXM, s/t; WB6FVG, Sgt-at-Arms. Then club meets the 2nd Wed. at UOP. Congrats to the recent upgrades: Extra KA6QVM KA6OMB KA6IPL KF6UL NV6S; Advanced N6EHA; General N6BMM N6DTZ; Tech KB6ANA KA6ZBQ KB6CCJ KB6CCK KB6CFS N6JPP. NF6K is KO3Z. KA6ZBQ is N6JQW. KA6YSF is N6JQT. WB6VIN has a FT901DM. W6TUI has a FR102. WB6ITM has a computer. The Fresno Hamfest is May 19-20 at the Tropicana Inn, Fresno. Plan to attend this ARRL Affiliated Hamfest. Traffic: N6AWH 74, WA6YAB 30, W6DPD 16, WD6FRS 10, W6SX 7. (Oct.) W6SX 7.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZU — SEC: KA6R. STM: W6PHT. PIO: WB6PU. ACC: W6MKM. STS-9 and W5LFL really had the amateurs in the section working to make contact with the shuttle Columbia. K6ITL KQ6E and all the members of the San Mateo RC really deserve to be recognized for their efforts in not only trying to make contact with W5LFL but also for the great publicity that was received by all of Amateur Radio. TV stations and newspapers were on hand on Dec. 1st when the San Mateo club staged an Amateur Radio demonstration in connection with the STS-9 mission. Seven 2-meter transmitters were used to attempt to contact the shuttle using the turnstile antennas featured in the Aug. 83 issue of QST. An HF station, computer generated orbit data and VCRs showing the video tape about the mission also gave the non-hams a chance to see what a small part of ham radio is about. KQ6E has been reelected for another year as the San Mateo club pres. N6TX also received TV and newspaper coverage of his attempts to contact the shuttle. N6TX is an electronics instructor at S.J. City College and the effort was part of a class project. The class includes K6JHI KE6IC & KG6JKS. The STS-9 mission has stirred a lot more interest in satellite communications. Every Wednesday evening at 8 P.M. local time, there is a group of hams that gather on the 147.33 MHz repeater for an informal discussion of amateur satellites including OSCAR 10 and the Russian satellites. Join the group discussion or just listen and learn. Everyone is welcome including those who want to know more about this method of communication. Las Cumbres ARC 1984 officers are: WA6RAG, pres.; WB6EVQ, v.p.; KB6TO, secy.; WA6IAK, treas. Members of the Las Cumbres group, many of whom are Hewlett-Packard employees, have set up a very well organized emerg. comm. system among all the H-P Santa Clara Co. facilities. Santa Cruz Co. ARC 1984 officers are: W6PIH, pres.; WA6OCV, v.p.; W6PHT, secy.; N6ARV, treas. Section Mgr. club visits in Nov: NPEC, SCCARA, Las Cumbres, West Valley, San Mateo and Santa Cruz Co. ARC. W6KXK Rptr User Group had its annual Xmas Champagne Cork Pop, complete with a visit by Kris Kringle whose call is WA6BXN. West Valley had a day of

free golf and a dinner party for its Xmas get together. Traffic: W6YBV 288, W6PRI 226, W6KZJ 175, KA6CVM 145, W6PHT 126, W6RFF 28, W6OII 13, KH6PP 2, WB6UGG 1. (Oct.) W6YBV 309, W6PRI 194, W6KZJ 101, KA6CVM 54, W6RFF 22, WA6HAD 7.

ROANOKE DIVISION

NORTH CAROLINA: SM, Ian C. Black — STM: W4EAT. SEC: KU4W.

Net	Time	Freq.	QNI	Tfc
CMN	7:45 P.M.	3.927	490	159
CEN	6:30 P.M.	3.902	460	211
JFKN	6:30 P.M.	3.923	763	106
THEN	7:30 P.M.	3.923	539	47
CSN	6:00 P.M.	3.715	214	59
CN	7 & 10 P.M.	3.574	593	249

VHF Nets (QNI, tfc, liaison.) CNCTN 974, 83, 20; PCTN 457, 63, 17; PETN 297, 44, 15. To explain the above figures and better understand what they mean to us as individual tfc hndlrs and to the section as a whole, the following is offered. NC has 4 reporting major phone nets: the Carolina Morning Net; the Carolina Evening Net; the John Fitzgerald Kennedy Net; and the Tar Heel Emergency Net. The first two are National Traffic System nets, and JFK and THEN are independent. There is no, or shouldn't be, competition between these nets. Each performs a function based on time of net, format, and interests of its members. That function is service to the community. The figures above reflect how this service is performed. The large number of QNI to the independent nets indicates the popularity of this type of format. But it also shows there is a large group of hams willing to be there "just in case." A smaller but equally important group checks in to the NTS nets. The VHF liaison stns are making it possible for this smaller group to handle more tfc with greater efficiency. Both types of net are important. Both serve the section. May they continue to do so. Traffic: WD4LRG 375, WD4CNR 303, WD4CNQ 269, WA4OBR 259, K4NLK 242, NJ4L 180, KU4W 121, WB4WII 116, WA4SRD 94, W4GRO 87, WB4HRR 73, WB4N 69, K4JHF 59, KA4WXK 57, KA4KJI 51, W4EAT 50, K4IWW 49, NT4K 42, WA4MNR 40, WA4YTQ 39, WD4HTE 34, WD4IHH 31, W4TWD 26, K4GI 22, WB4CYN 21, KB4CUI 16, N4UE 12, KA4ATK 9, KC4AM 6.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — The Blue Ridge ARS has been designated a Special Service Club (SSC). As such, the officers and members of BRARS have made a commitment to plan and implement programs to support and enhance Amateur Radio. BRARS has the honor of being the FIRST SSC in the section and the FIRST SSC in the Roanoke Division. To accomplish SSC status, it took cooperation and teamwork from all members of the club. CONGRATS to all. The following were officials of the club during 1983; Officers ND4N WD4KTG K4FYS N4ENX; Directors K4SUG KA4END WB4TBF N4EUL. There are a number of other clubs in the section that could qualify for SSC. Each club has received an application from ARRL. Take the time to get the info together and send it to me. We could have position number 2 in the Roanoke Division. Traffic: K4WJR 325, K4ZN 296, W4FMZ 162, W4NTO 103, W0IKT 79, W4ANK 53, WB4UDK 44, K4FRX 40, KA4AUR 35, KA4LRM 35, K4ZB 31, W4DRF 4.

VIRGINIA: SM, Phil Sager, WB4FDT — Amateur Radio has suffered a grevious loss with the death of Vic Clark, W4KFC. The world knows Vic Clark as an ARRL President and Vice-President, as a Region IARU President, an Amateur Radio representative at the World Administrative Radio Conference in 1979, and as a world class contest operator. Virginia amateurs knew him better. He moved to Virginia in 1946 and helped organize the Virginia CW Net (VN) and served as one of its first net controls. He was one of the charter members of the Potomac Valley Radio Club. While working for the Coast Guard, he helped found K4CG. He also served a term as SCM and was editor of The Virginia "Station Activities" in the mid-1950s. He was such a modest person, often giving credit to another for his ideas, that many of his accomplishments will never be known. Virginia amateurs will remember Vic for his kindness, for he never had a cross word to say about anyone. If one called him on the phone, or saw him at his home, or at a hamfest, Vic acted as if there was nothing more important to him at that moment than your ideas and your conversation. Furthermore, he had all the time in the world at your disposal. Vic's passing leaves a void that no one can truly replace. 73 Vic. In other Virginia news congrats to AA4AT and W3ATQ in their second BPLs in as many months. PSHR to K4JST N4GHI WA4CCK WD4CCK WD4ALY KR4V K4VWK K4KDJ AA4AT WB2OMZ WD4OCW KA3DTE KB4OG. STARES reports 30 sessions with QTC of 76, while SVEN reports 30 sessions with a QTC of 36. WB4FDT visited the Richmond ARC. WD4ALY reports 5547 message points handled this month with 57 different traffic reports received. N4YE reports new baby girl doing fine. Remember to cast your vote for your next Section Manager. Traffic: AA4AT 615, W3ATQ 602, WA4CCK 436, WD4FTK 291, N4GHI 284, KR4V 246, K4AET 242, K4KDJ 232, K4JST 219, WD4OCW 216, WD4ALY 205, WA4LJI 180, W4JLS 161, K4JM 157, WB4PNY 151, W3BBN 149, KA4IUM 123, KB4OG 107, KB4WT 79, WB4KIT 66, W4UQ 64, NN4I 59, K4VWK 54, NT4S 51, KA3DTE 50, KA4ZTB 50, WB2OMZ 41, WB4EDB 34, KB4PW 31, KC4HN 27, KA4JXZ 25, WB4FDT 20, W4LXB 19, WB4RDV 19, WB4ZNB 19, W3BBQ 18, WB4ODZ 17, N4TE 17, WA1VRL 17, N4FNT 16, K4MLC 16, K3RZR 15, W4NFA 14, KB4CYC 9, W4PVA 8, WB4UHC 8, WB4MAE 5, WA4TVS 5, KI4W 5, N4YE 4, N4NK 3, N4LE 2, N3RC 2, WA4EQW 1, W4TZC 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. SGL: K8BS. TC: K8CG. Rpt. Coord.: WA4KHL. LPM '84 for the Roanoke Div. will be held in Chas. May 12 & 13; more info later. Chas. area hams assisted Red Cross with their annual blood drive in Dec. WA3NUI has been appointed EC of Lincoln Co. KA8SWA now has his Gen. Congrats.

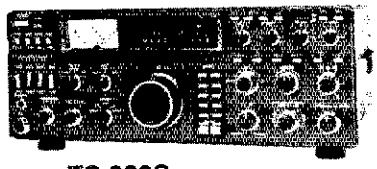
Net	Freq.	Time	QNI	QTC	Sess.
Hillbilly	14290	1600Z Sn	120	34	4
WVN	3567	7:00	182	62	29
WVFN	3900	6:00	748	110	30
WVMD	7235	11:45	616	65	30
WVNN	3730	6:15	105	17	29
KARC 2M	28/88	8:30 Sn	68	0	4

Traffic: KZ8Q 200, N8EMQ 97, K8TPF 88, WA3NUI 84, W8LYV 80, N8AJC 52, K8KT 36, WA8KCJ 35, W8FZP 30, KD8G 27, K8QEW 22, W8HZA 14, KQ8R 3.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J — SEC: WB0FQB. STM: WD0AIT. OO/RFI: NC0F. ACC: WB0DUV. PIO: WD0HNQ. SGL: KE0M. TC: KO0P. BM: W0MDT. At the Jackson Hole Div. Conv. last year, I really got to know Carl Smith, W0BWJ then the 1st Vice Pres. of ARRL. He has now assumed the duties of President of the League owing to the untimely and unfortunate passing of Vic Clark,

TRIO-KENWOOD SALE!



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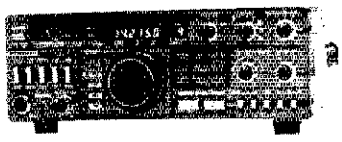

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- IF Shift—Notch Filter
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- Full Selection of Options Available

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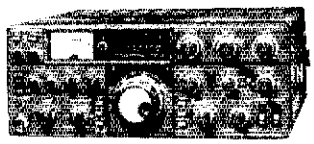

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- All Solid State Except Driver and Final Amplifier
- Wide Dynamic Range
- Variable Bandwidth Tuning (TS-830)
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- RF Speech Processor
- Adjustable Noise Blanker
- Full Selection of Optional Crystal Filters
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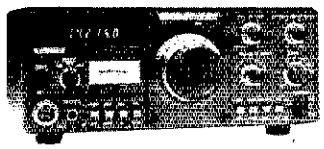

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- All Solid State
- 100W Output
- IF Shift
- Speech Processor
- Noise Blanker
- Narrow SSB/CW Filter Option

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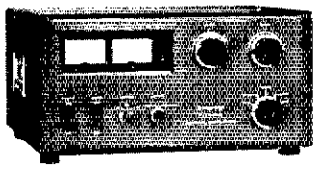

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- 160-15 Meters
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- Pair of Rugged 3-500Z Tubes Included
- Compatible with all Kenwood Transceivers and Many Others
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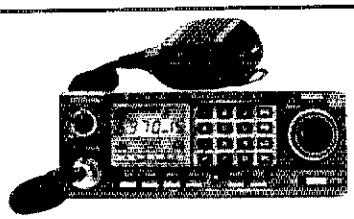

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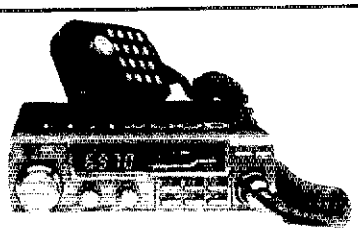
- Lithium Back-up
- 45 Watts (TR-7950) 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

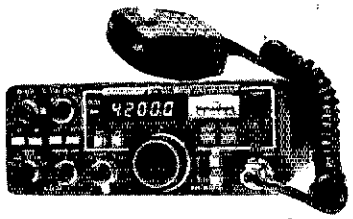
TR-7950 List $399.95 TR-7930 List $359.95
CALL FOR SPECIAL SALE PRICES!



TM-201A/TM-401A 2m/70cm FM Transceiver

- 25W Output (TM-201A) 12W Output (TM-401A)
- Ultra Compact
- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

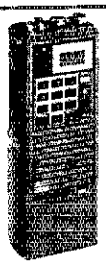
TM-201A List $369.95 TM-401A List $399.95
CALL FOR SPECIAL SALE PRICES!



TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
- Memory and Band Scan
- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List $529.95
CALL FOR SPECIAL SALE PRICES



TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES

TR-2500 Options:
ST-2 Base Charger **$89.95**
MS-1 Mobile Charger **$42.95**
VB-2530 25W Amplifier **$99.95**
BT-1 Battery Case **$11.95**
SMC-25 Speaker Mic **$34.95**
LH-2 Deluxe Leather Case **$37.95**
RA-3 Telescoping Antenna **$14.95**
BH-2A Belt Hook **$4.95**
PB-25H Heavy-Duty Battery Pack **$39.95**
DC-25 13.8VDC Power Adapter **$19.95**

All TR-2500 Accessories in Stock for Immediate Shipment!
TR-3500 Also in Stock at Sale Prices—Call!

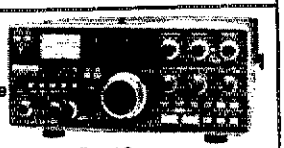
List $599.95

TW-4000A Dual Bander
2m and 70cm FM in One Compact Package!

- Big LCD Readout
- 25W Output—Both Bands
- 10 Memories w/Scan and Back-up
- Dual VFO
- GaAs FET Front End
- 16 Key Up/Down Mic

VS-1 Voice Synthesizer and Other Accessories in Stock—CALL FOR SPECIAL PRICES!

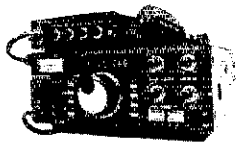
R-2000 Receiver
R-600—R-100S—R-2000 Receivers in Stock!
CALL FOR SPECIAL SALE PRICES—SAVE $$



TS-780 2m/70cm Dual Band—All Mode Transceiver

- Dual VFO
- 10W Output
- VOX
- Noise Blanker
- Band Scan
- 10 Memories
- Memory Scan
- AC Power Supply

TS-780 List $999.95
CALL FOR SPECIAL SALE PRICES!



TS-660 Quad Bander—All-Mode Transceiver
6m, 10m, 12m and 15m

- Dual VFO
- IF Shift
- 10W Output
- 5 Memories
- Noise Blanker
- VOX, Narrow Filters, AC Supply and Other Accessories Available

TS-660 List $699.95
CALL FOR SPECIAL SALE PRICES!

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special KENWOOD Sale Prices and Save $$$!!

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COMMUNICATIONS EQUIPMENT SALE!

ICOM

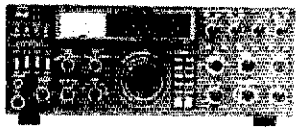
ICOM IC-751A . LIST PRICE $1399
CALL FOR SPECIAL SALE PRICE!

ICOM IC-745 LIST PRICE $999
CALL FOR SPECIAL SALE PRICE!

IC-02AT
NEW 2 METER
TOP OF THE LINE HT
- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

KENWOOD

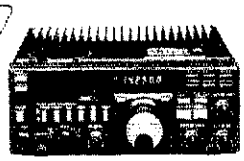


TS-930S LIST PRICE $1799
CALL FOR SPECIAL SALE PRICE!

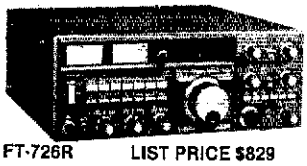
TS-430S LIST PRICE $899.95
CALL FOR SPECIAL SALE PRICE!

TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!
- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-in Sub-tone Encoder
- Built-in 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES



FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!



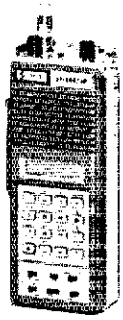
FT-726R LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List $319
FT-708R 440 MHz HT
List $319
- **LCD Display**
- **10 Memories**

CALL FOR SPECIAL PRICES!

SANTEC

NEW ST142μP 2M HT



- 3.5W/1W/0.1W.
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

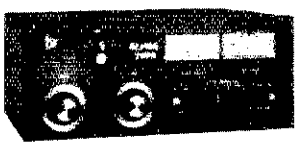
List $339.95
SALE $299!

ST144μP $259.95
ST222μP . . . . . CALL!
ST442μP . . . . . CALL!

SANTEC Accessories
SM3 Speaker Mic $34.95
ST-LC Leather Case $34.95
ST-500 NiCad Battery . . $29.95
ST-4QC Base Charger . . $69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ETO ALPHA SALE!

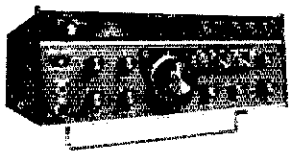


76PA $1699!

Model	List	Sale*
76A	$1985	CALL
76PA	$2395	CALL
76CA	$2695	CALL
374A	$2595	CALL
78	$3495	CALL

***Sale Prices Too Low To Print— CALL & SAVE $$!**

TEN-TEC SALE!



CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock for Fast Shipment!

TEN-TEC
New 2M HT
Full Featured!
List $319
Sale $279.95!

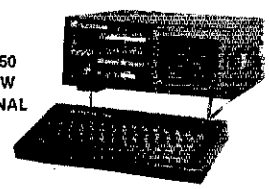
4229 2KW Tuner Kit $189.95!

HAL SALE!

NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

CWR6850 RTTY/CW TERMINAL



List $999 SALE $749.95!

Other HAL Products On Sale

CWR6700	$439.95	DS3100ASR	$1699.95
CWR6750	$629.95	MPT3100	$2199.95
CT2100/KB2100	$749.95	RS2100	$289.95
CT2200/KB2100	$949.95	ST5000	$219.95
DSK3100	$1049.95	ST6000	$649.95
ARQ1000	$649.95	KG-12	$169.95

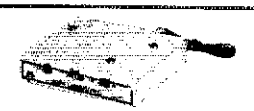
TOKYO HY-POWER LABS

HL-30V Reg. $69.95
SALE $59.95

HL-82V . $139.95	HL-90U . $329.95
HL-160V $289.95	HC-200 . . $89.95
HL-20U . . $99.95	HC-2000 $289.95

KDK FM2033

List $339 Sale $299



JANEL QSA5 PREAMP $39!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

MIRAGE AMPLIFIER SALE!

B1016
$249

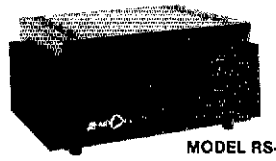
Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
A1015	6M	Yes	10W	150W	20A	$249
B23	2M	No	2W	30W	5A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	6A	$179
D1010N	440	No	10W	100W	20A	$269

RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty · High Quality · Rugged · Reliable
- Input Voltage 105-125 VAC Output, 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



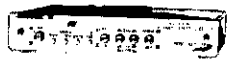
MODEL RS-50A

CP-1 COMPUTER PATCH

List $239.95 SALE $189.95!

CP1-20	$219	CP1-64	$219
MP-20	$219	MP-64	$219
VIC-20 MBAText	$79	C-64 MBAText	$79

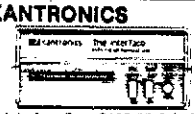
All AEA Keyers, Antennas & Accessories In Stock!



MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941C 300 W Tuner	$89.95
989 Deluxe 2KW	$299.95

KANTRONICS



The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

Apple Amtor Soft/Hamtext	$139	VIC-20 Hamsoft	49
VIC-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS-80C Hamsoft	59

METRON MA1000B AMPLIFIER

Solid State 1KW Amplifier
- No Tuning
- 13.8 VDC Operation
- Remote Bandswitching
- Compact
- Heavy-Duty Construction

List Price $895 SALE PRICE $795.95!

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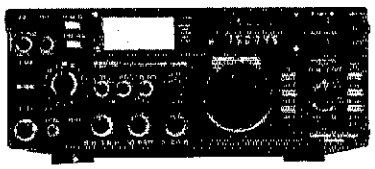
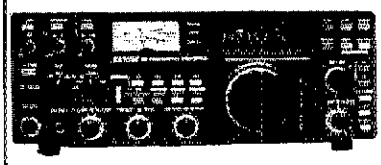
ICOM SALE! SALE! SALE!



IC-745
NEW GENERAL COVERAGE-ALL MODE
COMPACT HF TRANSCEIVER

- All Solid State
- SSB/CW/AM/RTTY
- FM Option
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $999—CALL FOR SPECIAL SALE PRICE!



IC-751-ICOMS' BEST!
NEW-HIGH PERFORMANCE-
SSB/CW/AM/RTTY/FM TRANSCEIVER-
GENERAL COVERAGE RECEIVER

- All Solid State
- High Dynamic Range
- Full QSK Operation
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation or Optional Internal AC Supply
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $1399—CALL FOR SPECIAL SALE PRICE!

IC-2KL 500 WATT LINEAR AMPLIFIER

- 160-15mtr Coverage
- SSB/CW/RTTY Duty Cycle
- Auto Bandswitching
- IC-2KLPS Power Supply strapable 120V/240VAC Operation
- Broadband Tuning
- 500 Watts Output
- Full Final Protection

LIST PRICE $1795—CALL FOR SPECIAL SALE PRICE!

IC-730 COMPACT 80-10mtr SSB/CW/AM TRANSCEIVER

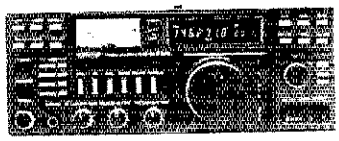
- All Solid State
- 100 Watt Output
- 12VDC Operation
- 80 - 10 Meters
- Dual VFO
- CW Filter Option

LIST PRICE $829—CALL FOR SPECIAL SALE PRICE!

R-70 HF GENERAL COVERAGE RECEIVER

- .1 - 30MHz Coverage
- Passband Tuning
- Notch Filter
- CW Filter
- SSB/CW/AM/RTTY
- FM Option
- Built-in 120VAC Supply or 12VDC Option

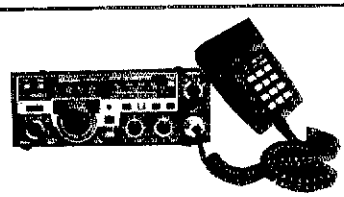
LIST PRICE $749—CALL FOR SPECIAL SALE PRICE!



IC-271A 2 Meter All Mode Base Transceiver
IC-471A 430-450MHz All Mode Base Transceiver

- SSB/CW/FM
- Dual VFO Tuning
- 32 Memories
- 25W Output - 2mtrs
- 10W Output - 430-450MHz
- Low Noise PLL Design
- Programmable Sub-audible Tones
- 12VDC or Optional 120VAC Operation

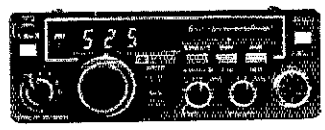
IC-271A List $699 IC-471A List $799
PLEASE CALL FOR YOUR SPECIAL PRICE!



IC-290H 2 Meter 25 Watt All Mode Mobile Transceiver
IC-490A 430-440MHz 10 Watt All Mode Mobile Transceiver
IC-560 6-meter 10 Watt All Mode Mobile Transceiver

- SSB/CW/FM
- Noise Blanker
- 12VDC Operation
- Dual VFO Tuning
- Memories

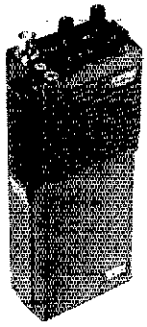
IC290H List $549 IC490A List $649 IC560 List $489
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



IC-25A/H 25/45W 2mtr FM MOBILE TRANSCEIVER
IC-45A 10W 440-450 MHz FM MOBILE TRANSCEIVER

- Green LED Readout
- 12VDC Operation
- Dual VFO Tuning
- 5 Memories

IC-25A List $359 IC-25H List $389 IC-45A List $399
PRICES SHOWN AS LIST—CALL FOR YOUR SPECIAL PRICE!



WORLD'S MOST POPULAR HT's
PLEASE CALL FOR SALE PRICES!

IC-2AT 2METER H.T. List $269.50
IC-3AT 220MHz H.T. List $299.95
IC-4AT 440MHz H.T. List $299.95
PRICES SHOWN AS LIST—
CALL FOR YOUR SPECIAL PRICE!

- 1.5W Output - All Models
- Complete w/Nicad & Charger

All Accessories in Stock!

BP2 Battery Pack	$39.50
BP3 Battery Pack	$29.50
BP4 Battery Case	$12.50
BP5 Battery Pack	$49.50
BC30 Base Charger	$69.00
CP1 Lighter Cord	$9.50
DC1 DC Cord	$17.50
HM9 Speaker/Mic	$34.50
LC10 Leather Case	$34.95

IC-02AT
NEW 2 METER TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

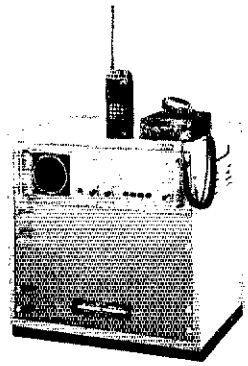
All These Features and Much, Much More!

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

PLEASE CALL FOR INFORMATION AND PRICES ON NEW ACCESSORIES FOR IC-02AT.

IC-RP3010
440 MHz REPEATER

- 10 Watts Output
- Microprocessor Controlled CTSS/DTMF/ID'ER
- Built-in 120VAC or 12VDC Operation
- Crystal Controlled



LIST PRICE $999
CALL FOR YOUR SPECIAL PRICE!
MOUNTING CABINET AVAILABLE—ONLY $249

IC-120
NEW 1200 MHz FM Mobile Transceiver

- 1 Watt Output
- Green LED Readout
- Programmable Offset
- 1260-1300 MHz Coverage
- 6 Memories
- Scanning

List Price $499—Please Call For Price and Delivery Information on the IC-120 and RP-1210 Repeater.

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YAESU SALE!

FT-ONE

GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

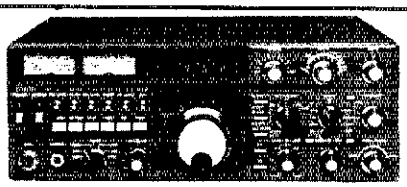
Buy Now and Receive These Accessories Free:
300Hz CW Filter..$FREE 600Hz CW Filter..$FREE
500Hz CW Filter..$FREE 6Khz AM Filter...$FREE
Memory Backup..$FREE Installation.....$FREE

List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!

