

# QST

devoted entirely to Amateur Radio



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CONFERENCE MONDIALE DES  
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COMUNICACIONES

1983

Flash! Amateur Radio and  
the Grenada Crisis

Page 66



## the tempo S-15

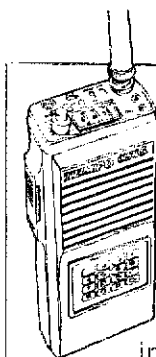
**...a no nonsense radio that provides more power, broader frequency range and simplicity of operation**

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

**Consider these features before you decide on any hand held:**

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

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



**now available!**  
**...the new CS-15**

It's a brand new version of the S-15... BUT for commercial use. It contains all of the features and fine quality that the S-15 is famous for...including 5 watt output, 10 MHz receiver coverage, fully synthesized, 10 channel internally programmable, AND it's FCC type accepted. It's all in a sturdy, ultra compact case and at a very affordable price.

**TEMPO M-1**

Superb quality VHF marine band hand held. Synthesized for world wide use... all marine channels & 4 weather channels. Ch. 16 override. All offsets built in.

**TEMPO S-2** Use 220 MHz repeaters nationwide. Synthesized, field tested and dependable.

**TEMPO S-4** The first 440 MHz hand held and still a winner.

*Available at your local Tempo dealer or from..*



# Henry Radio

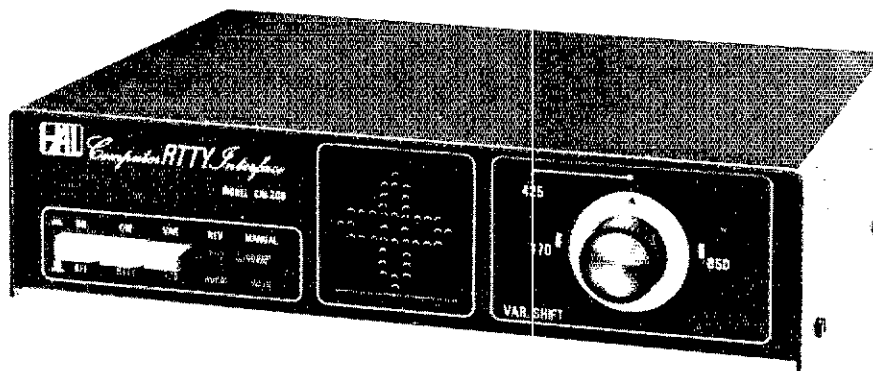
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**TOLL FREE ORDER NUMBER: (800) 421-6631**

For all states except California.  
Calif. residents please call collect on our regular number

# WORK ALL THE SIGNALS NOT JUST THE STRONG ONES

**CRI-200  
LED Matrix  
Tuning Indicator  
\$299.00\***

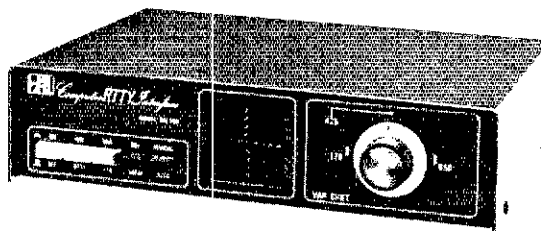


Give your computer a break with the "front-end" performance it needs for good RTTY and CW copy. Why settle for "make-do" RTTY performance of one-tone filters or phase locked loops? Our interfaces give you the solid RTTY and CW performance you need. Want to be sure you are "on-frequency" and not "walking around the band"? We have two different models of tuning indicators to put you on frequency. The deluxe CRI-200 features a matrix of LED's to give a scope-type ellipse tuning display. The CRI-100 has the familiar crossed line display, again using LED's. Best of all, the indicators are built-in—NOT add-ons. Take advantage of our many years of experience in high-tech RTTY and CW—put a HAL ahead of your computer.

- Full two-tone mark and space RTTY demodulation
- 170 or variable 80-975 Hz receive RTTY shift
- Linear-cross LED tuning indicator (CRI-100)
- Matrix LED-scope tuning indicator (CRI-200)
- 800 Hz CW receive Input filter (700-1000 Hz int. adj.)
- Plus or minus CW Key output to transmitter
- Computer interface for RS232C or TTL
- Relay isolated PTT switch circuit
- AFSK transmit tones AND FSK output
- Standard 4-pin mike connector
- Standard computer I/O connector
- Spare I/O connectors for customized connections
- Small and attractive cabinet (10"W x 2.4"H x 7"D)
- Includes 120V/60 Hz power supply—no batteries!
- User-friendly controls
- Compatible with HAL ARQ1000 for AMTOR

Best of all, the HAL CRI-100 and CRI-200 are NOT dependent upon special software or a specific computer. Flexibility is the key word—it's your choice for your favorite program and computer. If you are looking for both low cost and high performance, come to HAL, your real RTTY place. See the CRI-100 and CRI-200 at your favorite HAL dealer. Write or call us for our latest RTTY catalog.

**CRI-100  
Crossed LED  
Tuning Indicator  
\$249.00\***



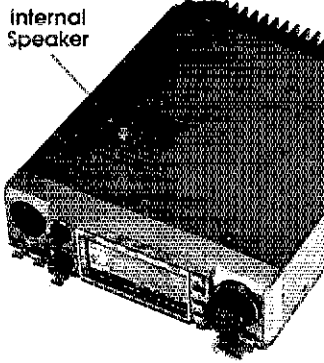
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\*Suggested list prices. Call your HAL dealer for his price!

# ICOM IC-27A

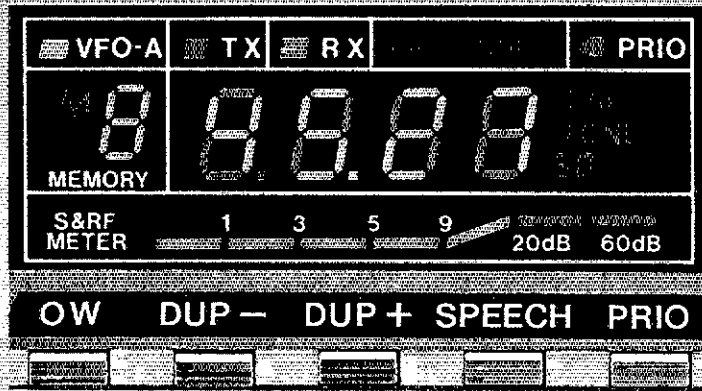
## The Most Compact 2 Meter Mobile!

Now ICOM presents an important breakthrough in two-meter mobile communications, the IC-27A. The smallest two-meter mobile available, the IC-27A measures only 38 millimeters high by 140 millimeters wide. As an added bonus, the IC-27A, through ICOM engineering, is able to contain an internal speaker to provide ease of mounting and make the unit one small compact complete package.



Internal Speaker

**25 Watts.** In such an incredibly small package, the IC-27A is able to provide 25 watts of output power. And even though the IC-27A is the smallest available two-meter mobile unit, it has sacrificed none of the features found in fully featured VHF mobiles.



**32 PL Frequencies.** The IC-27A comes complete with 32 PL frequencies ready to go and controlled from the front panel knob. Each PL frequency may be selected by the main tuning knob and stored into memory for easy access along with frequency.

**10 Memories.** The IC-27A has 10 tunable memories available to store receive frequency, transmit offset, offset direction, and PL tone.

Memories are backed up by a lithium backup battery, which will store memories for up to seven years.

**Speech Synthesizer.** As an added plus, the IC-27A features an optional speech synthesizer to verbally announce the receiver frequency of the transceiver through the simple push of a button. This allows the operator to hear what frequency he is operating on without looking at the transceiver.

**Scanning.** Included with the IC-27A is a scanning system which allows scanning of memories or scanning of the band. Each memory may be scanned between programmable limits.

**Priority Scan.** Priority may be selected to be either a memory channel or a VFO channel. By using sampling techniques, the operator can determine if a frequency he is interested in using is free or busy.

**Microphone.** Each IC-27A comes complete with a microphone which includes a 16-button touchtone pad for access to your favorite repeater or for dialing through an autopatch.



**THE ICOM 27A** is a superior piece of ham equipment engineered and built by ICOM to provide superb performance in the mobile radio environment. See the IC-27A at your local ICOM dealer.



# ICOM

## The World System

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## OUR COVER

Increasing the gain of a Yagi antenna is "element-ary," according to the authors of the article beginning on page 35. Check it out for yourself. (photo courtesy ElectroSpace Systems, Inc.)

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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™

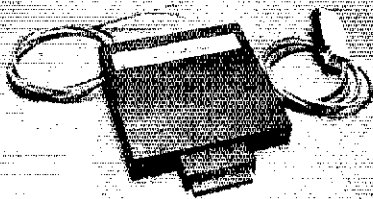
AMTORTEXT™ is a LOW COST software package that will allow the CP-1 and Commodore 64 computer to be used as a multi-mode AMTOR TERMINAL. Compare the outstanding FEATURES and PRICE of the AT-64 (AMTORTEXT for Commodore 64) to the competition:

- 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 synchronizing
- 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!

## NEW MICROAMTOR PATCH™

**\$89.95 List \$69.95\* C-64 AMTORTEXT**



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 TRANSCIEVER 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.

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.

**\$589.95 List \$499.95\* AMT-1**

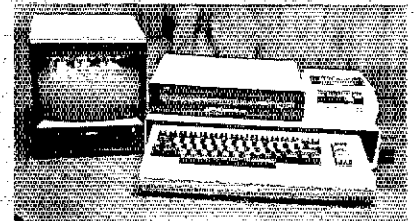
## Applications software for C-64 or VIC-20

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 IDENTIFICATION.

**\$89.95 List \$69.95\***

\*SUGGESTED AMATEUR DISCOUNT PRICE THROUGH PARTICIPATING DEALERS ONLY

## AMT-1



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

PLEASE SEND AEA CATALOG	
Name _____	
Address _____	
City _____	
State _____	Zip _____

**Advanced Electronic Applications, Inc.**

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# CUSHCRAFT

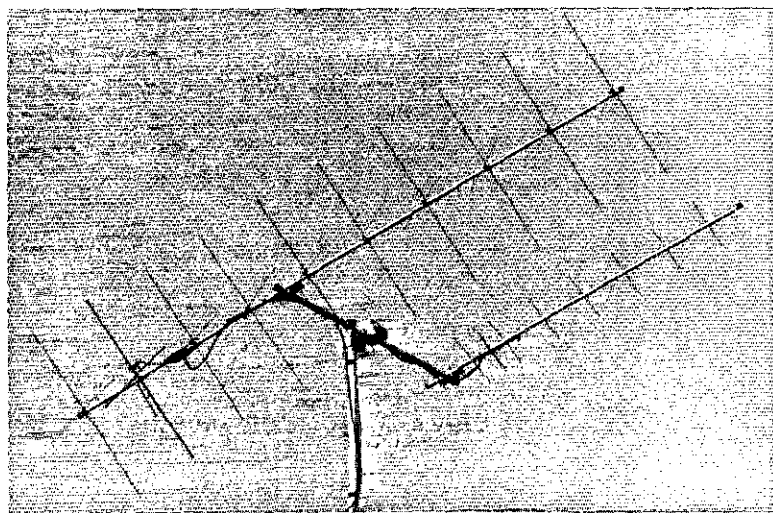
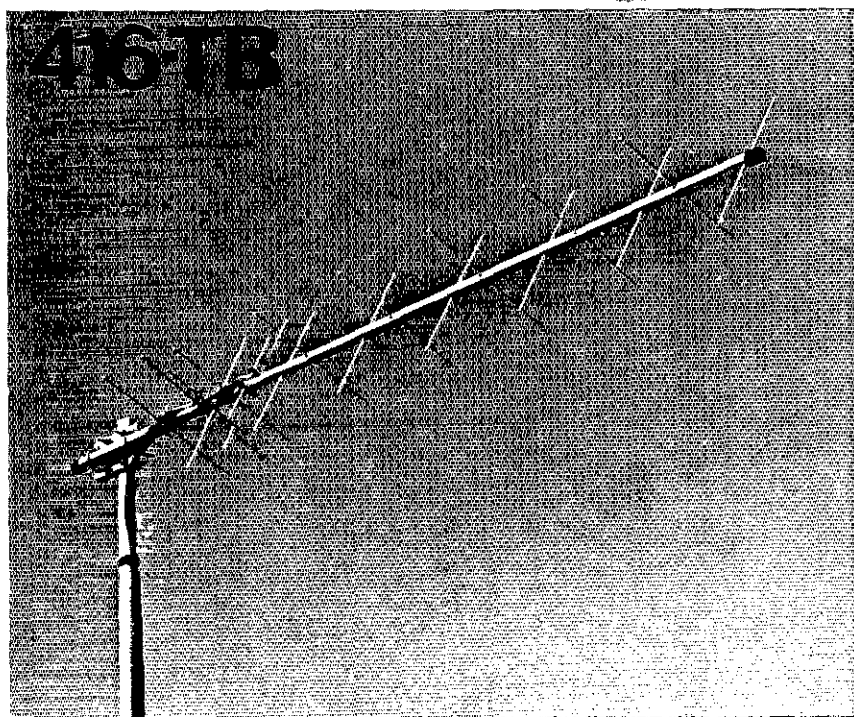
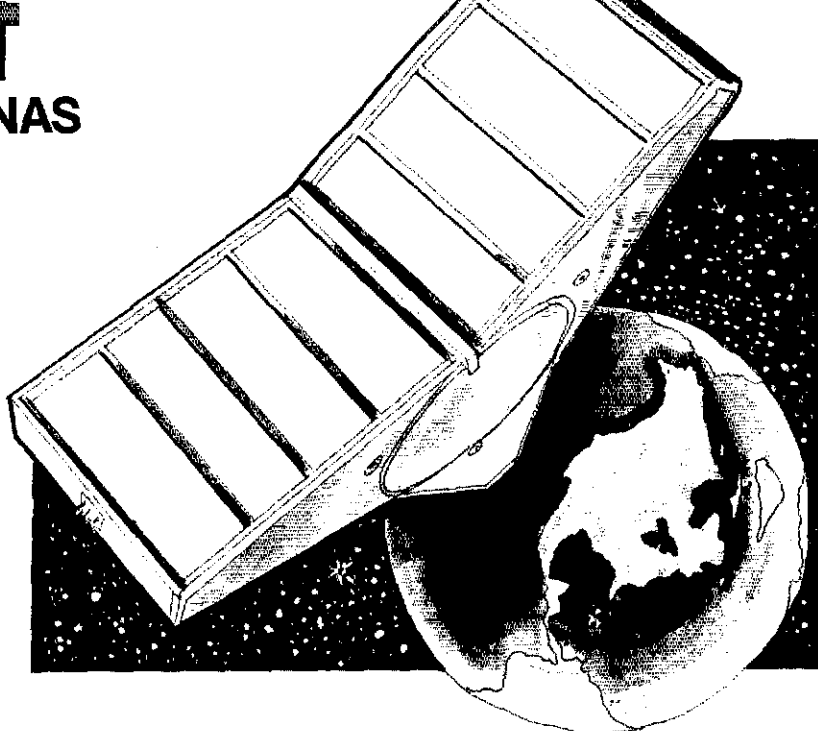
## OSCAR SATELLITE ANTENNAS

Satellite communications for more hours a day with the OSCAR Phase III in orbit... that's exciting news for hams around the world! And Cushcraft is right there with BOOMER antennas to provide greater performance and more enjoyment at your station.

NOW is the time to get ready for OSCAR with Cushcraft's all new high performance 416TB 16 element 435 MHz BOOMER, featuring our new insulated elements, T-matched driven elements, built-in balun, special phasing harness, rear boom mount, and stainless steel hardware. This amazing antenna has true circular polarization right or left, and gain to give an extra margin of radiated power to the satellite.

The two meter antennas have been proven in many thousands of ham satellite stations. They feature excellent performance plus ease of assembly and installation.

	10 Element	20 Element	16 Element
<b>MODEL</b>	A144-10T	A144-20T	416TB
<b>Frequency, MHz</b>	145.9	145.9	435
<b>2:1 SWR</b>	>2	>1.5	>3
<b>Bandwidth, MHz</b>			
<b>Forward Gain, dBd</b>			
<b>3-dB</b>			
<b>Beamwidth, deg</b>	52	38	34
<b>F/B Ratio, dB</b>			
<b>Boom Length, in (m)</b>	70 (1.8)	130 (3.3)	80 (2.03)
<b>Longest in</b>	40	40	13.3
<b>Element, (m)</b>	(1.0)	(1.0)	(.34)
<b>Wind Area, ft<sup>2</sup> (m<sup>2</sup>)</b>	.74 (.07)	1.42 (.13)	.5 (.046)
<b>Weight, lb (kg)</b>	3.5 (1.6)	6.6 (3.0)	4.9 (2.2)
<b>Max Mast OD, in (cm)</b>	1.50 (3.8)	1.50 (3.8)	2.0 (5.0)



### OSCAR MOUNTING BOOM

You can mount 2 meter and 70 cm twist antennas on the A14T-MB mounting kit. It has a 4.2ft (1.3m) support boom with mount plate for the U100 elevation rotator. The easy way to a complete OSCAR station.

Your complete OSCAR antenna system in one easy-to-use package. This is the convenient money saving way to a superior OSCAR signal.

**OSCAR  
PACK**

OSCAR Pack includes 416TB (435 MHz uplink) and A144-20T (145 MHz downlink) Boomer Twist antennas plus the A14T-MB mounting boom. It contains the U100 rotator plate plus all hardware for antenna and mast mounting.

OSCAR Pack is your key to enjoyment of the latest phase of worldwide amateur satellite communications. Model AOP-1



48 Perimeter Road, P.O. Box 4680  
Manchester, NH 03108 USA  
TELEPHONE 603-627-7877  
TELEX 953-050 CUSHSIG MAN

# "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  $\mu$ v, 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  $\pm 9.9$  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-adaptor).
  - 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

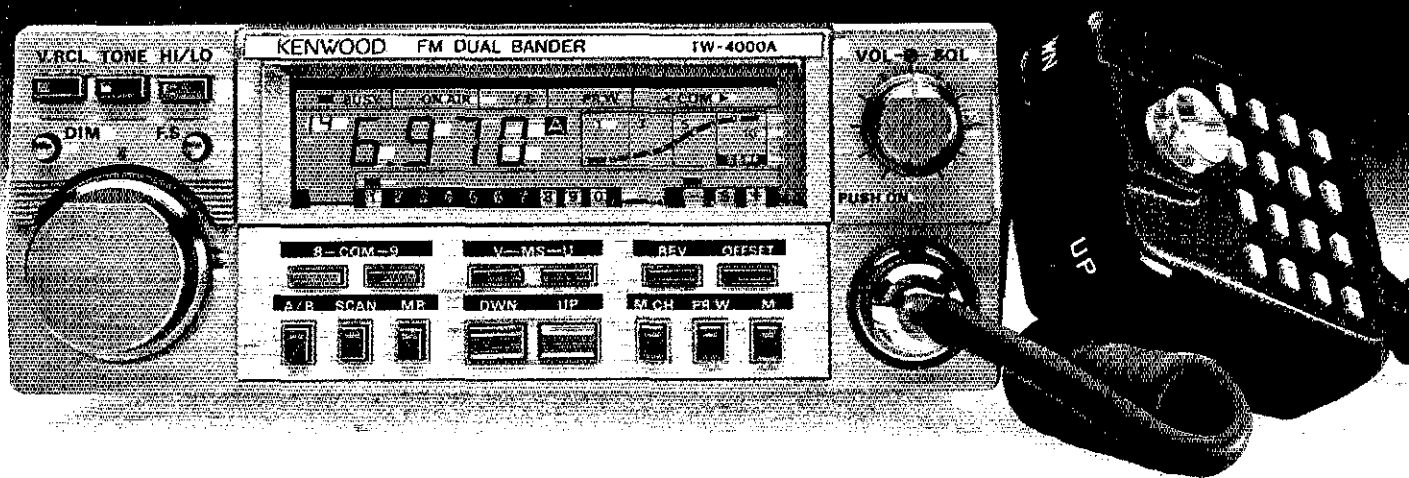
...pacesetter in amateur radio



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



# FM "Dual-Bander"



**2 m & 70 cm in single compact package, LCD, 25 W, optional voice synthesizer.**

## TW-4000A

**KENWOOD's TW-4000A FM "Dual-Bander" provides new versatility in VHF and UHF operations, uniquely combining 2 m and 70 cm FM functions in a single compact package.**

### TW-4000A FEATURES:

- **2 m and 70 cm FM in a Compact Package**  
Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg).
- **Large, Easy-to-Read LCD Display**  
A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.
- **25 Watts RF Power on 2 m/70 cm.**  
Hi/Lo power switch.
- **Optional "Voice Synthesizer Unit"**  
Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**

- **10 Memories with Offset Recall and Lithium Battery Backup**  
Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band operation.
- **Programmable Memory Scan**  
Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band Scan in Selected 1-MHz Segments**  
Scans within the chosen 1-MHz segment (ie., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority Watch Function**  
Unit switches to memory 1 for 1 second each 10 seconds, to monitor the activity on the priority channel.
- **Common Channel Scan**  
Memory 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **Dual Digital VFO's**  
Selectable 5-kHz or 10-kHz for 2 m, and 5-kHz or 25-kHz for 70 cm. Depress "UP" or "DOWN" key on the front panel for band change in 1-MHz steps.
- **16-Key Autopatch UP/DOWN Microphone (Supplied)**
- **Repeater Reverse Switch**

- **High Performance Receiver/Transmitter**  
GaAs FET RF amplifiers on both 2 m and 70 cm, high performance MCF's in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Rugged Die-cast Chassis**
- **Optional Two-Frequency CTCSS Encoder**  
Easily mounted inside the radio, allows DIP switch programming of two different tone frequencies, for 2 m and 70 cm.
- **"BEEPER" sounds through speaker.**
- **Easy-to-Install mobile mount**
- **TW-4000A accessories:**
  - VS-1 Voice Synthesizer
  - TU-4C Two-Frequency Programmable CTCSS Encoder
  - KPS-7A Fixed station power supply
  - SP-40 Compact mobile speaker

More information on the TW-4000A and TS-780 is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

# KENWOOD

pacesetter in amateur radio

## All mode "Dual-Bander"

### TS-780

**2 m & 70 cm all mode, dual digital VFO's, 10 memories, scan, IF shift...**

### TS-780 FEATURES:

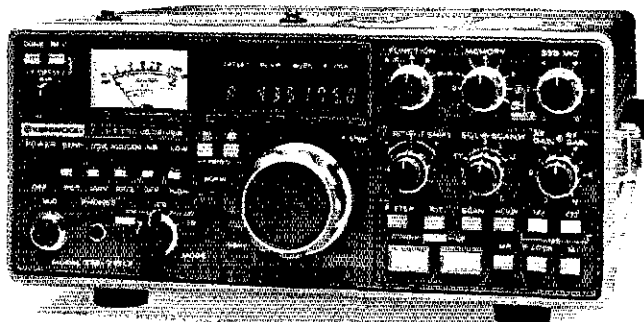
- USB, LSB, CW, FM all mode, covering the 2 m band (144.000-148.000 MHz) and the middle 70 cm band (430.000-440.000 MHz). UP/DOWN band switch.
- Dual digital VFO's with normal/tight drag switch. VFO steps in 20-Hz, 200-Hz, 5-kHz, or 12.5-kHz, plus "FM CH" channel-

ized 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  $\pm$ 600-kHz TX offset switch with reverse switch • Tone switch for optional TU-4C two frequency tone

encoder unit • VOX and semi break-in CW built-in • FM center-tune meter • Noise blanker for SSR, CW.



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\*Executive Committee Member

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

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Alberta  
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Manitoba  
Maritime/Nfld  
Ontario  
Quebec  
Saskatchewan

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Eastern Pennsylvania  
Maryland-D.C.  
Southern New Jersey  
Western New York  
Western Pennsylvania

### Central Division

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Indiana  
Wisconsin

### Dakota Division

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North Dakota  
South Dakota

### Delta Division

Arkansas  
Louisiana  
Mississippi  
Tennessee

### Great Lakes Division

Kentucky  
Michigan  
Ohio

### Hudson Division

Eastern New York  
N.Y.C. & Long Island  
Northern New Jersey

### Midwest Division

Iowa  
Kansas  
Missouri  
Nebraska

### New England Division

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Eastern Massachusetts  
Maine  
New Hampshire  
Rhode Island  
Vermont  
Western Massachusetts

### Northwestern Division

Alaska  
Idaho  
Montana  
Oregon  
Washington

### Pacific Division

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Nevada  
Pacific  
Sacramento Valley  
San Francisco  
San Joaquin Valley  
Santa Clara Valley

### Roanoke Division

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South Carolina  
Virginia  
West Virginia

### Rocky Mountain Division

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New Mexico  
Utah  
Wyoming

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Georgia  
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Southern Florida  
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The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, 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.

It is an incorporated association without capital stock, chartered under the laws of Connecticut. Its affairs are governed by a Board of Directors, elected every two years by the general membership. The officers are elected or appointed by the Directors. The League is noncommercial and no one commercially engaged in the manufacture, sale or rental of radio apparatus is eligible to membership on its board.

"Of, by and for the amateur," it 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.

Inquiries regarding membership are solicited. A bona fide interest in Amateur Radio is the only essential qualification; ownership of a transmitting station and knowledge of the code are not prerequisites, although full voting membership is granted only to licensed amateurs.

All general correspondence should be addressed to the administrative headquarters at Newington, Connecticut 06111, USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI.

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G. L. DOSLAND, W0TSN, 1952-1962  
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**Canadian Counsel:** B. Robert Benson, Q.C., VE2VW,  
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\*Executive Committee Member

## Team Spirit

Team Spirit . . . it is a powerful force.

We surely have it in Amateur Radio, and it is most in evidence when we are conspicuously threatened in some way. Recent examples are to be found in the rallying to the colors by amateurs all around the world as we prepared for WARC-79, and in the outcry prompted here at home by the FCC's proposal to create a codeless class of amateur license. Our "team" was victorious in the first instance, and we dare hope that this will prove to be the case when the Commission reports its decision in the latter.

Working together, folks can accomplish much more than they could ever do as individuals. Perceiving this, Hiram Percy Maxim, W1AW, back in 1914, took steps to organize the radio amateurs of his day. The motivation arose from recognition of two factors: the need for representation to the government to assure permission to operate at all, and the importance of developing procedures for cooperative use of the airwaves by all amateurs, regardless of their particular operating interest.

Fortunately for all of us who have come along later, the organization founded by HPM endured to become our mainstay against a succession of threats to the frequencies and privileges of Amateur Radio in ensuing years.

Here in the United States, our team is "ARRL." It is an organization of people, and it is not perfect. Nor does it "win" every game. But most of us who cherish our Amateur Radio privileges recognize the need to work together in the continuing effort to protect them.

ARRL is intended to be a democratic institution, providing opportunities for membership participation and influence. In recent years, through the combined efforts of concerned members, elected officials and staff, it has become much more so. There now exist not only greater opportunities for individual participation in new League organizational roles, but several additional channels have been created to enable members to express their views in shaping ARRL programs and policies.

"How, then," one might ask, "could any amateur rationalize withholding support from such a collective endeavor?"

The reasons vary; some are familiar to

us. A number of amateurs fled the membership scene because of their misperception of the responsibility for "incentive licensing," others over some real or imagined difference of opinion with an ARRL policy or action. One day last summer, in a single mail two letters arrived from amateurs who threatened to give up their membership in ARRL . . . one because the "ARRL opposes the no code license," and the other because "the League supports a no code license."

Then there are those who, failing to get their way in one matter or another, come to regard the League as "a group in Newington who control Amateur Radio."

Finally, there are the apathetic. We have many licensed amateurs who appear to feel no particular sense of commitment or obligation to their peers. They perceive no reason to join in cooperative efforts either to carry out the social responsibilities of the Amateur Radio Service or to assure that Amateur Radio will be available for future generations. How do we penetrate their indifference and make them aware of the value and importance of joining the team effort? The problem is not unique to Amateur Radio; it is present in other segments of our society, as well.

Those of us who temporarily occupy offices and staff positions in ARRL, and serve in a host of roles in its field organization, do so from a belief that Amateur Radio is worth working for. Having benefited from our own involvement, we wish to do whatever we can to keep it alive and thriving, to make its advantages available to others, and to assure that the commitments implicit in Part 97.1 of the FCC regulations, Basis and Purpose, are fulfilled.

The League is totally dedicated to the defense and development of the Amateur Radio Service and to a course of cooperation with all who share in that aim. Today, approximately one-third of those holding U.S. licenses are members of the ARRL team, and exert a profound influence through their membership toward achievement of those goals. They are the source of the team spirit that will enable us to cope with the challenges that loom ahead.

This is to say a hearty thanks for your continuing support toward that end! — Vic Clark, W4KFC

# League Lines...

NASA announced November 2 that STS-9 has been rescheduled for launch at 1600 UTC (1100 AM, EST) November 28. Although many of the scientific experiments have been reduced in scope, STS-9 remains a full duration (9 day) mission. At this writing, we believe that Dr. Garriott's operating schedule will not be adversely affected. W1AW will be your most reliable, most up-to-date source of information on changes in Dr. Garriott's schedule. Starting with the day of launch (November 28), W1AW will go to its emergency schedule of operation if there are imminent changes in W5LFL's announced operating plans. If there are no changes, W1AW bulletins will be at regularly scheduled times, but when there are changes, W1AW will operate as follows: phone on the hour, cw on the half hour and RTTY on the quarter hour. ARRL Hq. staffers KB1N and KH6WZ will be at the Johnson Space Center in Houston relaying instantly to W1AW any changes in the mission. (Please do not call ARRL Hq. asking for updates.) Other sources of news are W5RRR (28.6, 21.37, 14.28, 7.23 and 3.85 MHz), Electra/Bearcat (1-800-SCANNER), Westlink's special STS-9 number (213-465-1500) and ARRL's Ham-in-Space Info Line (203-666-0688). Remember, W1AW will have the most up-to-the-minute news, and it is free! (See November League Lines for frequencies and mode of operation).

The deadline for submitting footage of hams working STS-9 for inclusion in the second ("timeless") version of the "New Frontiers" videotape is now December 21. We need broadcast-quality, 3/4-inch U-matic cassettes. Send the tapes to STS-9, Public Information Office, ARRL Hq. All submissions must be accompanied by a release form from the TV station shooting it.

NASA Associate Administrator Major General James A. Abrahamson has informed AMSAT that NASA will launch the UoSAT B spacecraft as a secondary payload on the Landsat-D mission scheduled for February or March 1984.

During the initial stages of the Grenada crisis, the FCC issued a Public Notice that clarified the rules regarding commercial retransmissions of Amateur Radio communications. Broadcast stations do not need to obtain permission from the FCC before retransmitting ham conversations. News gathering is restricted to reporting of what is being said on the air, or retransmitting the amateur QSOs. A reporter cannot conduct an interview over the air, nor can the reporter ask any questions through the operator of a ham station. Broadcast stations must notify the Secretary of the FCC that the retransmissions occurred, indicating only the date and nature of the transmissions covered.

FCC has decided not to expand the 10-meter repeater sub-band, as proposed in PR Docket 83-485. Citing the potential of interference to amateur satellite operations and noting that over-crowding appeared to be a local as opposed to a widespread problem, the Commission terminated the proceeding without adopting the proposed rules.

FCC's Office of Science and Technology has issued a technical memorandum describing tests conducted by the FCC relating to the feasibility of integrating Amplitude Companded Sideband (ACSB) into existing fm two-way radio services. This information may be of interest to hams. Copies can be purchased from International Transcription Systems, Inc., FCC, 1919 M St., NW, Washington, DC 20554 for \$5.88. Ask for Technical Memorandum (FCC/OST TM 83-7).

Senator Barry Goldwater introduced into the Senate a Bill, SB 2045, to permit the recovery of out-of-pocket expenses for Volunteer Examiner Coordinators. This action came after the Senator's office and ARRL representatives reached agreement on language for the Bill. The ARRL Board has indicated that the League must be permitted to recover out-of-pocket expenses before ARRL can become a VEC. See p. 51 of this issue.

The American Radio Relay League will hold its Third Amateur Radio Computer Networking Conference on April 15, 1984. The Conference will be in cooperation with the 9th Trenton (New Jersey) Computer Festival (TCF84) being held April 14-15 at Trenton State College. Technical papers on all aspects of Amateur Radio are welcomed. Deadline for camera-ready papers is March 1, 1984. For further information, please contact Paul Rinaldo, W4RI, at ARRL Hq.

Need a job? ARRL Hq. is looking for a new Membership Services Assistant. This is a non-technical, generalist position requiring excellent oral and written communications skills, an Amateur Radio license and familiarity with FCC rules. If you are interested, please contact Hal Steinman, K1ET, Membership Services Manager, at ARRL Hq.

# HF Propagation: The Basics

Say it's 10 P.M. in Savannah, and you'd like to reach out and QSO someone in southern Europe. A solid knowledge of how signals travel will help you decide if you've got a fighting chance.

By Dennis J. Lulis,\* W1LJ/DL



Perhaps no other topic in Amateur Radio is as intriguing, yet confounding to the beginner as propagation — how signals travel from one station to another. Regardless of how you view it, propagation is essential to each and every QSO we make, be it a stateside ragchew or a rare DX contact. Some basic knowledge of how radio waves travel will go a long way in making your hobby a more interesting and enjoyable one. This article will introduce you to the primary modes of hf propagation. Vhf and uhf propagation is an entirely different subject.

## Ground and Sky Waves

Regardless of what type of antenna you are using, the radio waves emanating from it can be categorized broadly into two types — *ground waves* and *sky waves*. Simply stated, a ground wave is one that travels directly from the transmitter to the receiver without leaving the lower atmosphere (Fig. 1). Ground-wave propagation occurs, for example, when you contact another station across town on an hf band. Amateur communications of up to 50 miles are typically possible via ground wave.<sup>1</sup> It is the sky

wave that provides amateurs with the potential for worldwide communications.

A sky wave, just as the name implies, is one that does *not* follow the earth's surface; it travels up into the sky, away from the earth (Fig. 1). At this point, you are probably wondering how we can communicate via signals that travel out into space? After all, our receivers are down here on earth! Somehow, the signals must return here to be captured by our receiving antennas — plain and simple. And just what "persuades" our signals to come back down? Fortunately, there is a region in our upper atmosphere that is pretty good (and occasionally not so good!) at performing this task. This region is named the *ionosphere*, and it is here that we must look to understand the basic mechanisms of hf propagation.

## Ionospheric Characteristics

The ionosphere derives its name from the term *ion*, which is a free electron or other charged particle. In our atmosphere, ionization (or the charging of particles) occurs in the region that lies roughly between 25 and 250 miles above the earth. In this region, air pressure is low enough so that ions can travel freely for a considerable length of time without colliding and recombining into neutral atoms. When radio waves enter the ionosphere, their courses are altered by the process of *refraction*, or

bending (Fig. 2). Under proper conditions, the wave is diverted enough to head back down to earth, where it can be received.

The primary cause of atmospheric ionization is ultraviolet radiation from the sun. Therefore, solar conditions are of great importance to propagation. Exactly which solar indicators concern us will be discussed later in this article.

## An Ionic "Layer Cake"

A closer look at the ionosphere reveals that it consists of dense layers stacked one on top of another, concentric with the earth's curvature. Each of the layers has maximum density in the center, with regions of gradually deteriorating density extending out toward the edges (Fig. 3). However, the absolute level of ionization is changing constantly with the time of day, season, solar conditions and other long-term variations. These variables contribute directly to the constant changes in hf propagation that often frustrate the most seasoned operators.

## Each Layer Is Different

Although each ionospheric layer is comprised of free ions, their similarity (at least for our purposes) ends there. Each layer of the "cake" has special characteristics of its own, and you may be surprised to find out what effect each has on propagation.

The bottommost ionized region is known

\*Notes appear on page 15.

\*MoerfelderLandstrasse 26,  
D-6070 Langen/Hessen, Fed. Rep. of Germany

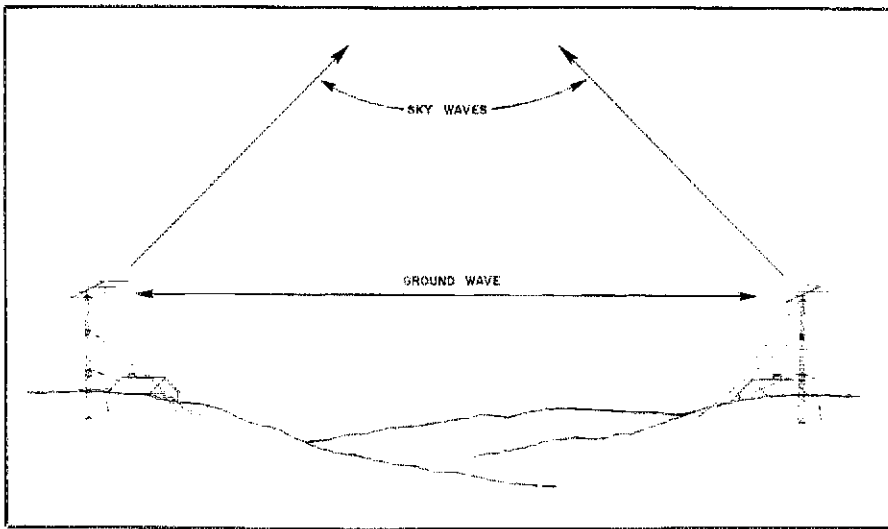


Fig. 1 — An example of the difference between ground waves and sky waves.

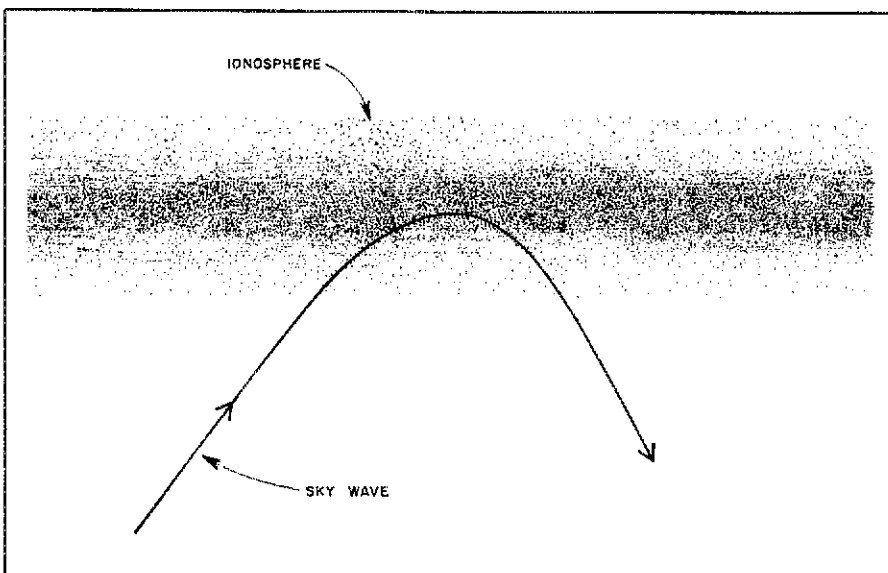


Fig. 2 — Under proper conditions, a radio wave entering the ionosphere will be refracted and follow a new course. This permits the signal to be heard on earth, perhaps thousands of miles from the transmitting antenna.

as the D layer, which lies between 37 and 57 miles above the earth (Fig. 3). This layer exists only during the daylight hours, and usually disappears within 30 minutes after sundown. Because it is located so close to the earth, the D layer is in a relatively dense part of the atmosphere. Here, ions often collide and recombine into neutral particles, which accounts for the rapid loss of this layer in darkness.

The D layer is not particularly useful to amateurs. Instead of refracting and propagating signals, it *absorbs* a great deal of them. A wave passing through this dense layer collides with a relatively large number of ions and sets them in motion. Much of the wave energy is thus used up through conversion to motion or heat energy.

Because a long wavefront will set more ions in motion than a short one, we can

assume that the D layer will absorb more energy as the frequency of our signal decreases (Fig. 4). Additionally, the angle at which a wave enters the D layer has an effect on the degree of absorption. A wave going straight through has the shortest path and least absorption; a wave cutting through at a low angle has much farther to travel in the layer, and absorption will be greater. Because of these effects, the D layer is responsible for the 160, 80 and 40-meter bands being good only for short-distance communications in the daytime.

At night, when the D layer disappears, these same bands can often support DX communications of several thousand miles. This daytime absorption effect is insignificant on 20 meters and higher, which in part allows daytime DX communications on these bands.

The next higher ionospheric layer is the E layer, which is also the lowest one that will *support* radio wave propagation. This layer is located between 62 and 71 miles above the earth, and has characteristics similar to those of the D layer. For example, maximum E layer ionization occurs around noon local time, and rapidly drops off after sundown. During the period of peak ionization (midday), the E layer will absorb some energy in the lower-frequency amateur bands, but not nearly as much as the D layer. It is also interesting to note that X rays and meteors entering the atmosphere contribute to ionization of this layer. The E layer is also the scene of a spectacular type of vhf propagation known as *Sporadic E*. Because it is beyond the scope of this article, interested readers should consult the reference for an explanation of this phenomenon.<sup>2</sup>

Except for occasional propagation via the E layer, we rely almost exclusively on the outermost F layer to provide long-distance hf communications. Here, between 100 and 260 miles above the earth, rarification causes ions to recombine more slowly than in the other layers. Because of this, the F layer can often remain highly ionized throughout the night. As with the other layers, maximum ionization occurs around local noon time, with minimum occurring about an hour before local sunrise.

An interesting aspect of the F layer is its tendency to split up into two layers, known as the F<sub>1</sub> and F<sub>2</sub> layers. This separation occurs during the day, and causes the lower F<sub>1</sub> layer to take on much of the same characteristics as the E layer. Therefore, daytime propagation is largely supported by the F<sub>2</sub> layer. At night, the F<sub>1</sub> layer disperses and the F<sub>2</sub> layer slightly reduces its height above ground.

### Refraction: The Critical Element

I mentioned briefly that refraction is the mechanism responsible for returning sky-wave signals back to earth. The most critical aspect of this phenomenon is the degree to which the waves are bent. There are two primary factors influencing this — the density of ionization and the length of the wave (or frequency). All other conditions being equal, bending will increase with higher ionization density. Also, bending increases with wavelength, or put another way, decreases as the frequency goes up. This sets up a condition in which both factors, working simultaneously, will finally determine whether a wave will be refracted back to earth.

Take a look at the example in Fig. 5. In A, we have an F layer of relatively low ionization, typical of nighttime conditions. Our 28-MHz signal is not refracted enough under these conditions to return back to earth. The 3.5-MHz wave, however, being of greater wavelength, is refracted much more and does make it back down.

In Fig. 5B, the ionosphere is more highly charged than in A, simulating typical mid-

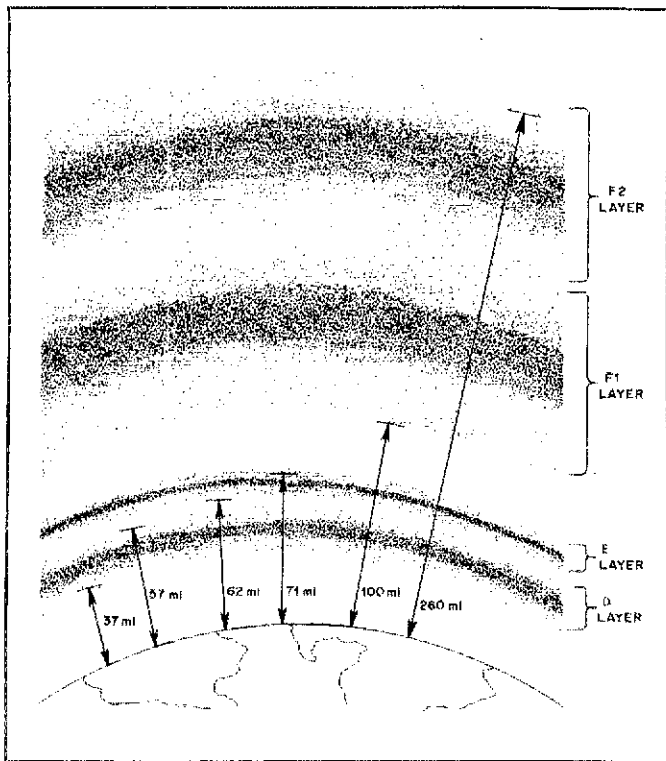


Fig. 3 — The various ionospheric layers with respect to the earth. Distances shown are not absolute, but vary with conditions as explained in the text.

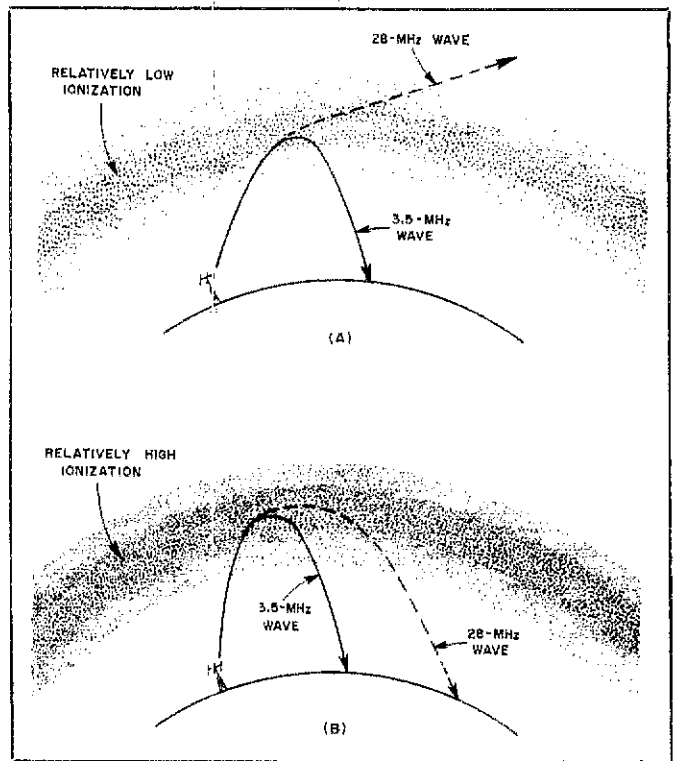


Fig. 5 — In A, the low-level ionization is insufficient to bend the 28-MHz wave back to earth; the level is high enough for 3.5-MHz propagation. Higher-level ionization in B is sufficient to refract the 28-MHz wave to earth.