FT-980

CAT SYSTEM—Computer Aided Transceiver
- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-In CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!



FT-102

160-10MTR WITH WARC BANDS TRANSCEIVER

- Digital Readout
- Built-in AC Supply
- Variable Bandwidth
- IF Shift
- CW/SSB/AM/FM Modes
- RF Speech Processor
- Noise Blanker
- Much, much more—

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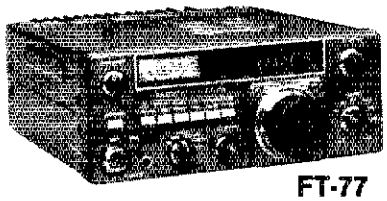

FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
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- Optional AC Supply, CW Filter, FM Unit External VFO, Antenna Tuner Available

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FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$

FT-726R VHF/UHF All Mode Tri-Band Transceiver
- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

Please Call For Price & Delivery Information

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FT-690R 50Mhz.....$379
FT-290R 144Mhz.....$399
FT-790R 430Mhz.....$399

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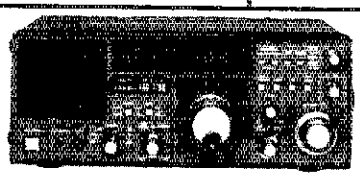

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All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

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FT-208R 2mtr HT.....$319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT....$319
RF Out: 200mw/1.0W
- LCD Display
- 10 Memories
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- Complete w/Nicad Battery, Charger and Rubber Duck Ant

Accessories Available:
LCC-8 Leather Case.....$35
YM24A Spkr/Mic.....$39
FNB-2 Nicad.....$29
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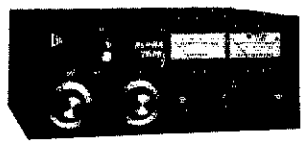
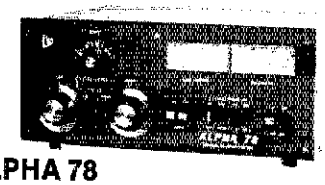
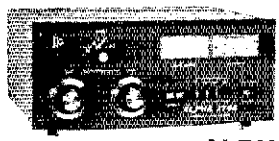
ETO ALPHA



76PA $1699



ALPHA 78

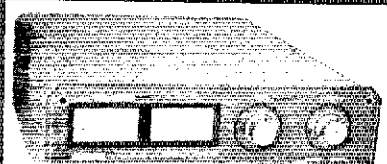


ALPHA 374A

SPECIAL SALE PRICES

Model	List	Sale
77DX	$5450	*
78	$3495	*
374A	$2595	*
76A	$1985	*
76PA	$2395	*
76CA	$2695	*

***Sale Prices Too Low To Print!!**
Call For Your Special Prices!!



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SALE $289.00
- Heavy Duty 2 KW Construction
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W4KFC. Vic is a Silent Key who will be long remembered and WØBWJ is a very capable, informed amateur & a fine gentleman who will make us all proud in Colorado with his leadership. Carl, we wish you the very best in your new job. STS-9 is now history. W5LFL/Columbia brought an excitement to Amateur Radio so great it is still a talked about event. Not everyone that tried worked him, but most at least heard him and Colorado was well represented in the number of amateurs dedicated to the attempt. Congrats to WDØHUH ORA, WDØGQL RMRL, KAØMQA ARA, KØRZ and many others too numerous to mention who helped pass information on orbits, times & beam headings. March 18th will start the hamfest season in Colo. with the ARA's 3rd annual event at the Nat'l Guard Armory in Aurora. Then on May 25-27 the first Div. Hamvention in the Denver Metro area in 10 years will be at the Holidome. This will be a joint club effort of the section. Plan to attend. 73, KQØJ. CWN QNI 207, QTC 171, time 724, 28 sess. CWXN QNI 2574, QTC 2658, time 2700, 30 sess. HNN QNI 2112, QTC 92, inf 469, time 1732, 30 sess. Traffic: NØBQP 2585, WAØHJZ 1295, WØFPT 685, KØJAN 518, WØACH 450, NØCXI 253, KAØDMR 186, KBØZ 160, WDØAUN 153, WDØAIT 114, WBØNHA 100, WØNFW 67, W5HRS 30, WØLQ 24.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: KB5XD. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 264 msgs with 288 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC and handled 68 msgs with 1220 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 97 msgs with 1238 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 12 msgs with 410 checkins. Caravan Club 2-Mtr Net 66/06 handled 18 msgs with 145 checkins. W5LFL was heard loud and clear in New Mexico and hundreds called him. Hope some of us made it. Lots of good publicity for ham radio. All vy sad at the passing of W4KFC. Our best to WØBWJ. Traffic: W5DAD 552, W5UH 381, ND5T 330, N5SJ 138, W5ENI 49.

UTAH: SM, Ron Todd, K3FR — STM: W7OCX. SEC: NA7G. BM: WA7MEL. OO/RFI: KD7FL. ACC: KB7XO. PIO: N7BHC. TC: K7RJ. I enjoyed meeting with Bridgerland ARC this month. University of Utah ARC looking for new members; contact NA7E. Some ECs need to send monthly reports to NA7G. STS-9 covered well by all SLC media. Sorry to report Silent Keys WB7UGR and the father of K7RJ. Start thinking now about your vacation. WIMU will be Aug. 3-5. New officers for UARC are NC7J N7EFP KD7ML N7EVW KD7FN KA7MKQ KC4WJ K7HFV and WA7QKF. Good luck all. Traffic: K7HLR 211, WA7WIB 157, N7FAM 140, WA7MEL 94, W7OCX 35, K7UM 33, K7CKF 28, K3FR 2.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: WØOGH. BM: KD7AN. OO/RFI & TC: KC7QY. PIO & ACC: KC7QJ. OO/RFI & TC positions are open. The responsibilities of the Frequency Coordinator for VHF and UFH Repeaters are being handled by your SM until a volunteer can be found and I hope to get the clubs and repeater owner/operators together this summer at the Wyoming Hamfest to revive the Wyoming Council Of Amateur Radio Clubs and to put the repeater coordination back under that organization. Congrats to Sweetwater ARC on the fine newsletter they publish with WB7AMP as editor. Wyo Cowboy Net held 22 sess. with 969 QNI & 39 QTC. Wyo Jackalope Net held 25 sess. with 720 QNI & 4 QTC. Traffic: WB7NHR 419, WØOGH 42, KC7KC 19, K7SLM 9.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, Jr., WA4RNP — SEC: N4DMA. STM: N4JAW. SGL: KA4WVU. PIO: WO4W. BM: KF4VV. I hope all of you have kept your New Year's resolutions and have finally learned to operate those new Xmas rigs by now. We now have a Bulletin Mgr for the section; he is "MARTY" Martin, KF4VV, and is in need of Official Bulletin Stations (OBS) to cover the section's local nets and large population area repeaters. Drop me a line and I will send you an application form. Tnx to all the weather spotters and net controls who handled the recent tornado and flood problems so professionally and expediciously. Recent upgrades include KB4EXO and N4CWL, both making EXTRA. Congrats. I am looking for a section-level leadership official to supervise the Official Observer/RFI program. It is the job of this individual to recruit, supervise, and direct the efforts of the OOs in the section and report their activity to both me and ARRL Hq., and to work with RFI problems in the section. If you qualify for this position my address is on page 8. ARRL Info Net meets Fri after "M" net on 3965. CAND rep 100% by W4CKS and N4FQD. PSHR: N4FQD W4CKS WA4JDH WA4LXP WA4RNP. BPL: WD4JDH. Traffic: WA4JDH 887, W4CKS 181, N4FQD 168, WB4IXA 103, NW4X 62, WA4LXP 45, KC4GS 16, WA4RNP 16, WB4TVY 7.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. OO/RFI: K4VHC. PIO: WA4PNY. SGL: W4BTZ. TC: K4UDR. I don't know how many of u FB ARRL members read this monthly column that I write but would like to know if it's to ur satisfaction. Please send me a QSL card or letter as to what u wud like to have in it. Remember u are the ones who elected me to the SM position; therefore it's ur column. Agn many tnx to K4VHC for the excellent performance for the kiddies from the North Pole. It takes a fine personality & a lot of wit to undertake being Santa. Tnx to the gals of MALARC fer making me an honorary member of their organization. WB4ABY, the section's vy capable SEC, still needs DECs & ECs for this FB section, so if you are interested let him know. If ur a computer bug please let us know who you are. There are many in the section with recently acquired computers who are looking for information. If u have any circuits that are usable or other info write me & we'll see if some sort of net can be arranged. Many of u like CW, so why not check into GSN at 1900 or 2200 daily. You'll meet some of ur old friends. Don't know how many worked W5LFL on STS-9, but if u did jot it down on the QSL I hope that u are going to send me. Many of the clubs that I receive bulletins from I'm sure can qualify to be Special Services Clubs. You should have gotten info from the League in the regular mailings. If you are interested, please contact either ACC WA4ABY or me. So far the Georgia winter has been very mild, not knowing what Feb will bring. I'm sure that if we do have any WX emergencies you'll help as u always have in the past. Hamfest season will be soon around the corner. If u desire my presence, do contact me so that we can get the info into the sked book. Traffic: WB4NTW 125, W4PIM 125, N9ECB 69, K4VHC 65, K4BAI 20, KA4ATM 19, W4BIA 17, W4HON 9.

NORTHERN FLORIDA: SM, Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. PIO: WA4PUP. BM: W4GUJ. SGL: KC4N. ACC: N4ADI. The big story this time is the STS-9 mission with W5LFL aboard. Very clear short duration reception noted throughout the section. Orbits 96, 97 and 112 most widely reported. It is estimated that over 2,000 hams in NFL were calling W5LFL at one time or another. Circuit discipline was generally excellent with very few disruptions. TV and press coverage was excellent as well. In Jax all 3 network affiliates did live and taped reports from two ham stations. WB4URU featured in article in the *Jacksonville Journal*. W5HUQ was interviewed on television shortly after being the first Jax station to be acknowledged. Special thanks to the KA4GXZ repeater (145.39 MHz) which rebroadcast the shuttle audio and put a big signal into Jax. In my opinion, it was an excellent public service. Also, K4DPZ/R in Gainesville. New officers of the Orange Park ARC are NX4F, pres.; KD4XP, v.p.; KZ4L, secy.; WD4NXY, treas.; KD4CG WA4UKJ WB3DBE WB4CGD NU4Y, directors. The North Fla. ARS elected N4UF, pres.; W4PTT, v.p.; NR4E, secy.; WB4STB, treas.; WA4B, act. mgr.; N4BZH WD4NYT, directors. Gulf Coast VHF Traffic Net now meets nightly at 8 P.M. CST. TARS planning a mini-hamfest for 1984. The Pensacola FM Repeater Assn. carries the National Radio Teleconference Net on its 16/76 machine. Cable TV leakage problems have been recently noted in Pensacola and Tallahassee. These should be documented and reported to the local cable company with a copy to me. All complaints are tabulated and used in support of our arguments for an interference-free spectrum. OARC classes now being taught by W4DNU N4BLD and WD4LIM. The 146.115/.715 Hernando Co. repeater is now located in Spring Lake with antenna at 620 ft. Coverage much improved. W4NTV gave program on spectrum analyzers at Daytona Beach ARA meeting. A record number of SARs for Northern Florida was set this month. The central Florida area is especially well represented. W4UEA needs more EC reports which should be sent to him by the 7th. ECs not reporting for 6 months are considered inactive and the post vacant. The Lake Monroe ARS has applied for SSC status. Traffic: N4PL 728, AA4FG 568, WF4X 564, WF4Y 521, WA4QXT 445, WD4IIO 334, WD4HBP 272, WB4ADL 259, N4GDT 250, WA4EYU 178, NY4E 168, KB4LB 163, WD4MLQ 147, KD4KK 133, KB9LT 110, WD4RIQ 108, W4GUJ 106, KF4U 91, WC4D 88, N4ADI 75, WD4HUZ 72, W4MGO 66, N4GMU 59, W4DTV 40, WB4YOP 32, W1HXK 31, KD4QZ 30, NA4F 27, WA4STZ 26, NS4C 23, WD4EQB 23, KA4RBY 22, KE4GW 21, WA4PUP 21, N4UF 20, N4HGD 19, N4JHI 18, K4PYV 16, N4BOY 14, WB4AWG 12, NQ4P 11, KB4T 11, N4IIP 9, KA4RMH 8, KI4BI 7, W4LUW 7, KF4GY 6, WA4PUO 6, KA4ETX 5, KA4ZOL 5, N4HTU 3, WD4NIX 3, W8IM 3. (Oct.) W4UEA 137, KF4U 111, W4MGO 75, W4KIX 30, N4KF 18, W3IDO 7.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. The big excitement has been the attempts to work W5LFL/STS-9. I don't know all who worked the space shuttle from this section but did hear that K4GFG WA4SFQ and WA4LZR, the Motorola ARC, did have confirmed contacts. The Motorola club developed the radios which W5LFL used. The Clearwater Convention was a resounding success; enjoyed seeing all the people and attending the various meetings. The traffic handlers breakfast Sunday morning was very well attended. The spirit of the hamfest was somewhat dampened, though, by the news that ARRL President W4KFC, WB4ISZ of Sarasota, and K4OER of De Bary in North Florida became Silent Keys the day before the convention. BM WA4EIC reported 82 bulletins received and 143 transmitted by WA4EIC N4IMI WD4KBW K4IEK W4ESH AA4BN NW4R KA4AMC and W4DL. KA4AMC is a new OBS covering Broward Co. through the Southeast Florida Traffic Net. Congrats to both W4RH and W4WYR on their election as Director and Vice Director resp. of the Southeastern Division. W4JM sent congratulations in his SAR to them, also thanks those who voted for him, and says let's all put together to support our ARRL elected officers. W4LLA reports that he handled 68 phone patches this month in addition to his formal traffic. W4UIO is back in Florida. Also heard he is recovering from surgery for a detached retina. N4KB says he is taking a TCC sked this winter now that his brother, W1NJM, is back down for the winter. Heard W1NJM on QFN for the first time this season just before starting to write this. KI4T reported that the Dade Co. SET held Nov. 19 was very successful with 150 pieces of traffic handled and 72 stations participating. The "SS Poinciana" was reportedly sunk at the mouth of the Miami River with a cargo of hazardous chemicals in their exercise. 73 de WA4PFK. Traffic: W3CUL 3513, W3VR 881, W4NFK 582, K4EUK 428, WA4PFK 424, K4ZK 413, WA4EIC 305, K4IA 246, K4SCL 242, KA4AMC 212, K2RUE 197, KA4GUS 192, WB4WYG 188, W4DL 182, NC4H 159, KY4U 157, WB4AID 145, WD4AWN 135, WB2NVJ 134, KE4O 131, WA4TWD 113, NW4R 95, AA4BN 94, N4KB 93, W4LLA 92, W4YCL 85, WD4CHO 60, WD9AEP 78, KA4NXF 68, KA4FZI 65, K7LCA 61, WD4KBW 60, NJ4O 54, WA4HXU 50, KF4RL 48, KA4YHS 48, K4JLL 45, W3TLV 43, KA4KDD 42, W4DVO 41, WB4GCK 41, W4ESH 38, K5IHH 36, W4SME 30, KB4KB 29, N4CMW 24, WA1VOB 23, KA9AKY 22, W4PKP 22, KA4RWV 21, K4JI 19, K4FQU 17, KA4BBA 15, KF4JA 15, KA4KSO 15, WB8SNT 15, W3IJR 13, WB2OUK 10, WV4F 8, KA4GDU 8, WB4GJH 8, N2WX 8, W4WYR 8, KF4JI 7, WK4F 6, AF3S 6, K4IRT 5, WD4MCC 5, KA8CXO 4, W4JM 4, W4MPV 4, N4BXU 3, KD4VN 3, WT4F 2, WA4LKY 2, W4MFD 2, KA4EBO 1. (Oct.) K4SCL 221, KE4O 45, W3TLV 38, W4MPV 3, KA4EBO 1.

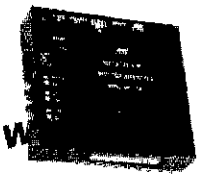
WEST INDIES: SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7:00 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2230 UTC) 146.94 MHz. The elected members of the Board of Directors of the Puerto Rico ARC met last Nov. 23 as directed by the by-laws of the Club, and they nominated and elected among themselves the leading positions of the Board for the new term 1983-84. Results were the following: KP4AOC, pres.; KP4AWS, v.p.; KP4ABG, secy.; KP4DDP, treas.; KP4AHX KP4ARY KP4ABN KP4EMP WP4AWJ, directors. The new president, KP4AOC, is a lawyer and is well known in our amateur community and an ex-president of the club. There is much enthusiasm in the ranks of the club and a comeback of many members is noted. Congrats to all of you and good luck. In a resolution in the meeting held Dec. 7, the Board of Directors expressed their sympathy on behalf of all amateurs of the West Indies Section for the passing away of W4KFC, President of the ARRL. KP4DJ reports the following totals for WINS: QND 477, QNI 119, QTC 34, 30 sess. WP4BEF reports the following totals for WINC: QND 422, QNI 645, QTC 34, 30 sess. Traffic: KP4DJ 58, NP4FQ 18.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7KQE WA7FDN. ARA reports that the following participated in the Camp Wildcat Bike-a-thon: KA7DIT KA7DRV KA7DTS AJ7C W7OPS W7FBX WB6TIX KA7PQO KL7JDQ N7AFM WB7BYK WB7PKR WB7CRK WB7PKP WBØOWL WA6III W7KOY. TRA reports the following participated in the AVRA Valley Aerobatic Competition

MFJ RTTY / ASCII / AMTOR / CW
COMPUTER INTERFACES

RTTY/ACSII/AMTOR/CW INTERFACE CARTRIDGE FOR VIC-20/C-64



NEW

MFJ-1228
$69.95

Most versatile RTTY/ASCII/AMTOR/CW interface cartridge available for VIC-20 and Commodore 64. Gives you more features, more performance, more value for your money than any other interface cartridge available.

Same interface cartridge works for both VIC-20 and Commodore 64. Plugs into user's port.

Choose from wide variety of RTTY/ASCII/CW, even AMTOR software. You are not married to one on-board software package. Use MFJ, Kantronics, AEA plus most other software cartridge, tape or disk.

850 Hz and 170 Hz shifts on receive **and** transmit.

Has mark and space outputs for scope tuning.

Normal/Reverse switch eliminates retuning.

True dual channel mark and space active filters and automatic threshold correction gives good copy when one tone is obliterated by QRM or selective fading.

Easy, positive tuning with twin LED indicators.

Narrow 800 Hz active CW filter. Automatic PTT.

Exar 2206 sine generator for AFSK output.

Shielded XCVR AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK out.

Powered by computer (few mA.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

Glass epoxy PCB. Aluminum enclosure. 4½x4½x1".

MFJ INTERFACE plus MFJ SOFTWARE CARTRIDGE

for VIC-20 or Commodore 64. MFJ-1228 PLUS MFJ-1250 or MFJ-1251 for one low price

$99.95
Save $20.00

SOFTWARE CARTRIDGE FOR VIC-20/C-64

MFJ-1250/MFJ-1251
$49.95

Powerful MFJ software cartridge for VIC-20 (MFJ-1250, $49.95) and Commodore 64 (MFJ-1251, $49.95). Plugs into expansion port. Developed by MFJ.

Features RTTY/ASCII/CW send and receive, split screen display, type ahead buffer, message ports, status display, automatic CW speed tracking, parallel and VIC serial printer compatibility plus much more.

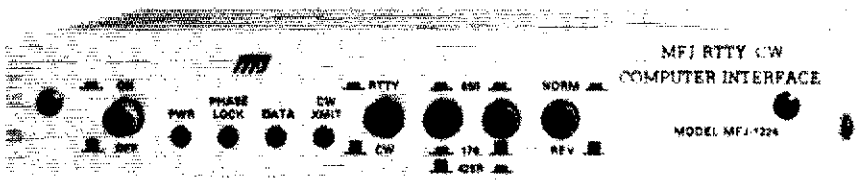
SUPER RTTY FILTER

MFJ-725
$39.95 NEW

Super RTTY filter greatly improves copy under crowded, fading and weak signal conditions. Improves **any** RTTY receiving system. 8 pole bandpass active filter for 170 Hz shift (2125/2295 Hz mark/space). 200 or 400 Hz bandwidths. Automatic noise limiter. Audio in, speaker out jacks. On/off/bypass switch. "ON" LED. 12 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95. 3x4x1 inch aluminum cabinet.

GENERAL PURPOSE RTTY/ASCII/AMTOR/CW COMPUTER INTERFACE

Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses MFJ, Kantronics software and most other RTTY/CW software.



MFJ Software plus MFJ Interface for VIC-20/C-64

Software cartridge alone, $49.95. Order MFJ-1250 for VIC-20, MFJ-1251 for Commodore 64. Includes cable to interface MFJ-1224 to VIC-20 or C-64.

$129.95

MFJ-1224
$99.95

New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

Use MFJ (see MFJ-1250/1251 below) software for VIC-20, Commodore 64 and Kantronics for Apple, TRS-80C, Atari, TI-99 and most other software for RTTY/ASCII/AMTOR/CW.

Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

Normal/Reverse switch eliminates retuning. +250 VDC loop output drives RTTY machine. Speaker jack.

Automatic tracking copies drifting signal.

Exar 2206 sine generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying output. Plus and minus CW keying. CW transmit LED. External CW key jack.

Kantronics compatible socket.

Exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out. CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

Use Gallo software with Apple, RAK with VIC-20, Clay Abrams with TRS-80C, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

Metal cabinet. Brushed alum. front. 8x1¼x6 in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.

CW INTERFACE CARTRIDGE FOR VIC-20/C-64

NEW

MFJ-1226
$39.95

High performance CW interface cartridge. Gives excellent performance under weak, crowded, noisy conditions. Works for both VIC-20 and Commodore 64. Plugs into user's port.

4 pole 100 Hz bandwidth active filter. 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

Plus and minus CW keying. Audio in, speaker out jacks. Powered by computer.

Includes Basic listing of CW transmit/receive program. Available on cassette tape, MFJ-1253, $4.95 and on software cartridge, MFJ-1254, $19.95.

You can also use MFJ-1250 (VIC-20) or MFJ-1251 (C-64), $49.95 each, RTTY/ASCII/CW software cartridge. Or use Kantronics, AEA and others.

Also copy RTTY with single tone detection.

UNIVERSAL SWL RECEIVE ONLY COMPUTER INTERFACE FOR RTTY/ASCII/AMTOR/CW

MFJ-1225
$69.95

MFJ-1225 plus MFJ-1250 or MFJ-1251 $99.95.

Use your personal computer and communications receiver to receive commercial, military and amateur RTTY/ASCII/AMTOR/CW traffic.

Plugs between receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers. Requires appropriate software.

Use MFJ (see this ad), Kantronics, AEA and most other RTTY/ASCII/AMTOR/CW software.

Copies all shifts and all speeds. Twin LED indicators makes tuning easy, positive. Normal/Reverse switch eliminates tuning for inverted RTTY. Speaker out jack. Includes cable to interface MFJ-1224 to VIC-20 or Commodore 64. 4½x1¼x4¼ inches. 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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- One year **unconditional** guarantee • Made in USA.
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MFJ TUNERS

QUALITY TUNERS THAT DELIVER MORE PERFORMANCE, MORE FEATURES, MORE VALUE FOR YOUR MONEY.

MFJ-941D 300 WATT VERSA TUNER II

$99.95 (+$4) **MFJ's fastest selling tuner packs in plenty of new features. New styling!** Brushed aluminum front. All metal cabinet. **New SWR/Wattmeter!** More accurate. Switch selectable 300/30 watt ranges. Read forward/reflected power.

New antenna switch! Front panel mounted. Select 2 coax lines, direct or through tuner, random wire/ balanced line or tuner bypass for dummy load.

New airwound inductor! Larger more efficient 12 position airwound inductor gives lower losses and more watts out. Run up to 300 watts RF power output.

Matches everything from 1.8 to 30 MHz: dipoles, inverted vee, random wires, verticals, mobile whips, beams, balanced and coax lines.

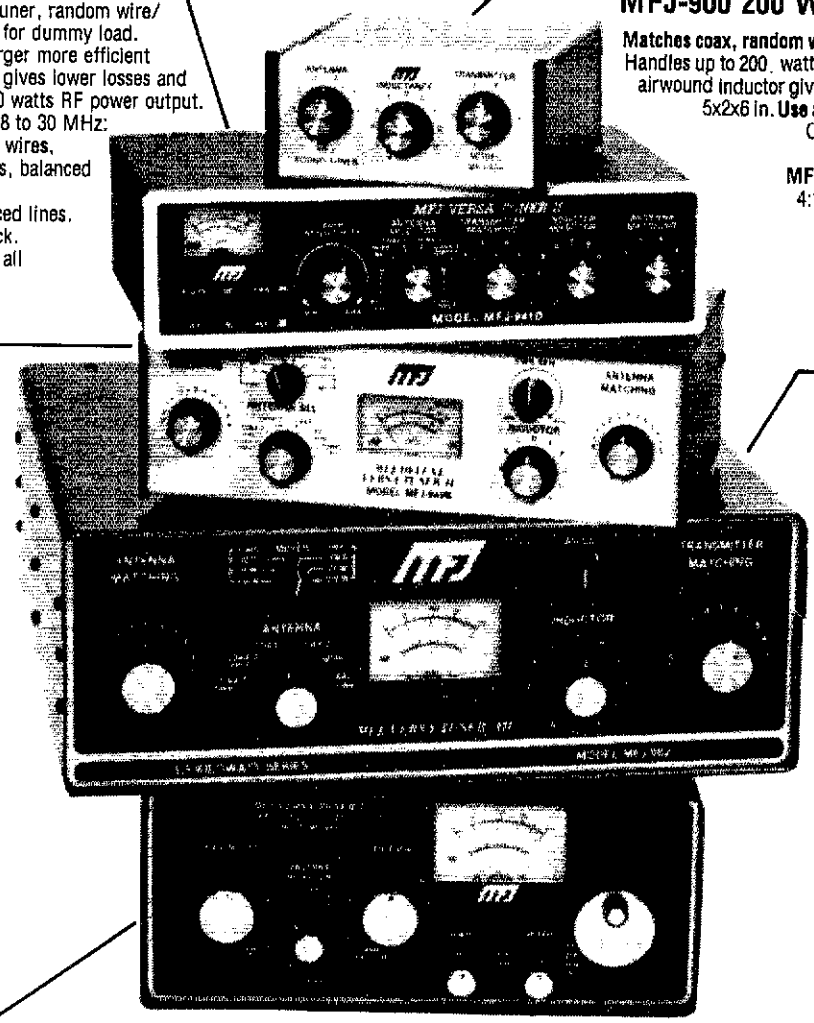
Built-in 4:1 balun for balanced lines. 1000 V capacitor spacing. Black. 11 x 3 x 7 inches. Works with all solid state or tube rigs. Easy to use anywhere.

MFJ-940B, $79.95, 300 watts, SWR/Wattmeter, antenna switch on rear. No balun. 8 x 2 x 6 in. eggshell white with walnut grained sides.
MFJ-945, $79.95, like MFJ-940B with balun, less antenna switch.
MDJ-944, $79.95, like MFJ-940B with balun, antenna switch on front panel, less SWR/Wattmeter.
Optional mobile bracket for 940B, 945, 944, $5.00.