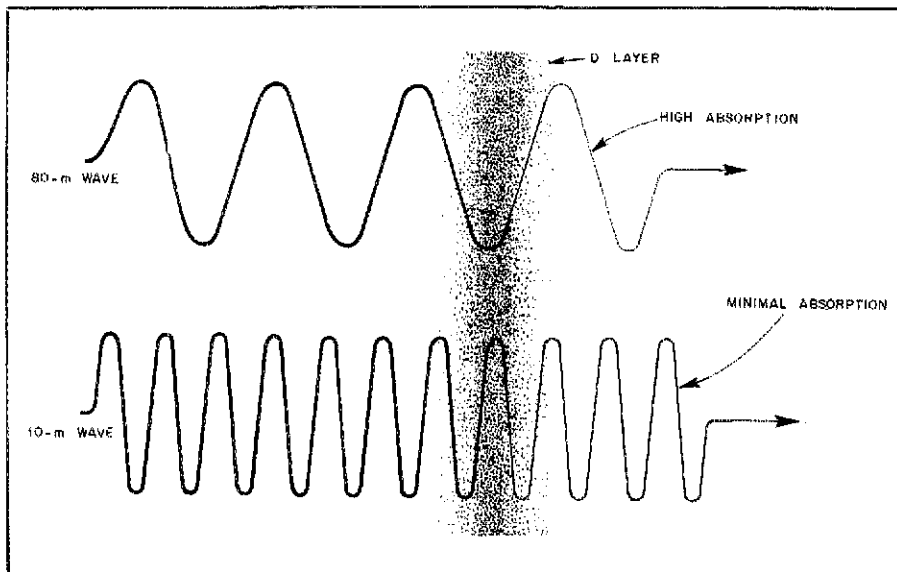


Fig. 4 — All other conditions being equal, a lower-frequency wave will undergo greater D-layer absorption than a higher-frequency one. The larger wavefront must travel a greater distance through the D layer.

day conditions. Now, with sufficient ionization we have a situation in which both waves are refracted back to earth. Note that the 28-MHz wave is not bent as much as the 3.5 MHz one, because of its shorter wavelength.

By now you should understand how the basic refraction process works. It's time to introduce a simple and valuable indicator that relates to our daily operating. The

*maximum usable frequency (muf)* is, in the strictest sense, defined as the maximum frequency that will support communication between two specified points under existing conditions. For example, during one evening, the muf between New York City and Chicago could be 3.5 MHz, while at the same time, the muf between NYC and Denver is 28 MHz. And why is this? To answer the question, we must work one

more factor into our discussion — *wave angle*.

We already know that the amount a wave is refracted depends on two factors: wavelength and the degree of ionization. But assume that for a fixed frequency and degree of ionization, waves penetrate the F layer at different angles. How does this affect propagation? Let's take a closer look.

Fig. 6A shows what typically occurs to a 28-MHz signal. Waves entering the ionosphere at high angles are not refracted back to earth, but continue out into space. As the wave angle decreases, there is a critical point where refraction causes the waves to return to earth. That angle is known as the *critical angle*, and all waves leaving at that angle or below will be propagated to earth.

The critical angle is also directly associated with a phenomenon known as the *skip distance* or *skip zone*. This zone or distance, as shown in Fig. 6, is a region where it is impossible for any regular sky-wave signals to be propagated. The length of the skip distance will vary according to the critical angle. Table 1 lists average skip distances for each band.

Fig. 6B shows the effects of the ionosphere on a lower frequency (3.5-MHz) signal. With all other conditions being the same as in Fig. 6A, we now see that the critical angle is much higher and the skip distance much shorter than on 28 MHz. Under these conditions, we would be able

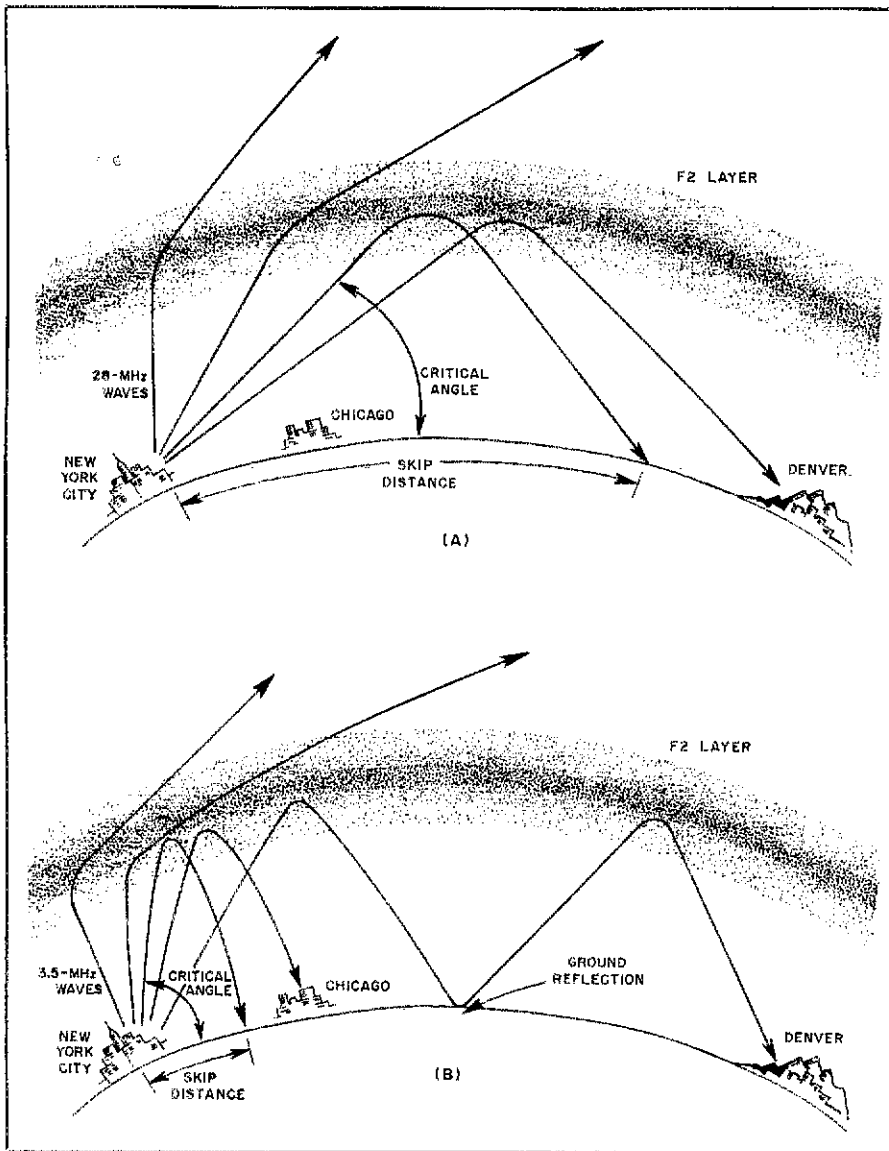


Fig. 6 — Illustration of how frequency, critical angle and skip distance are related. See text for explanation.

to QSO with Chicago from New York City. On 28 MHz, the skip distance prevents this. The reasons should now be clear as to why there is a different muf for every distance over which we wish to communicate!

### Multihop Propagation

For the sake of simplicity, I have only mentioned wave propagation in terms of a single "hop" off the ionosphere. But the F<sub>2</sub> layer is at a certain altitude, and the maximum distance we can cover on a single hop is approximately 2500 miles. Therefore, communication over distances greater than this requires more than one hop, commonly known as *multihop propagation*. Fig. 6B shows how a wave returning to earth is reflected back up to the ionosphere, where it can be refracted again. This phenomenon can occur several times for a signal to be propagated around the earth. Because there is a considerable loss of signal strength with each hop, it is

preferable to use lower-angle radiation, which takes fewer hops to reach the destination than higher-angle radiation. The factors determining radiation angle are covered in an excellent *QST* article by Hutchinson.<sup>3</sup>

Another factor in multihop path loss is whether signals reflect off a land mass or water. As you have probably guessed, water is the much better reflector of the two; signals will generally propagate more efficiently over it when multihop is involved. Is it any wonder that coastal stations have consistently big signals?<sup>4</sup>

### It's Up to the Sun

We know that the sun plays a major role in the short- and long-term propagation variations we encounter. The general reason for this is quite simple: Changes in solar activity affect the sun's output of ionizing radiation. This in turn affects the degree to which our atmosphere is ionized,

Table 1  
Approximate Skip Distances for the Amateur MF and HF Bands

Band	Noon*	Midnight*
160 m	0 mi	0 mi
80 m	0 mi	0 mi
40 m	50 mi	300 mi
30 m	300 mi	600 mi
20 m	500 mi	1000 mi
15 m	800 mi	(Daytime only)
10 m	1200 mi	(Daytime only)

\*Local time at the midpoint of the path.

Logically, to predict propagation we must study solar activity. As with the weather, we are not able to predict this activity with 100% accuracy. However, we can use various solar indicators to predict band conditions with fairly good results.

By now you are undoubtedly aware that sunspots have a lot to do with band conditions. The presence of these grayish-black blemishes has been found to correlate directly with the sun's output of ionizing radiation; the more sunspots visible at one time, the more ionization we can expect.

Fortunately, sunspot behavior has been studied and well documented for the past 200 years. In this time, we have learned that sunspots (or groups thereof) move across the sun from east to west at a constant rate. This movement is caused by the sun's axial rotation, which takes about 27.5 days for a complete revolution.

Perhaps the most significant of all sunspot characteristics (at least for amateurs) is the 11-year sunspot cycle. Records indicate that a peak in sunspot activity occurs every 11 years, give or take a year. Along with this peak is a corresponding increase in the average muf, and general improvement of hf propagation conditions. Our last peak occurred in the spring of 1980, when 10 meters was open worldwide on a daily basis, and often well into the night. There were even occasions when 6-meter signals were propagated by the F<sub>2</sub> layer, indicating an extremely high level of ionization.

### Sunspot Number and Solar Flux

These are the two primary indicators used to measure the amount of solar activity. Daily observations for sunspot count (although not the actual number of spots) are recorded, and averages determined for the month and year. The *smoothed sunspot number* for any given month is the mean for the preceding and succeeding six months. This number is also known as the Wolf number, after its inventor, or the Zurich smoothed sunspot number, because international sunspot records were stored there until recently.<sup>5</sup> Typical smoothed number values range from the single digits, during 11-year sunspot minimums, to over 200 during the tremendous 1957-1958 sunspot peak.

The solar flux number provides another



indication of ionospheric conditions. This number represents the amount of solar noise found on the 2800-MHz band. Research has revealed that on this frequency, noise amplitude is closely related to ionization of the F layer. This indicator has been monitored and recorded since 1947. You can obtain the daily solar flux number by listening to the WWV propagation bulletins at 18 minutes past each hour. The method of interpreting these numbers is beyond the scope of this article; those interested should consult other references for more detailed information.<sup>6,7</sup>

### Propagation Predictions

Understanding the basics of propagation will help you avoid making gross misjudgments regarding signal paths. Normal fluctuations in conditions can catch you off guard, however, and perhaps even prevent you from keeping that schedule with a DX friend. In this respect, a little bit of forecasting can go a long way. Like weather forecasts, propagation forecasts are not 100% accurate, but can offer a bit of

warning "before the storm."

The science of propagation forecasting is indeed an involved one. It is therefore a good idea for beginners to acquaint themselves with the available ready-made forecasts. It's worth mentioning again that WWV offers a propagation bulletin at 18 minutes past each hour. Every month *QST* offers easy-to-use charts in the How's DX? column. These, combined with the WWV data comprise a very useful tool for planning your operating.

Additional propagation bulletins are a part of the WIAW bulletin service. The bulletin schedules can be found in *QST* every other month (see the Table of Contents) or obtained by writing the ARRL Communications Department. DX-minded amateurs may consider subscribing to one of the excellent DX bulletins available.<sup>8-10</sup> In addition to information about exotic DX locations on the air, these bulletins offer up-to-date propagation forecasts to help you "nab the rare ones."

### Happy Hunting

I hope this article has helped to eliminate

some of the mysteries of propagation. As you continue to operate and gain experience on the bands, propagation conditions will become "old hat," and practically second nature to you. But beware, for as soon as you take propagation for granted, conditions will change abruptly and surprise you. Call it Murphy's Law or Mother Nature — that's what keeps propagation interesting!

### Notes

<sup>1</sup>km = mi × 1.609.

<sup>2</sup>M. S. Wilson, "Midlatitude Intense Sporadic-E Propagation," *QST*, Dec. 1970 and March 1971.

<sup>3</sup>C. L. Hutchinson, "Getting the Most out of Your Antenna," *QST*, July 1983, p. 34.

<sup>4</sup>This explanation of multihop propagation may be a bit oversimplified. For an explanation of several other possible theories, see the *ARRL Antenna Book*, 14th edition, 1982, p. 1-8.

<sup>5</sup>Sunspot numbers are now being recorded and compiled by the Sunspot Index Data Center, 3 avenue Circulaire, B 1180 Brussels, Belgium.

<sup>6</sup>G. Hall, ed., *The ARRL Antenna Book*, 14th ed. (Newington: ARRL, 1982), Chapter 1.

<sup>7</sup>E. Tilton, "The DXer's Crystal Ball," *QST*, June, August and September 1975.

<sup>8</sup>The DX Bulletin, 306 Vernon Ave., Vernon, CT 06066.

<sup>9</sup>The Long Island DX Bulletin, P.O. Box 173, Huntington, NY 11743.

<sup>10</sup>QRZ DX, P.O. Box 4072, Richardson, TX 75080.

## Strays

### TIS DO'S AND DON'TS

□ The ARRL Technical Information Service is offered free to members. Although we are eager to help newly licensed amateurs and others with technical problems, in fairness to members we cannot respond to continuing requests for assistance from those who choose not to join the League.

For us to respond promptly to your inquiries we must have:

- 1) your name
- 2) your amateur call and license class (tell us if you're not licensed)
- 3) your membership expiration date
- 4) a stamped, *business-size* envelope bearing your mailing address for our reply (IRCs acceptable from outside the U.S.).

When writing, please observe the following guidelines so we may provide the best possible service to the greatest number.

1) Before writing for technical assistance, search your files of *QST* and other ARRL publications. The answer you need may be there, available immediately. Consult the annual index of articles in each December issue.

2) Please do not ask for comparisons among commercial products. Choice of equipment is largely a matter of personal preference. Consult Product Review information in *QST*; compare manufacturers' specifications in their brochures.

Do not ask for information on articles published in other magazines. Write to the editor or author of that article.

Do not request custom designs for amateur gear.

Do not ask advice on nonamateur matters. We cannot respond to questions about CB, marine radio, hi-fi, etc. (unless they concern interference caused by amateur gear).

3) Use a typewriter when possible; otherwise, write or print *clearly*. Please be reasonable in the number of questions you ask; try to limit your questions to three per letter.

4) When writing, please come right to the point, and be sure to share with us whatever experience you have had with the problem in question. This will avoid our reply covering ground you've already been over.

5) Address all technical questions to Technical Information Service, American Radio Relay League, 225 Main St., Newington, CT 06111. — *Bob Schetgen, KU7G, Technical Information Specialist*

### *QST* congratulates...

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

- Charles Winkley, WIEIF, of Plymouth, Massachusetts
- Thomas A. Phillips, W3DOG, of Laurel, Delaware
- Ashod A. Hovsepian, W6EBM, of Sacramento, California
- Ralph W. Rea, W5AA, of Oklahoma City, Oklahoma
- Carl C. Drumeller, W5JJ, of Warr Acres, Oklahoma

- William R. Reiss, WIHAX, of Elmwood, Connecticut
- Milton A. George, WIBKG, of Pittsfield, Massachusetts
- Fred L. Whitson, W0GEF, of Jackson, Missouri
- Fergus T. Lea, W1JRM, of Portland, Maine

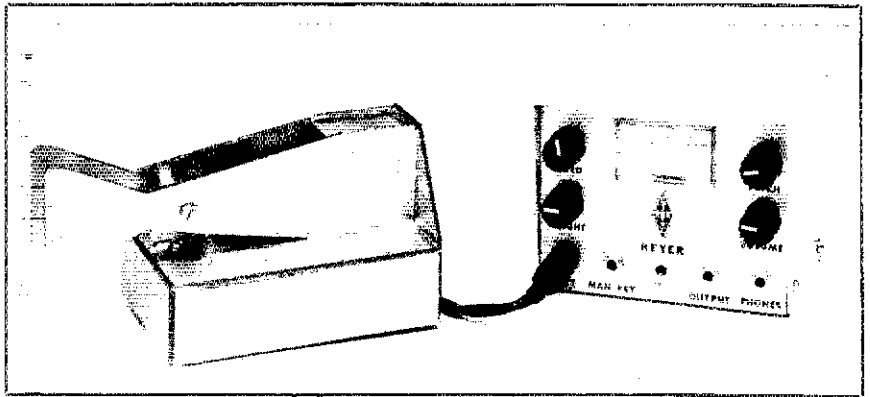
## Next Month in *QST*

To begin the new year, January *QST* will feature the first of a comprehensive series of articles designed expressly for those with little or no electronics background. You may want to pass the word to your pre-Novice friends and neighbors.

Also in January, look for word about the ARRL Antenna-Design Competition, and an article that will tell would-be *QST* authors how to put together a technical article. If you're into kit building, you'll want to take in the January article that provides practical hints to help make your next project one that you'll be proud of for years to come.

# CW on a Chip

Craving for a suitable weekend project? Keyers have been a longtime favorite of many! You can even wrangle a *free* paddle out of this offering!



By Bob Shriner,\* WA0UZO and Paul K. Pagel,\*\* N1FB

**K**eyers are fun to build! What makes the assembly of a good-quality, flexible keying system a cinch is the use of the Curtis keyer-on-a-chip. A ready-made pc board and kits of parts for the keyer and a unique, *no-cost* (no foolin'!) paddle make such an evening or weekend project that much more attractive. Does all this appeal to you? Then let's get on with it!

For some years now, the Curtis keyer-on-a-chip has been a regular part of the code transmission chapter of the *Radio Amateur's Handbook*. Although schematic diagrams and pictures of completed units using the Curtis ICs have been provided, a circuit-board template for would-be "homebrewers" has never appeared in the *Handbook*. This lack was the seed for this project. It grew rapidly from the presentation of a template only to that of offering a flexible keyer design.

## The Curtis Chip

There are basically four varieties of the 8044 IC. Two of these (8044/8044B) are contained in a 16-pin package and the others (8044M/8044BM) in an 18-pin package.<sup>1</sup> The additional pins are connected to internal circuitry that provides a keyer sending speed monitoring function by means of a meter and a few other external components. The whole family of ICs

features contact debouncing, rf immunity and self-completing character generation. A weight control, sidetone output and dot memory are also included. The memory function helps to prevent dot loss if the operator "leads" the keyer. With a quiescent current drain of about 50  $\mu$ A, an on/off switch is not really required.

The "plain vanilla" (no suffix) and B-suffix ICs offer two slightly different iambic (squeeze) keying methods in addition to single-lever (non-squeeze) keying.<sup>2,3</sup> With the no-suffix IC, a dot or dash being sent when the paddles are released is completed and nothing else is sent. The B-suffix IC completes the dot or dash being sent upon paddle release, and then sends an opposite element; that is, a dot after a dash or a dash after a dot. Many squeeze-key operators prefer the latter method of iambic operation. If you're a single-lever paddle operator, you don't have to concern yourself about these factors; either IC should suit you.

## Board Design

To make the keyer as universal in application as possible, the board is patterned so that any of the ICs mentioned earlier can be used with or without some of their inherent capabilities.<sup>4,5</sup> The board is single-sided, and is small enough to fit inside almost any transmitter or transceiver.

Any or all of the variable controls may be mounted on the board or brought out for external adjustment. Two on-board output keying options are provided: reed

relay output (with or without arc suppression components across the contacts) or a transistor-keyed output that can be configured to fit your requirements.

## Assembling the Keyer

Refer to Figs. 1 and 2 and the accompanying photographs during assembly. The parts overlay is shown in Fig. 3; the pc-board layout is in the Hints and Kinks section of this issue. The IC should be the last item installed. We'd recommend using a socket for it. If you install an 18-pin socket, you'll be able to use the 16- or 18-pin IC, the two unused socket positions simply being left empty when the 16-pin 8044 or 8044B IC is used.

You build the keyer to suit your personal requirements. Simply omit any of the components associated with the features you don't need or want. These may include: sidetone output, level and pitch control, and the speed-meter function. If you want transistor-output keying, you don't need to install the relay and arc suppression network. Should you not want the weight control, you'll still need to install a fixed-value 5.6-k $\Omega$  resistor between pins 15 and 16 of U1. If the weighting effect appears to be too heavy, reduce the value of C6 at pin 15 or remove it entirely from the circuit. The MANUAL KEY input can be used as a TUNE function; an spst switch that brings the line to ground will create a key-down condition.

If you elect to use the IC with the speed-meter function, any meter with a full-scale

\*Notes appear on page 19.

<sup>1</sup>P.O. Box 969, Pueblo, CO 81002

<sup>2</sup>Assistant Technical Editor, ARRL



deflection of from 50 to 500  $\mu\text{A}$  can be used as long as it has a linear scale. A modified VU meter is used in the prototype shown in the photos. A new meter scale was made; it has 2-word-per-minute increments of from 0 to 100.

With the 100-k $\Omega$  resistor shown in series with the SPEED potentiometer in Fig. 1, the maximum speed of the keyer is about 50 wpm. Alter the value of the fixed resistor to modify the speed range. The keyer has a top-end speed of about 80 wpm.

A switch is included to turn the keyer and/or the transistor audio amplifier, Q2, on and off. You can prolong the life of the battery by leaving the audio amplifier off. The sidetone oscillator probably won't be required since most modern transmitters and transceivers have built-in sidetone monitoring circuits. The keyer monitor does serve as a good indicator of battery condition: As the battery becomes depleted, the note will become quite chirpy.

#### Relay-Contact Arc Suppression

Certain transmitter keying lines may require the inclusion of an arc suppression network across the keying relay contacts. Most modern transmitters and transceivers should not need this network (C10, R19), as they are usually operated at low voltage levels. But keying some transmitters and transceivers using tubes in the final amplifier may require the relay contact pro-

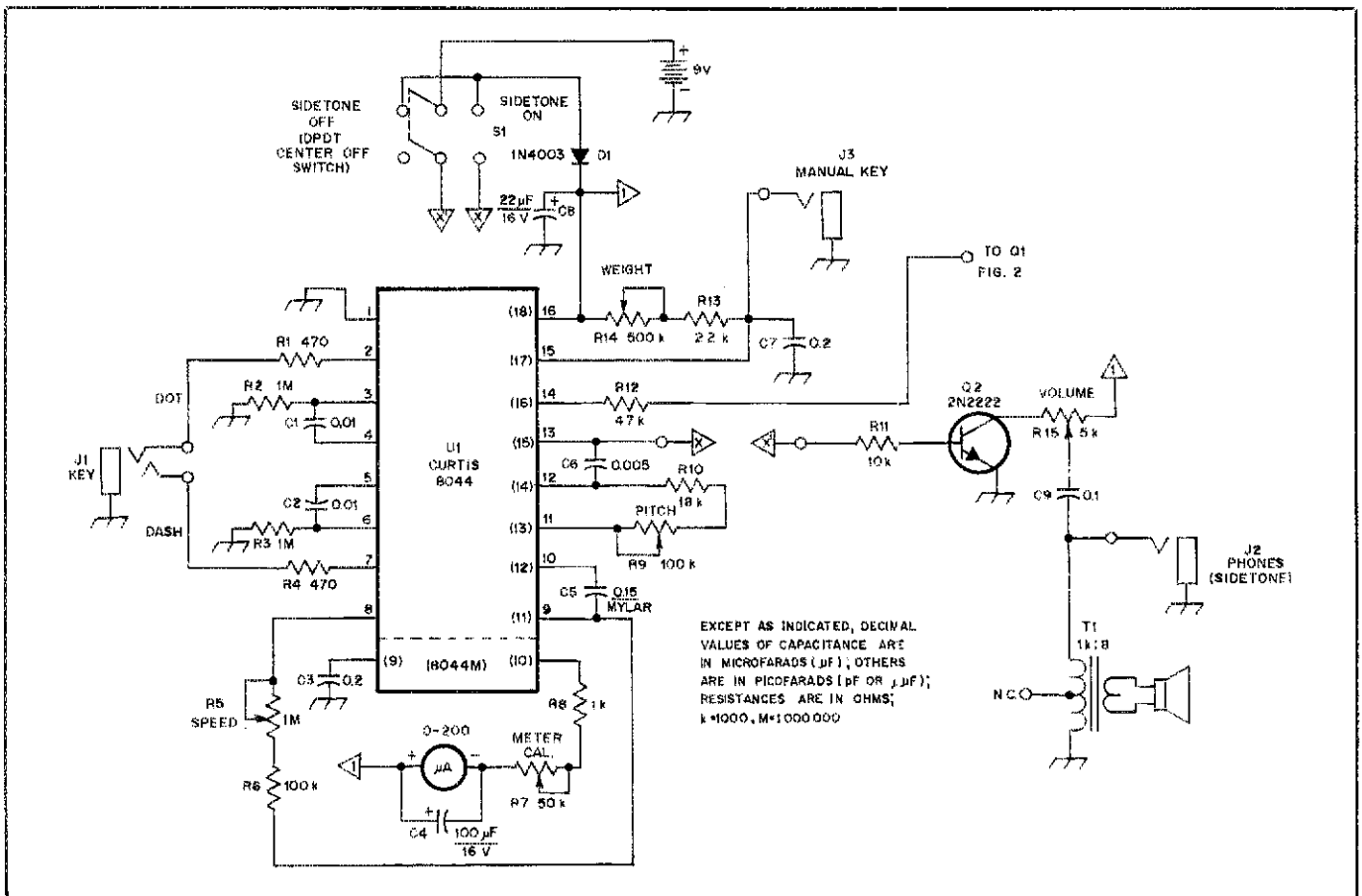


Fig. 1 — Schematic diagram of the keyer. All resistors shown are 1/4-W, 5% types.

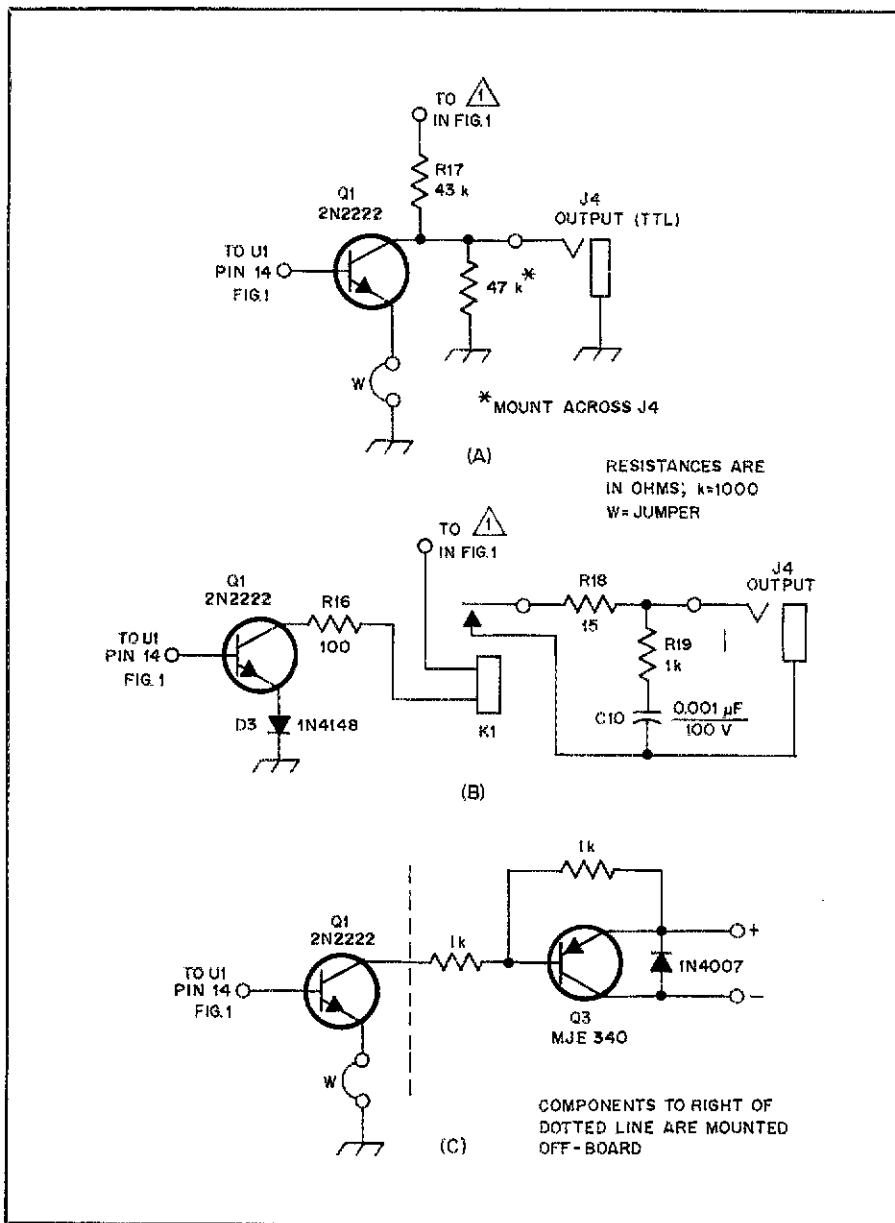


Fig. 2 — Some possible output circuit arrangements. The jumper (W) shown at (A) and (C) is inserted in place of D3. D3 is included to ensure rapid energization of K1; it may not be needed. Q3 and the components to the right of the dashed line in (C) are not mounted on the keyer circuit board.

tection. NIFB has successfully used the prototype keyer with a Kenwood TS-820S transceiver without the arc suppression network; no problems resulted. The key line voltage in that rig is -65-V dc. The appendix information should help you determine the network values required.

### Calibrating the Speed Control

Sending speed can be determined by counting the number of dashes sent in a five-second period. That number is the code speed in wpm. A more refined measurement method uses an oscilloscope or a frequency counter connected to pin 12

of U1. Use the formula

$$\text{speed} = \frac{f}{1.2} \quad (\text{Eq. 1})$$

where speed is in wpm and f is the dot frequency measured at pin 12 of U1. Thus, for speeds of 10, 25 and 50 wpm, the frequency counter should display dot frequencies of 8.33, 20.8 and 41.6 Hz.

### Keyer Case Construction

Two enclosure styles were tried. The first — the rectangular configuration — is easy to assemble. The control labels may be difficult to read at some angles, however. The

sloping-panel version is more attractive, but a bit more difficult to put together. Either case style is available from Circuit Board Specialists; specify which you prefer.

Double-sided pc-board material is used for the box parts. Once the box parts have been cut to size, burnish them with fine steel wool. The parts' edges must be beveled to provide a good fit. Use a sharp file to produce this beveled edge. Work slowly and check the parts periodically for a snug fit. Remember: You can always file off more material, but it's impossible to replace material that's been filed away!

Lay the speaker panel on a flat surface and place the speaker grill in position. Use a toothpick to apply quick-drying epoxy cement to the grill-and-panel joint.

When the box parts are ready, tack solder them together and check for alignment and correct fit. If all is well, lay a bead of solder around each seam. A 25- to 45-W soldering iron should be sufficient. Another pair of hands can help to hold the parts in position.

Finish the case to suit your personal tastes. The original models have a combination of clear polyurethane varnish over most of the box. Light-blue epoxy spray paint accents some panels.

Install the panel mounted controls, jacks, meter and speaker. When mounting the keyer board, orient it with the meter-calibration potentiometer on the bottom.

### A Free Paddle

Feast your eyes on that dandy paddle in the title photo! If anything has possibilities, that's it! To fishing enthusiasts, it might appear as a side view of headless, parallel-swimming fish — perhaps deserving the name "Tuna Twin Paddle." One might modify the design slightly to provide heads for the fish and have the output line exiting as a fishing line. Boaters might choose a different form and evolve a "Canoe Paddle." The possibilities are endless! Use your imagination and come up with something entirely "you."

To top all this excitement off, you can get the paddle parts *free!* Yes, indeed! Your request for the paddle parts will be honored by the delivery to your domicile of the pc-board material you'll need to construct one of these divine digital dexterity determinators.\*

For someone wishing to experiment with iambic keying, this is an inexpensive route to follow. Sure, it's not the best paddle in the world, but it will give a good account of itself (more on that later).

Outside of the pc board material required, you'll need a couple of contacts from a junk-box relay and some machine screws and nuts to fashion the contact points. Some lead shot or other material can be used to fill the base. Scroungers can pick up lead shot from the shooting area of a local skeet-shooting club, about 150 yards from the firing line. (Please wait until

the shooting is over.) Or, you might try the local garage; perhaps they can supply you with some lead tire-balancing weights.

### Constructing the Paddle

Cut the paddle parts to shape. Dress up the parts' edges using a sharp file. Be careful not to get them out of square. With some steel wool, buff the parts to a sheen and spray them with a coat or two of clear acrylic lacquer to retain the finish. Paint the paddle if you wish.

First assemble the base and fill it with the lead shot or other weighting material. Pour in some epoxy cement to hold the material in place. To prevent marring the surface of your operating desk, cover the bottom of the base with a piece of felt or install some rubber feet. Be sure to drill the holes in the paddle arms for the contact screws and drill a hole in the rear panel to pass the key wires. Also, remove a strip of copper from each side of the contact-mounting block to isolate the contacts from the key frame and one another.

You'll need an extra pair of hands to hold the paddle parts in place while you tack solder them together. Once they are aligned properly, solder them along the entire seam.

Break off a couple of contact points from a discarded relay. Solder them to the upright contact piece between the two paddles and attach the output line. Two no. 4-40 machine screws are passed through holes drilled in the dot and dash paddles and secured with one nut on each side of each paddle. These are then adjusted to provide the contact spacing you desire. If the paddle is too stiff to suit your keying style, file the paddle arms to achieve a lighter touch.

### How's It Work?

Admittedly, there were some chuckles, grins and outright guffaws when some members of the Hq. staff eyeballed the paddle. Not to laugh! Cw is serious business! Undaunted, N1FB toted the Dual Dolphin home. On the way, he found that the paddle rested rock solidly on the console of his car, the keyer occupying the passenger's seat. With this arrangement, he could easily send 20 wpm while zipping along at 55 mph. (Oh, for a 40-meter mobile rig and antenna!) The paddle/keyer combo became the main means of cw generation at N1FB. Keying must have been decent, since at least one station, during a long cw chat on 10-MHz, asked if he was using a "pokeboard" (keyboard)!

Lest you think this is a fish story, give the combination a try yourself. Perhaps you may even think of a minor modification or two. What the heck, the paddle shouldn't cost you anything and the keyer's a worthwhile addition to any shack.

### Appendix

Most modern Amateur Radio transmit-

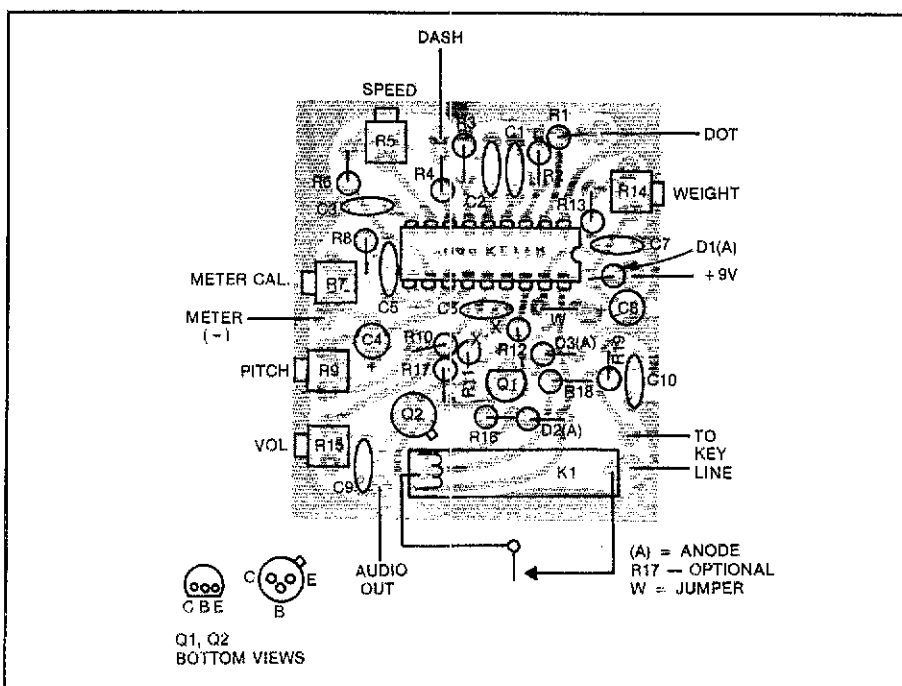


Fig. 3 — Parts-placement guide for the Curtis-IC keyer. Parts are placed on the nonfoil side of the board; the shaded area represents an X-ray view of the copper pattern. The etching pattern appears in the Hints and Kinks section of this issue.

ters, particularly solid-state designs, do not require additional relay-contact protection. Should your transmitter key line be a low-voltage type and not tolerate or require R18, it can be removed or jumpered.

Some grid-block-keyed transmitters will require additional relay-contact protection in the form of an added series-connected resistor if the key-line voltage exceeds 70 and a large-value bypass capacitor is tied between the key line and ground. Select the appropriate resistor value according to the accompanying table. Determine the resistor power rating by multiplying the resistor value by the square of the key-down circuit current in amperes. The added resistor can often be placed within the body of the key-line plug. For keying inductive loads (such as another relay), a silicon diode should be connected across the contacts of K1 (in place of C10, R19) to absorb the inductive kick.

Voltage	Series Resistor Value (ohms)
70	100
100	200
150	450
200	800

### Notes

- Curtis Electro Devices, Inc., generously supplied the ICs used in this project.
- L. Fay, "The Iambic Gambit," *QST*, July 1981, p. 52.
- Curtis Electro Devices Ltd' Bugger, Product Review, *QST*, March 1982, p. 47.
- A complete kit of parts is available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.
- The keyer ICs are available from Curtis Electro Devices, Inc., Box 4090, Mountain View, CA 94040. Be sure to specify which IC you prefer.
- Templates for the sloping-panel keyer cabinet and paddle, and free paddle pc-board material are available from ARRL Hq. Send a business-size envelope and \$2 to cover template and postage costs.

## 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 November issue were:

- "Equipment for CW-Meteor Scatter Operation," by Jan-Martin Noeding, LA8AK
- "MINIMUF for the Ham and the IBM Personal Computer," by John E. Anderson, WD4MUO
- More on AMTOR Protocol Change

*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 ARRL Headquarters for details.

### PHOTO YEARBOOK AVAILABLE

The first annual *Amateur Radio Operators' Yearbook* will include names, addresses, call signs and photographs of ham radio operators worldwide. The *Yearbook* will be available for sale to anyone who wishes to have his or her photo included. For more information, write to Lee Roy Kent, NØEMN (ex-WDØFFZ), AROY, P.O. Box 257, Malden, MO 63863.



# Feeding Your Station

Fat coaxial line, skinny cable, open-wire feeders or 300-ohm ribbon line — the correct choice can save the beginner a few dollars while helping to ensure maximum performance.

By Doug DeMaw,\* W1FB

There are a host of important factors to consider when planning the feed system for any antenna. The cost of the line should *not* be the first item to ponder. Rather, we need to be aware of the *loss* (measured in decibels per foot) at our chosen operating frequency and the quality of the cable — insulating material, extent of shield-braid covering and inner conductor size. Not all similar feed lines provide the same quality and performance. The choice between coaxial lines and balanced open-wire or ribbon lines is still another matter to contemplate. Finally, we should determine the longevity of the line. Pollutants in the soil and air, plus the effects of sun and temperature, have a significant deteriorating effect on feed lines; certainly, we don't want to replace the transmission line more often than necessary. After all, these are tough economic times, and nothing we buy seems to be priced as we feel it should be! Let's examine the high points of selecting the best feeder cable for several types of applications.

## The Matter of Losses

How much loss can we tolerate in a transmission line? Our objective should be to reduce the losses as much as possible, but there must always be some loss in the system, however slight it may be. Most manufacturers of transmission line rate the product in decibels of loss per 100 feet for a specified range of operating frequencies.<sup>1</sup> As the frequency is raised, the losses increase. For a given length of coaxial cable

the losses at 1.8 MHz may be so minor that we don't pay much heed to them. But at, say, 28 MHz and higher, they may be so great that half or more of our available transmitter power is lost en route to the antenna! This can happen even when the feeder is matched properly to the antenna at one end, and to the transmitter at the other end.

Fig. 1 contains a chart that will aid us in learning the various characteristics of feed lines, including the losses per 100 feet

at frequencies from 1 to 1000 MHz. We can observe from Fig. 1 that the least effective line we can select is miniature RG-174/U. The loss per 100 feet exceeds 5 dB at 29 MHz. Thus, if our transmitter puts out 100 W of rf power, only 31 W will reach the antenna, assuming we are operating at 29 MHz with 100 feet of RG-174/U cable! Imagine what this could mean if we were using a QRP (low power) station with only 1 or 2 W of transmitter output power. Ouch!

Now, let's envision the same general situation while using the least lossy line — open-wire feeders. The loss per 100 feet at

\*Notes appear on page 23.

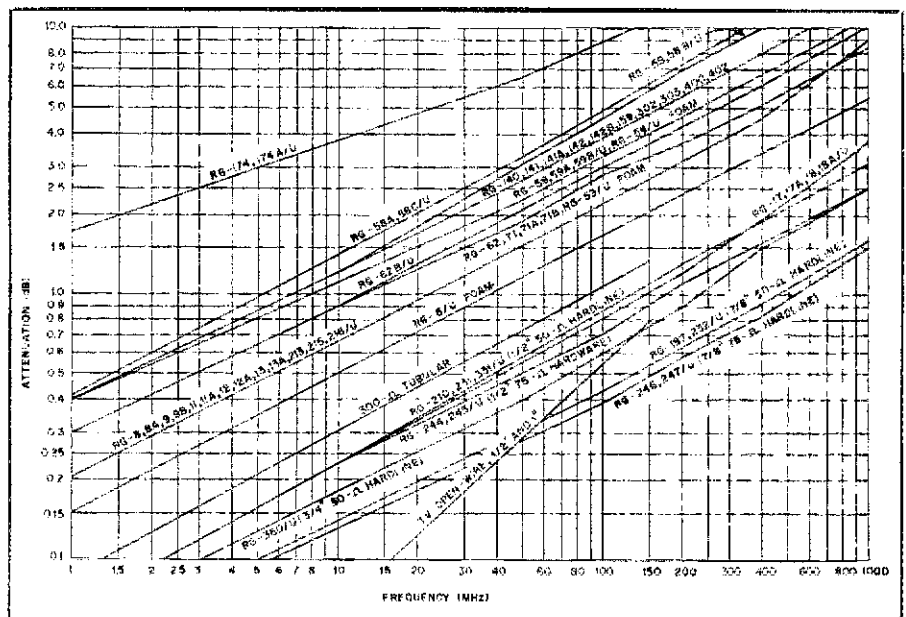


Fig. 1 — Method for determining transmission-line loss.

\*ARRL Contributing Editor, P.O. Box 250, Luther, MI 49656

29 MHz will be roughly 0.175 dB. Hence, for 100 W of output power we will be able to deliver 96 W to the antenna feed point, assuming the impedances are matched correctly at both ends of the line. So, we can see that even with the least lossy of feed line we will still be forced to sacrifice some of our power in the system. Additional losses will occur, however minor they may be, if we include Transmatches (antenna tuners) and baluns (balanced-to-unbalanced transformers).

There is no such thing in this business as 100% efficiency. So, somewhere along the course of our planning we must strike an acceptable compromise between losses and the cost of our feed line. RG-8/U coaxial line that contains foam dielectric is the frequent choice of amateurs for use from 1.8 to 30 MHz. The loss is 0.9 dB at 29 MHz and only 0.2 dB at 1.8 MHz. So, at 29 MHz our 100-W transmitter will deliver approximately 81 W of rf energy to the antenna feed point per 100 feet of foam RG-8/U line.

Semiflexible, aluminum-jacketed, foam-dielectric cable (Hardline) is the style of transmission line preferred by those amateurs who are willing to spend extra money for a low-loss feed system that should last for many years. This type of coaxial cable is well-suited to vhf and uhf work because of reduced losses and relative immunity to damage from the environment. Although the 0.5-inch-diameter Hardline (RG-210/U, etc.) is quite good in this respect, the 0.75-inch-diameter type (RG-360/U) is better with respect to losses. But, it costs substantially more than the smaller Hardline. The "flea on the dog's back" in either situation is obtaining the connectors for Hardline. Not only are these special fittings hard to locate — they cost a bundle! A method for adapting standard coaxial connectors to Hardline was treated in *QST* a few years ago.<sup>2</sup>

### Using Open-Wire Feeders

You may hear old-timers extolling the virtues of open-wire feeders or "ladder line." In bygone days, the standard ham antenna was the end-fed or center-fed Zepp. It got its name from a style of antenna that was used on Zeppelin airships. Open-wire feed line was used with a tuner to permit operation over a wide range of frequencies. The tuner was used to provide an impedance match between the feed line and the station transmitter and receiver. The arrangement did not ensure a match at the antenna feed point; because the feeder losses were so low, however, the mismatch was inconsequential.

Many amateurs still use Zepp-style antennas because they are convenient for multiband operation when there is room for only one antenna. Such a system is shown in Fig. 2. The purpose of the Transmatch (transmitter to transmission-line matcher) is to convert the balanced

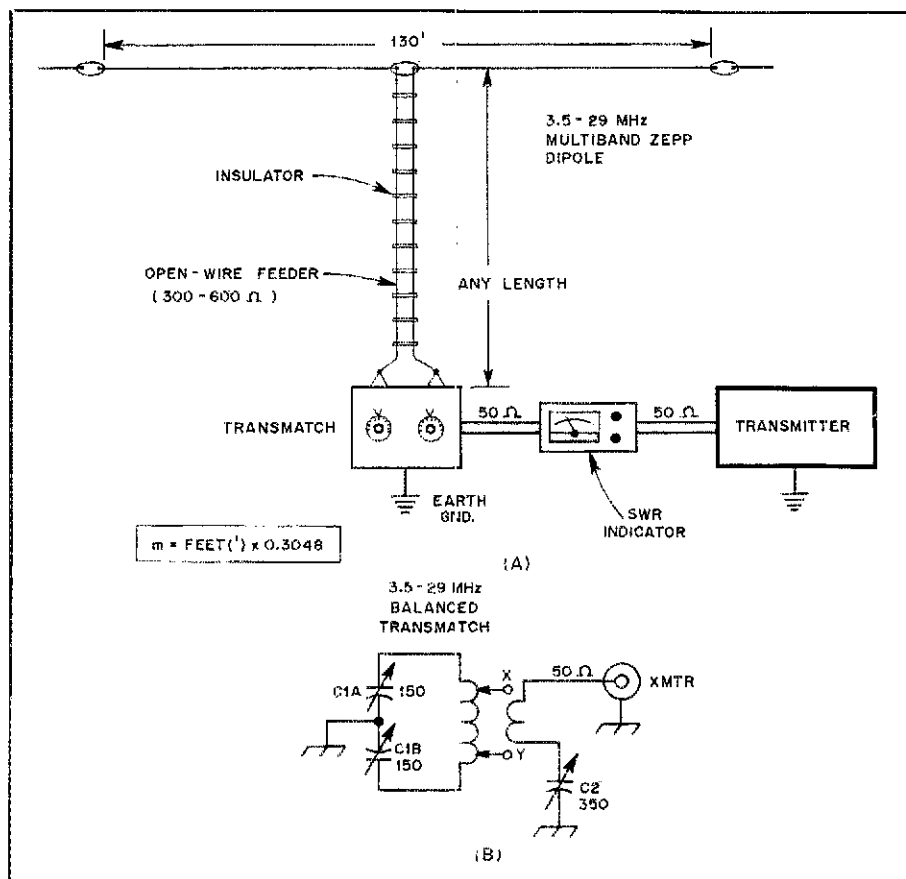


Fig. 2 — Example of a center-fed Zepp antenna for multiband use with open-wire feeders. A Transmatch is used to convert the system from a balanced to unbalanced condition while matching the line impedance to that of the transmitter (see text). Transmatch circuit is shown at B.

feed-line format to an unbalanced 50-ohm condition for interface to the transmitter and receiver. The Transmatch is adjusted to provide an SWR (standing-wave ratio) of 1:1, thereby assuring maximum power transfer from the transmitter to the antenna system.