MFJ-900 200 WATT VERSA TUNER

Matches coax, random wires 1.8-30 MHz. Handles up to 200 watts output; efficient airwound inductor gives more watts out. **$49.95** (+$4) 5x2x6 in. **Use any transceiver,** solid state or tube. Operate all bands with one antenna.

OTHER 200 WATT MODELS:
MFJ-901, $59.95, like 900 but includes 4:1 balun for use with balanced lines.
MFJ-16010, $39.95, for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.



MFJ-949B 300 WATT DELUXE VERSA TUNER II

$139.95 (+4) **MFJs best 300 watt Versa Tuner II. Matches everything** from 1.8 - 30 MHz, coax, randoms, balanced lines, up to 300W output, solid state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2 range wattmeter (300W and 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case. 10 x 3 x 7 in.

MFJ-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **$229.95** (+$10) and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

MFJ-989 3 KW ROLLER INDUCTOR VERSA TUNER V

$329.95 (+$10) **Meet "Versa Tuner V". It has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/ balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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AL-80 Compact QSK CW and SSB Kilowatt Amplifier

At the suggested retail price of $699.50, the Ameritron AL-80 is one of the lowest priced kilowatt amplifiers available.

- For CW and computer enthusiasts, the AL-80 is the only amplifier in its price range to offer QSK (full break-in).
- Individually tuned broad band pi network input presents a 50 ohm resistive load to the transceiver.
- The AL-80 incorporates the rugged 3-500Z tube.
- Compact size: 12"W x 6.6"H x 11.8"D. Weight: 43 lbs.

Frequency Coverage: 1.8-21.5 MHz amateur bands. Export model includes 10 meter amateur band.

Power Input: 1500W PEP SSB, 1000W CW and RTTY.

Drive Required: typically 65W PEP on SSB and 55W on CW.

Intermodulation distortion Products: In excess of — 33 dB below PEP.

Power required: 120 volts 50/60 Hz 15 amperes or 240 volts 50/60 Hz 7.5 amperes.

ATR-8 Antenna Tuner

The **Ameritron ATR-8** is a compact antenna tuner designed to match almost any antenna to any transceiver.

Band selection is by means of a high reliability inductor switch with one position per band. The 10 through 80 meter inductor is teflon insulated air core construction. The 160 meter inductor is teflon insulated on a large toroid core. This inductor system provides maximum "Q" and efficiency in a compact space.

The **SWR bridge** provides an accurate and sensitive method of matching solid state output transmitters to any antenna, insuring maximum output.

Model ATR-8B has a built in balun to provide maximum power into balanced feeders of either twin lead or open wire type. The balun provides a ground isolated balanced current source that is superior to conventional center tapped voltage source baluns.

Power Input: 300 watts, 10 through 80 meters
175 watts, 160 meters

Input Impedance: 50 ohms at match

Size: 6-1/2 x 6 x 2"

AMERITRON, Division of Prime Instruments, Inc.
9805 Walford Avenue • Cleveland, Ohio 44102 • (216) 651-1740

MFJ ACCESSORIES

HEAR POLICE/FIRE/WEATHER ON YOUR 2 METER HANDHELD

Scanning Handhelds become Police/Fire Scanners

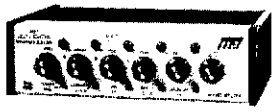
MFJ-313

$39.95

This MFJ VHF converter turns your synthesized scanning 2 meter handheld into a hot Police/Fire/Weather band scanner.
144-148 MHz handhelds receive Police/Fire on 154-158 MHz with direct frequency readout. Hear NOAA weather, maritime coastal plus more on 160-164 MHz. Mounts between handheld and rubber ducky. Feedthru allows simultaneous scanning of both 2 meters and Police/Fire bands. No missed calls. Highpass input filter and 2.5 GHz transistor gives excellent uniform sensitivity over both bands. Crystal controlled. Bypass/Off switch allows transmitting. Won't burn out if you transmit (up to 5 watts) with converter on. Low insertion SWR. Uses AAA battery. 2¼ x 1½ x1½ inches. BNC connectors. Enjoy scanning, memory, digital readout, etc. as provided by your handheld on Police/Fire band.

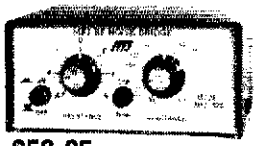
"GRANDMASTER" MEMORY KEYER

MFJ-484
$139.95



Up to twelve 25 character messages plus 100, 75, 50 or 25 ch. messages (4096 bits). Repeat any message continuously or with pauses of up to 2 minutes. LEDs show message in use.
Record, playback, or change messages instantly at touch of a button. Memories are resettable with button or touch of the paddle. Built-in memory saver— 9 V battery takes over when power is lost. Iambic operation with squeeze key. Dot-dash insertion. Dot-dash memories, self-completing, jam-proof spacing, instant start. 12-15 VDC or 110 VAC with optional adapter, $9.95. 8x2x6 in.

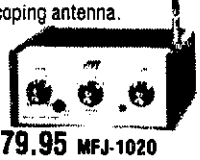
RX NOISE BRIDGE



Maximize your antenna performance! **$59.95** **MFJ-202B**
Tells whether to shorten or lengthen antenna for minimum SWR. Measure resonant frequency, radiation resistance and reactance.
New Features: individually calibrated resistance scale, expanded capacitance range (±150 pf). Built-in range extender for measurements beyond scale readings. 1-100 MHz. Comprehensive manual. Use 9 V battery. 2x4x4 in.

INDOOR TUNED ACTIVE ANTENNA

"World Grabber" rivals or exceeds reception of outside long wires! Unique **tuned** Active Antenna minimizes intermod, improves selectivity, reduces noise outside tuned band, even functions as preselector with external antennas. Covers 0.3-30 MHz. Telescoping antenna. Tune, Band, Gain, On-off bypass controls. 6x2x6 in. Uses 9V battery, 9-18 VDC or 110 VAC with adapter, MFJ-1312, $9.95.



$79.95 **MFJ-1020**

RECEIVER PRESELECTOR

MFJ-1040
$99.95

Improve weak signal reception, reject out-of-band signal, reduce image response from 1.8 to 54 MHz. Up to 20 db gain. Low noise MOSFET. Gain control. Bandswitch. Can use 2 antenna, 2 receivers. ON-OFF/Bypass. 20 db attenuator. LED. Coax, phone jacks. 8x2x6 in. Also for XCVRs to 350 watts input. Auto bypass. Delay control. PTT jack. 9-18 VDC or 110 VAC with optional AC adapter MFJ-1312, $9.95.
MFJ-1045, $69.95. Same as MFJ-1040, less attenuator, XCVR auto bypass, delay control, PTT. Use 1 ant., 1 rcvr. 5x2x6 in. 9 V battery, 9-18 VDC or 110 VAC with optional AC adapter, MFJ-1312 $9.95.

MFJ/BENCHER KEYER COMBO

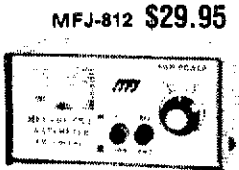
MFJ-422
$99.95

The best of all CW worlds- a deluxe MFJ Keyer in a compact configuration that fits right on the Bencher iambic paddle! MFJ Keyer - small in size, big in features. Curtis 8044 IC, adjustable weight and tone, front panel volume and speed controls (8-50 WPM). Built-in dot-dash memories. Speaker, sidetone, and push button selection of semi-automatic/tune or automatic modes. Solid state keying. Bencher paddle is fully adjustable; heavy steel base with non-skid feet. Uses 9 V battery or 110 VAC with optional adapter, MFJ-1305, $9.95.

VHF SWR/WATTMETER

MFJ-812 **$29.95**

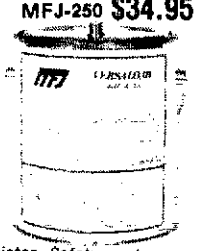
Low cost VHF SWR/ Wattmeter! Read SWR (14 to 170 MHz) and forward/ reflected power at 2 meters. Has 30 and 300 watts scales. Also read relative field strength. 4x2x3 in.



1 KW DUMMY LOAD

MFJ-250 **$34.95**

Tune up fast, extend life of finals, reduce QRM! Rated 1KW CW or 2KW PEP for 10 minutes. Half rating for 20 minutes, continuous at 200 W CW, 400 W PEP VSWR under 1.2 to 30 MHz, 1.5 to 300 MHz. Oil contains no PCB.



50 ohm non-inductive resistor. Safety vent. Carrying handle. 7½x6¾ in.

24/12 HOUR CLOCK/ ID TIMER

MFJ-103
$34.95

Switch to 24 hour GMT or 12 hour format! Battery backup maintains time during power outage. ID timer alerts every 9 minutes after reset. Switchable seconds readout. Elapsed timer. Just start clock from zero and note time of event up to 24 hours. Bright blue .6" digits. Alarm with snooze function. Synchronizable with WWV. Lock function prevents mis-setting. Power out, alarm on indicators. Black. 5x2x3 in. 110 VAC, 60 Hz.

DUAL TUNABLE SSB/CW FILTER

MFJ-752B **$89.95**

Dual filters give unmatched performance! The primary filter lets you peak, notch, low pass or high pass with extra steep skirts. Auxiliary filter gives 70 db notch, 40 Hz peak. Both filters tune from 300 to 3000 Hz with variable bandwidth from 40 Hz to nearly flat. Constant output as bandwidth is varied; linear frequency control. Switchable noise limiter for impulse noise. Simulated stereo sound for CW lets ears and mind reject QRM. Inputs for 2 rigs. Plugs into phone jack. Two watts for speaker. Off bypasses filter. 9-18 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

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comm. exercise: KA7FRY KA7DAC K7KYW WA7WKE KC7AQ K7OMD WB0KSW WB7ESQ KA7FTZ WB7TWM. K7SEC reports that another fine YL luncheon was held in Mesa with WB9TDR, YLRL Secretary in attendance. Coconino ARC reports the following upgraded their licenses: WB7OPT N7EDV KC7KY KA7PZM. W7YB reports that KA7RNG newest ham in Flagstaff using the new Novice test procedure. Many of the clubs from which reports were received indicate all are preping for the upcoming holiday season. I know we were all saddened to learn that ARRL President and former Arizona SCM W4KFC became a Silent Key. We will all miss Vic's valuable contribution to Amateur Radio. PSHR: KB7FE KO7V. Cactus Net: QNI 839, QTC 222. ATEN: QNI 1117, QTC 104. Section-level appts are still available. For info, please contact yours truly. Traffic: KB7FE 359, KO7V 202 W7EP 178, K6LL 138, W7LVB 54, K7RDH 35, KA7JNU 31, K7NMQ 21, W7KXE 20, WA7KQE 18, N7EH 8, WA7NXL 5, N7CQY 1. (Oct.) W7EP 82, KE7W 14.

LOS ANGELES: SM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. Nov. 17 N6UK and I appeared before the Joint Committee on fire, police, emergency and disaster services in Sacramento. We presented the committee information on the Los Angeles ARES/RACES groups. Our report was well received. Nov. 20 the Pasadena RC did a walk for hunger walkathon. W6ZPV was the PRC coordinator. The Western ARA elected new officers in Nov. N6ME, pres.; N6DWR, v.p.; KA6JDT, treas.; KA6ART, ways and means. I was at Big Bear over the Thanksgiving holidays. I guess a lot of you are gearing up for the holiday season; not much information is coming in the mail. Have a good one. 73. Traffic: K6UYK 770, K6YBV 482, AD7G 272, W6INH 321, AD0A 156, WA6OCM 146, KT6D 111, WA6LVO 24, W6NKE 22, K6CL 12, W6ORF 8, N6DZQ 7, WD6WFZ 3.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI: Coord: N6PE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. DECs (by counties): WB6JBI (Orange); W6LKN (Riverside); K6GGS (San Bernardino); WB6YZY (Inyo). NMs: AI6E (CW); WA6QCA (FM); KA6HJK (RTTY); W6CPB (SSB); WA6WZO (ASCII). Many section hams worked W5LFL aboard STS-9 including well known hams WB6NOA N6NB & N6RJ. SSC Barstow ARC set up a public display that included a station at the mall during the STS-9 flight. Congrats to AEC WB6GCT on being honored "Ham of the Year" by Anaheim ARA. Mt. Wilson RA won the 1st annual softball game/chili-off, with West Coast ARC coming in second. Contesters are invited by pres NE6I and OC Area Coordinator NI6W to join So CA Contest Club; SCCC net changed to Wed 7:30 P.M. on 3815 kHz. Coachella Valley ARC reports their local RTTY net on 146.7 (– .6) has been changed to 8 P.M. Sundays. RTTY repeater WB6IRZ/6 145.12 (– .6) on Running Springs has moved to Crestline. Free General classes are being given by WB6GNR of the Tri-County ARA. EC WA6OFT reports supplying communications for the Victorville Xmas parade using WA6EFW/R 146.94 (– .6). OC ham/computer/electronics swap meet is now being held at Orange Coast College in Costa Mesa every 2nd Sunday with talk-in on 147.51 and 147.09 (+ .6) Catalina repeater AA6DP/R. New 1984 officers — So Ca AR Computer Club: WA6WZN, pres.; KA6WAH, v.p.; KF6NO, secy.; KA6IGG, treas. Bishop ARC: KA6HII, pres/treas.; WB6YZY, v.p.; NW6C, secy.; NM6L, editor. Lee DeForest RC (Hemet/San Jacinto): WA6MGU, pres.; W6NBJ, v.p.; KA6RON, secy. Orange Co. ARC: KA6IMP, pres.; W6IBP, v.p.; W6MIL, secy.; W6HHC treas. Western ARA: N6ME, pres.; KE6JS, 1st v.p.; N6DWR, 2nd v.p.; WB6BIM, secy.; KA6JDT, treas. Riverside ARA: N6AIX, pres.; W6KON, v.p.; K6AJP, secy.; N6FRW, treas. 1984 ARRL convention will be held in Santa Marie Oct. 10-12; for info contact chairman WB6HJW (new Santa Barbara SM). PSHR: WB6QBZ AI6E W6CPB KA6BNW WA6QCA, KA6HJK/T.

Net	Freq	Time	QNI	QTC
SCN/1 (20+)	3598 kHz	7 P.M.	402	431
SCN/2 (13–)	3598 kHz	8:15	193	98
SCN/V (FM)	146.685	9 P.M.	552	436
RTTY/VHF	145.12	10 A.M.	496	110

Traffic: AI6E 237, WA6QCA 201, WB6QBZ 138, KA6HJK 106, K6GGS 110, W6CPB 69, N6GIW 66, KA6BNW 65, W6RE 63, N6GOT 55, W6TKV 33, N6FRW 28, K6ZCE 20, W6PNS 18.

SAN DIEGO: SM, Arthur R. Smith, W6INI — ACC: WA6COE. TC: N6NR. BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: WA6CUP. An ARRL/AMSAT booth at IEEE's GLOBECOM 83 was staffed by W6ABT W6BLK K6DS WD6FPY N6GW WA7HRA W6INI KM6I WA6LLO K6NC WB6TQF KW6V W6YVY. History of OSCAR program was presented by K6JEY. City of San Diego held simulated flood drill with WA6BCC N6BUK WD6CSS KT6E WD6GIW KA6IBZ N6IIM N6IMN W6INI KG6JLB KF6KE W6NFG K8QJP WA6RDF WB6TQF & W6UZL participating. W1LE's aluminum gutter antenna wrkg FB. New ARES members: KF6MQ KA6YBC. No. County TFC Net met 29 times, handled 235 msgs. Nice going! This net meets daily at 2000 on Palomar ARC's 13/73 repeater. Good way to break into handling formal messages. ARC of El Cajon has code practice each Tue and Thurs at 1900 on 146.19 MHz. W6RHV won club's homebrew contest. Poway ARS 1984 officers are: N6YO, pres.; KF6HU, v.p.; W6EKO, treas.; W1LE, secy. Active traffic handlers are eligible for appointment as Official Relay Station. Contact STM N6GW. Traffic: KM6I 403, W6HUJ 285, KU6D 218, KB6AI 112, N6GW 18, WA6IIK 9.

SANTA BARBARA: SM, Ernie Kapphahn, WB6HJW — Many thanks to W6POU for his 2 terms as SM. He also rcvd award from FEMA and State of Arizona for his recent flood emergency work. Section's first Special Service Club (SSC) is Conejo Valley ARC. Any clubs wanting to follow suit should contact W6ZZN. Satellite ARC held prgm mtg in Santa Maria w/N6NB as guest spkr. Paso Robles RC held great spaghetti feed for 90 hungry hams. K6YZR new pres PRRC; W1UUQ takes reins at Santa Barbara ARC. Poinsettia ARC provided support for Diabetes Bike Ride. Congrats to W6EP on 50 years as ARRL member. Santa Barbara section will host ARRL SW Division convention in Santa Maria, Oct. 12-14, w/satellite and Lompoc ARC sponsoring. Pse send ur reports and upcoming events to me at 1404 Grand Ave.; Arroyo Grande 93420.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. SEC: W5GPO. STM: W5VMP. PIO: N5FDL. BM: W5QXK. SGL: W5UXP. OO/RFI: WB5JBP. TC: WB5IIR. The Potter/Randall ARES conducted their SET on Nov. 19; a mock tornado causing multiple disaster communications problems. The operation was planned and organized by EC WD5UDX. DEC W5MVJ was very pleased with the exercise and commended the group on a job well done. W5PUM KA5OXR and WB5POK are conducting licensing classes in Amarillo. N5AQS reports that the Panhandle Tfc. and Emer. Net (3933 kHz @ 1800L, daily) has average QNI of 35 stns daily with good tfc load. This is the net to meet for the best QSP into the Texas Panhandle. Our State Gov't. Liaison, W5UXP, and friends got nice press coverage on Ft. Worth RACES operation, and the Grenada invasion. W5UXP and W5URI put K2BSA (Boy Scouts of America) on the air from its new Texas home, with an Amateur Radio exhibit at the Boy Scout show, visited by 5000+. K5LP and W5UXP have secured a workable antenna tower agreement with the Ft. Worth Zoning Office, and secured a city water tower as site for RACES repeater. ARES District #12 has been divided by SEC W5GPO into three sub-districts, each with its own District EC. Each major city within these districts will have its own EC and ARES Unit. This will give us much better service and better efficiency in the heavily populated D/FW Metroplex area. The Second Annual "Stormcom 84" is slated for February 18 at Mountain View College in Dallas. A fine program is scheduled. This seminar is a MUST if you are interested in SKYWARN, ARES, RACES activities, and a great opportunity to meet the gov't. officials and members of the press from all over our section. All DECs, ECs and RACES Officers are urged to attend, or to send delegates. New officers for Richardson Wireless Klub for 1984: K5AQ, pres.; W5YR, 1st v.p.; KA5Q, 3rd v.p.; KA5OFZ, secy/treas. PSHR: KC5NN N5EZM KD5FR N5FDL KA5AZK KB5UL WB5CIC N5DKW. Traffic: KB5UL 242, KA5AZK 121, W9OYL 115, KD5FR 74, KC5NN 72, NI5V 55, K5SOR 51, N5DKW 48, WB5CIC 41, W5ERT 23, KD5XH 22, W5CUE 18, N5GKF 17, N5EZM 11, N5FPL 10.

SOUTHERN TEXAS: SM, Art Ross, W5KR — ASM/STM: N5TC. SEC: WA5RVT. ORS ND5C is new section Bulletin Manager. BPL: WB5YDD. This section's first computer OBS, WB5FCO in Austin, is making the Armadillo Computer BBS open to non-Hams — spreading Amateur Radio word around! He also reports N5ECN is experimenting with BBS on 147.48 MHz thru TIERS network. Upgrades reported: NK5M, to Extra; KA5RWL N5GKQ WD5ADC, to Tech; N5EUC, to General. Congrats all! Brazos Valley ARC reports Novice classes going great. OBS N5DFO gave 47 readings of 36 bulletins on 8 nets. OBS W5KLV gave 88 readings of 36 bulletins on 8 nets. DRN5 mgr WB5YDD reports STX represented 100% by N5AMH N5DFO WB5EPA WB5FQU W5CTZ W5KLV KB5JL W5URN K5WOB N5EFG KD5KQ KA5KRI WB5YDD. CAND mgr W5KLV reports STX represented 100% by N5CRU N5EFG N5AMH KD5KQ WB5YDD N5DFO W5KLV. RN5 mgr KB5W (from MS) reports Texas represented 100%. Matagorda ARC has been busy showing the videotape "Amateur Radio's Newest Frontier" to area clubs (including Port Lavaca and Lake Jackson), to schools and on Cable TV; will soon show it to Boy Scouts and a couple of civic clubs. EC KB5SY coordinated amateur communication for "foodathon" in Beaumont. Traffic: WB5YDD 742, W5KLV 406, W5CTZ 398, N5DFO 302, W5TFB 214, N5TC 165, KS5V 140, WB5MMI 95, WB5EPA 90, K5HZR 36, KK8L 33, WB5FQU 32, WD5GKH 27, W5BGE 26, K5OWK 26, W5KR 23, KD5RE 18, AK5M 15, WD5GKK 3, K5RVF 2. (Oct.) K5GM 112. (Sept.) K5GM 100. (Aug.) K5GM 175.

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. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

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 "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they 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.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

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).

FOURTH ANNUAL Ohio State Convention and Flea Market: Join in the even bigger "Cincinnati ARRL '84," February 25 and 26. Activities for Hams and electronics enthusiasts: forums, meetings, vendors, Wouff Hong, women's activities, banquet, hospitality suite, more. Sure cure for "cabin fever." Hospitality suite Friday and Saturday nights. The $5 convention registration includes all convention awards. Flea market is $4/space for two days — Ham and electronics items, only. Write: Cincinnati ARRL '84, P.O.B. 11300, Cincinnati, OH 45211 or telephone 513-825-8234. Vendor and exhibitor inquiries invited.

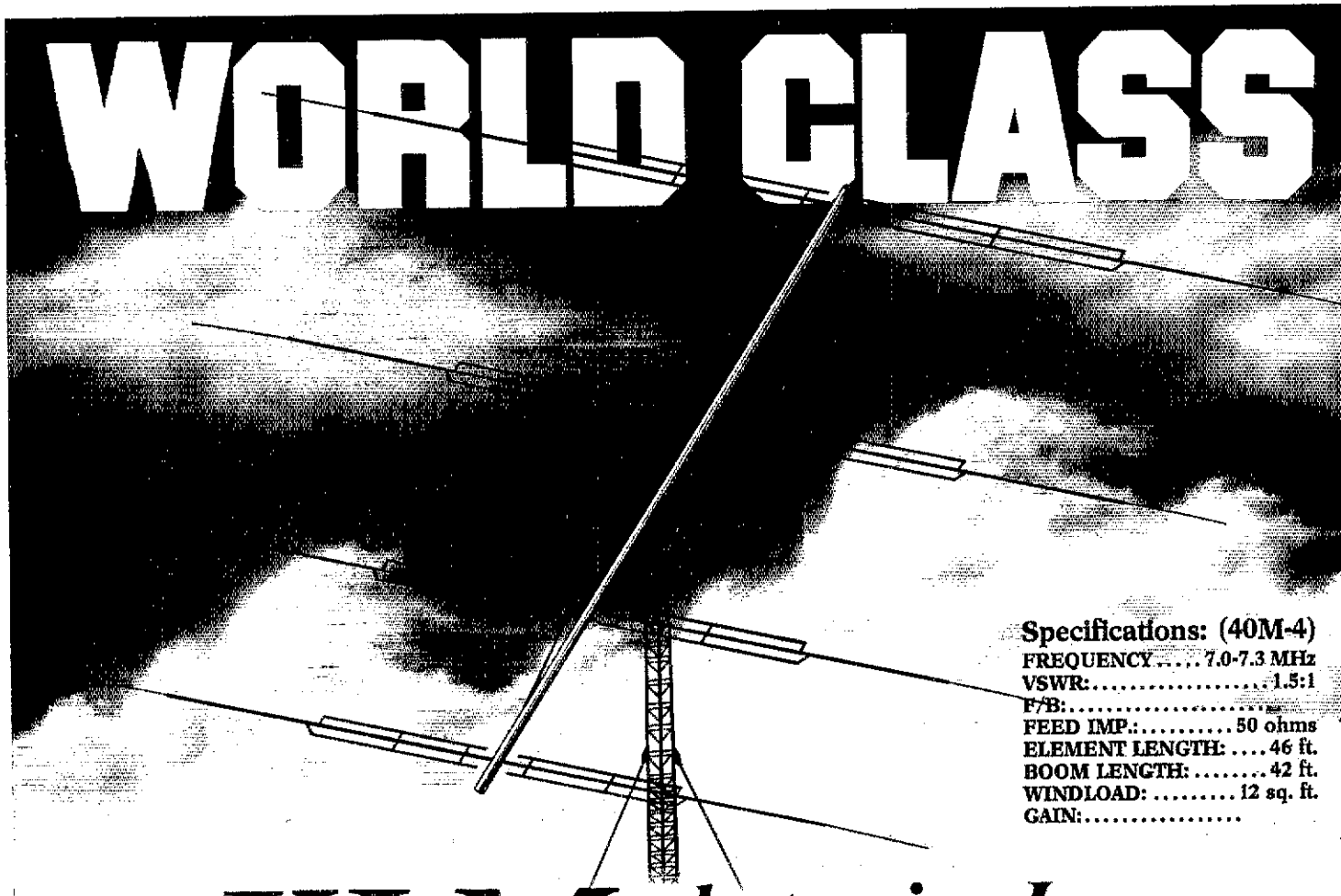
W.A.R.A. Warren Ohio Hamfest Aug. 19, 1984 at Kent State University, Trumbull Campus.

ON MARCH 11, 1984 the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairground Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8 am. Table reservations: contact Aileen Scales, 3142 Market Place, Bloomington, IN 47401.

LIMARC INDOOR HAMFAIR '84 — sponsored by the Long Island Mobile Amateur Radio Club will be held on February 19, 1984 at the Electrician's Hall, 41 Pinelawn Road, Melville, New York from 0900 to 1600. Table reservations are $10.00 each payable in advance to Bob Reed, WB2DIN, 2970 Valentine Place, Wantagh, NY 11793. Buyers admission is $3.00 per person, spouses/friends/children included. Food and refreshments will be available. Talk-in will be W2VLI/R 146.25/146.85 or on 146.52 simplex. For additional information contact Al Flapan, WA2FBQ, at 516-796-2965 or Hank Wener, WB2ALW, at 516-484-4322.

FOR SALE: Large wall calendar with AMATEUR RADIO printed in top half. Excellent gift at $3.50 each, including USA mailing. Enclose self-addressed mailing label. W6LS, 2814 Empire, Burbank, CA 91504.

WORLD CLASS

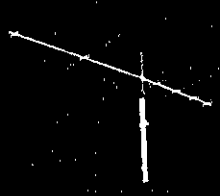


Specifications: (40M-4)
FREQUENCY..... 7.0-7.3 MHz
VSWR:.....1.5:1
F/B:.....
FEED IMP.:.....50 ohms
ELEMENT LENGTH: ....46 ft.
BOOM LENGTH: .....42 ft.
WINDLOAD: .....12 sq. ft.
GAIN:.....