Some of you are no doubt wondering, "What should the open-wire line impedance be?" Actually, its value is not critical. A multiband antenna of the type seen in Fig. 2 may not be matched to the antenna feed point on any band, irrespective of the typical balanced feeder impedance. Generally, we will use open-wire line that ranges in impedance from 300 to 600 ohms. This depends on the wire diameter and center-to-center spacing between the two wires. Most commercially made open-wire feed line is 300 or 450 ohms with respect to the characteristic impedance. Homemade ladder line may be as great as 600 ohms in value. We can easily calculate the line impedance by applying Eq. 1.

$$Z_0 = 276 \log \frac{2S}{d} \text{ ohms} \quad (\text{Eq. 1})$$

where  $Z_0$  is the feeder impedance,  $S$  is the distance (center to center) between the two wires and  $d$  is the diameter of the conductors. The dimensions are in inches. Hence, if we made an open-wire line from two

lengths of wire that had an outer diameter of 0.125 inch, and the center-to-center spacing of the wires was 4 inches, the impedance would be

$$Z_0 = 276 \log \frac{8}{0.125} = 498.5 \text{ ohms} \quad (\text{Eq. 2})$$

Spacers of good insulating quality should be used at 12-inch intervals, approximately, to maintain the desired spacing between the wires. Steatite, ceramic, Plexiglas,<sup>6</sup> fiberglass or phenolic is suitable. Some amateurs, in an effort to keep the cost low, have used pieces of wooden dowel rod after boiling the pieces in paraffin (canning wax).

### What About TV Ribbon Line?

Can we use 300-ohm TV ribbon as balanced feeders? Sure! It suffers from a significant limitation, however: The insulating material — usually polyethylene — increases the line loss, as is the case with coaxial cable. Therefore, we will not enjoy the benefits of the almost air-dielectric open-wire line. But, we will have a balanced system.

An annoying problem with the use of TV ribbon is a change in the SWR when it rains, when the line becomes dirty, or when ice and snow are present. This can happen to a lesser extent when using open-wire line, but it seldom presents the annoyance that

we will experience with ribbon types of 300-ohm line.

If TV line must be used, try to obtain the uhf style of feeder. It will be foam filled, or may have sections of the insulating material cut out at short intervals along the inner portion of the line. Also, try to select 300-ohm line with large conductors. Some of the "cheap" ribbon line has inferior insulation and very tiny conductors. Avoid this variety! It will be very lossy.

### Back to Coaxial Cables

Commercial antenna designers need to consider a number of factors when choosing a proper feed line: power rating, operating voltage (rms or peak), shielding integrity, velocity factor ( $V_f$ ) and environmental damage, for example. Not all of these points will be of concern to us amateurs, since we are dealing with low levels of rf power, comparatively speaking, and will not be operating our stations at altitudes greater than 10,000 feet or in ambient temperatures exceeding 100° F. Those two conditions must be taken into account by many commercial operators, however, since the greater the heat and altitude the lower the power capability of the transmission line. An article on this subject, along with derating charts and other feed-line matters not discussed here, was published in *RF Design*.<sup>3</sup> We will focus instead on the velocity factor and potential environmental damage. The operating voltage will also be treated.

### Velocity Factor

Each type of coaxial or balanced feed line has a specific velocity factor. The  $V_f$  is dictated by the dielectric material used as insulation between the conductors. We can learn the  $V_f$  from

$$V_f = \frac{100}{\sqrt{\epsilon}} \% \quad (\text{Eq. 3})$$

where  $V_f$  is the velocity factor as a percentage of the speed of light and  $\epsilon$  is the dielectric constant of the insulation. Solid polyethylene (for feed lines) has a dielectric constant of 2.31, and Teflon is rated at 2.07. Air is specified as 1.0, which indicates no need for concern about the  $V_f$  of air-insulated lines. Foam polyethylene has an  $\epsilon$  constant of 1.56, so we must be mindful of whether our coaxial line contains solid or foam insulation. In accordance with these constants, we may apply the  $V_f$  of 66% for solid polyethylene cables and 80% for foam types of feed lines. If we should be fortunate (or wealthy) enough to obtain Teflon-insulated feeder cable, we can use 69% for the  $V_f$ .

Since each style of cable has a  $V_f$ , we can think of this as a time delay factor along the line. This time delay (T) can be obtained from

$$T = 1.016 \sqrt{\epsilon} \quad (\text{Eq. 4})$$

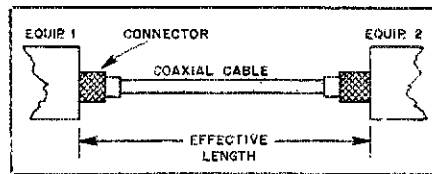


Fig. 3 — When you are cutting a length of coaxial cable to a specific part of a wavelength, it is essential to include the coaxial connectors in the measurement. The velocity factor of the cable is also included in the calculations (see text).

**Table 1**  
**Characteristics of Some Popular Coaxial Feed Lines**

Cable Type	Nom. Impedance	p/ft	Max. rms Voltage
RG-174/U	50 ohms	30.4	1500
RG-58A/U	50 ohms	28.5	1900
RG-59A/U	75 ohms	21.0	2300
RG-8A/U	50 ohms	29.0	5000
RG-11A/U	75 ohms	0.5	5000
<i>Alum. jacketed Hardline (foam dielectric)</i>			
1/2 inch	50 ohms	25.0	2500
3/4 inch	50 ohms	25.0	4000
7/8 inch	50 ohms	25.0	4500
1/2 inch	75 ohms	16.7	2500
3/4 inch	75 ohms	16.7	3500
7/8 inch	75 ohms	16.7	4000

Additional types and characteristics can be found in Chapter 3 of the *ARRL Antenna Book*, Fourteenth Edition.

where T is in nanoseconds/ft and  $\epsilon$  is the dielectric constant of the cable insulation.

What does all this mean? Is it worth bothering with? By all means! Suppose you needed to cut a piece of RG-8/U coaxial line (solid polyethylene insulation) to one quarter wavelength at 3.9 MHz. Perhaps this line section is needed as a matching transformer. The free-space length of such a line would be found from  $L(\text{ft}) = 246/f(\text{MHz})$ . Therefore, the line for that condition would be 63 feet long. But, we must take into account the  $V_f$  of our feedline section. Hence, we will multiply 63 by 0.66 to secure the correction factor. The total length (including connectors) of the quarter-wave section then becomes 41 feet 7 inches.

Indeed, the coaxial connectors are a part of the electrical line length, as illustrated in Fig. 3. In an ordinary antenna system that is matched properly to the terminations at each end, we need not be concerned about the precise length of the feed line, except for the losses resulting from long runs of such cable.

### Operating Voltage

Feed lines are rated for maximum safe rms (root mean square) operating voltages. The rf voltage from our transmitters is the rms type, assuming the wave form is pure. We can learn what the line input voltage is if we first measure the transmitter output power into a 50-ohm dummy load.

$E(\text{rms})$  is obtained from

$$E = \sqrt{PR} \text{ volts} \quad (\text{Eq. 5})$$

where P is in watts and R is in ohms. Therefore, if we delivered 100 W to a 50-ohm load, our rms voltage would be 70.7. This assumes an SWR of 1:1. If the line to the antenna exhibits an SWR other than this, however, we need to include this factor when determining the *effective* line-input voltage. This is accomplished by multiplying the actual input voltage by the square root of the SWR. So, if we had 100 W of power (70.7 volts rms) and an SWR of 1.7:1, the effective input voltage would be 92. We can learn from this that the higher the SWR the greater the possibility of damage to the feed line at the higher power levels. Table 1 lists the maximum safe rms voltage for a number of common feed lines.

### Environmental Considerations

It's no secret that air contains all manner of man-caused pollution. These acid and alkali materials can, with time, contaminate the plastics used as coverings on coaxial cables. The poison migrates into the cable and causes it to be lossy. How bad the contamination, and the length of time required to spoil a feed line, depends on the level of contamination for a given region. Those living in large cities and industrial regions will fare the worst in this respect. The ultraviolet (UV) radiation from the sun will also affect the plastics in our antenna systems.

Cables that contain foam dielectric are generally more resistant to pollution damage than are the solid-dielectric types; the air bubbles in the insulation help to restrict the migration process. Aluminum-jacketed Hardline is more likely to resist the effects of pollution than is RG-style flexible line with its braided-copper outer conductor. Moisture is the first-order enemy of coaxial cables, especially when the moisture carries damaging chemicals into the feed line. Acid rain, a common threat in some areas nowadays, can cause oxidation of the feeder conductors. Because of UV radiation in areas of high sun activity, polyethylene jacketing is preferable to PVC outer-jacketed lines. In areas of high sun intensity, PVC lasts about half as long as polyethylene.

### Special Impregnated Cables

If we chance to live where the salt content in the air is high, or if a substantial level of air pollution is prevalent, we may be wise to invest in one of the impregnated RG-8/U types of coaxial line. I use this style of line for all underground installations, and tend to prefer it for above-ground use as well. The center conductor is solid rather than stranded. Otherwise, the cable is very similar to RG-8/U. The transmission line is pressure-pumped



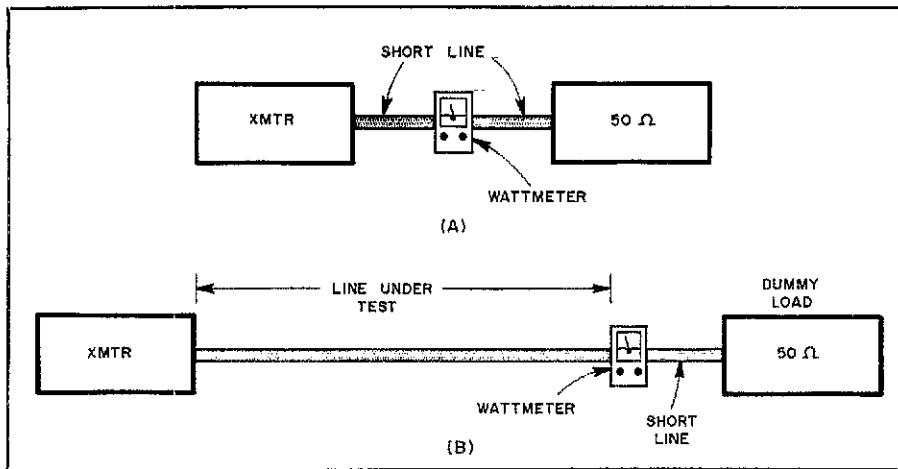


Fig. 4 — An old piece of coaxial feed line can be tested for losses by establishing a given transmitter output power (A) and maintaining it. Next, as shown at B, the wattmeter and dummy load are moved to the far end of the line to be tested and a second power reading is taken. The loss in decibels is then found from  $\text{dB} = 10 \log P_1/P_2$ , where  $P_1$  is the highest power observed and  $P_2$  is the lowest reading.

with a sticky, low-loss compound to prevent dirt, air and moisture from penetrating it. It costs more than standard RG-8A/U, but it will last a lifetime under normal circumstances. It is available from at least two manufacturers.<sup>4</sup> It is also immune to damage from rodents, in that it is self-healing (some rodents delight in gnawing on exposed wires).

If you are suspicious of your feed line because it has been out of doors for a long time, or if it has been buried in the soil, it would be prudent for you to do a power-loss measurement of the line. This is a simple procedure. The essentials are shown in Fig. 4. The transmitter power is set to a specified amount after we connect a power meter and dummy load to the transmitter output. Next, the suspected coaxial line is attached to the transmitter, while the power meter and dummy load are moved to the far end of the feed line. A second power reading is taken. The loss in decibels is then compared to the loss of a new feed line, at the operating frequency. (See Fig. 1 and calculate the loss per foot.) If it is greater than 10% of the rated value, the feed line should be replaced.

We can slow down the deterioration process measurably by applying a quality sealant to the open portions of the cable when the antenna system is first commissioned. This will prevent unwanted moisture from entering the line and flow-

ing along the inner and outer conductors. I like to use noncorrosive Silastic<sup>®</sup> compound or five-minute epoxy cement. I also apply sealant around the back side of my coaxial connectors. The putty used for dry floral arrangements works nicely as sealant for coaxial fittings.

#### Shielding Integrity

Bargain-price coaxial cable often has very poor shield-braid construction. The manufacturers of this material skimp in an effort to speed production and increase their profits. Well designed single copper braid provides 85 to 90 percent shielding efficiency. Two layers of this braid are even better, and triple-layer braid is best.

But these are quite expensive, and are not necessary for most of us. The extra shielding is essential for duplexer harnessing in repeater stations, and where incidental radiation must be held to a minimum. By comparison, aluminum-jacketed Hardline has an isolation rating (per foot at 100 MHz) of 700 dB. Single-braid line, such as RG-8A/U, provides only 48 dB of isolation. These isolation amounts are referenced to the desired transmitter output power.

If you are tempted to buy low-cost feeder cable, sneak a peek at the shield braid before paying for it. If there are gaps between strips of stranded braid, don't buy

it. Some imported cables fit this description all too well!

#### What Have We Learned?

The object of this discussion has been to caution the newcomer about the matters of feed-line loss, potential deterioration of the cable and the velocity factor of a length of transmission line. A single lost decibel in a transmission or reception system may seem rather inconsequential. After all, few of us could discern an increase or loss of 1 dB while listening to a signal. But decibel losses are cumulative, so it is to our advantage to salvage every decibel possible. When we add up the potential losses in a complete amateur system — losses from feed-line attenuation, baluns, Transmatches and poor matching — it can become startling, especially at the higher frequencies! It isn't a casual matter to have even a 3-dB system loss, for that means we have cut our available rf power by 50%. We must accept some losses, but being miserly about the situation is wise. Three dB, for example, could mean the difference between being copied or lost in the QRN (noise) or QRM (interference).

We might summarize by saying that we should try to buy quality feed line, avoid the small-diameter coaxial cables for runs greater than 50 feet up to 30 MHz, and seal the points where moisture can enter the line. If we need to bury the feeder cable, we should consider using impregnated feed line. For vhf and uhf antenna systems, we should attempt justification of Hardline in preference to flexible feeders to minimize losses. RG-174/U line should be avoided at all costs, even for use in the lower part of the high-frequency spectrum.

Generally speaking, we will fare pretty well for all but the most demanding applications if we use foam-insulated RG-8A/U line in our 50-ohm systems. It represents a reasonable compromise between cost, longevity and minimum losses. Open-wire line will always be best for very long feed lines, however.

#### Notes

<sup>1</sup>mm = ft × 0.3048; mm = in. × 25.4.

<sup>2</sup>DeMaw, "Connectors for CATV 'Hardline' and Heliax," *QST*, Sept. 1980, p. 43.

<sup>3</sup>DeMaw, "RF Coaxial Cables — Choosing the Right One," *RF Design*, May 1980.

<sup>4</sup>VB-8 coaxial cable from Decibel Products Corp., 3184 Quebec St., Dallas, TX 75247 (W5KF, VP). Imperveon 50-ohm cable from Times Fiber Communications, 358 Hall Ave., Wallingford, CT 06492.

## Strays

### 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) Sub-

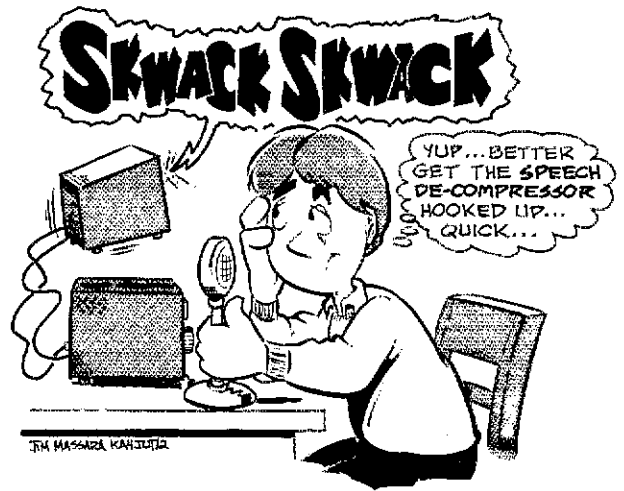
mit your material before deadline — the 8th of the second month preceding desired publication (i.e., arrive at Hq. before December 8 for February *QST*). (3) Any photographs you send should be good-quality, black-and-white glossy prints. Color prints, slides and instant photos do not usually reproduce 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, KAIJGG

# Try This Speech "Decompressor"



Tired of listening to unpleasant or monotonous speech-processed signals? Restoration, in part, can be accomplished at your receiver output with this interesting gadget.

By Eric Nichols,\* KL7AJ

Speech processing for a transmitter is probably as good as the circuit design or the operator's ability to adjust the processor correctly. Unfortunately, neither condition is met most of the time. But, even when the overall system is functioning as prescribed, our ears or minds tend to tire of the restricted-speech sound. It's unlikely that we would be so brash as to ask the other station, "Could you please turn off your processor for awhile?" A more practical alternative is to "decompress" the speech at the output of our receiver or transceiver.

It appears that speech processing is here to stay. Practically all new transmitters and transceivers contain processors of some form. Isn't it surprising that no manufacturer incorporates the natural complement to speech compression — audio expansion at the receiver end? Audio expansion is no stranger to the hi-fi enthusiasts among us. These dynamic-range enhancers have been around for years. They compensate for the lack of "head room" on audio recordings. These devices are expensive when designed for music systems, but a simpler and less expensive expander can be devised for speech-only reception.

Here we will consider a simple decompressor which, when connected between a low-level audio output of a receiver or transceiver and an external power amplifier, can effectively restore to the original product even the most "squashed"

audio. This project can be assembled in an evening or during a weekend.

## Circuit Information

Fig. 1 shows the circuit of the decompressor. We should be aware that all processors — rf or audio — achieve the same end results: to reduce the level of difference between audio peaks and to bring the average power to a higher plateau. This is done with some type of nonlinear amplification.

D1 and D2 of Fig. 1 cause U1 to operate nonlinearly in the opposite sense. As the level into the diodes increases, the amplifier gain also increases. This effect accentuates the difference between the peak voltages.

The values for R1 and R2 can be changed to any resistance from 0 to 10 k $\Omega$  to tailor the expansion to the amount desired. The values specified in Fig. 1 provide approximately 20 dB of expansion.

## Laboratory Tests

I recently demonstrated this compressor at a club meeting. The test system consisted of a closed-circuit audio chain with speech that was prerecorded. The audio was first compressed with 20 dB of instantaneous peak clipping (the most "trashy" method of speech processing). Next, the clipped audio was expanded and fed to a quality audio amplifier; the difference between the original and the expanded audio (after clip-

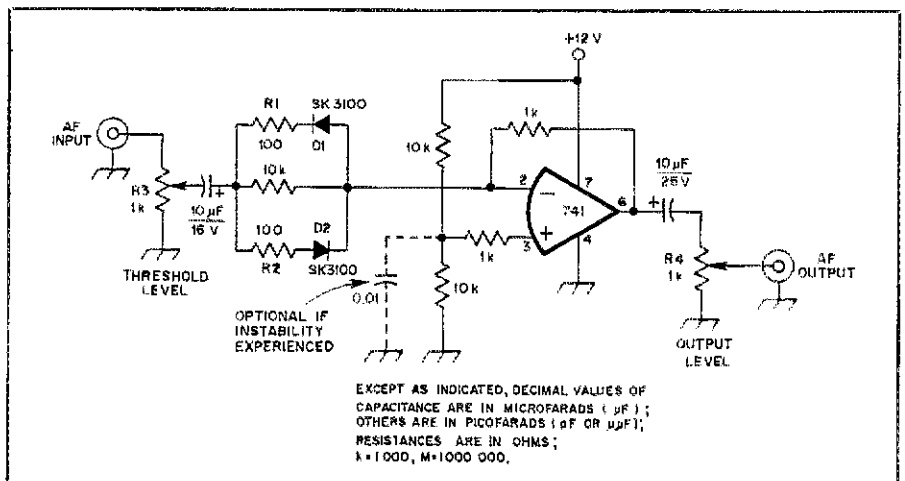


Fig. 1 — Schematic diagram of the speech decompressor. Resistors are 1/4- or 1/2-W carbon composition.  $V_{CC}$  can be from 9 to 13.5, positive. R3 and R4 are linear-taper carbon controls. D1 and D2 are small-signal silicon diodes (1N914 or equiv.).

\*P.O. Box 0, North Pole, AK 99705

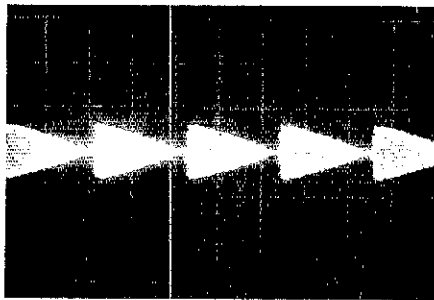


Fig. 2 — Original audio wave form without processing or expansion, as viewed on a scope.

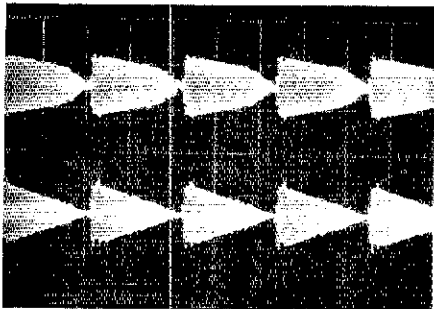


Fig. 3 — The upper trace shows the audio energy after being processed. Processed audio, recovered then expanded by the circuit of Fig. 1, is shown in the lower trace. The ratio between the peaks and ebbs of the audio signal is more pronounced in the lower waveform example.

ping had taken place) was indistinguishable to anyone in the room. Figs. 2 and 3 contain oscillographs of the unprocessed audio, compressed audio and expanded audio energy.

The circuit of Fig. 1 has an unexpected bonus. It reduces the background noise, particularly the high-frequency hiss, considerably. The speech information seems to jump right out of a noiseless background. This greatly enhances the listening quality.

#### Adjustments

The expander input level should be low. It can be taken from a low-level output point in the receiver. The 600-ohm phone-patch output on most transceivers is ideal for the take-off terminal.

First, we need to set the output level for a fairly high amount. Next, we advance the threshold-control setting until background noise can just be heard. Then the control is backed off just below this point. Now we can listen with pleasure to those hams who don't know that their processors have an "off switch" at our end of the line!

The decompressor has what might be considered a disadvantage: It requires an outboard audio amplifier. If you don't care for a collection of outboard equipment, you may want to try my "Mickey Mouse" way of achieving the necessary result. This method works only with solid-state rigs that contain complementary-symmetry output stages. It will not work with rigs that use conventional Class A output amplifiers.