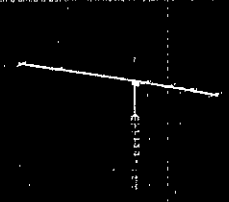
KLM electronics, Inc.
Full Line Performance

The incredible performance of the World Class KLM 40M-4 is used by many DX'ers as a "Standard of Comparison" in Competitive Antenna Equipment.

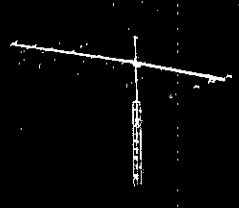
Obviously, not everyone needs this type of Awesome performance, but its nice to know that the same performance proven design theory and quality construction have been carried over into our full line of quality antennas for all frequency ranges.



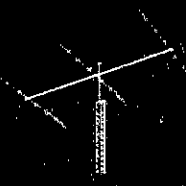
Specifications: (20M-6)
BANDWIDTH: ... 13.9-14.4 MHz
VSWR:.....1.5:1
F/B.....
FEED IMP.:.....50 ohms
ELEMENT LENGTH: ....37 ft.
BOOM LENGTH: .....57 ft.
WINDLOAD:.....12.8 sq. ft.
GAIN:.....



Specifications: (30M-3)
BANDWIDTH:... 10.1-10.150 MHz
VSWR:.....1.5:1
F/B.....
FEED IMP.:... 50 ohms unbal.
ELEMENT LENGTH: ....35'6"
BOOM LENGTH: .....24'3"
WINDLOAD: .....7 sq. ft.
GAIN:.....

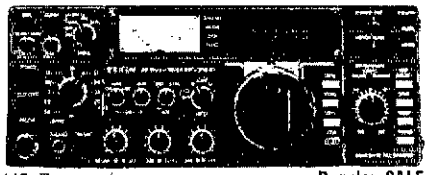


Specifications: (15M-6)
BANDWIDTH: ..21.0-21.5 MHz
VSWR:.....1.5:1
F/B:.....
FEED IMP.:.....50 ohms
ELEMENT LENGTH: ....25 ft.
BOOM LENGTH: .....36 ft.
WINDLOAD:.....8.5 sq. ft.
GAIN:.....



Specifications: (7.2/10-30-7LPA)
BANDWIDTH: ..7.2/10-30 MHz
VSWR: .....2:1 typical
F/B:.....
FEED IMP.:.....50 ohm unbal.
ELEMENT LENGTH: ....46 ft.
BOOM LENGTH .....42 ft.
WINDLOAD: .....12 sq. ft.
GAIN.....

And there's more!
See your local dealer or write to KLM, Electronics, P.O. Box 816, Morgan Hill, CA 95037.



ICOM

HF Transceivers

	Regular	SALE
IC-740 9-band 200w PEP Xcvr w/mic	$1099.00	949.95

plus **FREE** PS-740 internal power supply &

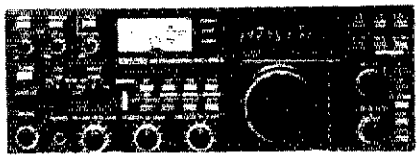
$50 Factory Rebate - until gone!

PS-740 Internal power supply	$159.00	149.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	

**Options also for IC-745 below.*

IC-730 8-band 200w PEP Xcvr w/mic	$829.00	599.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44/A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk mic	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band Xcvr/.1-30 MHz Rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 KHz AM filter	49.50	
SM-5 Desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band Xcvr/.1-30 MHz Rcvr	$999.00	899.95
PS-35 Internal power supply	160.00	144.95
CF5-455K5 2.8 KHz wide SSB filter	TBA	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

See IC-740 list above for other options (*)



IC-751 9-band Xcvr/.1-30 MHz Rcvr	$1399.00	1229
PS-35 Internal power supply	160.00	144.95
FL-52A 500 Hz CW filter	96.50	89.95
FL-53A 250 Hz CW filter	96.50	89.95
FL-33 AM filter	31.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
RC-10 External frequency controller	35.00	
CR-64 High stability reference xtal	56.00	

Options: 720/730/740/745/751	Regular	SALE
PS-15 20A power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adapt. cable; HF radio/PS-20	10.00	

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synthesizer for IC-751	39.95	
SP-3 External speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
MT-100 Manual antenna tuner	249.00	224.95
AH-1 5-band mobile ant w/tuner	289.00	259.95
PS-30 20A systems power supply	259.95	233.95
GC-4 World clock	99.95	94.95

HF linear amplifier	Regular	SALE
IC-2KL 160-15m/WARC solid state linear	1795.00	1299

VHF/UHF base multi-modes

IC-251A* 2m FM/SSB/CW xcvr	$749.00	549.95

***$50 Factory Rebate** - until gone!

IC-551D 80w 6m Xcvr	$699.00	599.95
PS-20 20A switching ps w/speaker	229.00	199.95
EX-106 FM adaptor	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW Xcvr	TBA	
PS-35 Internal power supply	160.00	144.95
IC-271A 25w 2m FM/SSB/CW Xcvr	699.00	629.95
IC-451A 430-440 SSB/FM/CW Xcvr/ps	899.00	769.95
IC-451A/high 440-450 Xcvr/ps	899.00	769.95
AG-1 15 db preamp for IC-451A/45A	89.00	79.95
IC-471A 10w 430-450 SSB/CW/FM Xcvr	799.00	719.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

VHF/UHF mobile multi-modes

IC-290H 25w 2m SSB/FM Xcvr, TTP mic	549.00	489.95
IC-560 10w 6m SSB/FM/CW Xcvr	489.00	439.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95

VHF/UHF/1.2 GHz FM

IC-22U 10w 2m FM non-digital Xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-25A 25w, 2m, grn leds, up-dn-TTP mic	359.00	319.95
IC-25H as above, but 45 Watts	389.00	349.95
IC-27A 25w 2m mobile Xcvr	TBA	
IC-45A 10w 440 FM Xcvr, TTP mic	399.00	359.95
EX-270 CTCSS encoder	39.00	
BU-1 Memory back-up	38.50	
RP-3010 10w 440 MHz FM repeater	999.00	899.95

Buy (10) IC-45A's at one time at our SALE PRICE & get an RP-3010 at 50% off of LIST.

IC-120 1w 1.2 GHz FM Xcvr	$499.00	449.95
RP-1210 10w 1.2 GHz FM repeater	TBA	
Cabinet for RP-1210 or RP-3010	249.00	

VHF/UHF portables	Regular	SALE
IC-505 3/10w 6m port. SSB/CW Xcvr	$449.00	399.95
BP-10 Internal nicad battery pack	79.50	
BC-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
IC-402 432 MHz portable SSB xcvr	389.00	299.95
SP-4 Remote speaker for portables	24.95	
IC-3PS Power supply for portables	95.00	89.95
IC-20L 2m 3/10w PEP or FM amp	98.00	89.95

Hand-held transceivers

Deluxe models	Regular	SALE
IC-02A for 2 meters	$ 319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	TBA	

Standard models	Regular	SALE
IC-2A for 2 meters	239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95

Accessories for hand-helds	Regular
BC-25U Extra wall charger	$ 10.00
BC-30 Drop-in rapid charger	69.00
BP-2* 425ma 7.2v 1w long life battery	39.50
BP-3 Extra 250ma 8.4v 1.5w battery	29.50
BP-4 Alkaline battery case	12.50
BP-5* 425ma 10.8v 2.3w high power batt	49.50
**BC-30 required to charge BP-2/5*	
CA-2 Telescoping 2m antenna	10.00
CA-5 5/8-wave telescoping 2m ant	18.95
CP-1 Cig lighter charger (for BP-3)	9.50
DC-1 DC operation module	17.50
FA-2 Extra 2m flexible antenna	10.00
HM-9 Speaker/microphone	34.50
LC-2A Leather case without TTP cut-out	34.95
LC-2AT Leather case w/TTP cut-out	34.95
ML-1 2m 2.3w/10w amplifier (use BP-5)	SALE 79.95
ML-25 2m 20w amplifier	SALE 179.95
3A-TTN 16-button TTP front; 2A/3A/4A	39.50
CommSpec SS-32M 32-tone encoder	29.95
CA-3 Extra 220 flexible antenna	9.12
CA-4 Extra 440 flexible antenna	9.12
M-12 12 ch marine hand-held	SPECIAL 269.95

Shortwave receiver	Regular	SALE
R-70 100 KHz-30 MHz digital receiver	$749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44/A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	49.50	
EX-299 (CK-70) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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In Wisconsin (outside Milwaukee Metro Area) 1-800-242-5195

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Outside Ohio 1-800-321-3594

ORLANDO, Fla. 32803
621 Commonwealth Ave.
Phone (305) 894-3238
Fla. WATS 1-800-432-9424
Outside Florida 1-800-327-1917

CLEARWATER, Fla. 33575
1898 Drew Street
Phone (813) 461-4267
No In-State WATS
No Nationwide WATS

LAS VEGAS, Nev. 89106
1072 N. Rancho Drive
Phone (702) 647-3114
No In-State WATS
Outside Nevada 1-800-634-6227

CHICAGO, Illinois 60630
ERICKSON COMMUNICATIONS
5456 N. Milwaukee Avenue
Phone (312) 631-5181
Outside Illinois 1-800-621-5802

FLEMINGTON, N.J. Hamfest by Cherryville Repeater Association will be held Saturday, April 7 at Hunterdon Central Field House. For table reservations or other information write Bill Inkrote, K2NJ RD10 Box 294, Quakertown-Croton Rd., Flemington, N.J. 08822 or call 201-788-4080.

ON MARCH 11, 1984 the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8 am. Table reservations: contact Aileen Scales, 3142 Market Place, Bloomington, IN 47401.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cars, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: will give quote. Little Print Shop, Box 9848, Austin, TX 78766.

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.

WOODGRAINED QSLs. Beautifully printed. You have to see them. Write for free samples. Ham Graphics, Box 244Q, Camden, NY 13316.

QSL samples — 25¢ Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

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.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — KØAAB collection, railroad employees and railfan's specials, front report styles. State your sample wants. 37¢ self addressed business size envelope required. Marv WØMGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

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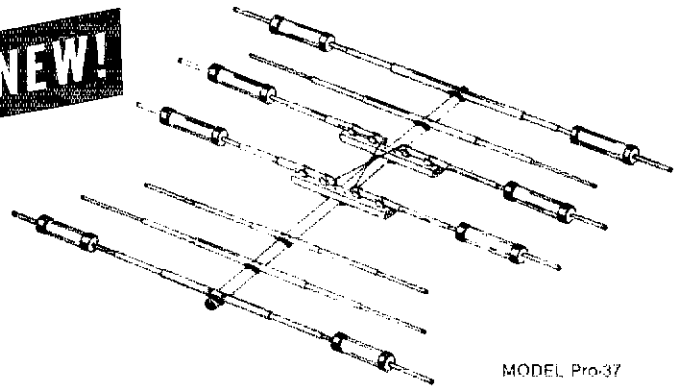
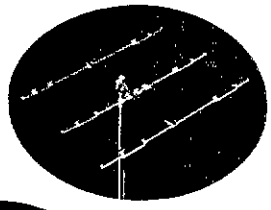


MODEL Pro-37



TA-33 Jr
Three element rotary beam aerial.
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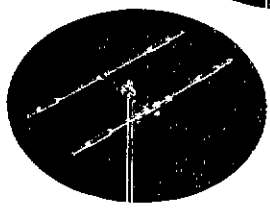

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MODEL TA-32 Jr

The Pro-37 follows in the Mosley tradition of high performance, dependability, and quality construction. The Pro-37 is pre-drilled for easy assembly. No adjustments or measuring. Average assembly is about 1½ to 2 hours. As with all the Mosley antennas we use stainless steel hardware throughout. Rugged construction makes our antenna the cleanest, strongest of its class, no cluttered elements or boom to cause electrical and mechanical problems down the road. Put it up and leave it up. In performances it has no peers...it is as broadbanded or broaderbanded than any antenna made. Its gain and front to back is as good or better than other antennas in its class, even those with longer booms. Mechanically we feel it's the best built.
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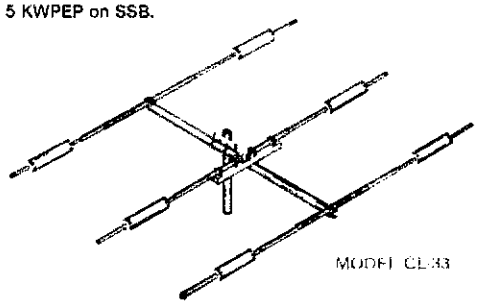

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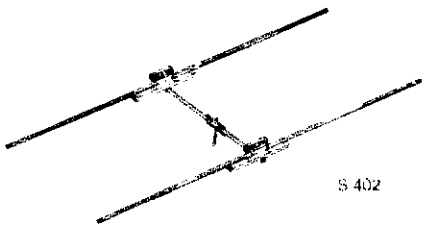

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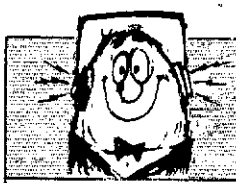

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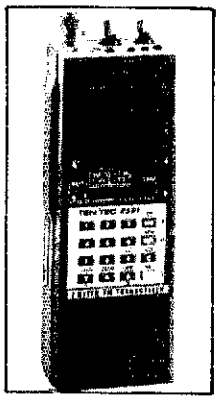

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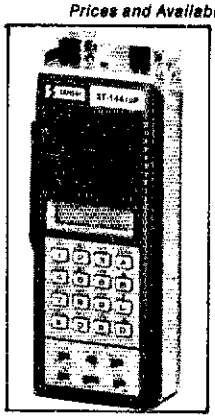

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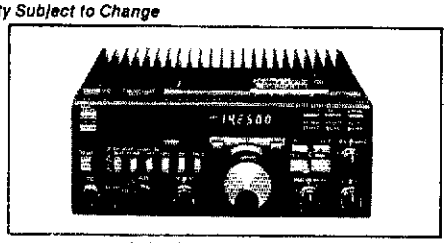

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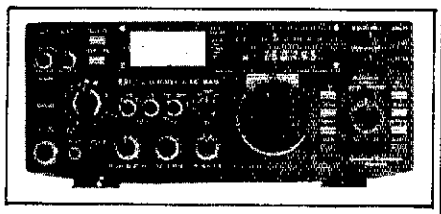

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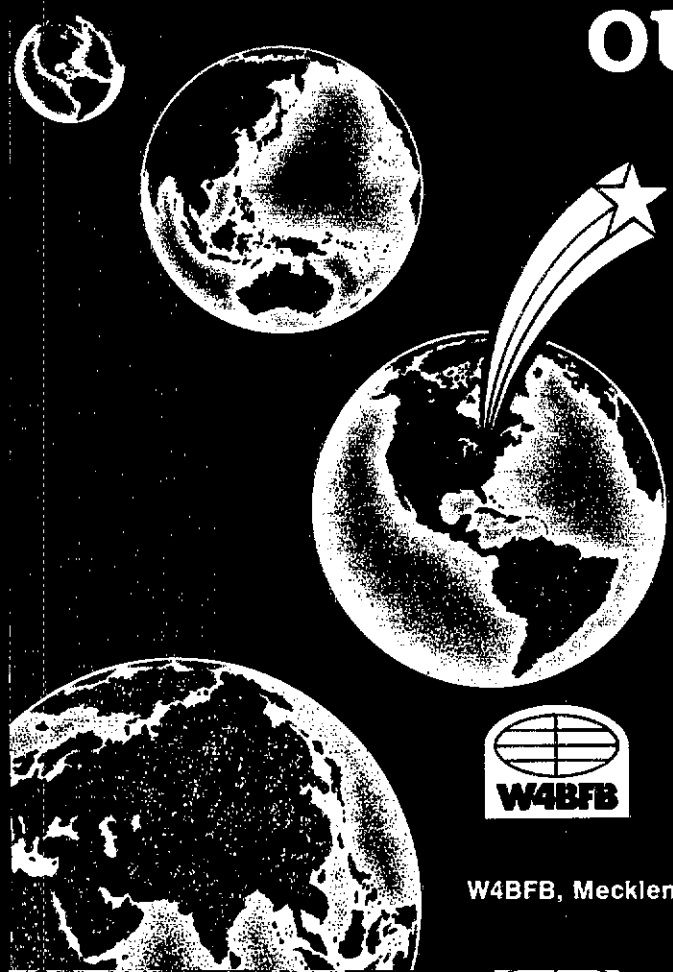

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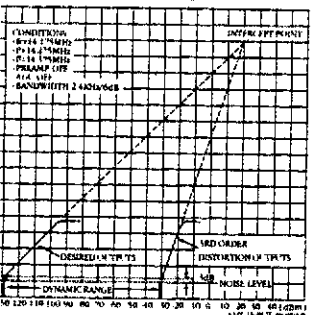

Superior front-end receiver performance, coupled with a switchable preamplifier and IF shift or passband tuning (optional), gives the IC-730 receiver flexibility yet allows it to be easy to operate.

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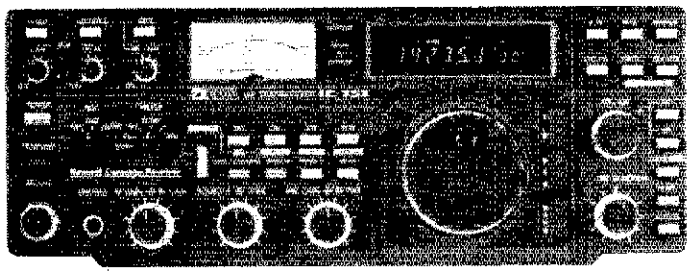

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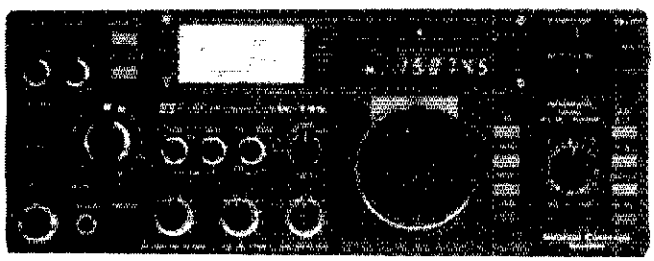
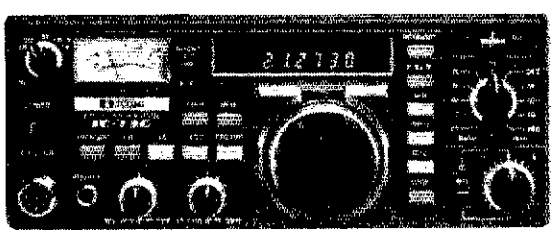


IC-745 **General Coverage Receiver 9 Band Ham Transceiver**

- General Coverage Receiver
- 160 — 10 Meter Ham
- 16 Tunable Memories With Lithium Battery Backup
- IF Shift
- Passband Tuning
- Program Scan
- Memory Scan
- 100dB Dynamic Range
- Internal Power Supply Option
- Dual VFO
- Multiple Filter Options
- Mode Memory
- Squelch
- CW Keyer Option
- 100% Duty Cycle
- Built-in Preamp



IC-730 **8 Band Ham Transceiver Compact, Mobile**

- 30 — 10 Meter Ham
- 8 Tunable Memories
- Dual VFO
- IF Shift
- Passband Tuning Option
- CW Filter Option
- 100dB Dynamic Range
- 12 VDC Operation
- Large RIT Knob
- Mobile Size: Only 3.7"(H)x9.5"(W)x10.8"(D
- Built-in Preamp

Optional Accessories: PS15 Power Supply, PS30 System Power Supply, PS35 Internal Power Supply (751, 745), Mobile Mounting Brackets (730,745), IC-2KL Linear Amplifier (includes separate IC-2KLPS Power Supply), AT100 Antenna Tuner, AT500 Antenna Tuner, BC10 Memory Backup (730), SP3 External Speakers, SM6 Base Mic (745, 751) and SM5 Base Mic (730).

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 **(206)454-8155** / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 **(214)620-27**

1.2 GHz! NEW!

Explore the world of 1200 MHz FM with ICOM's new IC-120 Mobile!

Now you can move out of crowded 144 and 440 MHz ds into the wide spectrum of MHz because ICOM gives the opportunity to explore spectrum from 1260 to 1300 . . . 40 MHz . . . with all the ures found on popular 2 r and 440 MHz rigs plus e:

Memories. Six memory nnels plus 2 VFO's provide ge of most used uencies in this wide band. memory allows memory of uency, offset direction, offset uency, and tone encoder ency. Internal memory up available.

Scanning. Scan the ories, scan all 40 MHz or ram a segment to be ned. All scanning has the n of scanning for a busy or channel.

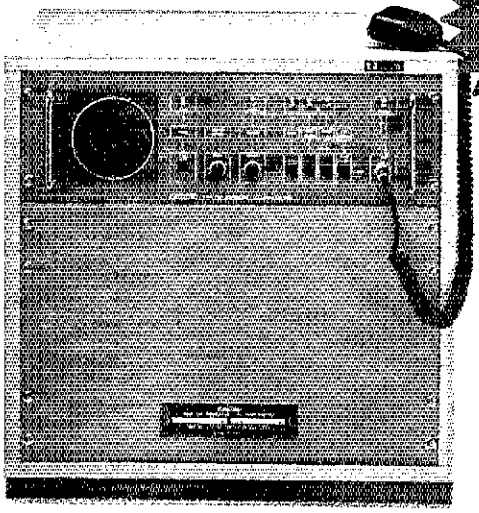
Duplex. Be able to work different repeater offsets, with ICOM's programmable offset system, as they become available.

3 Tuning Rates. Tuning increments of 10 KHz, 20 KHz or 1 MHz are available for rapid or slow tuning of the band.

RIT. RIT on FM? Yes, ±5 KHz on either side of the transmit frequency allows you to tune signals offset from yours.

Readout. Four digit green LED readout for easy visibility day or night.

The ICOM IC-120 gives you all of this plus a very quiet PLL circuit, with excellent signal to noise ratio, high sensitivity and a stabilized power amplifier to provide full power over its temperature and voltage ranges, and the IC-120 is small, only 2"H x 5½"W x 8⅛"D.



NEW 1.2 GHz Repeater

Complete your system with the IC-RP1210 repeater.
• PLL frequency selection (198 channel, 10 KHz steps, DIP switch) • High stability PLL (0.5PPM/-30° to +60°C) • Repeater access via CTCSS • DTMF control functions • Selectable hang time • ID'er.

ICOM

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All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

ICOM's IC-02A

Digital Readout, Scanning, Memories and...

ICOM introduces the new top-of-the-line IC-02A and IC-02AT to compliment its existing line of popular handheld transceivers and accessories. The new direct entry, microprocessor controlled IC-02A is a full-featured 2 meter handheld.

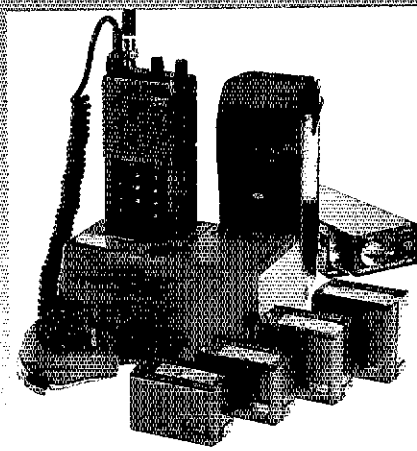
Scanning, 10 memories, duplex offset storage in memory, odd offsets, 32 keyboard selectable PL tones which store in memory, and internal lithium battery backup.

Keyboard entry through the 16-button pad allows easy access of frequencies, duplex, memories, memory scan, priority, dial lock, PL tones and DTMF in the IC-02AT.

An easy-to-read custom LCD readout indicates frequency, memory channel, signal strength and transmitter output, PL tone, and scanning functions.

The new IC-02A has a battery lock, frequency lock, and lamp on/off switch. An aluminum case back is provided for good heat sinking when the IC-02A is run at the standard 5 watts or 8 watts (optional battery pack).

will be available for the IC-02A including new long-life 8.4 volt and 13.2 volt packs. Charging may be done from a top panel connector for 13.8 volts which will also power transceiver operation.



ICOM's IC-2A(T) continues to be available...and its complete line of accessories work with the new IC-02A.

The IC-02A comes standard with BP3 NiCd battery pack, BC25U wall charger, flexible antenna, wrist strap and belt clip.

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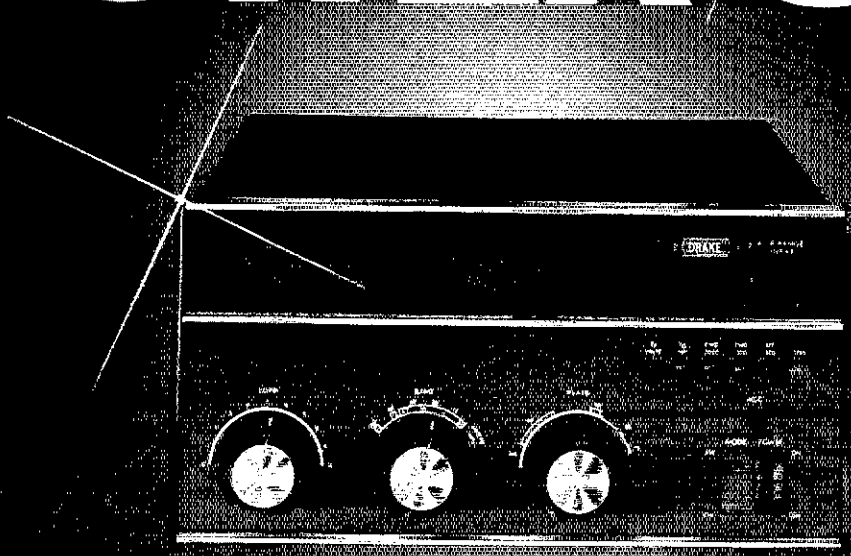
POWER UP!



DRAKE L7
2kW Linear Amplifier

• 2kW PEP, 1kW cw, RTTY, SSTV operation — all modes full-rated input, continuous duty cycle • 160-15 meter amateur band coverage, plus expanded ranges for any future hf band expansions or additions within FCC rules. These ranges also include increased coverage for MARS, embassy, government, or other such services • The Drake L7 utilizes a pair of 3-500 Z triodes for rugged use, and lower replacement cost compared to equivalent ceramic types. • Accurate built-in rf watt-meter, with forward/reverse readings, is switch selected. Calibrated 300/3000 watt scales. • Temperature controlled two-speed fan is a high volume, low noise type and offers optimum cooling. • Adjustable exciter agc feedback circuitry permits drive power to be automatically controlled at proper levels to prevent peak clipping and cw overdrive. Front panel control. • Bypass switching is included for straight through, low power operation without having to turn off amplifier. • Bandpass tuned input circuitry for low distortion and 50 ohm input impedance. • Amplifier is comprised of two units — rf deck for desk top, and separate power supply. • Operates from 120/240 V-ac, 50/60 Hz primary line voltage. • Manufactured in U.S.A. •

R.L. DRAKE COMPANY DRAKE

For more information, write or call:
540 Richard St., Miamisburg, Ohio 45342, USA
Phone (513) 866-2421 Telex 288-017

TUNE IN THE WORLD WITH HAM RADIO

YOUR PASSPORT TO HAM RADIO ADVENTURE!

Imagine being able to personally communicate with an astronaut as the Space Shuttle circles the globe. Perhaps you would like to become a friend over the airwaves with a descendant of the mutinous crew of the *HMS Bounty* who lives on Pitcairn Island in the remote South Pacific.