Most of today's rigs have an af-output stage that is similar to the circuit of Fig. 4. D1 and D2 provide a slight forward bias for Q1 and Q2 to reduce crossover distortion. Sometimes a resistor is used in place of D1. All we need to do in order to introduce crossover distortion intentionally is to change the bias on Q1 and Q2 of Fig. 4. The crossover distortion provides the same results as is created by D1 and D2 of Fig. 1, surprisingly. If there are two such diodes in your rig, you may jumper one of them (as in Fig. 4), and that will do the

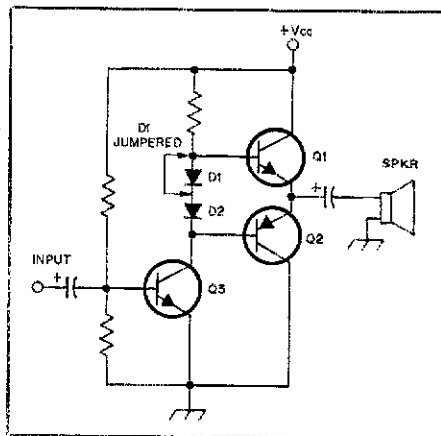


Fig. 4 — Typical circuit of a complementary-symmetry audio channel found in a modern receiver or transceiver (see text).

trick. As an alternative, you may replace the silicon diodes with germanium units, which have roughly half the forward-conduction voltage characteristic of silicon diodes. If a resistor is presently in use at D1 of Fig. 4, you may need to reduce the value of the resistor to approximately half the present value. Do not replace both diodes with resistors, because at least one diode is necessary to ensure thermal stability.

#### Final Comments

The human voice is a great thing to hear. The state of the art seems to require that the voice quality be "butchered." So, let's use the available technology to increase the effectiveness of our amateur communications. But let's also try to recover the pleasant character of the human voice.

## Strays



Gary Firtick, K1EB, is one of about 25 members of the Hen House Gang in Bethlehem, Connecticut, who will be operating W1FHP until January 7, 1984, looking to contact hams in as many towns of Bethlehem across the country as they can. This will be their 28th Christmas season operation. See Special Events, Nov. 1983 QST, for more details. (photo by KA1YP)

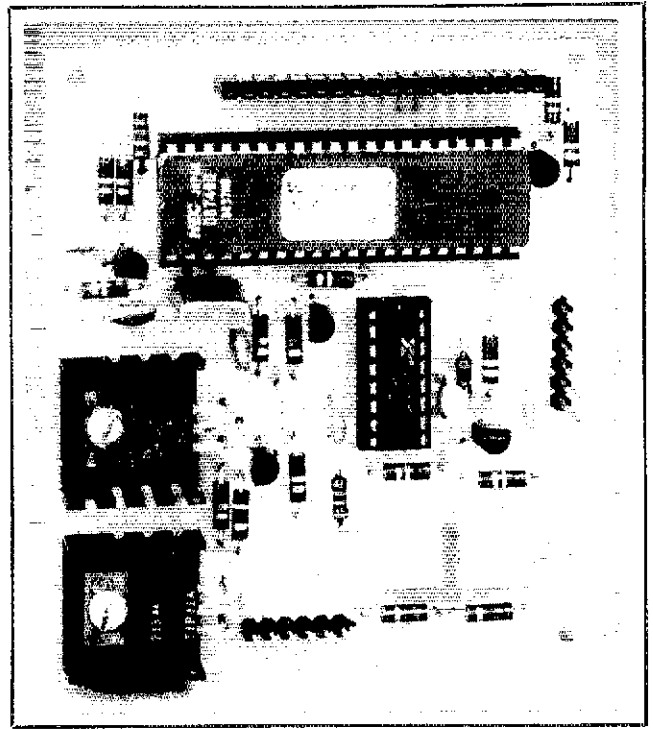
#### CALL FOR PAPERS

□ Papers are invited for the Experimental Packet Radio Networks International Symposium to be held in Linköping, Sweden, May 26-27, 1984. Areas of interest are experimental packet radio, networking routing and control, distributed processing, channel-access protocols and proposed standards. Write to SOFTNET User Group, Dept. of Electrical Engineering, Linköping University, S-581 83 Linköping, Sweden, or call 46 13 28 10 00 and ask for Per Lundgren or Gunilla Svahn, Dept. of EE.

Deadlines are January 31, 1984, for the notice of intent, and March 31, for camera-ready manuscripts. Author's kits will be mailed by February 29. — Jens Zander, SMSHEV

# The Microcomputer Repeater Controller

Planning to upgrade your repeater control system? Step into the world of microcomputers with this simple, inexpensive controller. It is easily interfaced to most existing repeater circuits.



By Scott M. Freeberg,\* WA9WFA

Many repeater owners and users would like to have a computer-controlled repeater, but are reluctant to build such a system. This may be caused by unfamiliarity, computer complexity, potential high cost, or the nightmare of interfacing the system to a new or existing repeater. The Microcomputer Repeater Controller should quiet all of these complaints. The system is simple, low in cost and easy to interface. Two ICs on a 3- × 3-inch pc board provide complete microcomputer-controlled operation for your repeater.<sup>1</sup>

You are probably wondering what features a controller that only uses two ICs can possibly provide. The answer is *plenty*, if the ICs are a completely self-contained computer and a sine-wave tone generator! Just consider some of the features: two cw identification (i-d) messages, an i-d to i-d timer, a hang timer, a time-out timer, courtesy beep, pre- and post-time-out cw messages, transistor drivers for direct or indirect push-to-talk (PTT) operation and a flexible carrier-operated relay (COR) input interface. A single 12-V dc power supply is required to operate the unit. An optional User Module allows all timer functions to be reprogrammed instantly. Auxiliary control

inputs are also provided, for use with an autopatch or a voice-message generator.

## System Concepts

My goal at the start of this project was to design a completely self-contained microcomputer repeater controller. I wanted to include all functions and system-interface hardware on a single pc board. At the heart of the controller is a single-chip computer that does not require any support ICs. Computer software performs the functions normally done by two or more pc boards full of digital circuitry. This software can be personalized with i-d messages and timer features that meet the needs of each repeater owner.<sup>2</sup>

I decided to use a sine-wave tone-generator IC to produce a clean, crisp cw note for the i-d messages and courtesy beep. This seems to be an often-overlooked function, judging by the chirpy, harsh tones that I have heard from repeaters.

Problems normally associated with interfacing a controller with a repeater have been reduced by including a variety of interface circuits right on the controller pc board. For example, a two-level PTT interface, which will allow high- or low-current, direct PTT or indirect relay drive, is included. The receiver COR-to-controller interface is a transistor input circuit that can be configured to accept a variety of COR signals. I included several auxiliary control inputs in my design, which can be

used by other repeater devices. The computer can recognize the presence of these devices, and aid in interfacing them to the repeater system.

Most repeaters are able to supply +12-V dc for the controller. The tone generator can operate from this voltage, but the microcomputer requires a +5-V dc supply. A 5-V regulator is included in the circuit, to meet this requirement. The current drawn from the 12-V supply will be under 100 mA.

Before starting to design the hardware, I made a list of all the features that should be included in the controller. This is an important part of any project, because your design can take into account the most efficient method of meeting your goals.

## CW Features

Most users are keenly aware of the repeater i-d features. I gave this area special attention to help our club machine have a good reputation. An EXAR 2206 tone generator produces a clean sine-wave note for the cw functions of the repeater controller. Two cw i-d messages are provided by this controller. I call them the "first" cw i-d and the "normal" cw i-d. After the repeater has not been used for several minutes the microcomputer stops all control timing. When a signal is received, the first message is sent. Our repeater transmits VIA WA9WFA/R FORT ATKINSON. The normal cw i-d is sent for each succeeding i-d

<sup>1</sup>Notes appear on page 31.  
<sup>2</sup>809 West Cramer St., Fort Atkinson, WI 53538

during that activity period. We use a shortened version of the first message, WA9WFA/R. These i-d messages are programmed into the microcomputer, and can be almost anything you want.

Another feature that is included with the cw i-d is a timing window designed to avoid double i-ds. On many repeaters, when the activity stops, the controller is reset immediately. If the machine is accessed again after a pause of a few seconds, it will send the i-d message. The microcomputer-controller timing window looks for activity after the last normal i-d. If someone accesses the repeater before the window closes, the controller is not reset, and the next i-d will not be sent until the regular i-d time has elapsed. After the window is closed, the controller is reset. The next user to access the repeater will cause the first i-d message to be sent.

The cw speed can be programmed as 10, 15 or 20 wpm if you order your microcomputer chip from Processor Concepts.<sup>3</sup> These speeds can be changed at any time by using the optional User Module that is available from the same supplier.

A short tone, called a courtesy beep, is sent a few seconds after a user stops

transmitting. The next users should wait for this beep before starting their transmission so others can join the conversation. The time-out timer is reset just before the beep.

The delay time before sending the courtesy beep and the beep length are programmed into the microcomputer. Common values for these times are 0.5, 1, 1.5 and 2 seconds for the delay, and 0, 0.04, 0.08 and 0.12 seconds for the beep length. These parameters can also be changed by means of the User Module.

### Timer Features

All of the timing functions for the repeater controller are programmed into your microcomputer. They are set to your specifications when you buy the chip, and can also be changed later with the User Module.

When a user stops transmitting, the controller is programmable to hold the repeater transmitter on for up to five seconds (the maximum hang time allowed by FCC rules). During this time the courtesy beep will be sent. There are arguments for and against using a hang timer. A long hang time results in fewer closures and extended working life for relays. This is one good

reason for using a hang timer.

FCC rules require a remotely controlled transmitter to be turned off within three minutes if a malfunction should occur. Many control operators use a time-out timer to comply with this rule. A time-out timer will also prevent one user from monopolizing the repeater for long periods. When the carrier is dropped and the courtesy beep sounds, the timer is reset to zero. The time-out timer can be programmed for from no time-out to 9 minutes.

Rather than just abruptly turning off the repeater when a time-out occurs, the computer is programmed to send a pre-time-out warning message. This message consists of a series of 10 beeps sent just before the transmitter is shut off. Listeners will be alerted to what is about to happen. After the carrier has been dropped the computer will turn on the transmitter and send a post-time-out message. This cw message can be just about any length you want. Our club message is ?? TIME. These two messages provide a nice feature to keep the users informed about the repeater status.

The time interval between cw i-ds is called the normal time. This timer function is programmable from 30 seconds to 10

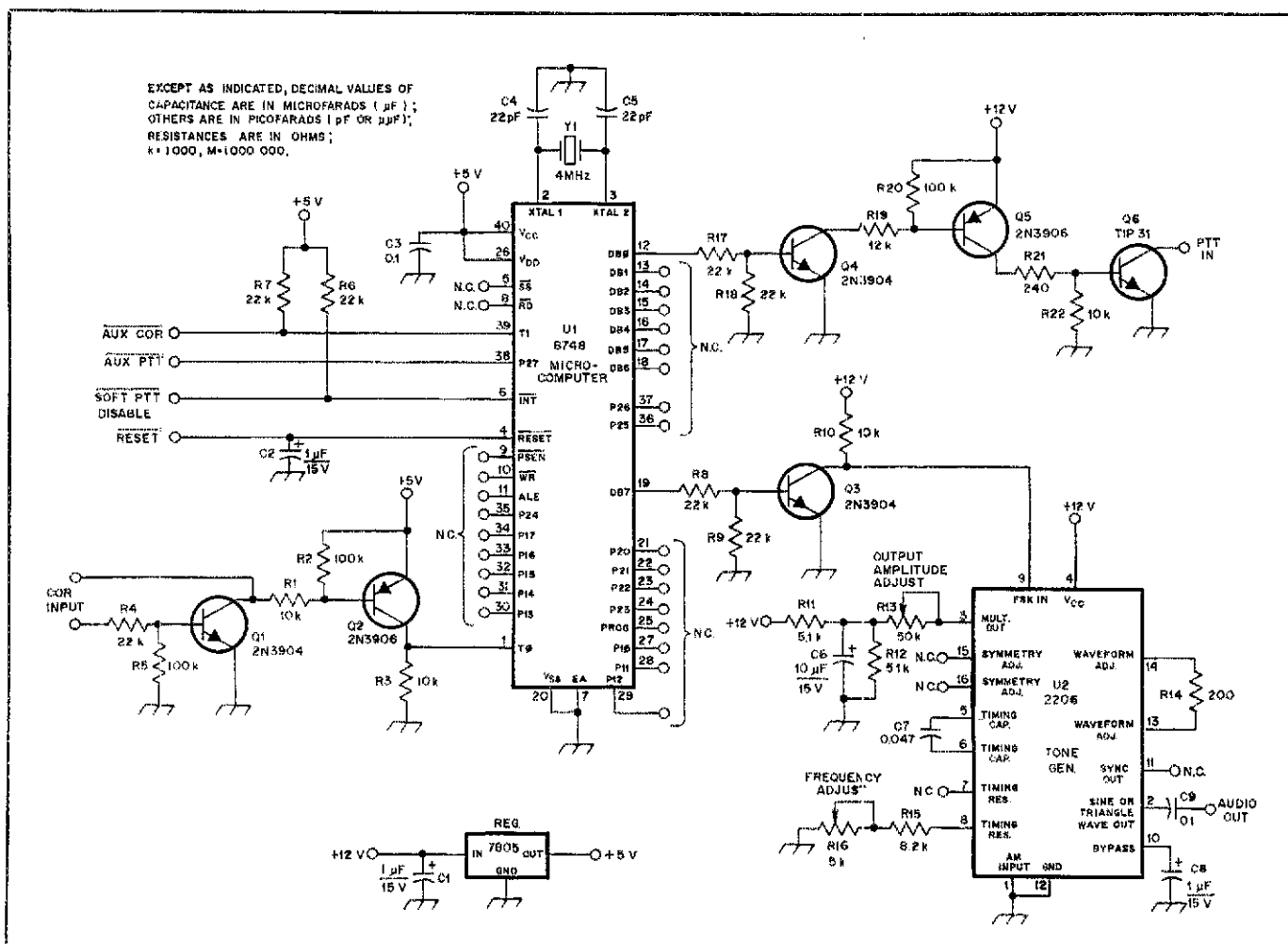


Fig. 1 — Schematic diagram of the Microcomputer Repeater Controller. All resistors are 1/4-W, 5%, carbon- or metal-film construction. Polarized capacitors are 35-V, 10% tolerance, tantalum units. Other capacitors are 50-V monolithic ceramic types.

minutes. The normal timer resets each time an *i-d* is sent. Also, the timer-window feature uses the normal timer to reset the microcomputer controller.

### Hardware

A complete schematic diagram for the Microcomputer Repeater Controller is given in Fig. 1. The heart of this project is an Intel 8748 single-chip computer. One unique aspect of this chip is that all of the microprocessor support functions normally supplied by peripheral chips are contained in this one 40-pin IC. The 8748 features 1 K of Programmable Read Only Memory (PROM), which stores the control program permanently. There are 64 bytes of random-access memory (RAM) available for data and system memory. The computer clock oscillator circuit is self contained and requires only an external crystal and two 22-pF capacitors. For timing applications, an internal 8-bit counter is included. This can be used to generate time delays or internal clocks for real-time processing. It is interesting to note that the computer chip provides 27 I/O lines, divided between 24 bidirectional I/O lines and three input lines.

For the 8748 microcomputer to input and output control signals, transistor interfaces are required to isolate and drive other devices. To simplify the interface problems of connecting the controller to existing repeaters, I designed the inputs to the board so they are pulled to a known state when disconnected. In the case of the COR signal, this means that the transmitter will be held off rather than on if the control line is broken. All of the inputs are designed to use negative logic, which means the input will be high when it is inactive, and pulled to ground to be activated.

I use a 4-MHz crystal for the clock. Other frequencies can be used, but any change will affect the internal counter, and that will affect the controller timing features. The higher the clock frequency, the faster the internal timer will count.

### Tone Generator

An Exar 2206 function generator provides a pure sine wave output for use with the cw messages. I selected this chip because it is capable of producing a high-quality sine, square or triangular waveform that has excellent stability and accuracy over a wide range of operating temperatures and voltages. The frequency and amplitude of the generator are established by means of the components connected to IC2 of Fig. 1. R13 controls the output amplitude. The 50-kΩ variable resistor shown will provide an output of up to 3 V. C7 and the series combination of R15 and R16 set the tone frequency. R15 presets the upper frequency limit. Exar recommends that this value be not less than 4 kΩ. R16 varies the frequency over the desired range. For the values given, this

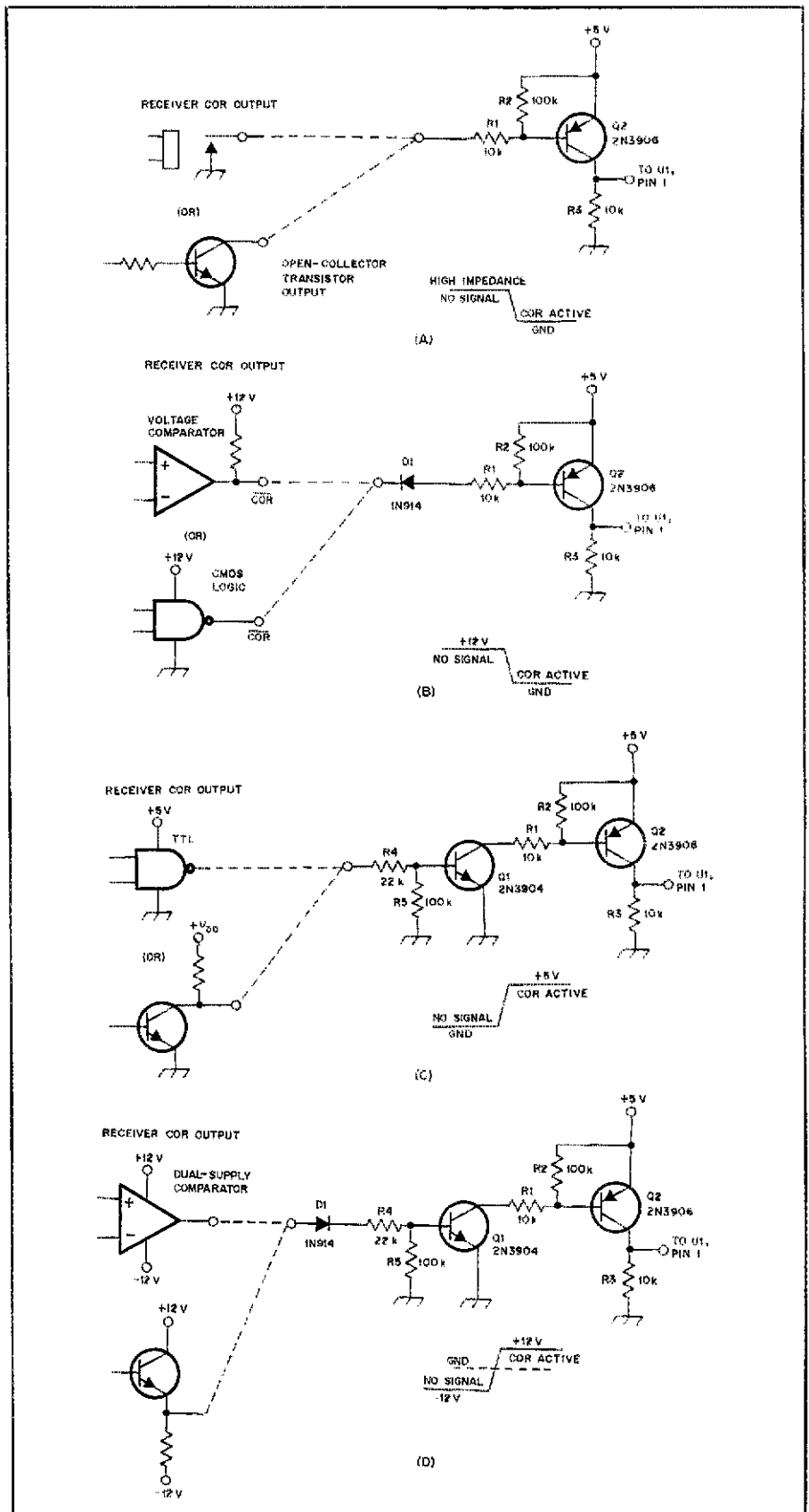


Fig. 2 — Four methods of interfacing the receiver COR signal to the controller board are shown. If the input is pulled to ground when the COR is active, but no voltage is present when it is inactive, use the configuration shown at A. Use the circuit given at B if the COR line supplies a positive voltage when inactive and is pulled to ground when active. Part C shows an interface circuit that can be employed for a receiver COR line that is at ground potential with no signal present, and supplies a positive voltage when active. Part D shows a configuration that will work with a COR that is at ground or a negative potential with no signal and a positive voltage when active.

range is from 1650 to 2550 Hz. For a different range of available tone frequencies, you will have to calculate the new resistor and capacitor values, using Eq. 1.

$$f = \frac{1}{(R15 + R16)(C7)} \quad (\text{Eq. 1})$$

where  $R15 + R16$  is used to determine the lowest frequency. To calculate the highest frequency, the denominator in Eq. 1 is simply  $R15(C7)$ . The frequency stability of the tone will depend on the temperature characteristics of these components. I recommend that you use a  $0.047\text{-}\mu\text{F}$  ceramic monolithic capacitor with an X7R temperature characteristic ( $\pm 15\%$  capacitance variation over a temperature range of  $-55$  to  $+125^\circ\text{C}$ ). Use a good-quality variable resistor for  $R16$ .

The tone generator is controlled by the microcomputer-bus I/O port on pin 19. When this pin is low, the tone is off. If pin 19 goes high,  $Q3$  turns on and enables the tone.  $R9$  is required because of the high impedance state of the I/O port on reset or power up. The output from the tone generator is capacitively coupled, and can be connected directly to the mixer in most repeater transmitters. Use shielded cable for this connection to help eliminate interference.

#### COR Interface

The COR interface is designed to handle just about any receiver COR output. This includes TTL, CMOS, HTL and open collector transistor circuits. The interface will accept 5-V logic levels, 12-V levels and the output from split-supply voltage comparators.

Fig. 2 shows a variety of ways that the COR input can be interfaced to the microcomputer. By reviewing each configuration, you should be able to determine which circuit is compatible with your receiver COR. The circuit of Fig. 2A is for use with a receiver COR output that is pulled to ground when active. It does not supply a voltage when no signal is present. Examples of this type of COR are open-collector-transistor types and relays. The circuit of Fig. 2B can be used with a COR output that is pulled to ground when active, but which has a positive voltage on its terminals when it is inactive. This type of output could be from 12-V CMOS logic, 5-V comparator circuitry or from some transistors.

A positive-logic COR output requires an interface circuit such as is shown in Fig. 2C. With this arrangement, the output is at ground potential when inactive and at a positive voltage when active. An npn switching transistor keys  $Q1$  in this case.  $R5$  forms a voltage divider for the COR input. It also serves to maintain a stable off condition even if the receiver COR is disconnected. This will prevent the transmitter from turning on in the event of a COR cable failure.

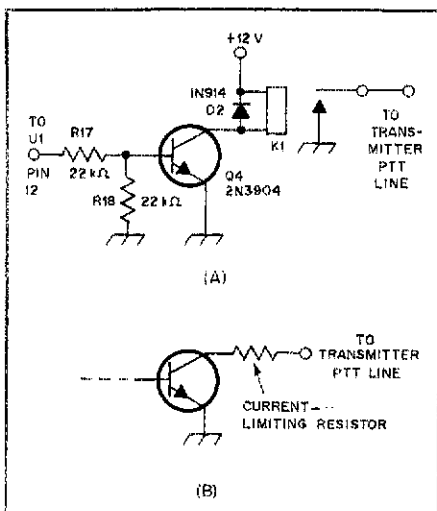


Fig. 3 — PTT driver transistor  $Q4$  can interface directly to some transmitter circuits. Normally open contacts on a low-current relay can be used to close the transmit PTT line, as shown at A. The diode, used to protect the transistor from the inductive kickback that occurs when the relay is turned off, can be any small-signal switching diode, such as a 1N914. B shows  $Q4$  used to drive a solid-state transmitter directly. The series current-limiting resistor value should be determined for your particular transmitter.