There are Amateur Radio stations everywhere! They are located in homes, boats, airplanes and even on bicycles. Hams take their gear on vacations, camping trips and even on walks around the block. Just think how thrilling it would be to talk to a ham in Australia using equipment as you drive along in your car.

Hams communicate with each other using voice, morse code, computers and teletype. The movement of floats during the Rose Parade on New Year's Day is coordinated by hams using amateur television. Hams have even built their own communications satellites to provide reliable communications around the earth.

Your passport to all of this fun and adventure is the Novice Amateur Radio License, and the best study material for passing your FCC Novice exam is contained in *Tune in the World with Ham Radio.*

Over 200,000 persons have used *Tune in the World with Ham Radio* as their steppingstone into Amateur Radio. The package contains the best study material available for passing your Novice FCC exam. The booklet tells all about the FCC rules and regulations and Amateur Radio operating procedures. An easy-to-read section of the booklet provides you with the basic electronic knowledge you need for the exam. The cassette makes learning the code as painless as possible. We have added a separate supplement which provides the FCC question pool for the Novice license and brings the package up-to-date.

The Tune in the World with Ham Radio package consists of 134 pages of easy-to-understand text and an additional 26 pages of equipment and publication advertising. The cassette prepares the prospective Novice for the 5-words-per-minute code exam by teaching the code character by character — a proven method. Code practice at 5 words per minute follows. A supplement provides questions and answers from the FCC question pool. The entire package is available for $8.50 (in U.S. funds) and is available at your favorite dealer or from **The American Radio Relay League, 225 Main Street, Newington, CT 06111.**

MICROPROCESSOR Trainer. Factory assembled Heathkit/Zenith complete unit like new condition. *ETW-3400-A trainer:* EWA-3400 accessory unit: ETA-3400-1 3K chip memory: EE3401 self instruction course. The accessory unit and 3K chip memory have never been hooked up. Sold only as complete package $480. Prepaid on receipt of cashier's check. Lorin Brown, KR6I, 1336 Paseo Ladera, Arroyo Grande, CA 93420. 805-489-8617.

LOUISIANA'S NEWEST ham store! Dixie Electronics-Gonzales, LA. Azden PCS-4000 $279.95. PCS-300 $269. Hy-Gain TH-7 $369.95. New Explorer 14 $279.95. Ten-Tec Corsair $999.95. All Hustler resonators in stock. Call Robin WB5UXA 1-800-535-8134 in LA. 1-800-272-8293.

COAX RELAYS spdt, BNC, 24-VDC enclosed coil, Amphenol type, silver-plated, 2GHz, super value at $14.95 ea. PPD, others in stock. W3ZD, 520 Centennial Road, Warminster, PA 18974. 215-675-4539.

FOR SALE: Sencore CB42 CB Analyzer exc. condition $600. Yaesu FT207R w/most acc. $200. Kenwood TR7850 $200. Radio Shack PC-1 w/printer-like new $200. All as priced or best offer. KF4OG, 305-282-6328, 2732 Adela Ave., Orlando, FL 32826.

WANTED: Drake C-4 Console, K7KJM, 503-760-5739.

D & V Radio Parts — Reduced prices variable capacitors, toroids, etc. Stamp for flyer please. 12805 W. Sarle, Freeland, MI 48623.

LIKE to visit China? Join us. Escorted and hosted by Radio Peking. Most comprehensive 21 day tour. Inquire cost and details. Paul Hale, 1619 N. Royer St., Colorado Springs, CO 80907.

WANTED: PRE-1923 radio equipment. Tubes, books, mags-Pre-1940 T.V. any condition. Phil, Forest Hills Wireless Museum, 6761 Alderton, Flushing, NY 11374 212-896-3545.

QRZ DX weekly newsletter. DX Tips For Big Guns And Little Pistols. Send 20¢ stamp for sample. P.O. Box 834072-Q, Richardson, TX 75083.

SELL Teletype model 32ASR with 60 W.P.M. gears installed, ready for amateur use, all machines in excellent condition $125. Bob KL7HDY (907) 563-6209.

WANTED: mast, 40-foot crank-up, telescoping, self-supporting, in good operating condition. KB3ED, Fineman, 1839 Carwithan, Philadelphia, PA 19152, 215-342-1365.

NEW - Drake TR7-$1195; R7-$1195. IF filters installed — $49. Limited quantities. Organs and Electronics box 117 Lockport, Ill. 60441. Phone: 815-838-1580.

WANTED: Back issues QST 1915-1930. Send dates prices. Ken Gilbert, 8285 SW Brentwood St., Portland, OR 97225.

WANTED: RTTY Reinker Kits and spare felts for M15, M15, and Kleinschmidt. Bill Johnson, N5KR, 1808 Pomona, Las Cruces, NM 88001 505-522-2042.

FOR SALE: Mint condition Kenwood Twins, T-599D transmitter and R599D receiver E/W 2 and 6 meter converters. Complete with all cables and manuals. $400, cash and carry. WB3HNK, Palmyra, PA 17078.

HP-41CV $160; HP-41C + two memory modules $135; extended functions, time modules $60 each; HP-82143A printer/plotter $210. Free software. N7DH, 509-332-3978. Box 146, Pullman, WA 99163.

COLLINS S-Line/75A4 parts available at reasonable prices. Michael Bill WB9APC Box 362, Normal, IL 61761 309-874-2402.

HW 101 Owners! Put R.I.T. in your transceiver for under $10. Plans $5. K2PDJ, Box 201, Alexandria Bay, NY 13607.

COLLINS 30S-1 in mint condition with 3 extra 4CX1000A tubes + manual. Sacrifice $2,000. You ship. Jim, N4ITO 501-624-4935, 629 Prospect Avenue, Hot Springs, AR 71901.

COLLINS 312 B-4 round, very good, $165. Hallicrafters SX100, good condition, $120, both with book. AA6S Bill, 209-732-7163.

KENWOOD TS 820 w/digital display. Mint condx. Owner & Service Manuals. $475. AF2N 212-445-2799.

WANTED: Amateur equipment built from ARRL or Radio Handbooks, 1930s. Nagle, 12330 Lawyers, Herndon, VA 22071.

HENRY 3K Classic, factory modified to X. Bird equipment, tilt-over tower S.A.S.E. for list. W1AGA.

TRITON II 481 solid state xcvr, 200 watts, with CW filter, perfect condx, $240. U-ship. W5HWP 512-358-4382.

GENERAL Coverage Receiver, Collins R390A/URR 0 to 30 MHz, rack mount, Excellent condition, $325. U-ship. W5HWP 512-358-4382.

WANTED: Back issues "Oscillator" Magazine published Gardena, Calif. early 1930s. Also other magazines prior early 1930s. Nagle, 12330 Lawyers, Herndon, VA 22071.

WANTED: old glass antenna insulators for collection. Good prices paid for ones I need. Jim Singleton K2IRO, 77 Cochrane St., Melrose, MA 02176.

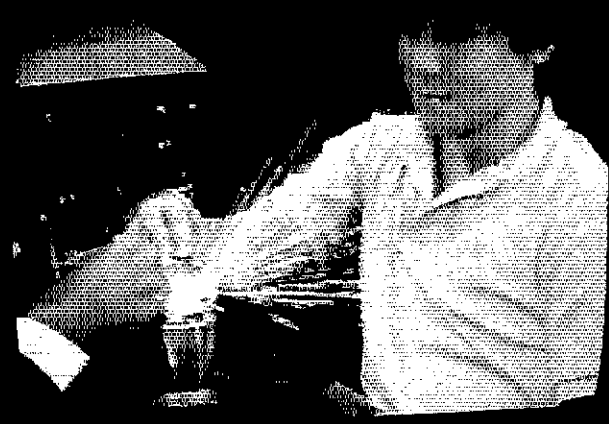
U.S. NAVY Dept. Bureau of Ships Radio Frequency Oscillator Model O-275/SRT covers all bands from .3 MHz to 26 MHz. 500 Watt amplifier (also U.S. Navy Model AM-800/SRT no power supplies. Both units in mint condition. They are from an SRT 14,15,16 Radio Transmitting Set. $250 takes all (plus shipping). Call Mike WA2WCO at 914-452-5839 10 AM-2 PM.

QUALITY TOWER accessories. SO-1 Standoffs $34.50. SO-2 Standoffs $59.50. PO-1 pully kits $8.50. GP-81 and GP51S Ginpole Kits $129.50. MA-2 Mast Adapters $22.50. BG-18 Laddermast for big beams $249.50. Free catalog IIX Equip. Ltd., P.O. Box 9, Oak Lawn, IL 60454. 312-423-0605. VISA-Mastercharge.

Actual slow motion frames from Ham MasterTapes

1 Larry, N2NY, Lee, KA2RNV

2. Lee discharges cap



3. In slow motion it's dazzling

4. Wow. Can we see it again?

You've never seen this, like this, before this!

And you can see it—in color—again and again when you own the N2NY Ham MasterTapes.

Ever see a cap discharge in slow motion? You will on Ham MasterTapes. Ham MasterTapes can perform the dozens of complicated demonstrations necessary for a beginner's understanding of Ham Radio Theory.

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☐ Video Graphics highlight important details.

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The hobby has long needed better, clearer, high-tech teaching aids to help newcomers into our wonderful world of Ham Radio.

These six-hour tapes cover completely all the material needed to understand Novice and Tech/General Theory and operations, and include the new 200-question FCC syllabus used beginning September 1983.

Only $199.95. Order direct and specify Beta or VHS format. Call or write: Larry Horne, N2NY

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Grab a fistful of TEN-TEC's new 2 meter FM rig

it has features never before available in one handheld, it's made in the USA and it's priced right!

COMPARE TENNESSEE TECHNOLOGY WITH THE OTHERS...

Do their handhelds have memory lockout?
Exclusive memory lockout on the TEN-TEC 2591 allows scanner to temporarily bypass channels for quick lockout of busy frequencies yet retain them in memory for normal operation on demand.

Do theirs store transmit offset?
The 10 memories of the 2591 allow stored offset for easiest operation. And memory channel 0 accepts any non-standard offset.

Do theirs offer selectable SKIP or HOLD?
When scanning with the 2591, choose HOLD to stop and stay on a busy frequency. Choose SKIP to stop for several seconds and continue.

Do theirs offer modifiable Band Scan without complete reprogramming?
With the 2591 you can scan any section of the band with user defined upper and lower limits in steps of 5, 10, 15, 25, or 30 kHz. Change step size, upper and lower limits independently. Manual Scan also, up or down, in 5 kHz steps.

Do theirs have Quick-Release NI-CAD Battery Pack?
The 2591 battery pack slides off easily, yet is secure in use, has a heavy duty 450 mAH rating at 8.4v, and the 2591 has capacitive memory retention to permit pack changing without reprogramming.

THE TEN-TEC 2591 HAS ALL THE RIGHT FEATURES...

• **Memory Scanner scans only programmed channels** and has user selectable HOLD or SKIP • **Selectable 2.5 Watts or 300 Milliwatts power,** top panel switched • **Extended Frequency Coverage—143.5 to 148.995 MHz.** Covers full Amateur Band plus some CAP and MARS frequencies. • **4-Digit LCD Readout with Switchable Back Light**—large, easy-to-read digits, selectable for frequency or memory channel number. • **Key-Pad Frequency and Function Control**—16 key dual tone encoder • **Dual Function LED**—shows battery status and transmit mode. • **Electret Microphone** plus separate speaker for superior audio. • **Compact, Lightweight, Complete**—easy to handle and rugged. Standard equipment includes flexible antenna with BNC connector, AC charger, belt clip, connectors for mike and speaker. Options include: adaptor pack for +12 VDC mobile operation, speaker/mike, 25 watt power amplifier, leather case, desk charger, subaudible tone module, and spare NI-CAD pack.

DESIGNED AND MANUFACTURED IN TENNESSEE and it carries the famous TEN-TEC 1 year warranty. See your dealer for the best in 2 meter FM—the TEN-TEC 2591. Or write for information to TEN-TEC, Inc., Sevierville, TN 37862.

160/40 METER dipole. 115 ft. long, coax-fed, $45 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

COLLINS WANTED: CT-2 cable trough for KWM-2, -2A, S-line. Also need the SC-301 antenna control console. This was designed to replace the blank front panel in the 516F-2. Need any original sales literature for early 30K-1 transmitter (circa 1946), no copies please. Contact AC1Y at ARRL Hq.

COAX: Low-Loss 50Ω (1/2, 3/4, 7/8, 1 5/8, 3 1/8) inches. Specifications S.A.S.E. Link, 1081 Aron St., Cocoa, FL 32922.

TI99/4-4A Basic, Extended Basic, Assembly Language programs. CW RECEIVE/Transmit, CW Practice, DX Log/Call Locator, Amateur Call Locator, Amateur Call Locator, SSTV Keyboard, 1010 Record, WAS, Programs for Hamkids. Write Sam Moore, AC5D, Box 388, Stigler, OK 74462.

IBM-PC RTTY. CompRtty is a comprehensive new RTTY communications program for the IBM-PC. Features include: all standard ASCII and Baudot speeds, selectable parity, split screen display with status, hardcopy, diskcopy, key-string detect for autostart/stop, text file transfer, autologging, 12 programmable messages. Ideal for traffic handling. Requires 64k PC-DOS 1.1 or 96k PC-DOS 2.0, disk, IBM compatable serial port and an RS-232C compatable TU. $50. David A. Rice, KC2HO, 7373 Jessica Dr., N. Syracuse, NY 13212.

CUSHMAN CE-3, covers 2M, complete and excellent. Ray Knight, N1BHM, Norway, ME 04268. 207-743-6690.

SWAN 700-CX ssb 5-band transceiver, 700 watts PEP input, very good condition, $400, Pete, KC8ER, 216-951-0244.

YAESU FT-102, 300 Hz cw filter, MH-1B8 mike. Like new, $755. WB7VOO 602-298-4820.

COMMODORE 64 Random Code Practice. You select character speed, spacing speed any characters any number characters, group length plus program 250 words any call sign $9.95. VIC-20 new all call signs and Q-Signals $6.95. Barney Miller KA3LHD 1024 Washington St., Reading, PA 19601 215-374-4433.

QST BACKISSUES — new batch — 1923 to date Overstocked, 1934 to 1945 $10, 1946 to date $5 per year plus UPS-S.A.S.E. W3ZD 520 Centennial Road, Warminster, PA 18974 215-675-4539.

BRAND NEW Eimac 4-1000A, Eimac chimney, socket $175. Collins 516F-2, needs high voltage reactor $75. 50-year-old carbon broadcast mike, best offer. W6MRE 213-344-6309.

COLLECTOR wants Cathedral or Tombstone type radios from 1920-30's. Send letter stating make, model, cabinet condition, working condition and price. Alan Piorek, WB9RAD, 1050 N. Paulina, Chicago, IL 60622.

INFOTECH M-300 keyboard, DGM MVD-1000 cw, RTTY, ASCII video display, Clegg FM-27B, Drake AA-22 amplifier, Daiwa RF speech processor. Please contact Marty, WA2OHM, 613-923-1146.

HEATH Compact Kilowatt HA-14 with HP-14 and HP-24 (base and mobile supplies) mint $500. KLM, 6-meter, 11-element beam, complete, with balun $125. Drake TC-2, SC-2, SC-6, CPS-1, SCC-1 and CC-1 console, all manuals, mint, $400. 313-475-2359 WB8BKC.

YAESU FT101B, excellent condx $350 you ship, also FTV-250 2-mtr transceiver mint condx, no activity my area, $150. WD8MQY, Callbook or Ph. 1-517-345-3452.

CLASSICS: restored EX signal shifter 10-160 sn1312 exc $65, good Collins 32V1 sn640 $90, Motorola METRUM II, eight channels $105, Motorola S1321Z 25-175 MHz FM signal generator $200, old D104 sn 5723947 $25, demo R600 digital .1-30 MHz receiver $260, LABVOLT 10 MHz 5 inch scope $65, restored HP200B audio oscillator $35. Gerald Park W8QS, 1022 Cresenwood Road, East Lansing, MI 48823 517-351-5106.

FOR SALE: Heathkit CO-2600 solid state ignition analyzer. $500. W1YUW.

GETTING OUT of Ham Radio-Illness. CX7A converted to 6, Thomas manual, S1 letters, (2) extra finals - $950. R1051B, digital s.s. receiver - $950. 50 ft tower, Rohn, EP, self supporting - $75. KW tribander - mosley $65. AFM4D - $10. SCM ADS321 TTY ASR all SS, needs some work manual $95. Kilenschmidt ASR perfect $125. Millen Ant Tuner $125. Model 28 ASR w/dome reperf, 3 sp. 100 wpm - $125. SS RTTY converter, exc. $65. Manuals, paper, tape. Many more S.A.S.E. for list. K3ZQN 215-946-6354 evenings or write 26 Wildrose Lane, Levittown, PA 19054.

TR7 with two optional filters $775. PS7 $200. Will sell xcvr separately. R4C with three extra xtals and two optional filters $340. All mint. You ship. WA2LYZ 609-627-5683.

TEMPO 6N2, 2kW plus desk-type amp for 6 and 2 metres. Great for EME and tropospheric $1,150; Drake TC-6, TC-2, SC-6, SC-2, CPS-1, CC-1 console, more than 100 watts out on 6 and 2 metres $525; Drake WV-3 144-220-440, PS-3 ps $650; Yaesu 107 240-Watt solid state rig, SP-107 speaker patch, FTV-107R transverter, FP-107 internal ps, YM-35 mic, scan 160m to 432 MHz $1,050; wanted Drake L-7; National NC-240R rcvr w. speaker 490 kHz to 30 MHz $325. WB8VYF 513-875-2992 after 7:00 EST.

COMPUTER Dupe Sheet for Apple II. Holds 2500 calls, 1 second dupe, prints dupe sheet. $34.50. Check/MC/VISA no C.O.D. RCIS Inc., 2701-C W 15th Suite 228, Plano, TX 75075.

FT901DM: Yaesu xcvr, Curtis keyer. Clean, asking $700. Vinnie Coppola, 12 Charles St., Plantsville, CT 06479 203-621-5954.

WANTED: Johnson Viking kW Matchbox, with or without directional coupler. W0ROT Box 726, Oskaloosa, IA 52577 515-673-0305.

SELL - MINT transceiver HF SSB Yaesu FT101ZD $495. Linear amplifier Dentron MLA-2500B $450. Morse - A - Keyer Microcraft $95. H. Trueblood, 7335 Donna Avenue, Reseda, CA 91335.

WANTED: Paragon RA 10 tuner and DA 2 detector/amplifier. Write Art Cameron, W7HKU, 16305 Rock Creek NW, Portland, OR 97231.

WANTED: QST in permanently-bound (sewn-in) volumes. Bound in red or maroon, six issues per book, two books per year. Need 1961-1963 and most before 1945. Will pay cash and, if desired, furnish identical unbound copies. Neil Friedman, N3DF, 503 Kalmia, Boulder, CO 80302. 303-449-7753.

DRAKE 2B/2BQ $120. KX2B, 16 Clark St., Painted Post, NY 14870.

TRACK DXCC progress with T/S1000 (16K). Tape $10. ND8R, 1170 Greentimber Trail, Spring Valley, OH 45370.

FASTRACK® 2007 Interval Timer uses digital logic to provide accurate timing without faising; adjustable length; ideal for 10 minute id use; 3.6 x 1.5 inch pcb and manual $9.95. Proham Electronics Inc., 34620 Lakeland Blvd., Eastlake, OH 44094.

FOR SALE: Hallicrafter HT-37, good condition. Will ship Greyhound $90. Polmanteer, W5WJR 512-751-2013.

TENTEC Century 21 Digital, excellent condition, $275. Clark W5QE/7, 153 E. Center, Nephi, UT 84648. 801-623-2053.

WANTED: 2 meter FM moblie - CC acceptable. WB4YKP Box 120 Rt 6, Lawrenceburg, TN 38464.

SELL: Kenwood TS-930S with 500 Hz 6 kH filters SP930 speaker MC 60A mike all less than 1 yr old perfect $1295. InfoTech M-200F RTTY CW converter with 12" green monitor like new $375. Brimstone 2-meter FM from 142.00 to 149.99, tone burst 1800-2400 Hz $195. Joseph J. Perry, 177 Paris Road, New Hartford, NY 13413 1-315-724-5374.

FASTRAK® 2009 DTMF Decoder uses 2 CMOS devices and accurately decodes all 16 digits; latched 4-bit output and strobe simplify use; 3.6 x 2.0 inch pcb and manual $9.95. Proham Electronics Inc., 34620 Lakeland Blvd., Eastlake, OH 44094.

KENWOOD TS830S, Kenwood digital VFO-230, both $850, mint. Will ship in original boxes. J.E. Rehler, W5KNZ, Box 371, Corpus Christi, TX 78403. 512-884-1961, 512-993-8368.

ICOM IC701 transceiver p.s. SM2 mike IC-EX1 $525. Icom 25A $195. All mint. KC2I ex-WA2JCJ 201-939-2237.

QSTs complete 1976-1982 make offer. W1HAX, CT 203-247-9602.

TS130S, 8 bands, perfect cond. Standby rig, seldom used. Will ship in carton with manuals. $450. COD UPS. W2EVJ, 201-666-9012.

SELL: Kenwood TR-9000 $250; Dentron MT-3000A $210; ARCOS 430 MHz kW rf deck $375; Ten-Tec speech processor and mike $85. WØSP 913-539-6061.

HAL ST-5000 Demodulator/Keyer, like new $150. W2DB/4, 904-344-1041.

BENCHER XZ-2 Audio Filter with matching power supply, new condition, $55. WØFDN, 371 Claymore, Cleveland, OH 44143.

WANTED: Old bugs for my telegraph and radiotelegraph key collection. I am trying to find each make and model of bug manufactured before 1950. Vibroplex, Martin, D&K, Boulter, TMC, MacDonald, etc. Also looking for spark keys, Boston keys and large or unusual radiotelegraph keys. K5RW Neal McEwen, 1128 Midway, Richardson, TX 75081.

COLLINS FILTERS, Wanted: 200 Hz and 800 Hz or 200 Hz and 500 Hz for 75S-3C. Mike Castleman KD8MD, 701 Baldwin, Jenison, MI 49428, 616-457-5610.

MINT condition Drake TR4, MS4, MN4, RV4, R4B, T4XB, TR3, TR-22, all perfect. 20 or more years of QST, 73, CQ, Ham Radio mags. Pr. 4-125A linear. Robot 400 & 800, new. WØMNK, Callbook, or 913-764-2859.

FOR SALE - Tempo-One transceiver with power supply and VFO, SWR meter, antenna tuner, 5 BDQ antenna, $600. KA1IIX, 40 Greenfield St., Windsor, CT 06095. 203-688-6727.

ICOM, my 90 day written guarantee, original cartons, all manuals: 720 with LDA, CW narrow & AM filters, SM5 & HM mikes $800; PS20 $175; new Phone Patch-720 $75; 211 all-mode 2m xceiver $400; RM2 remote controls either xceiver $50; $1400 takes all. WB7PRV 7411 SW 59th Ave., Portland, OR 97219 503-244-7013.

JOHNSON kW Matchbox, mint, $95, D104 mic and stand, $25. Howard, W2HKE/3, 215-399-8977.

IC 21A, DV21 VFO $500 or best offer. KA5QWN via '83 Clbk.

TUBES - 4D32, 8122, 250TH, 450TL, 4-1000A, 5868, 5894, 6146B. Send S.A.S.E., N1BGL, 16 Hillcrest, Dedham, MA 02026.

DECIBEL Products' DB-4002-B cavity filter. 144-174 MHz 3 sets of coupling loops included. $137. WD8KNL, 942 Amherst, Massillon, OH 44646.

COMMODORE 64: "1541" disk based log and QSL program approx. 1900 QSO's per disk. Data output to screen or printer. Print QSL's for less than 1¢ each. User guide open disk. $15.00 ppd INFO: SASE: Harv Nelson, KA9KUH, P.O. Box 736, Stevens Point, WI 54481.

FT901DM Yaesu, FV101Z external VFO, two microphones, extra set of finals, new-in box, all mint, $795. N8FKD, 216-872-7755.

SELL Hallicrafters SX-117 Receiver, HT-44 Transmitter, HA-10 lf/mf Tuner and PS-150-120 Speaker/Power Supply. All in immaculate working condition. Some spare tubes and all original manuals included. Sell all for $250. Too heavy and fragile to ship. Write or call KDØBG, Don E. Boyvey, 3122 Holcomb, Des Moines, IA 50310. 515-279-6732.

TX/RX — cheap — WB2EUF — 516-324-4066.

HAM HOME for sale Tower-Antennas-Ham Shack pool-solarheat-F.P.L. energy efficient, S.A.S.E. for details. George B. Riley, W2KJJ, 1174 Scotten St., Port Charlotte, FL 33952. 813-627-3167.

YAESU FRG-7700 recent, like new, $300; Hy-Gain 400 rotator $80; 900 feet 4-w telephone cable with shield $70; Ten-Tec electret mike $15; Turner 124 mike $12. KØLD, 67567, 316-982-4454.

WANTED — Heath SB-644A and SB-634 Glen Mills, N6ESG, P.O. Box 3393, Mission Viejo, CA 92690, 714-768-0585.

TEKTRONIX manuals needed for 661 mainframe and 5T1A and 4S1 plug-ins; low serials. N1ATB.

WANTED: Dentron vertical EX-1. Paul Wise, W5LI.

PROTECT your Bencher Key. Rigid Plexiglas cover $9.95. George Chambers, KØBEJ, 302 S. Glendale, Coffeyville, KS 67337.

SELL Drake L-4B linear. Has ten meters. Mint. $725. W7EZ 503-344-3646.

OSCAR 10 gear for sale. Kenwood TS-700S all-mode two-meter Transceiver with remote VFO and service manual: $350. Microwave Modules 432-28S Transverter (432-436): $195. Carl Mills, WA3ZHW, RD6, Stroudsburg, PA 18360. 717-992-4538.

SONY ICF-6500W portable general coverage receiver, digital display, double conversion, 6 months old, used little. Asking $160, or trade for stereo gear of like value. KD8LF 419-726-2467.

SELL: Drake, Heath, Dentron, etc. Reasonable. S.A.S.E. for list, prices. Joe Badlovies, 241 Dover St., Bridgeport, CT 06610.

Johnson Transmitters - Challenger w/122 V.F.O. - $75, Adventurer - $40, Lafayette HE-50 12W/10 meter Transceiver - $30, Regency HR-212 12 ch./20 W 2 meter Transceiver - $80, Tennelec MCP-1 crystalless scanner - $75. All w/manuals plus shipping. W2QZ, 1678 North Gate, Merrick, NY 11566. 516-623-6449 evenings.

SALE — 8 fiberglass Quad arms 13'-6" N1AO 315-446-6388.

SACRIFICE — account of sickness: Icom 740 with only 30 hours use - includes FL-44, FL-45, FL-30, FL-52A filters, FM unit, Curtis Keyer, and PS-35 - all factory installed. Must sell $955. TenTec 540 Trident with all factory options - CW filter, 100 Hz crystal calibrator and Noise Blanker - $350 or best offer. Ten Tec Ultramatic Keyer $50. James Mozzillo, N4ITO, 501-624-4935.

WANTED: 4CX1500B and SK800B socket. Schaaf, W9ZR, 414-434-2938.

WANTED: Drake RV4C Remote VFO. Clean and working, for cash. — AA2Q.