Some receiver COR outputs switch between negative and positive voltage levels. Fig. 2D illustrates how this type provides reverse-current protection for  $Q1$ .

One auxiliary COR input is available on the Microcomputer Repeater Controller. This input has an effect similar to the regular receiver COR, except that the time-out function and courtesy beep are not included.

The auxiliary input can be used with an autopatch system. Most autopatch circuits are self contained and provide a digital transmitter-enable signal. This signal is often wired in parallel with the COR or PTT line. When the autopatch has received the proper access code it will turn on the transmitter. By connecting the autopatch control line to the auxiliary COR input, the transmitter will be turned on, the courtesy beep will be disabled and the time-out timer on the controller will be disabled. The autopatch control circuit will handle the autopatch time limit.

#### PTT Interface

Pin 12 of the microcomputer chip is the port used to key the transmitter PTT line. Driver transistor  $Q4$  can be used either as

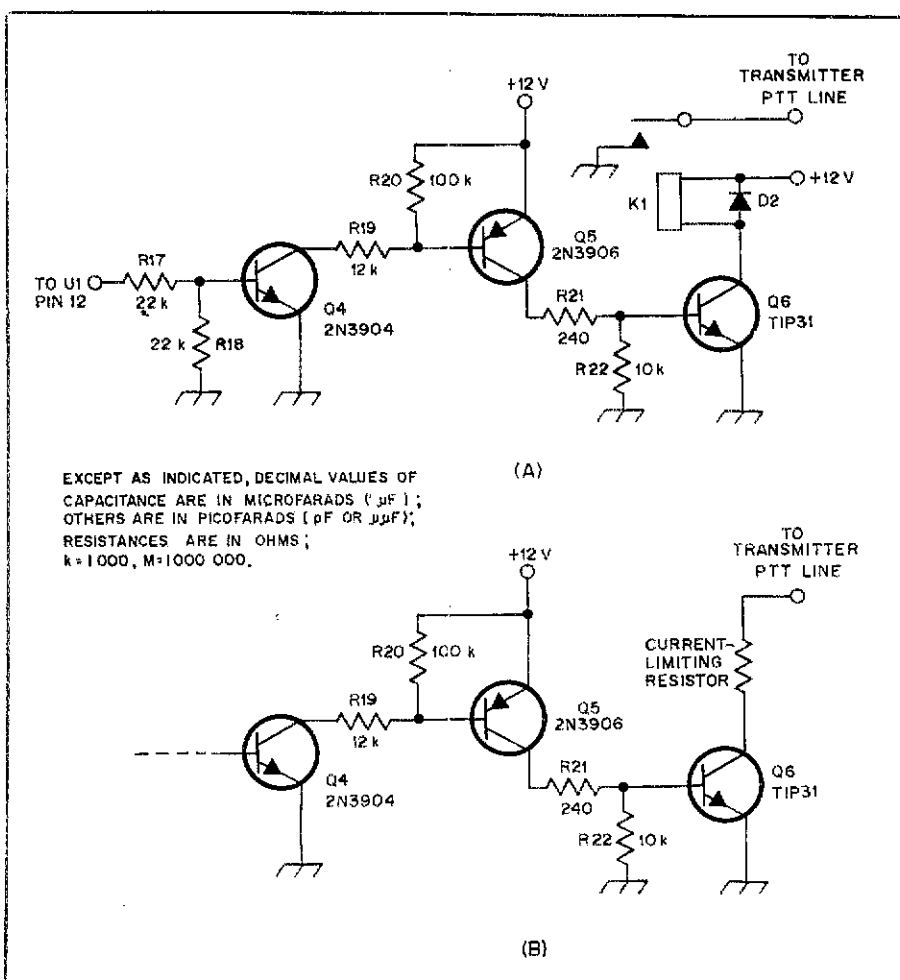


Fig. 4 — High-current PTT demands can be met by using a high-power npn transistor for  $Q6$ . A relay can be used, as shown at A, or a current-limiting resistor can be added to allow direct keying, as shown at B. The resistor value will depend on your transmitter.

a direct PTT-line interface or to drive Q5 as a keying transistor for the npn power transistor, Q6. By giving special attention to interfacing problems during the design process, I have provided a circuit that can be adapted to a wide variety of keying requirements. Fig. 3 shows two examples of PTT interfacing using the low-current transistor. If the PTT current requirement is higher than the 2N3904 can handle (200 mA), then Q5 and Q6 can be included to drive a larger relay or key the transmitter directly. The TIP-31 transistor will drive a 12-V PTT line at up to 1 A. Fig. 4 shows the circuit arrangement for two high-current interface configurations. Be sure to use an adequate heat sink with the high-current interface circuit. If the heat sink gets too hot to hold your finger on, increase its size to provide extra cooling.

An auxiliary PTT line is provided in the design. This digital control bypasses all timer functions, and holds the transmitter on for as long as the input line is active. This feature can be used with a voice i-d tape or other devices. When it is time for a voice i-d, the tape machine activates the auxiliary PTT input, which turns on the transmitter and holds it on until the tape machine releases the control line. None of the normal repeater functions will be affected.

To bypass the receiver COR control and turn off the transmitter locally or remotely, two PTT-disable levels are provided. The first level, called a "soft" disable, can be used with a DTMF decoder for remote control. The actual PTT disable is performed by the computer software. Fig. 5 shows two examples of interfacing the soft disable to remote decoders. When the control pin is pulled to ground the computer will stop all timing functions and turn the transmitter off.

The second level of PTT disable is a hard-wired control. A switch is used to break the electrical connection between the controller and the transmitter. This is a local control, and should be used to prevent the transmitter from being turned on while someone is working on it. Fig. 6 illustrates the wiring for this control. Two wires connect between the pc board and an spst switch that is located on a control panel or other convenient location.

### Resetting the Computer

Problems such as static discharges from lightning, power-line transients or low voltage can cause the microcomputer to stop or to begin executing what seems to be a different set of instructions. To get the computer back to normal, a reset line has been provided on pin 4 of the IC. This line is normally high. Grounding it will cause the computer to be reset.

Fig. 7 shows how I interface the reset line to a 12-V CMOS DTMF decoder. The diode in series with the line provides compatibility between the 12-V decoder signal

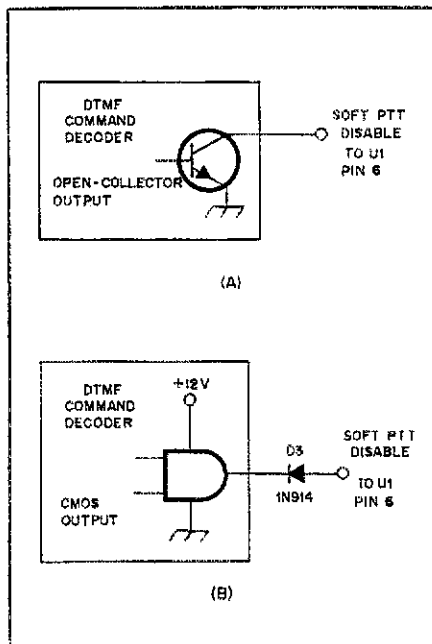


Fig. 5 — A DTMF decoder that uses an open-collector output can be connected directly to the soft PTT-disable line, as shown at A. For a decoder that supplies a positive voltage when inactive, a diode, such as a 1N914, should be added in series, as shown at B.

and the 5-V computer control line.

It is a good idea to provide a local reset control, and Fig. 7 also shows how this can be included. A momentary push-button switch is all that is required. The series diode prevents the decoder output from being damaged when the switch is depressed.

### Power Supply

The two IC chips in the controller have different power requirements. The 8748 microcomputer requires 5 V at a maximum current of 165 mA. The tone generator can operate from a supply voltage of from 10 to 26 V, at 25 mA maximum current. Since most repeaters have a source of 12 V, I included a 5-V regulator for the microcomputer supply, and power the tone generator from the repeater supply. You will have to use a heat sink on the 5-V regulator to prevent the operating temperature from going too high. The supply voltage is not critical, and can vary from about 10 up to 16 without causing any problems.

As a final note on construction, I recommend that you use some type of connectors between the controller and your repeater-equipment lines. Then the pc board can be removed quickly, or lines disconnected for troubleshooting purposes. Repair or modification can be difficult if the wires are soldered directly to the pc boards.

### Software

The repeater controller program gives "personality" to the microcomputer hard-

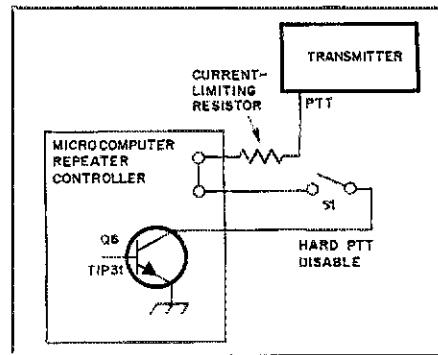


Fig. 6 — A typical PTT wiring scheme includes a hard PTT disable between the output keying transistor and the transmitter line.

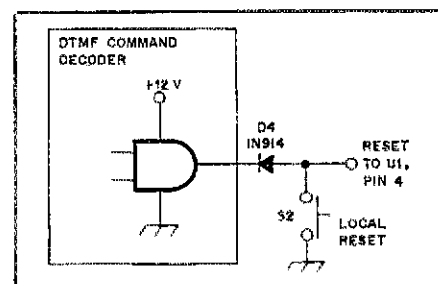


Fig. 7 — The microcomputer reset input can be wired to both a local push-button switch and a DTMF decoder output.

ware. This is where you tell the computer what to do and when to do it. An object code listing of the RPT-1 version 0 software is available from the author. (Send an s.a.s.e. for information.) This version does not include the User Module software option, so you will not be able to use this unit to change system parameters. If you purchase the microcomputer chip from Processor Concepts, version 1 software is programmed into it. This is the version designed to work with the User Module.

If you decide to generate your own program, I have a few suggestions to make your task a bit easier. First, make a list of all the functions that you want your controller to perform. This list should include requirements such as "Generate a cw i-d" or "Give a courtesy beep." The idea of this list is to reduce the chances that you will complete the program, only to discover that you forgot the cw i-d or some other important feature.

Once you have listed your requirements you must generate a flow chart. This is like a map of the program, showing what activity will be done in which sequence. Spending some time developing the flow chart will make your programming efforts flow much smoother.

The final step is to actually write the program. It is extremely important to use comments in your listing. A short statement



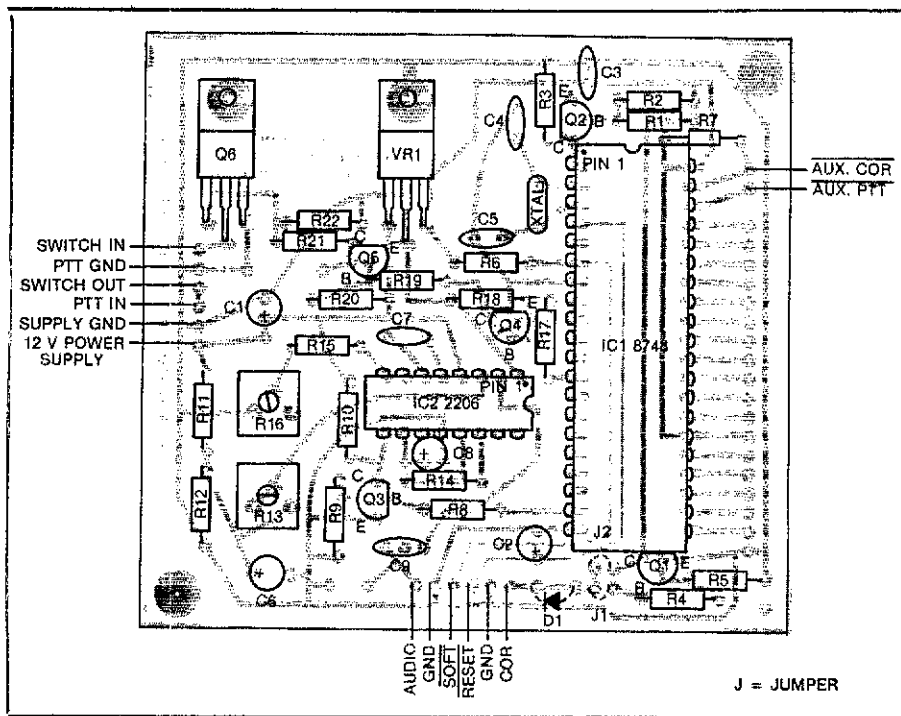


Fig. 8 — A parts-placement diagram for the Microcomputer Repeater Controller. The board is shown from the nonfoil side, and gray areas represent an X-ray view of the unetched copper. The full-size etching pattern is given in the Hints and Kinks column.

next to a set of instructions will tell you at a glance what that section does. If your comments closely follow the flow chart, it will be easier to follow the program and locate a particular activity.

### Conclusion

The Microcomputer Repeater Controller is designed to be a simple, low-cost, easy-to-interface repeater controller. It makes a self-contained package that will bring you and your repeater into the computer age.

### Notes

- <sup>1</sup>mm = in.  $\times$  25.4.
- <sup>2</sup>Assembled and tested units or complete kits for the Microcomputer Repeater Controller are available. Assembled User Modules can be purchased from Processor Concepts. An etched and drilled circuit board for the controller is available for \$17 postpaid, and programmed microcomputer chips cost \$49.95. Complete kits cost \$89.95. For complete ordering and pricing information send a large s.a.s.e. to: Processor Concepts, P.O. Box 185, Fort Atkinson, WI 53538. The ARRL and QST in no way warrant these offers.
- <sup>3</sup>See note 2.

Scott Freeberg has been licensed since 1967, at the age of 14. He holds a BSEE from Milwaukee School of Engineering. He is presently employed by Norland Corporation, designing microcomputer heart pacing systems and nuclear-medical analyzers. His Amateur Radio interests include 2-meter fm, 20-meter RTTY and 10-meter ssb.

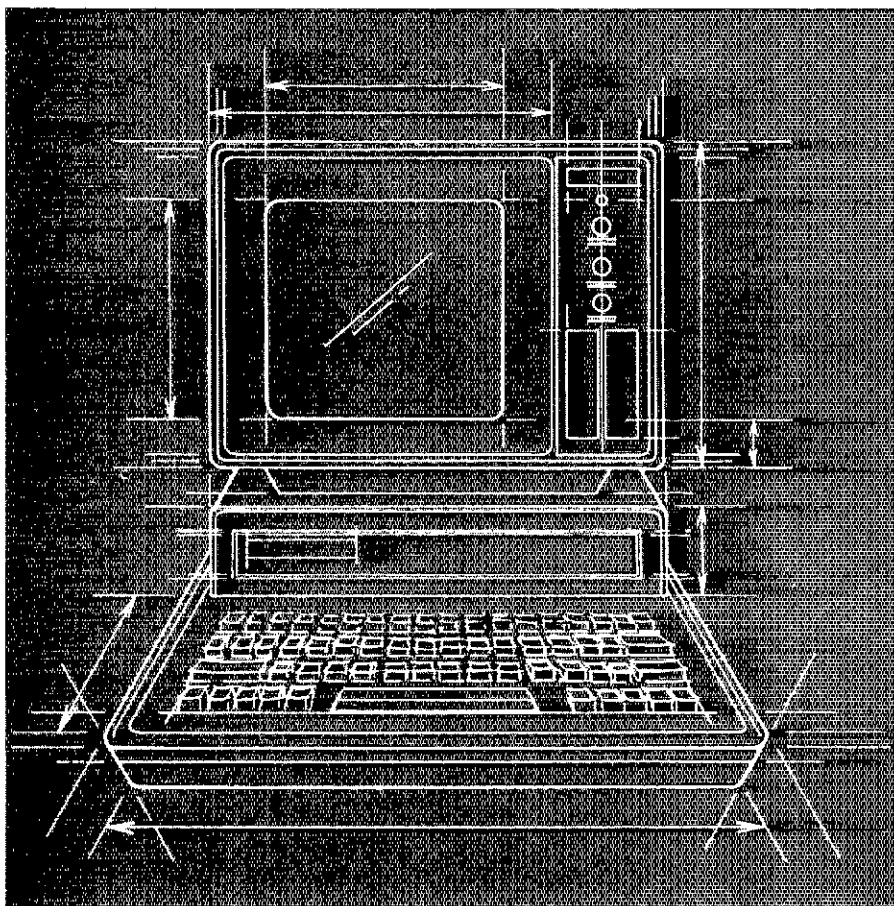


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Marge Tenney	WB1FSN	Lee Aurick	W1SE	Chuck Chadwick	K8AXL
John Nelson	W1GNC	Gerald L. Hall	K1TD	Chuck Hutchinson	K8CH
Bill Webb	WB1GOO	Perry Williams	W1UED	Jeff Ward	K8KA
Bob Atkins	KA1GT	Arlene Bender	WA1VMC	Curt Holsopple	K9CH
Ed Tilton	W1HDQ	Greg Bonaguide	WA1VUG	Jim Clary	WB9IHH
Steffie Nelson	KA1IFB	Bill Jennings	K1WJ	Bernard D. Glassmeyer	W9KDR
Joan Becker	KA1IFO	Chuck Bender	W1WPR	B. Robert Benson	VE2VW
Jean Peacor	K1IJV	Bob Halprin	K1XA	Harry MacLean	VE3GRO
Cheryl Sowers-Clift	KA1IXI	John Lindholm	W1XX	Maxim Memorial	
Andrew Tripp	KA1JGG	Sandy Gerli	AC1Y	Station	W1AW
Jodi McMahon	KA1JPA	Ellen White	W1YL/4	ARRL Hq. Station	W1INF
Lori Weinberg	KA1KOW	David Sumner	K1ZZ		

# The Personal Computer†

**Part 2:** Peripheral devices allow a computer system to operate efficiently. Such peripherals as disk drives and printers are worth considering when you put together a personal computer system.



The role of a computer is to obtain data from an input device(s), process the data, and deliver the final results to an output device(s). To perform any useful task, a computer must interact with the outside world. A computer peripheral is any device that is attached to a computer for the purpose of getting useful information into and out of the computer's Central Processing Unit (CPU).

A peripheral is defined as being external to, or away from, the center. The name "peripheral" was selected to designate an input or output (I/O) device external to the CPU. Originally, these devices were physically separated from the CPU. However, since the advent of micro-processor chips, this is no longer the case. Now, complete computer systems, including CPU, memory, and peripheral interfaces are being packaged on single printed-circuit boards and as single ICs.

Therefore physical placement can no longer be used to distinguish computer peripherals from the CPU.

This should not cause much of a problem if we think of peripherals in terms of their function rather than their placement. Some devices (printers, disk drives, terminals, etc.) can clearly be defined as computer peripherals, but what about switches, lights, motors, internal RAM and ROM, etc.? These types of devices are being used more and more with microcomputers and personal computers since new and different applications are being thought of and introduced. If you consider the function of these "gray area" devices, they must be categorized, at least for the purposes of this discussion, as peripheral devices, since they are input or output devices.

To attach certain peripheral devices (keyboards, CRTs, printers, tape and disk drives, modems, etc.) to a computer and make them functional, two things are required: interface (hardware and software for device control and communication), and operating system support. Generally, the more complex the peripheral, the more complex and costly the required hardware and software support packages. Some simple peripherals, like discrete I/O

devices (switches, lights, etc.), require minimal hardware interfacing and no device-driver routines or operating system support.

## What Is Required

All personal computers require at least two peripherals: (1) some amount of memory (RAM and ROM), and (2) a keyboard. Some come with a CRT display and a tape or disk drive, while others provide only the hardware interface and software drivers, and you must furnish the peripheral devices. An area that should be examined closely before making a purchase is whether or not you have definite plans to add peripherals to your system at some future date. Because, as so many personal computer owners have discovered (unfortunately too late), their needs and desires have changed after using the system and becoming familiar with it. Generally, the more peripherals with a system, the more useful the system will be. Some of the more common peripherals you may want to add to your system are:

- Printer
- Additional memory (RAM, EPROM)
- Mass storage device (hard disk, floppy disk or cassette tape)

†Adapted from *Personal Computer*, a Combustion Engineering Corporate Technology Newsletter, published by the Electronics Technology Applications Center, Combustion Engineering, Inc., 44 South 122 East Ave., Tulsa, OK 74128. The individual articles were written by several C-E employees in an internal newsletter for the benefit of the corporation.

- Color video monitor
- Audio response unit (speaker)
- Modem
- Joysticks
- Discrete I/O devices (switches, lights, etc.)
- Analog I/O devices (potentiometers, meters, etc.)

The thing to look for here is how difficult and costly it is to add these devices to your system. Some manufacturers provide spare slots for plugging in hardware-interface boards. These may be optional boards offered by the manufacturer, boards offered by other vendors or, if you really know what you are doing, a special-purpose board that you design and build for interfacing with a peripheral device. Other manufacturers provide only a connector for plugging in an interface board or card rack.

In addition to the hardware-interface circuitry required to connect the peripheral device with the computer, you may also need an I/O device-driver routine to control, synchronize, and format the data to or from a particular hardware interface or device controller. Usually, these I/O device drivers, sometimes called I/O handlers, are provided with the software package that comes with the unit, or they are offered optionally by the manufacturer or other vendors.

### I/O Types

There are three basic types of I/O classified according to the method of controlling and synchronizing data transfer to peripheral devices: program-controlled I/O, interrupt-controlled I/O and direct memory access (DMA) I/O.

#### *Program-Controlled I/O*

With this type of I/O, the CPU is in complete control of handling the input or output transfer of data. Control and status words are issued and read by the CPU to synchronize and control the transfer of data. Address and data words define what the data is and where it goes (memory location or device).

#### *Interrupt-Controlled I/O*

This type is used in cases where an input needs to be serviced immediately or occurs very seldom. When an interrupt input occurs, the CPU stops what it is doing, services the interrupt, then goes back to what it was doing before it was interrupted. Servicing the interrupt usually involves branching to what is called an interrupt service routine, to perform some task related to the input.

#### *Direct Memory Access (DMA) I/O*

DMA transfer of data is used with I/O devices, such as disk drives and high speed line printers, which require rapid rates of data transfer. The information is transferred directly between the I/O device and memory without microprocessor interven-

tion. The data transferred is controlled by a dedicated, high-speed logic circuit (DMA controller), capable of operating at higher speeds than the microprocessor.

### Hardware Interface

Modularity has become an important consideration with all computer manufacturers and many computer buyers. This concept enables computer systems to be expanded or altered by adding or changing modules or peripheral devices. To make systems modular it was necessary to develop standard "computer bus" structures, which permit other manufacturers to develop compatible products that may be used with any microcomputer. Some of the more common standard bus structures are: S-100, IEEE 488, STD and Multibus. The purpose of interfacing is to match the peripheral device to the computer systems bus in the following characteristics: data speed, control codes, data format and electrical properties.

The format for interfacing data between computer and peripheral may be in serial or parallel form. Parallel data transmission is the transfer of one word of data at a time between the CPU and peripheral device. Although parallel transmission is much faster than serial, it requires more wires, one for each output data word bit.

Serial data transmission is the transfer of one bit of data at a time. It is used in cases in which data is transmitted over great distances and would be impractical to use many wires, for example, with remote terminals or modems. Some of the more common interface standards used for serial data transmission are RS-232-C, RS-422 and current loop. These interfaces establish required control codes and electrical properties.