KENWOOD TS930S with AT930 $1275. Robot 800 with Sanyo VM4209 $350. K4CUU 205-766-4175.

ROCKWELL/COLLINS KWM-2A, 516F-2, $1695. 312B-3, $45. Winged KWM-2A, 516F-2, $595. 312B-5, $350. Winged S-line, 75S-3, $295. 32S-3, $350. 516F-2, $135. 312B-4, $150. SM-2, $50. All $895. 30L-1, $495. CP-1, $175. CC-2, $45. SM-3, $85. 637T-2, $295. HQ170A-VHF, $285. D-104 w/PTT, $40. Beam antenna, $95. Most with original boxes, manuals, cables, excellent to like new. Must sell, may negotiate. WB9SMP, Bob 414-375-1749.

YAESU FR101S rcvr - loaded - mint. $275. Jim, WA1EDN, 1-413-783-3172.

COLLINS 75-S-3 — 32S-1 — 516F-1 pwr supply - spkr. D104 mike in mint cond. Set of extra tubes. $600 F.O.B. Lou Retzkin, W2KHV, 8260 S.W. 24 St. No. Laud., FL 33068.

CRYSTALS: Build something, QRP oscillator, or try 160M, or for older transmitters, experiments, etc. We have crystals and sockets. FT-243, all frequencies, General, Novice, .01% 4001 - 8700 kilocycles (including 30M doublers), $2, minimum five $1.75 each. 30M fundamentals 10100 - 10150, .01% $2.95, five $2.45. 3500 - 4000 $2.95, five $2.50 each. 160M $3.45, five $2.95. Sockets 50¢. Postage - Airmail 25¢ per crystal. "Crystals Since 1933." WØLPS. Stamp for 1700 - 60000 kilocycles-listings-circuits. C-W Crystals, Marshfield, MO 65706.

YAESU FT-107M/DMS (WARC model), internal AC supply, 500 kHz CW filter, FV-107 remote VFO, 12 tunable memories — excellent condition, $795. Jeff Ross, Box 138, Sergeantsville, NJ 08557 — 609-397-3255 evenings/weekends.

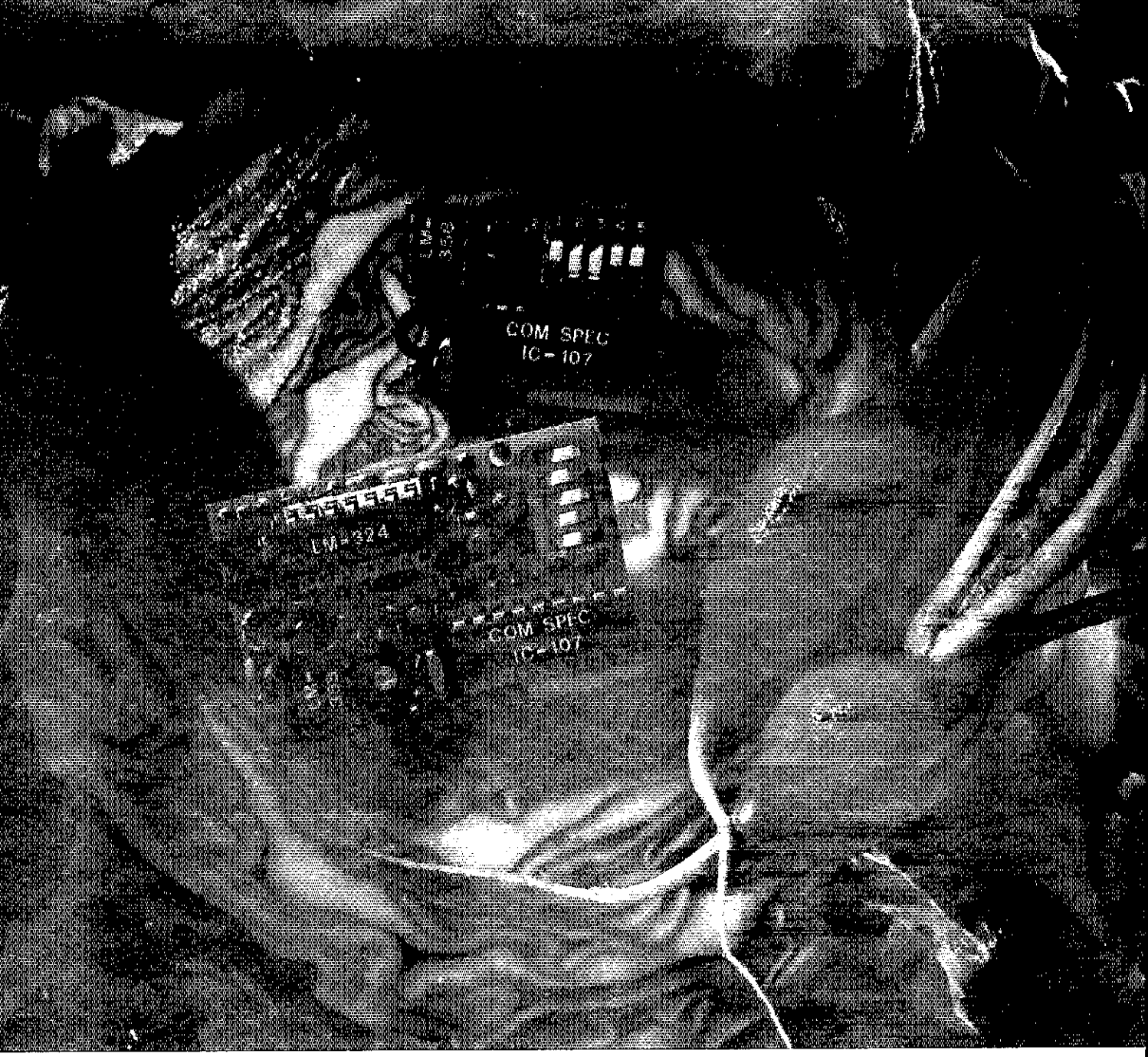
TELETYPE Model 28ASR 3spd, 28 3spd Reperf, Tape-Winder, Unwinder, Paper, Tape. Pick-up $150. K2OMP.

COLLINS must sell-32S-3, 75S-3B, 30L-1, Hy-Gain TH6, tower, more. WA7WOC (Phoenix) 602-867-2378 evenings.

ROBOT 400 SSTV circuit board. Best Offer. Contact Marty, WA2OHM, 813-923-1146.

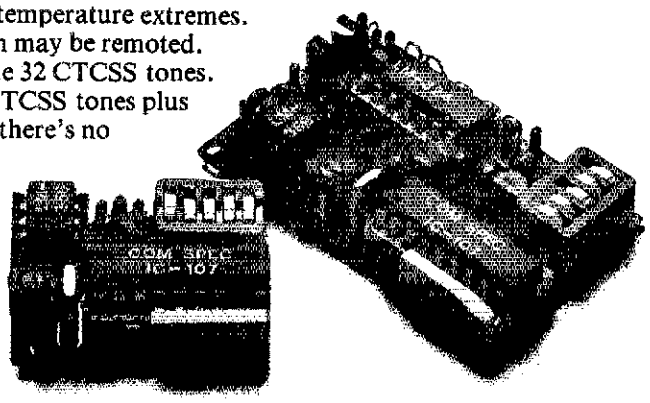
FOR SALE: Yaesu FL-2100B amplifier, factory installed 10 meters, Used very little, $400. Kenwood 2400 H.T., wall charger, ST-1 Debco DC to DC charger, $210. Vista 30 amp. regulated power supply, $90. Send certified check, will ship prepaid. K2QEY - Jerry call days 516-222-1200, nites and weekends 516-785-6297.

KENWOOD TW-4000A, UHF and VHF. With voice synthesizer and 32 tone PL encoder. Like new, $450. WA6CCW, 916-343-4837.



A fresh idea!

Our new crop of tone equipment is the freshest thing growing in the encoder/decoder field today. All tones are instantly programmable by setting a dip switch; no counter is required. Frequency accuracy is astonishing ±.1 Hz over all temperature extremes. Multiple tone frequency operation is a snap since the dip switch may be remoted. Our TS-32 encoder/decoder may be programmed for any of the 32 CTCSS tones. The SS-32 encode only model may be programmed for all 32 CTCSS tones plus 19 burst tones, 8 touch-tones, and 5 test tones. And, of course, there's no need to mention our one day delivery and one year warranty.



COMMUNICATIONS SPECIALISTS

426 West Taft Avenue, Orange, California 92667
(800) 854-0547 / California: (714) 998-3021

SS-32 **$29.95**, TS-32 **$59.95**

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

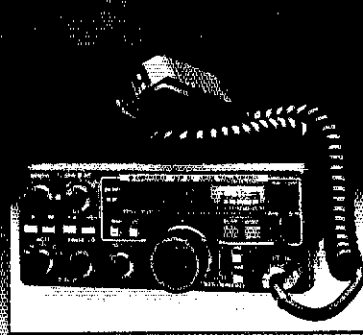
The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/CW transceiver. Available with a 16-key autopatch UP/DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. Selectable tuning steps of 100-Hz, 1-kHz, 5-kHz, 10-kHz.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch, Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan.
- Dual digital VFO's.
- Transmit frequency tuning for OSCAR operations.
- Squelch circuit for FM/SSB/CW.
- Repeater reverse switch.
- Tone switch.
- CW semi break-in; sidetone.
- Compact size and lightweight.
- Covers 143.9 to 148.9999 MHz.
- High performance noise blanker.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- RF gain control. • RIT circuit.

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.



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-780

All mode "Dual-Bander" ...2-m & 70-cm all mode, dual digital VFO's, 10 memories, scan, IF shift...

TS-780 FEATURES:

- USB, LSB, CW, FM all mode, covering the 2-m band (144.000-148.000 MHz) and the middle 70-cm band (430.000-440.000 MHz). UP/DOWN band switch.
- Dual digital VFO's with normal/tight drag switch. VFO steps in 20-Hz, 200-Hz, 5-kHz, or 12.5-kHz, plus "FM CH" channelized tuning. Split (cross) frequency operation possible. F. LOCK switch provided.
- 10 memories include band and frequency data, backed up by internal batteries (not supplied). Battery life exceeds one year. Memories 9 and 10 for priority instant recall.
- Band scan, with selectable 0.5, 1, 3, 5, and 10-MHz scan bandwidth.
- Memory scan selectable for all memories, or 2-m or 70-cm only.
- IF shift circuit rejects adjacent interference.
- High sensitivity and wide dynamic range.
- 7-digit fluorescent tube digital display.
- 10 watt RF output.
- 2-m ±600-kHz TX offset switch with reverse switch.
- Tone switch for optional TU-4C programmable two-frequency CTCSS encoder unit.
- VOX and semi break-in CW built-in.
- FM center-tune meter.
- Noise blanker for SSB, CW.

TS-780 accessories:

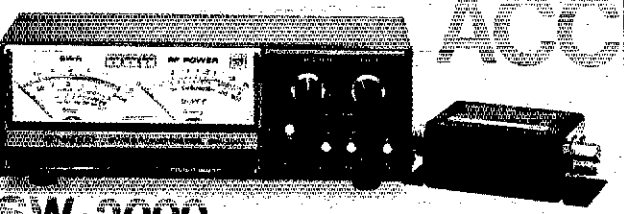
- **TU-4C** programmable two-frequency CTCSS encoder.
- **MC-42S** 500 Ω UP/DOWN han microphone.
- **MC-48** 16-button Autopatch U DOWN microphone.
- **MC-60A** deluxe desk top microphone.
- **MC-80** desk top UP/DOWN microphone.
- **TK-1** AC adaptor for memory back-up.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

ACCESSORIES

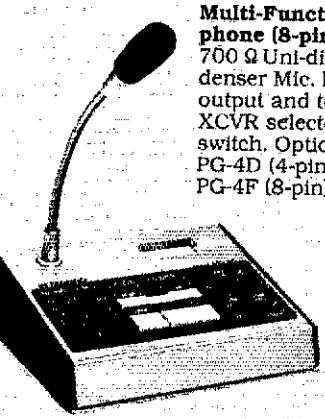


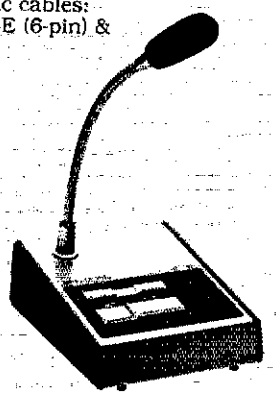
SW-2000

160~6-m 2 KW SWR/PEP-POWER Meter
Up to 3 separate directional couplers may be connected. (One SWC-3 is supplied.) Optional couplers: SWC-2 (2-m/70-cm, 200 W) & SWC-3 (160~6-m, 2 KW).

MC-85

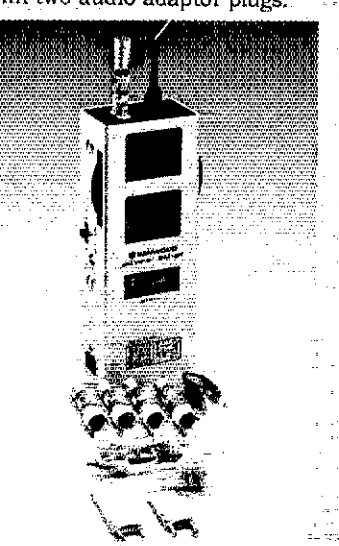
Multi-Function Desk Top Microphone (8-pin)
700 Ω Uni-directional Electret Condenser Mic. Built-in mic-amp with output and tone control, meter, XCVR selector and UP/DOWN switch. Optional mic cables: PG-4D (4-pin), PG-4E (6-pin) & PG-4F (8-pin).





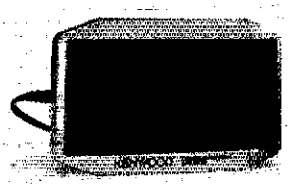
IC-7

ilicro Headphones (16 Ω)
ltra light weight and portable ar-fitting headphones supplied ith two audio adaptor plugs.



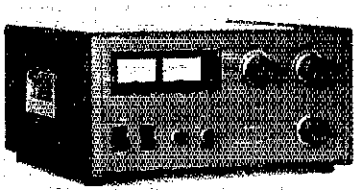
MC-80

Desk Top UP/DOWN Microphone (8-pin)
700 Ω Uni-directional Electret Condenser Mic. with "FLEX" type boom. Built-in mic-amp and UP/DOWN switch. Optional mic plug adaptors: MJ-84 (8p-4p) & MJ-86 (8p-6p).



SP-50

High Quality External Mobile Speaker

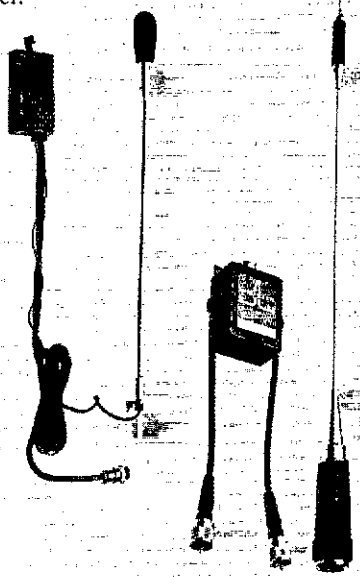


TL-922A

160~15-m 2 KW PEP/1 KW DC Input Linear Amplifier
Pair of EIMAC 3-500Z tubes and excellent IMD characteristics. Perfect safety protection with blower turn-off delay circuit.

MC-55 (8P/6P)

Mobile Microphone (8-pin or 6-pin)
700 Ω Electret Condenser Mic. with flexible boom, and separate STAND-BY box built-in UP/DOWN switch and 5 minute Time-Out-Timer.

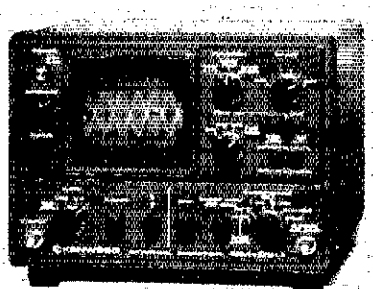


MA-4000

2-m/70-cm Dual Band Mobile Antenna
5/8 λ for 2-m and stacked 5/8 λ for 70-cm. Duplexer is supplied.

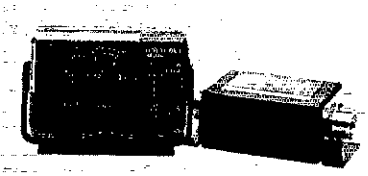
PC-1A

Phone Patch (FCC Part 68 registered)



SM-220

Station Monitor/High-Performance Oscilloscope
Pan-display capability with optional BS-8 (for TS-830S/820S/180S) or BS-5 (for TS-520 series). Transmitted waveforms and/or receiving signal waveform monitor. Built-in 2-tone generator.



SW-100A/B

A: 160-m~2-m. B: 2-m~70-cm. 150 W SWR/POWER/VOLT Meter
Compact design with separate coupler, ideal for mobile use. Built-in 0-20 V voltmeter.

MICROPHONES:
- **MC-60A** Deluxe desk top microphone with UP/DOWN switch. (8-pin) Pre-amplifier. 500/900 Ω
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included). (4-pin) 50 k/500 Ω
- **MC-50** Desk top microphone, 50 k/500 Ω (4-pin)
- **MC-48** 16-key autopatch UP/DOWN microphone. (8-pin)
- **MC-46** 16-key autopatch UP/DOWN microphone. (6-pin)
- **MC-42S** Hand microphone with UP/DOWN switch. (8-pin)
- **MC-35S** Noise-cancelling hand microphone, 50 k Ω (4-pin)
- **MC-30S** Noise-cancelling hand microphone, 500 Ω (4-pin)

MICROPHONE CABLES:
- **PG-4A/4B/4C** For MC-60A/60N4. PG-4A(4-pin)/4B(6-pin)/4C(8-pin)
- **PG-4D/4E/4F** For MC-85. PG-4D (4-pin)/4E(6-pin)/4F(8-pin)

MICROPHONE PLUG ADAPTORS:
- **MJ-48** (4-pin mic to 8-pin XCVR)
- **MJ-84** (8-pin to 4-pin)
- **MJ-86** (8-pin to 6-pin)

HEADPHONES:
- **HS-6** Lightweight headphones
- **HS-5** Deluxe headphones
- **HS-4** Standard headphones

GENERAL PURPOSE AC POWER SUPPLIES:
- **KPS-7A** 13.8 VDC, 7.5A intermittent
- **KPS-12** 13.8 VDC, 12A intermittent
- **KPS-21** 13.8 VDC, 21A intermittent

ANTENNAS:
- **RA-3** 2-m 3/8 λ Telescoping antenna with BNC connector
- **RA-5** 2-m 1/4 λ /70-cm 5/8 λ Telescoping dual-band antenna with BNC connector

Other accessories:
- **RD-20** Dummy load, 50 Ω, DC-500 MHz, 50 W intermittent
- **SP-40** Compact external mobile speaker
- **AL-2** Lightning & static protector, 50 Ω 1 KW output
- **PG-3A** DC line noise filter for mobile

SERVICE MANUALS:
- Available for most transceivers, receivers, and major accessories.

NOTE: Prices and specifications of all Trio-Kenwood products are subject to change without prior notice or obligation.

MM-21

0 kHz-250 MHz Dip Meter
l solid-state and built-in battery.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

JPC/AZDEN®

4000 SERIES
FM TRANSCEIVERS
10 METERS & DOWN

WINTER SALE
PLEASE CALL FOR SPECIAL PRICE

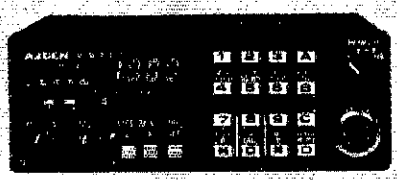
PCS-4000
2-m FM Transceiver

COMMERCIAL-GRADE QUALITY AT AMATEUR PRICES

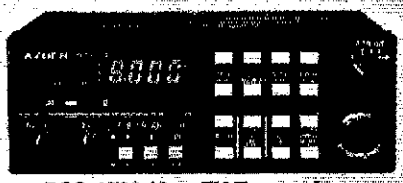
EXCLUSIVE 1 YEAR LIMITED WARRANTY! *COMPARE!*

THE 4000 SERIES

PCS-4300 70-cm FM Transceiver



PCS-4500 6-m FM Transceiver



PCS-4800 10-m FM Transceiver

WINTER SALE
PLEASE CALL FOR SPECIAL PRICE

PCS-300
2m Handheld
FM Transceiver
142-149.995 MHz

- **WIDE FREQUENCY COVERAGE:** PCS-4000 covers 142.000-149.995 MHz in selectable steps of 5 or 10 kHz. PCS-4200 covers 220.000-224.995 MHz in selectable steps of 5 or 20 kHz. PCS-4300 covers 440.000-449.995 MHz in selectable steps of 5 or 25 kHz. PCS-4500 covers 50.000-53.995 MHz in selectable steps of 5 or 10 kHz. PCS-4800 covers 28.000-29.990 MHz in selectable steps of 10 or 20 kHz.
- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
- **TINY SIZE:** Only 2"H × 5.5"W × 6.8"D. COMPARE!
- **MICROCOMPUTER CONTROL:** At the forefront of technology!
- **UP TO 8 NONSTANDARD SPLITS:** Ultimate versatility. COMPARE!
- **16-CHANNEL MEMORY IN TWO 8-CHANNEL BANKS:** Retains frequency and standard simplex or plus/minus offsets. Standard offsets are 600 kHz for PCS-4000, 1.6 MHz for PCS-4200, 5 MHz for PCS-4300, 1 MHz for PCS-4500, and 100 KHz for PCS-4800.
- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
- **TWO RANGES OF PROGRAMMABLE BAND SCANNING:** Limits are quickly reset. Scan the two segments either separately or together. COMPARE!
- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; autoresume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
- **DISCRIMINATOR SCAN CENTERING (AZDEN EXCLUSIVE PATENT):** Always stops on frequency, no matter what the offset.
- **ILLUMINATED KEYBOARD WITH ACQUISITION TONE:** Unparalleled ease of operation.
- **BRIGHT GREEN LED FREQUENCY DISPLAY:** Easily visible, even in direct sunlight.
- **DIGITAL S/RF METER:** Shows incoming signal strength and relative power output.
- **BUSY-CHANNEL AND TRANSMIT INDICATORS:** Bright LEDs show when a channel is busy and when you are transmitting.
- **FULL 16-KEY TOUCHTONE® PAD:** Keyboard functions as autopatch when transmitting (except in PCS-4800).
- **PL TONE:** Optional PL tone unit allows access to private-line repeaters. Deviation and tone frequency are fully adjustable.
- **TRUE FM:** Not phase modulation. Unsurpassed intelligibility and audio fidelity.
- **HIGH/LOW POWER OUTPUT:** 25 or 5 watts selectable in PCS-4000; 10 or 1 watt selectable in PCS-4200, PCS-4300, PCS-4500, and PCS-4800. Transmitter power is fully adjustable.
- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
- **REMOTE-CONTROL MICROPHONE:** Memory A-1 call, up/down manual scan, and memory address functions may be performed without touching the front panel! COMPARE!
- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
- **ACCESSORIES:** CS-7R 7-amp ac power supply, CS-4.5R 4.5-amp ac power supply, CS-AS remote speaker, and Communications Specialists SS-32 PL tone module.
- **ONE YEAR LIMITED WARRANTY!**

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THE FIRST...
FULLY SYNTHESIZED* HF TRANSCEIVER.

EXPERIENCE THE
milspec 1030

NOW AVAILABLE! *MADISON ELECTRONICS* **713-658-0268**
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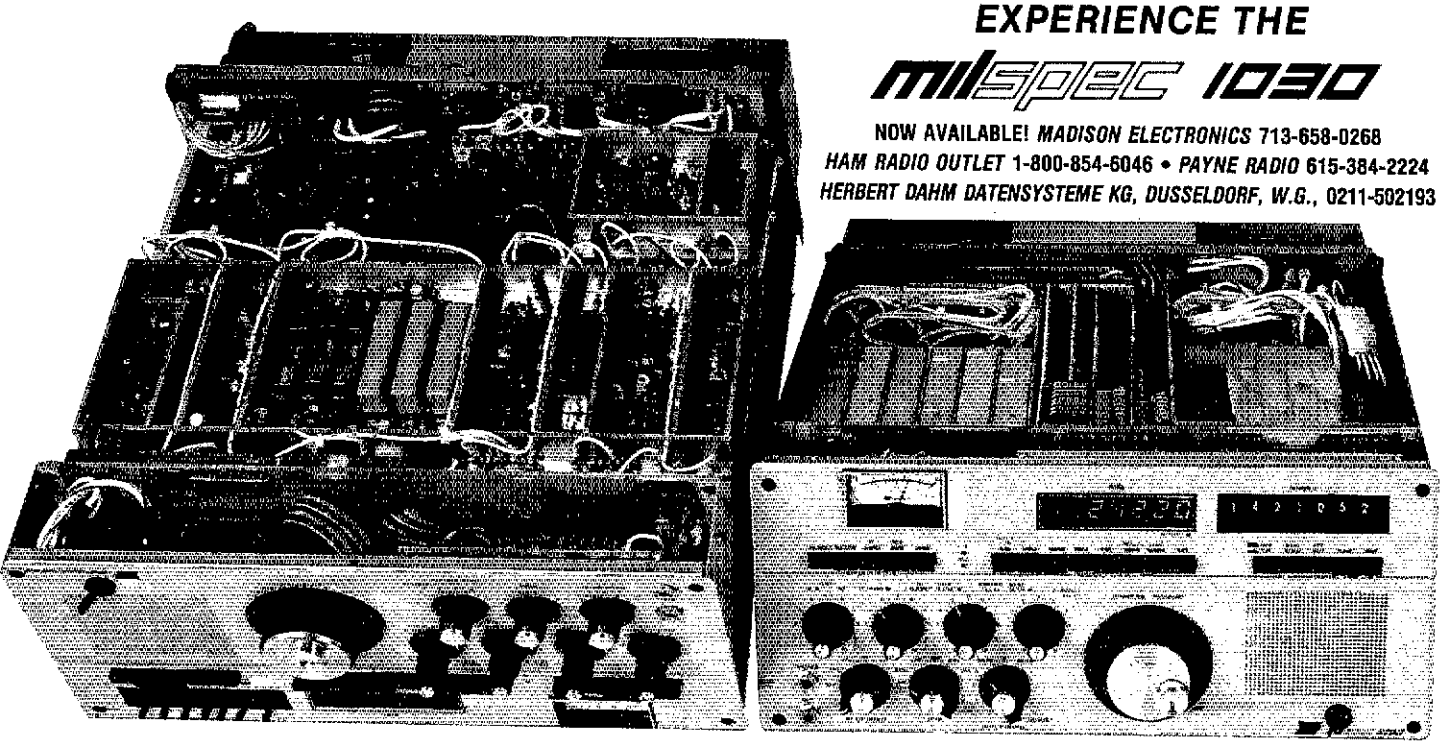
HERBERT DAHM DATENSYSTEME KG, DUSSELDORF, W.G., **0211-502193**



The Signal One Corporation continues its leadership with the introduction of the Milspec 1030, ***A NEW CONCEPT IN SYNTHESIZER TECHNOLOGY. COMBINING THE ENTIRE DIGITAL FREQUENCY CONTROL SYSTEM, INCLUDING PASSBAND TUNING AND BFO FREQUENCIES, WITH THE MAIN TUNING, FREQUENCY PRESET AND REMOTE COMPUTER CONTROL . . .*** we have achieved an ultra fast, real time frequency controlled, high performance, military grade, fully synthesized communications system that will out perform any HF transceiver ever offered in the amateur and commercial market.

Featuring:

●**Fully Synthesized General Frequency Coverage:** 10 kHz — 30 MHz in 1kHz,100 Hz or 10 Hz steps; tunable with encoder or thumbwheel preset; stability of 1 Hz/C°

●**Lever Switch Frequency Pre-Set:** Provides instantaneous band change;sets to within 10 Hz;automatically returns to Tuning A/B. The fastest and most convenient method of frequency entry and recall with additional digital display and memory, **TUNING C**, make this superior to keyboard systems.

●**New Synthesizer Technique:** 120 dB/Hz phase noise close to carrier; extensive CMOS circuitry used for improved spectral purity and great reduction of digital noise—a problem that plagues other HF transceivers causing unwanted mixing products—that insures weak signals will not be covered by internally generated noise due to adjacent strong signals.

●**Real Time Frequency Acquisition:** Not multiplexed; unique synthesizer design allows frequency jumps of 30 MHz in 10 milliseconds, useful in military surveillance applications that demand ultrafast synthesizer switching.

●**Remote Control and Programability:** Permits transceiver use in computer based communication systems. (Optional interface req.)

●**Unequaled Receiver Dynamic Range and Front End Selectivity:** + 20 dBm, 3rd, order intercept point and .25 uV sensitivity offer the best immunity to strong signal overload currently available to the commercial and amateur market. Specially developed high level monolithic, double quad balanced mixers combined with low synthesizer phase noise and up-conversion to 40.455 MHz 1st. I-F thru 8 pole Crystal Cross Mod. Filter with a ± 4 kHz bandwidth, designed for low intermodulation distortion products, makes this performance possible.

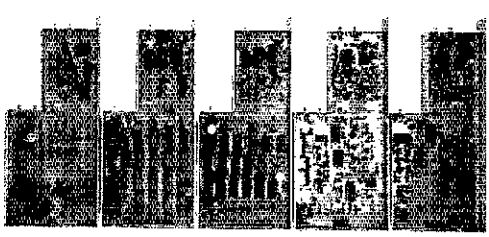
●**Synthesized Passband Tuning:** 1st. and 2nd. I-F tune in 10 Hz steps over ± 5 kHz range with respect to 1st. and 2nd. I-F filter passbands, a unique dual passband feature for maximum interference rejection. Controlled by tuning A/B.

●**Collins/Rockwell® Mechanical Filters:** For maximum selectivity and ultimate rejection performance. Demanded in most military/commercial applications. 2.1 kHz (USB/LSB), each selected for optimum performance on SSB, cascaded with front end VHF 8 pole crystal filter, active I.F. notch filter, passband tuning and noise blanker deliver 16 pole, 1.4:1 performance (6/60 dB) and add up to the most powerful anti-QRM system available.

●**Noise Blanker:** Pre I-F blanker with adjustable threshold and 80 dB dynamic range; gating effectively placed in receiver RF path and triggered by pulsed noise such as over-the-horizon radar.

●**I-F Notch Filter:** Active 300 Hz notch in 2nd. I-F. Adjustable ± 1.5 kHz with 40 db rejection. Receiver AGC not affected by notched-signal.

●**High Power Transmit System:** Motorola® high power final amplifiers with 150 watt CW/SSB output or 200 watt option.



●**RF Speech Processing:** Clipped transmit RF signal is passed through mechanical and crystal filters for unequaled SSB talk power and elimination of unwanted intermodulation distortion products. This is a preferred process and considered superior to audio type processors.

●**OSK CW Full Break-In:** Vacuum relays and 200 Hz filter offer a superb full break in CW System.

●**Construction:** All circuit boards, including synthesizer modules, plug-in; ribbon cable interconnection and Minisert® sockets ,or transistor and IC replacement insure ease in self servicing; military and computer grade components used exclusively.

RECEIVER PERFORMANCE

Sensitivity: .25 uV (—118 dBm or better) for 10 dB S:N ratio at antenna input 1.6-30 MHz (2.1 kHz width in SSB).

Selectivity: 1st. I-F: 40.455 MHz ± 4kHz @ -6 dB, 1 dB ripple, 8 pole crystal filter.
2nd. I-F: 455 kHz mechanical filters, @ 3 dB.

Standard:	Optional:	
USB 2.1 kHz	CW2 375 Hz	AM 5.8 kHz
LSB 2.1 kHz	CW2 200 Hz	AFSK/LSB 300 Hz
CW1 1.9 kHz	(extra steep skirts) (CF high tone pair)	

Mixers: Specially developed, high-level, monolithic double balanced mixers with hot carrier diodes used in first and second mixer stages.

Intermodulation Distortion: (typical) 3rd, order input intercept point + 20 dBm for separated signals of 20 kHz;
2nd, order IMD is —80 dB.

Cross Modulation: Unmodulated wanted signal of 100 uV together with a modulated (30% at 1 kHz) unwanted signal of 100 mV spaced 30 kHz apart produces 10% Cross Mod.

Blocking: Attenuation of a wanted AF signal of 50 uV and caused by an unmodulated unwanted signal of 1V spaced 30 kHz apart then produces 3 dB blocking.

IF and Rejection: 80 dB

Synthesizer Phase Noise: Mean S/N ratio of 1st. L.O. (typical, reference to 1 Hz bandwidth); 90 dB measurement 1 kHz from carrier; 135 dB measurement 20 kHz from carrier.

TRANSMIT PERFORMANCE

Power Amplifier: Solid state, broadband 1.6 — 30 MHz 150 W or 200 W (high power option) CW/PEP output keydown all bands and modes. Automatic power cutback under excessive VSWR conditions. Heavy duty Hypersil® transformer for exceptional regulation and power. For continuous full power "key down" operation, blower option required.

Third Order Intermodulation Distortion: 25 dB below each of two tones at full PEP output.

Unwanted Signal Suppression: Carrier: —50 dB min; undesired sidebands, 1 kHz —55 dB min; harmonic (all: —40 dB 10 log of mean power output; mixer products: —50 min.

GENERAL

Frequency Coverage: 10 kHz to 29.9999 MHz receive; 10 kHz to 1.6 MHz at reduced sensitivity; 1.6 to 29.9999 MHz transmit.

Frequency Control: Memory provides **split tuning A/B** — using opto-electrical shaft encoder tuning in increments of 1 kHz 100 Hz and 10 Hz (180 kHz, 18 kHz, and 1800 Hz/360° respectively), selectable with front panel push buttons. **Tuning C** — preset frequency settable to 10 Hz with front panel lever switch; frequency entered by set button,display and BCD registers updated.

Memory:— frequencies stored in any of 9 memories, recalled for Tuning A/B frequencies with read-push buttons; frequencies from Tuning A/B or C entered into memories with Auto Write or Write push button.

Stability: 1 ppm/month, 1 Hz/C°; 1 ppm after 15 min. warm-up at 25°C typical. For more demanding requirements, high stability reference oscillator option available — will meet military and commercial standards for specialized data transmissions.

Modes: USB, LSB, CW, AFSK, AM — receive. USB, LSB, CW AFSK/LSB — transmit

Remote Computer Control: via rear panel 60 pin connector
1. BCD (1-2-4-8) 12 V CMOS parallel command for:
A. Frequency / handshake
B. Mode detection
C. Bandpass tuning
D. BFO tuning
2.Pulse input to drive shaft encoder counters
3.AGC output
4.Receiver mute command

Power Supply: Built-in heavy duty AC/DC supply. 115/230V ± 5%, 50 to 400 Hz. 12 to 15 VDC at 40 AMPS max., negative ground. 120 W max. in receive, 600W peak at full transmit input. Thermal and current overload protection.

Size: 16.2" wide; 7.8" high; 17.8" deep. **Weight:** 50 lbs.

Specifications are subject to change without notice or obligation.

Black Canyon Industrial Park/8146 N. 23rd Ave. Phoenix, Arizona 85021 (602) 995-0608

signal/one®

S-100 computer boards: 2 Ithaco audio 8K memory: $55 ea. Morrow cassette interface: $50. Vector Graphic 16K memory kit less 4114 RAM's: $45. SSM VB-1B memory mapped video: $45. Data Vector 16K EPROM including 12 2708's: $65. Bill Elsinger, AA7X, 11510 Alejandro, Boise, ID 83709, 208-376-2378.

SALE: 5el 10M beams $10 each. 2M 2 pole ant. $10, 2M 24 el DX array $25. PE-75 $50. p/u Atlanta. Heath SB303 Rx $150. HW-18 (4 MHz) w/ps $150. Eico TX-62 $35. FOB Atlanta. K4SKP Mac 404-434-3295 after 6 M-F.

HELP! Need LMO for SB-300 also Split LMO for SB-102. Steve, KØSR, 243-14th Ave., So., South St. Paul, MN 55075. 612-451-9504.

SELL 2M Kenwood TR-2400 leather case, chargers, VoCom 2M amp, new 6/83. All $200. KB9CI, 414-786-7027.

SELLING: HW-12, 80 meter tmcvr, $85 HW-22 40 meter tmcvr, $85 ps $35, HP-10 dc ps $50. Swan 500 & ps $265. XTL calibrate (Heath) $15, or offer on any. Bob - WBØVGX, 612-364-5224.

HEATH HX1681 xmtr mint $210, manuals. W2AWM 201-899-1981.

KENWOOD R-1000. Bought new 1983. Perfect. $319 prepaid. (replaced with TS-430.) Pat Matthews, White Oak, SC 29176.

KENWOOD TS-620S, mint, $495, W9TJH, 219-884-5519.

TS830S clean and like new $850. W1MG. Tel. 1-617-987-5075.

FILTER CAPACITORS, Cornell-Dubilier, 9 MFD - 7,500V, new - $65 ea. A. Emerald, 8956 Swallow, Fountain Valley, CA 92708.

MADISON Surplus Goodies: Kenwood VFO700 (TS700S) $50; BO9 $30; Miller AT2500 $699; KWM380 blower $195; Drake TR5 $400; RG14 (40' max) 50¢/ft; RV75 $190; RV7 $150; 550CW $385; Yaesu FV107 $100; FRA7700 $39; FRV7700 $89; FV707DM $229; NC7 $49; FT790R $339; FT730R $349; FL2010 $69; NC1A $30; SP107 $20; Icom EX1 $30; IC451A-call; RF Powerlabs V71 2Mbase amp $400; V76/Fan 6M amp $400; demo IC740/220V $800; used, guaranteed: Elmac 3CX2500 $250; 4100Ø $150; 4125 $35; VFO520S $100; IC290H $395; IC290A $295. Prices FOB Houston, all guaranteed. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-6580268 (inquiries) 1-800-231-3057 (orders). Mastercard/Visa/COD.

WANTED: Crank Tower, 50-60 ft. Call 201-526-0781, Herb Krumich.

MUST SELL complete station original owner minimum use like mint w/covers Drake C-line T-4XC R-4C MS4 W4 w/250 CW xtal W/10 meter rec/xmt CW xtals w/AM xtal D104 mike mint unused $825. UPS WA2SRO 914-657-6534.

TWO Elmac 4-400 tested - $30 each. One Penta 4-400 new - $45. 1 box - you ship. N4JHY 803-546-3626.

FT101ZD, narrow CW filter, factory realigned with new finals, $550. WØVTP, 402-391-0188.

COLLECTORS ITEM (scarce), 1937 RCA ACT-40 amateur transmitter and manual. 160 thru 20 meters, rack mounted in 30 inch cabinet, nice condition, spare tubes. No shipping, must pick up. Make offer. W8ZJQ 216-324-4914.

ULTIMATE Transmatch UTC-2000A mint unused w/cover $95. UPS WA2SRO 914-657-6534.

ICOM 720-A, ICP15 power supply, SM5 desk mic, extras. Under warranty. Used few hours receiving. $925. No delivery. Wanted: Icom IC751 w/wo accessories. Yilmaz 212-684-4703, 150 East 39th Street, New York, NY 10016.

MUST SELL: Collins 75S3B $365. 75S3 $285. 75S1 $195. 32S1 $195. 32S3 $285. 516F2 $125 with units. 312B4 $160. Icom 701 $475. Galaxie V ac $150. Hallicrafters SR500 $195. SR160 $185. Oldies: S40 $55. SR20R $55. SX85 $55. NC173 $88. NC98 $75. DX40 $45. DX35 $45. VF1 vfo $25. WRL VFO 10-80 $50. 6M $50. 301 rcvr $125. HQ145 $125. HX50 $125. 4-1000A tube $88. RF deck unfinished $150. T4X $150. AC4 $85. N4LX 251 Collier Ave., Nashville, TN 37211. Phone 615-833-2724.

SWAN 500C w/117C ac/ps spkr $225. KC3LC Frank Lanzer, 1751 Linkwood Ln., Crofton, MD 21114, 301-721-9133.

FOR SALE: Drake R4B-T4XB AC4-MS4 - Immaculate $495. Local sale preferred. Will demonstrate HY-KI2E-CL8-3219.

ROBOT 400 slow scan. Mint, used approx. 6 hrs. Original carton. $285. Joe K3CQY 215-588-1338.

KENWOOD TS520S $395. Perfect, will ship UPS. Call Frank N2EGP after 6 PM 609-645-1969.

WATERS 349 Channelator (KWM2/2A), $75. Cushcraft 3 element 20M (new), $100. F455N20, F455N80, F455N160 suitable for 75A4/S-line, $45 each. 51S1 $700. KWM2 (r/e), 516F2, $575. 75S3B, 32S3, 516F2, 312B4, $775 (w/e); $975 (r/e). 312B5, $275. KWM2, PM2 $450. 75A4 $215. TR7500 $125. IC2AT (new) $219. James Craig, 32 Birchwood Dr., Rye, NH 03870. 1-603-964-6658.

NEW Elmac 3-500Z. $80. Limited quantity. W1TAK 617-358-7173.

WANTED: 800 ML scanner option for Clegg FM-28. KC3LC Frank Lanzer, 1751 Linkwood Ln., Crofton, MD 21114. 301-721-9133.

SELL: Robot 400 board - $175. Video Modulator - $20. Kantronix CBM64 Hamtext - $60. VIC20 Hamsoft - $30. VIC-1541 Disk Drive - $160. All new. WA5QAP 318-824-7111.

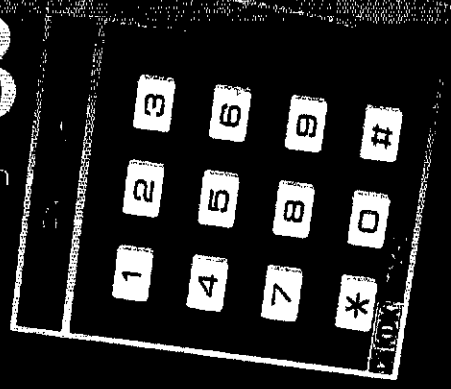
WANTED - BFO can for Hammarlund HQ-129X, must be intact, please write Norm Gender, KA9EZA, 6345 N. Magnolia, Chicago, IL 60660.

HAMMARLUND HQ-180 receiver $100, Heathkit SB200 linear $200, Heathkit DX60 transmitter $25. Manuals included. Stead, K3PMH, 814-498-2687. RD1, Kennerdell, PA 16374.

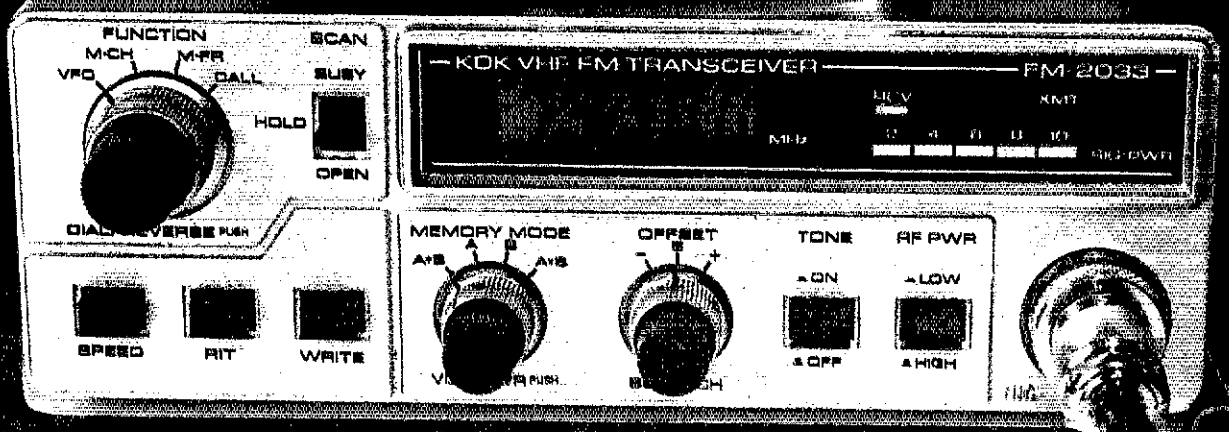
ICOM IC-740, PS-15, FL-44A. All in good condition $775. WB8HIW 216-733-5978 or 216-784-3506.

FM-2033

2m C-MOS MICROPROCESSOR CONTROLLED
DIGITAL SYNTHESIZER FM TRANSCEIVER



Shown actual size.



6 in 1

Exclusive KDK 6 in 1 control is now joined by 6 exciting new KDK features:

NEW! ✓ Soft Orange background Liquid Crystal Display (LCD) for direct sunlight viewing plus lighting for night viewing.

NEW! ✓ Offset (+, −, S) stored in memory along with the frequency information.

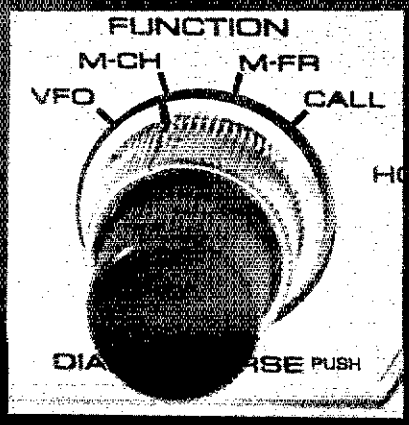
NEW! ✓ Frequency coverage of 142.000 to 149.995 MHz for M.A.R.S. and C.A.P. usage.

NEW! ✓ Chrome front panel with accent knobs and lighter color on case to match today's auto decor.

NEW! ✓ Scan for signal now has 3-second delay before resume after loss of signal.

NEW! ✓ Repositioned controls for more convenient operation.

The Exclusive KDK 6 in 1 Knob.



- Only memories with data are scanned; blanks are skipped.
- Complete memory back-up with power unplugged. Re-chargeable Ni-Cd with capability of several months back up of memory.
- Single frequency sub-audible tone generator included as a standard feature.
- Tone unit switch on front panel to prevent "humming" on the wrong channel.
- Repeater input monitor capability with the push of a single momentary switch.
- Solid-state level meter for both output level and input level monitoring.
- User programmable initial characteristics for band limits, channel step size, etc.
- Odd repeater splits can be handled with the memory in the A×B mode.
- Programmable band-scan limits are stored in protected RAM.
- Modular construction with pluggable interconnecting wiring.
- Touch-Tone® microphone TM-2 is standard with each radio.
- Change channels, skip-scan or step up and down the band from TM-2 microphone.
- Audible beep for end-of-band or last memory location for better "eye's off" operation.

The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the radio user. The KDK '33' series of transceivers provides excellent readability in any lighting condition for either the operating frequency or the memory channel number in use. The use of a warm orange background for the LCD displays improves the readability by providing an easy on the eyes contrast improvement.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall of the desired repeater offset from memory, the FM-2033 continues to provide relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end of memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142 - 149.995 MHz to operate in balance with most repeater signals and provide quieting on the simplex operations. M.A.R.S. (NAVY too!) and C.A.P. frequencies are also accommodated.

You want convenience, reliability and easy operation for your mobile station and a tough to beat dollar value. Check out the FM-2033 at your local dealer TODAY or send a QSL for specifications.

® Touch Tone is a Registered Trade Mark of American Telephone and Telegraph.

Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

KDK

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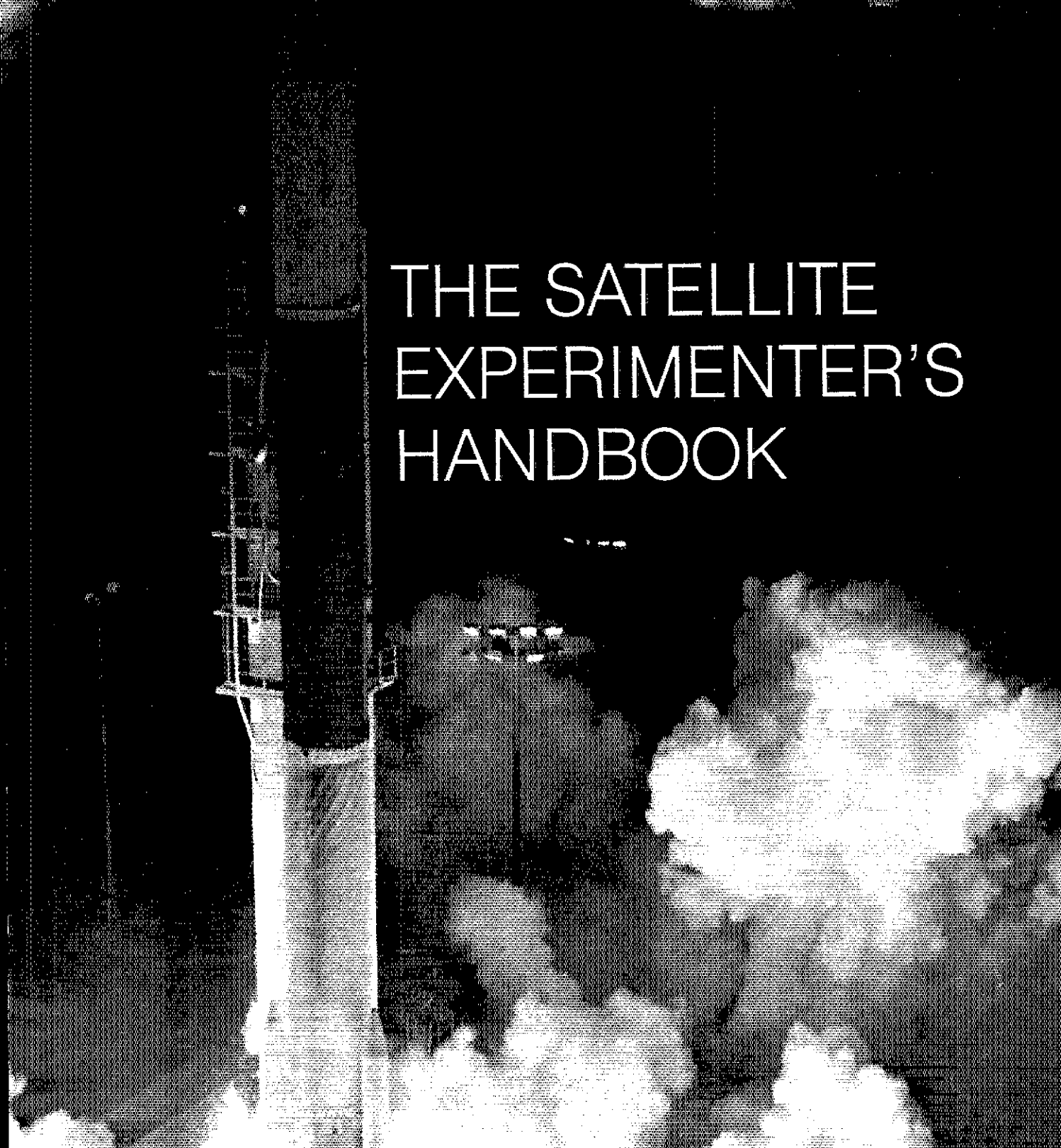


THE SATELLITE EXPERIMENTER'S HANDBOOK

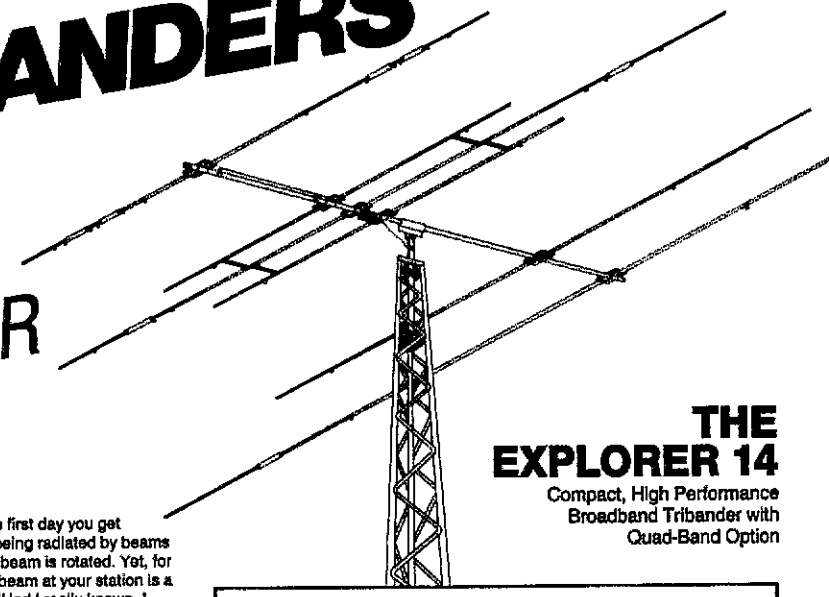
A Guide to Understanding and Using Amateur-Radio, Weather, and TV-Broadcast Satellites

PUBLISHED BY THE AMERICAN RADIO RELAY LEAGUE

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.

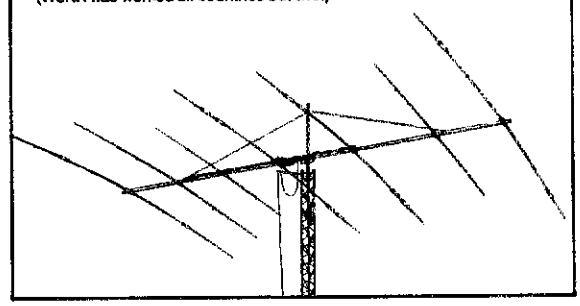
Congratulations!

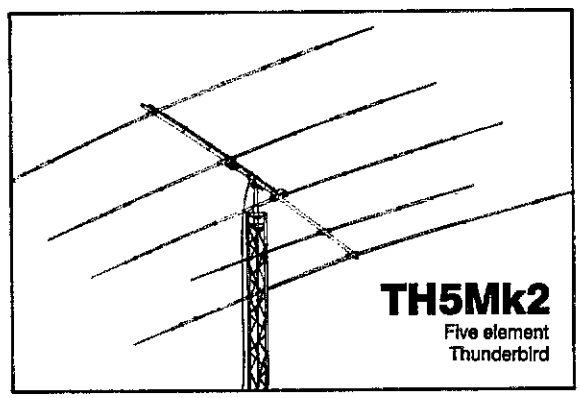
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

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SB201 1200-watt linear $200 & shipping. MFJ-984 antenna tuner. Mint, $200 & shipping. Bob, KD5ZT, 4622A 34th, Lubbock, TX 79410.

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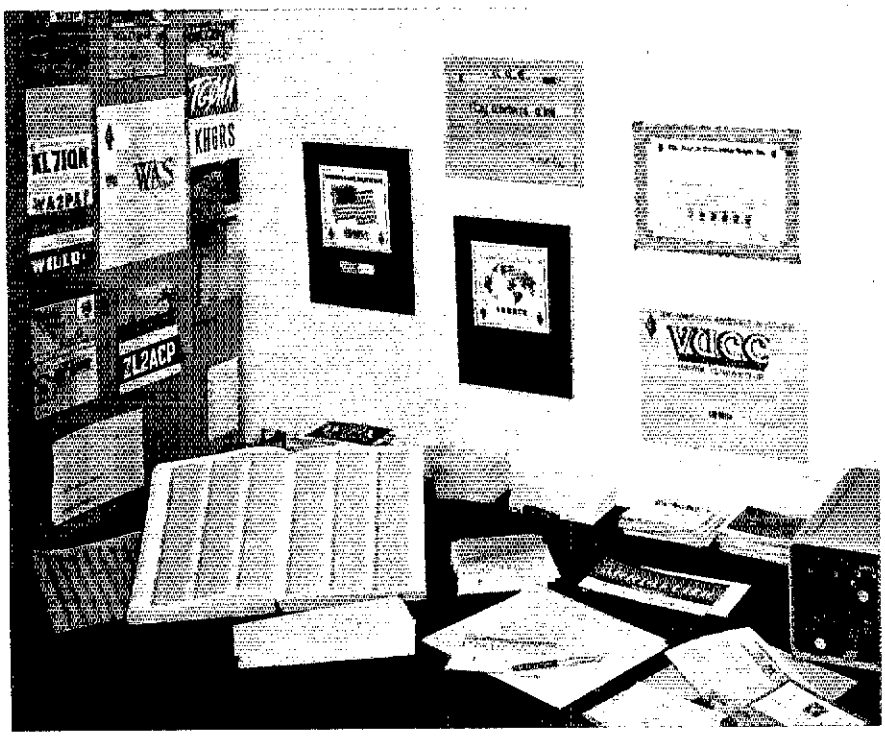

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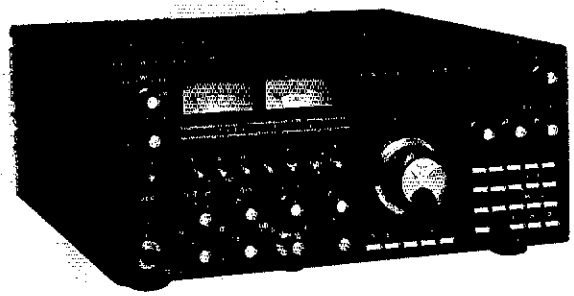

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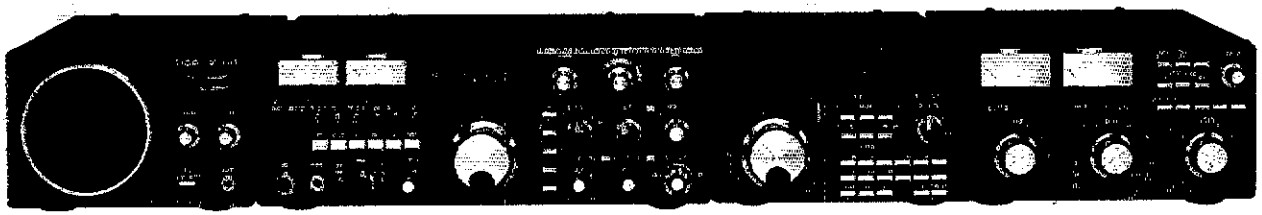

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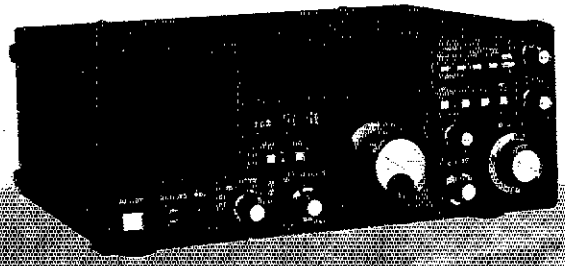

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All mode synthesized general coverage receiver—perfect for serious shortwave listening. Options include 12-channel Memory Unit, VHF Converters, Antenna Tuner and an Active Antenna.

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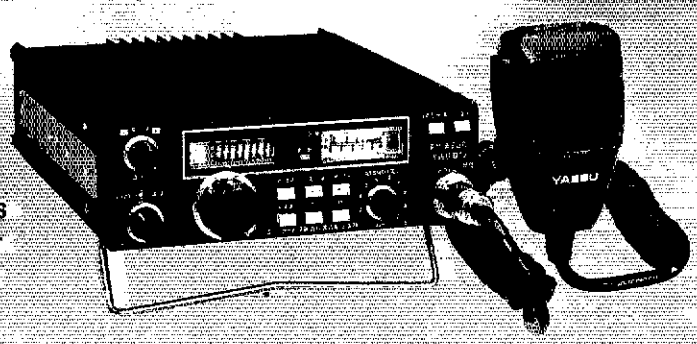

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Compact FM mobiles engineered for reliability and convenience. The perfect balance of current drain and power output for all mobile needs. Built to withstand years of punishing mobile use.

FT-230R 25W RF: 143.5–148.5 MHz
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FT-690R 2.5/1W RF: 50–54 MHz
FT-290R 2.5W/1W RF: 143.5–148.5 MHz
FT-790R 1W/200 mW RF: 430–440 MHz

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FT-780R 10W RF: 430–440 MHz

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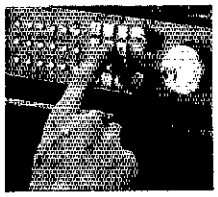

The Bearcat® DX1000 makes tuning in London as easy as dialing a phone.

Direct access keyboard tuning brings a new level of simplicity to shortwave radio. With the *Bearcat® DX 1000,* dialing in the BBC in London is as easy as dialing a telephone. And you can switch from the BBC to Peruvian Huayno music from Radio Andina instantly. Without bandswitching.

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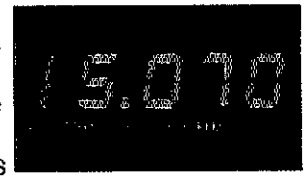

The digital display measures frequencies to 1 kHz, or at the touch of a button, doubles as a two time zone, 24-hour digital quartz clock. A built-in timer wakes you to your favorite shortwave station. Or, it can be programmed to activate peripheral equipment like a tape recorder to record up to ten different broadcasts—any frequency, any mode—while you are asleep or at work.

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For the name of your nearest retailer dial toll-free... 1-800-SCANNER.

Frequency Range: 10 kHz to 30 MHz continuously. **Tuning:** Direct keyboard entry, selectable 3 or 24 kHz per revolution knob tuning, or manual step tuning in selectable 1-99 kHz steps. **Sensitivity:** 1.0 μV AM, 0.5 μV CW/SSB/FM, 1.6-30 MHz. **Image and IF Rejection:** 70 dB or more. **Memory:** 10 frequency capacity. **Frequency Stability:** Better than 100 Hz after warm-up. **Modes:** AM/LSB/USB/CW/FM. **AGC:** Selectable Fast/Slow release times. **Filter Bandwidths:** 2.7 kHz, 6 kHz and 12 kHz. **Filter Selection Independent of Mode.**

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TELREX ANTENNAS for a quality and top performance 10,15,20,40,80 M, easy to install and top performance "Inverted-Vee" Dipole, Model MIV4KWP/5. Price $145 plus U.P.S. ($5.25 East, $6.25 West of Miss.). Phone 201-775-7252.

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SELL: Drake gear. C-4 console, FS-4 synthesizer, L-4B amplifier with new Eimac tubes never opened. K5UR, 501-988-2527.

TS830S, KB1, service manual, $650. VFO230-$185. YK88C, YG455C, $100. TS700S, RSK7, ME3, MC305 $375. K8IFF 313-676-2872.

AMPLIFIER WANTED: Collins 30L-1, National NCL-2000, or Heathkit SB-220. Contact George Hawrysko, K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

ROSS $$$$ New February Specials: Callbook 1984 U.S. $16, Foreign $15, Collins HF-380 make offer KWM-380 $2890. If this months special is not what you are looking for send Call Letters name & phone # for personal price quote. Over 5,000 ham related items stock. Icom # IC-02AT $314.90, IC-745 $859.90, IC-R70 $569.90, Kenwood # TS-530SP $649.90, TS-530S $589.90, TR-9000 $379.90, TS-780 $839.90, TR-7950 $349.90, Yaesu # FT-708 $259.90, FT-757GX $$$ phone, FRG-7700 $379.90, FRG-7 $239.90, Used Kenwood TS-520 $429.90, TS-520S $489.90, TS-120S $449.90. Prices cash, FOB Preston. Closed Monday at 2:00 Ross Distributing Company, 78 South State, Preston, Idaho 83263 (208)852-0830.

SELL: Collins crystal pack, 312B-4 round. K5UR, 501-988-2527.

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WANT Sideband Engineers SBI-LA linear amplifier Callbook address or 619-244-5380. Bill, 18390, Birch St., Hesperia, CA 92345.

DRAKE TR-7 with NB, AUX-7, 300/1.8/6K filters and FA-7, PS-7 25-amp supply with FA-7. SP-75 speech processor. RV-7 Remote VFO. Desk mike. Package $1125 prepaid. I ship. Fred Naumann, Box 1081, Hailey, ID 83333. 208-788-4540.

SELL: 1938-9 Silvertone (Howard) communications receiver, $135; Hammarlund HQ-150, $135; Viking I, VFO, $75; Viking II, VFO, $75; Valiant I, $150; Valiant II, Johnson SSB, $275; CE20A, Phasemaster VFO, $90; SX101, speaker, $100; 75A3, .8, 3.1, $150; 75A4, 3.1, no. 1100, $175; Lysco Transmaster, $50; Dentron 160 XV, $95; Nye 500W Matchbox, SWR, $95; Clipperton L, 10M, $425; Mint Yaesu FT101E, $425; BC610 I, $225; Hallicrafters SR-160, AC, DC, $100; 180 foot BC tower, $100; HB 304TL linear QST, $225; HB100TH linear, $75; H.B. linear, Pair 1000T's, $2500; F.O.B., Want CX11A, Milspec, Telrex 40M, Alpha 77SX, RG17, K8CCV, 216-427-2303, weeknights, 6-9 P.M. E.S.T.

WANTED - RME 4301 Side Band Selector. Also need Multi-Eimac power supply. PS-2V for AF-68 xmtr. KB6BMS, P.O. Box 1240, Mendocino, CA 95460.

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WANTED: Hallicrafters SX100, SX88 any condition. WA3WHR 4109 Queen Mary Drive, Olney, MD 20832.

MODEL 55 printer, ST-6 terminal unit. RTTY extras. $125. Pick-up only. K3BW, 215-754-7349.

NEED an exciting DX presentation for conventions or banquets? See Nov '83 QST, page 203. Now booking summer 1984. WA4WME.

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WANTED for summer of 1984: instructors in electronics, ham radio, and computers. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

COUNSELORS: Connecticut brother-sister camp. Completely equipped with ham radio station. Program includes electronics, kit building, code and communications. June 25 - August 22. Send resume: Lloyd Albin (N2DMQ) Ken-Mont and Ken-Wood Camps, 2 Spencer Place, Scarsdale, NY 10583.

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ANTENNA/TOWER SALE!

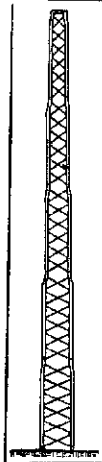
BUTTERNUT ELECTRONICS CO.

- Designed to operate on all Amateur Bands at "FULL" Legal Power Input.
- Automatic Band Switching (80/10 meters).
- Automatic Band Switching (160/10 meters) with optional model TBR-160 HD.
- IN STOCK for IMMEDIATE DELIVERY & LOOK at very SPECIAL PRICES . . .
- New Model HF6V $129.00
- New Model TBR-160HD (High Power 160 meter Base Resonator) $49.00.

Model RMK-11 (roof mount kit with multiband radial kit $39.00. Model STR-2 (Stub Tuned Radial Kit) $29.00.

Delivery Anywhere In The Continental USA At No Additional Cost. (Free Shipping On Butternut Accessories Also When Purchased With Antenna.)

UNARCO-ROHN Self Supporting Towers — On Sale!

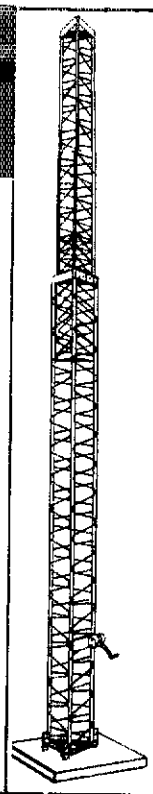


Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And — Save even more — include antenna and roter of your choice with the order and we will ship them along freight prepaid also! How's that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	289	24	313
HBX48	48 ft	10 sq ft	303	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
HDBX40	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXB8	429	30	459



hy-gain CRANKUP SALE!

All Models Shipped Factory Direct— Freight Paid*!

Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting— no guys needed

Model	Height	Load	Sale Price
HG37SS	37 ft.	9 sq. ft.,	$ 967
HG52SS	52 ft.	9 sq. ft.,	$ 959
HG54HD	54 ft.	16 sq. ft.,	$1499
HG70HD	70 ft.	16 sq. ft.,	$2399

Masts—Thrust Bearings—Other Accessories Available —Call! Prices Shown Are Your Total Delivered Price In Continental U.S.A.!

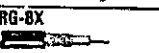
RG-213U

$.29/ft $279/1000 ft Up to 600 ft via UPS

- RG-213/U—95% Bare Copper Shield
- Mil-Spec Non-contaminating Jacket for longer life than RG8 cables.
- Our RG-213/U uses virgin materials.
- Guaranteed Highest Quality!

RG-8X

$.19/ft $179/1000 ft

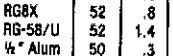


- RG8X—95% Bare Copper Shield
- Non-contaminating Vinyl Jacket
- Low Loss Foam Dielectric

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™ $1.49/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™	$22	$22	$22	$22
⅞" Heliax™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 . . . . $1.25 Nickle PL259 . . . . $.90
UG21B N Male . . $2.95 UG23D N Female . $2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld . $.12/ft 14 Ga. Copperweld . $.10/ft
14 Ga. Stranded . . . $.10/ft 18 Ga. Copperweld ¼mi $30
450 Ohm H.D. Line . $.16/ft H.D. End insulators . $2/ea
Van Gorden 1:1 Balun $11
Van Gorden Center Insulator $6

HUSTLER

6BTV 80-10 mtr Vert . $129
4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert . $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base . $119

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander . . . $219 A4 4-el Tribander . . . $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit . $75

HF MONO-BAND ANTENNAS

10-3CD	$ 95	10-4CD	$109
15-3CD	$119	15-4CD	$129
20-3CD	$199	20-4CD	$279
40-2CD	$289	D40	$149

VHF/UHF BEAMS

A50-5	$ 79	617B	$199
214B	$ 79	3219	$ 95
220B	$ 95	424B	$ 79

OSCAR/TWIST ANTENNAS

A144-10T	$ 52	A144-20T	$ 75
A147-20T	$ 63	416TB	$ 59
A14TMB	$ 29	PS4	$ 69

VHF/UHF FM ANTENNAS

A147-4	$ 29	A147-11	$ 49
214FB	$ 79	228FB	$219
A449-6	$ 29	ARX2B	$ 39

HY-GAIN

Broadband 3-el Triband Beam Explorer-14, In Stock—$289

QK710 30/40 mtr. Add-On-Kit	$79.00
V2S 2-mtr Base Vertical	$39
TH5MK2S Broad Band 5-el Triband Beam	$389
TH7DXS 7-el Triband Beam	$439
TH3JRS 3-el Triband Beam	$179
TH2MK3S 2-el Triband Quad	$159
HY-QUAD 2-el Triband Quad	$299
402BAS 2-el 40-mtr Beam	$219
205BAS 5-el 20-mtr Beam	$329
155BAS 5-el 15-mtr Beam	$189
105BAS 5-el 10-mtr Beam	$129
204BAS 4-el 20-mtr Beam	$249
203BAS 3-el 20-mtr Beam	$149
153BAS 3-el 15-mtr Beam	$89
103BAS 3-el 10-mtr Beam	$69
QB1015BAS 3-el 10/15 mtr Beam	$179
64BS 4-el 6-mtr Beam	$59
66BS 6-el 6-mtr Beam	$119
18HTS 80-10 mtr Hy-Tower Vertical	$429
LC-160 160-mtr Coil Kit for 18HTS	$39
214 14-el 2-mtr Beam	$39
2BDQ 80/40 mtr Trap Dipole	$59
5BDQ 80-10 mtr Trap Dipole	$119
BN86 80-10 mtr KW Balun W/Coax Seal	$19

MOSLEY

CL-33 3-el Triband Beam	$279
TA-33 3-el Triband Beam	$249
TA-33JR 3-el Triband Beam	$189
TA40KR 40mtr Kit for TA33	$119

Tri-Ex TOWERS SPECIAL PRICES! SAVE$$!

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	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$6200	Call

ALPHA DELTA COMMUNICATIONS

Transi-Trap™ Surge Protectors—In Stock Now!

Model LT 200W UHF Type . . $19
Model HT 2KW UHF Type . . $29
Model LT/N 200W N Type . . $39
Model HT/N 2KW N Type . . $44
Model R-T 200W Deluxe . . . $29
Model HV 2KW Deluxe $32

KLM

KT34A 4-el Broad Band Triband Beam	$339
KT34XA 6-el Broad Band Triband Beam	$489
80m-1 80-mtr Rotatable Dipole	$469
40m-1 40-mtr Rotatable Dipole	$179
40m-2 2-el 40-mtr Beam	$309
40m-3 3-el 40-mtr Beam	$339
40m-4 4-el 40-mtr Beam	$549
20m-6 6-el 20-mtr Beam	$689
15m-6 6-el 15-mtr Beam	$439
10m-6 6-el 10-mtr Beam	$259
10-30-7LPA Log Periodic Beam	$639
2m-13LBA 13-el 2-mtr Beam	$79
2m-14C 14-el 2-mtr Satellite Antenna	$89
435-18C 435 MHz Satellite Antenna	$65
432-16LB 16-el 432 MHz Beam	$69

MINI-PRODUCTS HQ-1 only $159!

Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating)	$109
Alliance U100 (for small beams & elevation)	$49
Telex HAM 4 (15 sq ft rating)	$199
Telex Tailtwister (20 sq ft rating)	$249
Telex HDR300 Heavy Duty (25 sq ft rating)	$479
Kenpro KR-500 Heavy duty elevation rotor	$189.00

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)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating)	$.13/ft
1/4" EHS Guywire (6000 lb rating)	$.16/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating)	$.12/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)	$.35
1/4" CCM Cable Clamp (1/4" Cable)	$.45
1/4" TH Thimble (fits all sizes)	$.30
3/8EE (3/8" Eye & Eye Turnbuckle)	$5.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle)	$6.95
1/2" EE (1/2" Eye & Eye Turnbuckle)	$8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle)	$9.95
3/16" Preformed Guy Grip	$1.99
1/4" Preformed Guy Grip	$2.49
6" Diam - 4 ft Long Earth Screw Anchor	$12.95
500D Guy Insulator (5/32" or 3/16" Cable)	$1.39
502 Guy Insulator (1/4" Cable)	$2.49
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)	$.43/ft
HPTG6700 Guy Cable (6700 lb rating)	$.69/ft
9901LD Cable End (for 2100/4000 cable)	$6.95
9902LD Cable End (for 6700 cable)	$7.95
Socketfast Potting Compound (does 6-8 ends)	$12.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod . . . . $19 HDT-5 5 ft Tripod $29
HDT-10 10 ft Tripod . . $49 HDT-15 15 ft Tripod . . $69
Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

1108 Summit Ave., Suite 4 / Plano, Texas 75074

Mon.-Fri.: 8:30 a.m.-5:30 p.m. Sat. 9 a.m.-1 p.m.

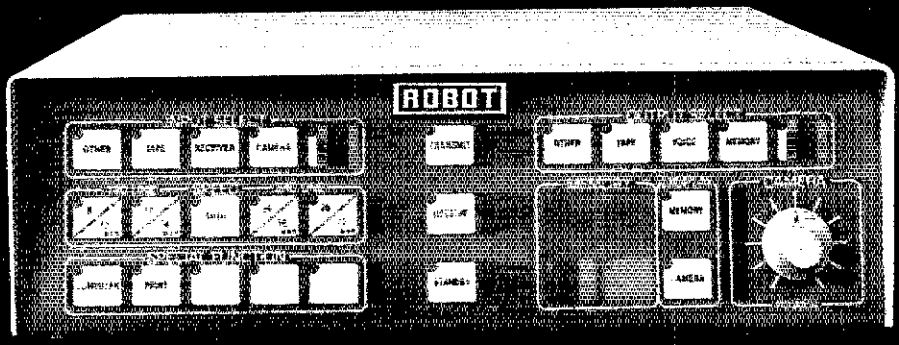
ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

TELEPHONE: (214) 422-7306

MasterCard VISA

CIRCLE 43 ON READER SERVICE CARD

COLOR SSTV



Introducing the Robot 450C and 1200C Single Frame Color SSTV Converters

Robot's new color slow scan TV converters provide you with a whole new dimension of Amateur Radio activity. Now you can exchange color pictures of your latest DX QSL card, the best stamp in your collection, or even that terrific sunset scene you shot last summer.

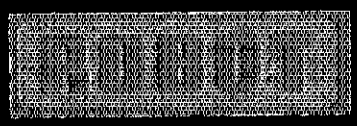
Robot's microprocessor controlled color SSTV equipment provides a significant breakthrough in the transmission of single frame color images known as "Time Multiplex Color Component System" (TMCCS). This method was chosen as being faster, easier to use and more reliable than the cumbersome frame or line sequential systems now in use, as well as being black and white compatible with the thousands of slow scan stations already on the air world wide.

In addition to having fast, single frame color capability as with the Robot Model 450C, the Model 1200C also offers sharp, high resolution color pictures that rival commercial broadcast television! With all their flexibility, interfaceability and dependability, the Models 450C and 1200C will be in the forefront of technology for years to come. Their new multi-dimensional SSTV standards will be the pace-setters in the industry.

There are even more features and capabilities too numerous to be listed here, such as computer interface, automatic fine tuning, multi speed operation and many more, so see your dealer today for literature and a demonstration, or write.

ROBOT COLOR

ATTENTION MODEL 400 OWNERS: Now you can have single frame color SSTV capability too by installing the Model 400C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.



Also introducing the new Robot Model 800C Super Terminal with color graphics capability when used with the new Robot color scan converters. Also has expanded memory with lithium battery back-up, and has both serial and parallel printer interface. A complete terminal for RTTY and Morse Code.

ROBOT RESEARCH, INC.
7591 Convoy Ct., San Diego, CA 92111 (619) 279-9430

World Leaders in Slow Scan TV, Phone Line TV and Image Processing System

MEET THE NEW YAESU FT-102

The FT-102 is factory equipped for operation on all present and proposed Amateur HF bands. An extra AUX band position is available for special applications. Equipped for SSB, CW, and AM (RX), the FT-102 may be activated on FM and AM (TX) via the optional AM/FM-102 Module.

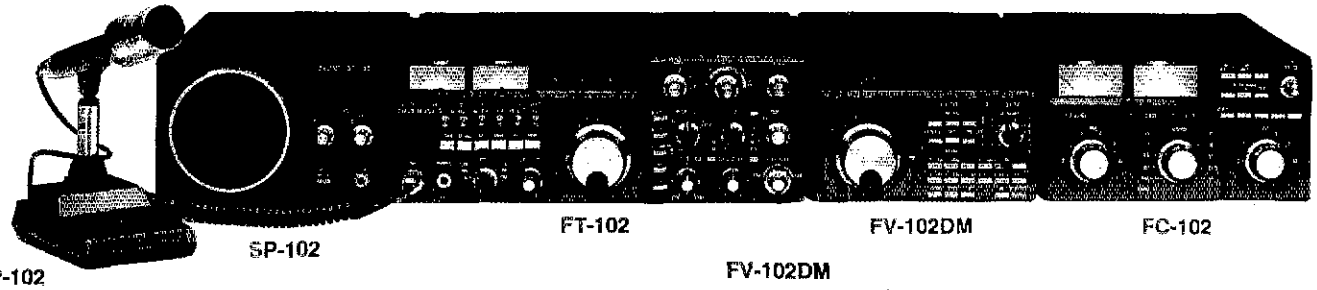
The all-new receiver front end utilizes a low-distortion RF preamplifier that may be bypassed via a front panel switch when not needed. Maximum receiver performance is yours with this impressive lineup of standard features: IF Notch Filter, Audio Peak Filter, Variable IF Bandwidth Control, IF Shift, Variable Pulse Width Noise Blanker, Independent SSB and CW Audio Channels with Optimized Audio Bandwidth, and Front Panel Audio Tone Control. Wide/Narrow filter selection is independent of the Mode switch.

The celebrated transmitter section is powered by three 6146B final tubes, for more consistent power output and very low distortion. An RF Speech Processor, Mic Amp Audio Tone Control, VOX, and an IF Monitor round out the transmitter lineup.

Futuristic panel design and careful human engineering are the hallmarks of the FT-102. Convenient pop-out controls below the meters may be retracted when not in use, thus avoiding inadvertant mistuning. Abundant relay contacts, rear panel phono jacks for PTT, microphone/patch input, and other essential interface connections make the FT-102 extremely simple to incorporate into your station.

Special Supplier of Ham Radio Equipment for the Sarajevo 1984 Winter Olympic Games

YAESU



FT-102 FV-102DM FC-102

SP-102

SP-102

The SP-102 External Speaker/Audio Filter features a large, high-fidelity speaker with selectable low- and high-cut audio filters. The front panel A-B switch allows selection of two receiver inputs for maximum versatility. Also available is the SP-102P Speaker/Patch.

See your Authorized Yaesu Dealer today for a hands-on demonstration of the rig that everybody's talking about. It's the FT-102, The Transceiver of Champions!

FV-102DM

The FV-102DM Synthesized External VFO tunes in 10 Hz steps. Keyboard entry of frequencies, UP/DOWN scanning, and 12 memories make the FV-102DM a "must" for serious DX or contest work.

FC-102

The FC-102 Antenna Coupler is capable of handling 1.2KW of transmitter power, with an in-line wattmeter, separate SWR meter, and A-B input/output selection expanding your station's capability. The optional FAS-1-4R allows remote selection of up to four antennas via one coaxial cable connected to the FC-102.

Price And Specifications Subject To Change Without Notice or Obligation

1082

YAESU **ELECTRONICS CORPORATION** 6851 Walthall Way, Paramount, CA 90723 (213) 633-4007
CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 (513) 874-3100

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T-F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibility
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

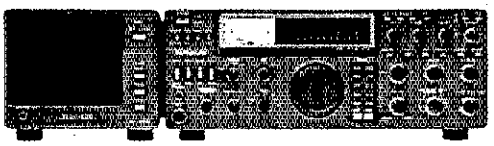
Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug.
- TL-922A linear amplifier (not for CW QSK).
- SM-220 station monitor (not for pan-adapte
- HS-6, HS-5, HS-4, headphones.

More information on the TS-930S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

...pacesetter in amateur radio



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