Serial data may be transmitted either synchronously or asynchronously. Synchronous transmission is much faster than asynchronous, but is more critical as far as synchronizing the CPU with the peripheral device. Synchronous transmission is usually used on larger systems where rapid transfer of data is required.

Synchronous transmission is the sequential transfer of many characters or a block of data at a time. Characters are usually ASCII coded. The entire block of data is synchronized by timing signals. Asynchronous transmission is the transfer of these serial data bits, one character at a time. The characters are usually ASCII coded and bounded by start and stop bits.

Serial data may be transmitted either in a full- or half-duplex mode. In full-duplex mode, data may be transmitted and received simultaneously, whereas in half-duplex it can only do one at a time. Although full-duplex is the most desirable since it is faster, it also requires more wires, one set for transmit and another for receive, so it is not always feasible.

An important factor in the determination

of the cost of a personal computer is the method of storing its software (programs and data). No matter how large the memory capacity of a personal computer may be, you will have more information available for use than can be contained within its memory at one time. It is necessary, therefore, for all systems to provide a means of saving programs and data for later use so the computer's memory capacity is made available for other uses. This storage method must allow the program or data to be reloaded into the computer when the program is to be used or when the data is needed.

Most low-cost personal computer systems use an ordinary cassette tape recorder to store and retrieve both programs and data used by the computer; some models use a modified tape recorder. This is an advantage because the tape recorder need not be supplied (and is frequently not included in the system price), or if it is, it is a low-cost peripheral item that adds little to the system cost. Since most systems use audio tones to place the data on tape, ordinary low-noise recording tape may be employed to store programs. This combination of low peripheral cost (the tape recorder), and low media cost (the cassette tapes), makes cassette-tape storage desirable, and almost all personal computer systems will accommodate cassette data storage. Indeed, some of the very low-cost computer systems are available only with cassette storage.

Cassette storage is popular because of its low cost. However, it exhibits some deficiencies. For example, it is slow compared with other methods — it may take several minutes to load a large program into memory each time it is needed. While this is certainly better than reentering these programs by the computer keyboard, it makes applications requiring frequent swapping of programs or data virtually impossible. Also, most cassette-storage systems offer no help in locating a program once it is placed on tape, and it may be necessary to read (play) an entire tape to find a single program. This problem may be solved by placing only one program on each cassette, but this can make the cost of data media (the cassettes) very expensive.

### Disk Storage

*Floppy disks:* An alternative to cassette-tape storage provided as an option with most personal computer systems is flexible diskette storage, commonly known as "floppy-disk" storage. Floppy disk systems consist of one or more disk-drive assemblies, the floppy disk and any necessary circuits and cables to make it function with the personal computer. The disk drive performs the same function as a tape recorder in a cassette-based system — it reads and writes programs and data to the floppy disk.

The disk resembles a small, thin

phonograph record housed in a paper jacket and is inserted into the drive through a slot in the front of the unit. Data is recorded magnetically on the disk (in a fashion similar to audio-tape recording) as the disk spins continuously past the disk-drive head assembly. The head assembly (similar in function to a record-player arm) allows the drive to record or read data anywhere on the disk. The associated electronics allow the computer to transfer data from its memory to the disk, or from the disk to the computer.

The floppy-disk system of data storage has a number of advantages over cassette storage. A most obvious advantage is that data transfer is much faster, with large programs being loaded or saved in seconds instead of minutes. The large storage capacity of the disk allows a number of programs to be stored on a single disk. The average cassette tape can hold large quantities of data, but since it is not practical to search the entire tape for a single program, much of its theoretical capacity is often not used.

Floppy-disk systems have an additional feature that makes storage of several programs on a single disk practical. Most disk systems contain features that catalog the various programs contained on the disk. This permits all files to be given descriptive titles and allows verification of whether or not a particular title exists on the disk. Program loading and saving is also accomplished by similar title reference. With this method, it is no longer necessary to be concerned with where a particular program is stored on the disk, as the operator can refer to it simply by title.

Another advantage of disk storage is that the media is accessed randomly. This means that every portion of the disk is available

to the drive at all times, without the need to move the media forward or backward as with a cassette. The disk spins constantly, and the head can move immediately to any place on the disk. When the disk is removed and replaced with another, no attention need be paid to media movement to access data.


Floppy disks can cost more than cassette tapes, but the price is decreasing steadily. Their additional usable storage capacity, as well as their added convenience and flexibility, make them cheaper to use per program stored. They are, however, more fragile than cassettes, and require greater care in handling and storage. The access holes in the jacket expose the media to damage, and care must be taken to ensure that the diskette is not touched in these areas. The disks must be stored and transported in such a manner that they cannot be bent or creased, as this will make the media permanently unusable. If precautions are taken, disks will provide reliable operation for a long time.

Perhaps the biggest disadvantage of using floppy-disk storage systems is the initial cost of the disk drives and interface circuitry. In a typical personal computer system, the initial cost of disk storage is from \$300 to \$900 per drive. This is a significant cost factor, as many applications require the use of at least two such drives. The cost of a disk-storage system can exceed the cost of the personal computer itself. For this reason, cost comparisons of personal computers should always be made with the desired storage systems (as well as any other peripherals not included in the base price) taken into consideration.

**Hard disks:** A few applications of personal computers, such as those that involve handling large quantities of data, require storage capacities that exceed those of flexible disk systems. These systems utilize rigid disk media, and are usually referred to as "hard" disks. A hard disk is quite rigid both in composition and in mechanical attachment to the drive. This lack of movement allows these disks to store data in a compressed form, allowing large quantities of data to be contained on a single disk. Because of the mechanical precision required, most of these systems do not have removable disks. This means that systems that use hard disks rely on other storage systems to save (back up) programs against disk failure, and to store programs not currently in use.

Hard-disk storage systems are expensive. A single-drive hard-disk system can cost \$1000 to \$5000, depending on features and storage capacity. To this cost must be added the expense of the required back-up system. In spite of this, hard disks are advantageous in some systems because they have a much larger storage capacity and are operationally much faster than floppy disk systems. They are currently too expensive to be used for most personal computer applications.

### Summary

Peripheral devices are worth considering for any computer system. They expand the system capability, making it more useful and versatile. Before making a purchase of any computer, consider all aspects of adding peripherals to your system: cost, effort, additional space and power requirements, and hardware and software support packages. 

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## New Products

### EMERGENCY COMMUNICATIONS: AN ORGANIZATIONAL AND OPERATIONAL HANDBOOK


by F. Dale Williams, K3PUR. Published by FDW Arts, P.O. Box 2540, Falls Church, VA 22042. Soft-bound, 6 x 9 inches, 175 pages. Single copies are \$9.95 plus \$1.50 postage and handling.

□ According to the history books, Amateur Radio operators have been providing emergency communications since 1913, and since then a magnificent record of accomplishment has been built up, most recently shown in the service provided during Hurricane Alicia. Such volunteerism on the part of radio amateurs is an even more vital asset in this era of limited government resources. Substantial opportunities now exist for contributions by organized

volunteers such as the League's Amateur Radio Emergency Service (ARES), as well as the Radio Amateur Civil Emergency Service (RACES). Author (and publisher) Williams's effort is certainly timely.

This publication delivers exactly what the title denotes — a comprehensive guide to organizing an Amateur Radio emergency communications group and efficiently employing that group in times of need. Subjects given in-depth treatment include the kinds of Amateur Radio public service; liaison with government and relief agencies; the art of communicating; how to organize the Amateur Radio public service group; appropriate equipment for both fixed and field operations; proper procedures for emergency and public service activities; and effective drill/test scenarios. Four appendices provide additional information.

The author is well-qualified to add to the emergency communications literature. K3PUR has been a licensed amateur for more than 20 years, and his credentials include serving in a variety of leadership roles in ARES and RACES, most recently as ARRL Section Emergency Coordinator for Colorado. He also has worked extensively in the area of emergency/disaster communications with government and public service agencies, and has served in administrative and advisory positions with the American Red Cross.

As awareness grows that Amateur Radio has a unique ability to survive when commercial communications break down, we, as amateurs, must rise to that challenge. *Emergency Communications* can be an important tool in meeting that challenge — Robert Halprin, K1XA 

# The Extended-Element Beam

Using only three elements, this beam has the gain of a 6-element Yagi array. Extending the elements is the key to such success.

By Richard C. Fenwick,\* K5RR, Richard C. Fenwick, Jr.,\* N5BXB and Bobby Schroeder\*

It is well known that the optimum length of a dipole antenna for maximum gain is approximately  $5/4$  wavelength. Such an antenna is commonly called an "extended double Zepp."<sup>1</sup> The radiation pattern is as shown in Fig. 1, and the gain is 3.1 dB over a half-wave dipole (3.1 dBd). It does not seem to have been recognized that extended-double-Zepp elements can be utilized in parasitic arrays. Such use results in a compact, high gain antenna, with characteristics generally similar to ordinary Yagi antennas, but with 3-dB greater gain and narrower beamwidth for the same number of elements. This has been verified both analytically and experimentally for 3-element arrays, shown schematically in Fig. 2.

An extensive experimental investigation was conducted on a 3-element beam designed to operate at 280 MHz (Fig. 3). The model was designed to permit exploring a range of element spacings and element tuning. Element tuning was accomplished by incorporating variable capacitors in parallel with the fixed inductors shown in Fig. 2. Element length is not at all critical; all elements were made 51.3 inches, or  $1.22$  wavelengths, long. The driven element was fed through a coiled coaxial type of balun, ensuring balanced feed. The radiation pattern of the driven element alone was observed to be virtually identical with what was expected theoretically (Fig. 1). E- and H-plane patterns and impedance measurements were made on the model for director and reflector spacings of  $0.15$  and  $0.2 \lambda$  respectively,  $0.175$  and  $0.225 \lambda$ , and  $0.2$  and  $0.25 \lambda$ . The antenna was tuned for two conditions at each spacing — maximum gain and maximum front-to-back

ratio. The results generally correspond to those expected for ordinary parasitic arrays.

## Effect of Element Spacing

The wider spacings gave reduced gain

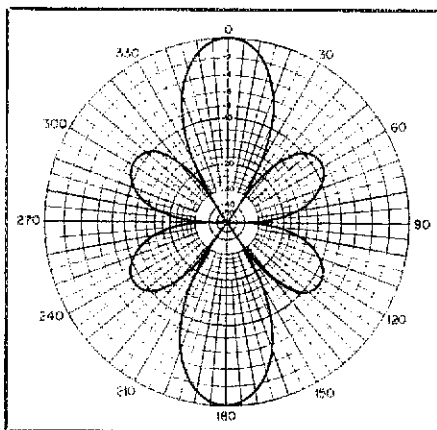


Fig. 1 — Free-space directive diagram for the extended double Zepp. This array has a gain of 3.1 dB over a dipole. (In this plot, the radiator lies along the  $90^{\circ}$ - $270^{\circ}$  line.)

and front-to-back ratio and increased bandwidth compared to the  $0.15$ - and  $0.2$ - $\lambda$  director and reflector spacing. Table 1 gives a comparison of these characteristics for the three spacings. Closer spacings were not explored owing to the increasingly narrow bandwidths encountered, although the maximum front-to-back ratio would presumably be improved. Reduced bandwidth is the price paid for the extended-element beam advantages of compactness and mechanical convenience when compared to two ordinary Yagi antennas arrayed side-by-side and spaced at  $1 \lambda$ . An extended-element beam performs very similarly to such an array in all respects except bandwidth.

## Performance

Fig. 4 summarizes the front-to-back ratio, gain and VSWR observations for  $0.15$ - and  $0.2$ - $\lambda$  director and reflector spacing. Increased gain with increasing frequency is a familiar characteristic of all Yagi antennas. The bandwidth over which the front-to-back ratio is high is less for the extended-element beam than with ordinary Yagi antennas, judging from Lawson's epic work.<sup>2</sup> If the maximum gain of an ordinary

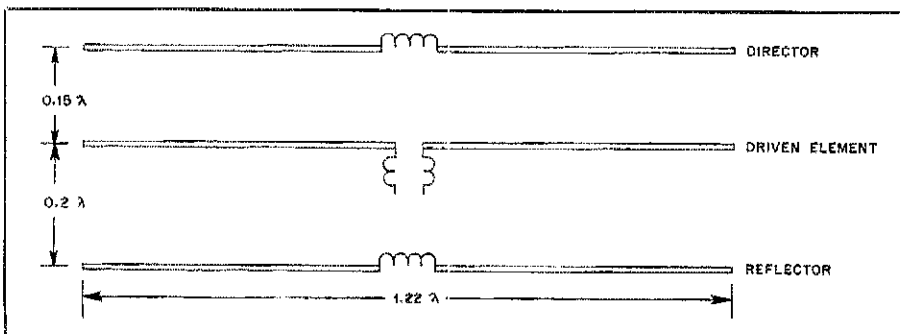


Fig. 2 — Extended-element beam, with suggested dimensions.

\*Notes appear on p. 37.

\*c/o Electrospace Systems, Inc., Richardson, TX 75083-1359.

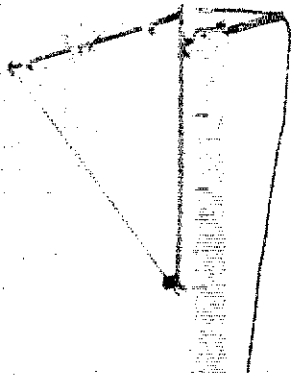


Fig. 3 — Extended-element beam model, designed to operate at 280 MHz.

3-element Yagi is 7 dBd, then we'd expect the maximum gain of an extended-element beam to be 10 dBd. This is very nearly what was observed. A gain penalty of about 0.7 dB is incurred when choosing tune-up for maximum front-to-back ratio rather than maximum gain, but often this will be the preferred choice, especially if bandwidth is a consideration.

Fig. 5 shows measured radiation patterns for the maximum gain and maximum front-to-back conditions. Lack of symmetry in the back lobe is believed to be caused by imprecision in model construction.

#### Tune-up Procedure

Considerable experimentation was carried out to determine the optimum tune-up procedure. Whether tuning for maximum gain or maximum front-to-back ratio, it was found that the director should be tuned first, with the reflector removed or open circuited. The director is tuned for maximum signal off the front or minimum signal toward the rear, as desired. Then, the reflector is tuned for maximum effect. The process converges very rapidly, such that it is not absolutely necessary to retune the director after tuning the reflector. However, this was sometimes found to improve the results. A convenient method that has been used successfully for tuning an antenna for maximum front-to-back ratio is to lash the antenna onto the side of a tower, with the reflector closest to the ground and at least  $\lambda/2$  above ground. Then transmit from a dipole near ground at the base of the tower. The antenna under test is connected to a receiver, and the director and reflector tuned sequentially for minimum S-meter reading.

The suitability of the extended-element beam to this tuning approach is one of its advantages over ordinary Yagi antennas; the usual practice is to adjust element lengths to achieve the desired performance. A single ordinary Yagi requires six elements

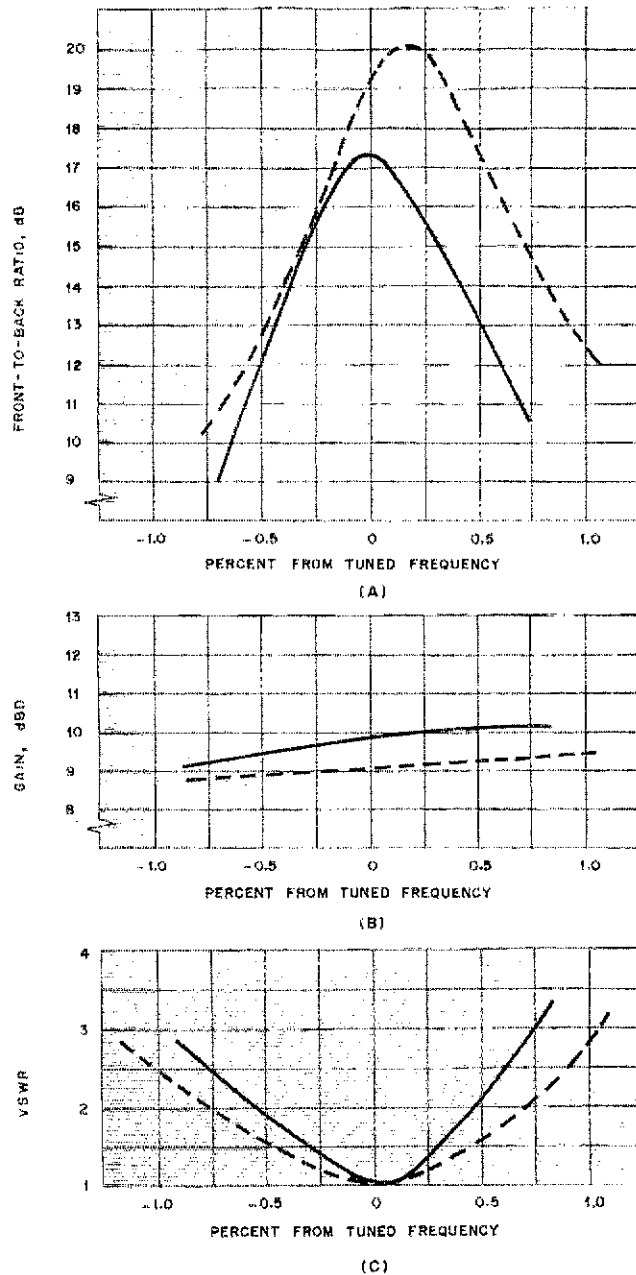


Fig. 4 — Performance of the extended-element beam with dimensions shown in Fig. 2. At A is the front-to-back ratio; at B, the gain over a dipole; and at C, the VSWR. In each plot, the solid line shows the performance with the beam tuned for maximum gain, and the broken line when tuned for maximum front-to-back ratio.

Table 1  
Measured Performance of 3-Element Antennas

Dir. and Refl. Spacing ( $\lambda$ )	Tuning Condition	Gain* (dBd)	F/B* (dB)	Input R* (Ohms)	Bandwidth for 2:1 VSWR (%)
0.15 and 0.20	max. gain	9.8	17.3	25	1.0
0.15 and 0.20	max. F/B	9.1	19.2	34	1.5
0.175 and 0.225	max. gain	9.5	14.9	34	1.3
0.175 and 0.225	max. F/B	9.0	15.9	39	1.8
0.20 and 0.25	max. gain	9.5	9.3	31	1.1
0.20 and 0.25	max. F/B	8.2	13.8	51	2.1

\*At tuned frequency (280 MHz)

for 10-dBd gain. Optimizing such an antenna experimentally is clearly much more difficult than optimizing a 3-element

extended-element array.

The driven element may be tuned and matched by conventional means quite in-

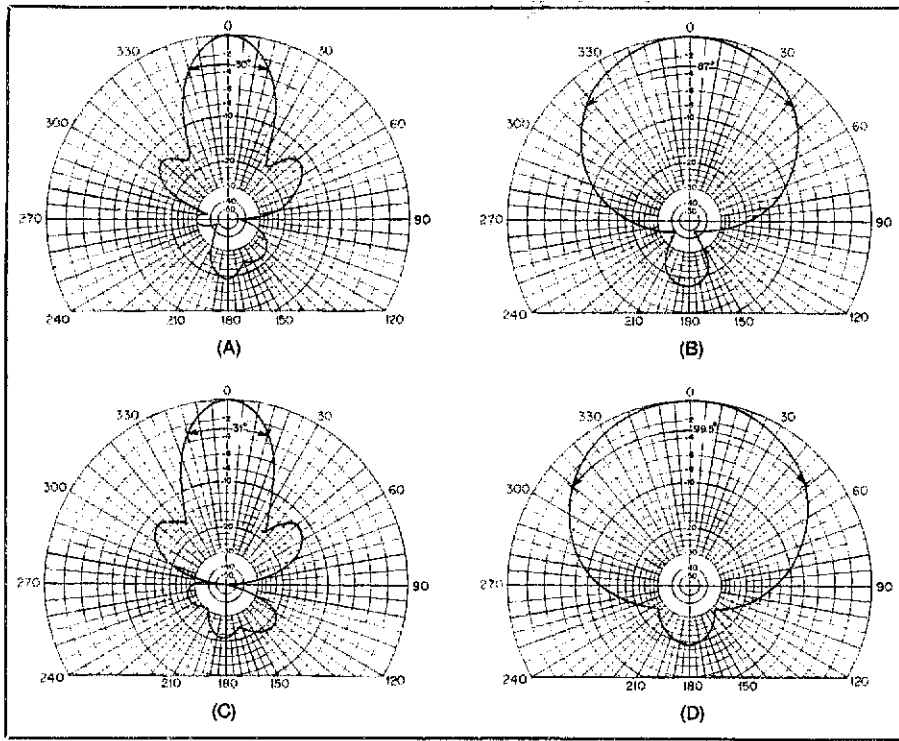


Fig. 5 — Measured patterns of the extended-element beam of Figs. 2 and 3. E-plane patterns are shown at the left, and H-plane patterns at the right. The patterns at A and B were obtained with the beam tuned for maximum gain, while those at C and D were for the beam tuned for maximum front-to-back ratio.

dependent of the tuning of the director and reflector. The patterns of the antenna are not a function of the driven-element tuning.

The values of the inductors needed to tune the antenna must be determined experimentally. As a start, it is suggested that the reactance for the director be about 400 ohms, and that for the reflector about 600 ohms. A range of adjustment of approximately  $\pm 50\%$  from these values is recommended. Probably the easiest mechanical arrangement for variable inductors is a length of transmission line made of rod or tubing, with a movable shorting strap.

#### Method of Measurements

All model measurements were made on the Electrospace Systems, Inc., antenna pattern range (Figs. 6-8). The range was set up carefully to minimize ground reflections. Impedances were measured with a Hewlett-Packard network analyzer (Fig. 7). Frequency settings were quite critical, and a frequency counter was used for all measurements.

Gains were calculated from the radiation patterns using the familiar expression

$$\text{Gain} = 10 \log \frac{41,253}{\theta_E \theta_H} - 2.14 \text{ dBd}$$

where

$\theta_E$  is the E-plane 3 dB beamwidth, and  $\theta_H$  is the H-plane 3 dB beamwidth.

(Gain and directivity are assumed to be synonymous here.) A gain-correction factor was developed to account for sidelobes. As a check, gains were measured experimentally by rotating the parasitic elements  $90^\circ$  to the driven element and observing the decrease in signal at the receiver. It was concluded that the gains calculated from measured patterns are probably accurate to within 0.2 dB.

Care was taken to ensure that the presence of the tuning person's body did not affect the tuning of the antenna (Fig. 8). Even so, the tuning for maximum front-to-back ratio was critical, and it is entirely possible that higher ratios than we observed can be achieved. Some scatter in the data (Table 1) suggests that tuning was not always optimized.

#### Future Work

A modest attempt to evaluate a 4-element array was made; it seems logical that such an array would work. However, no significant improvement in gain over a 3-element array was observed. More investigation of such arrays is needed.

Extended-element beams of three elements each for 10 and 15 meters, mounted on the same boom, are under construction as of this writing. This project may be the subject of a future article.

#### Acknowledgment

Thanks go to Toney Magnino, W5MVK,

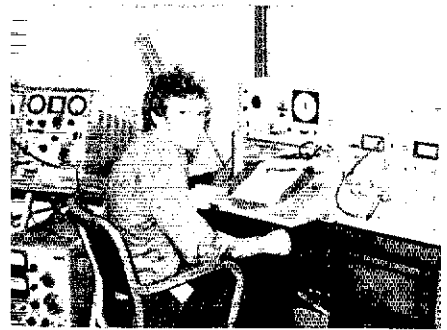


Fig. 6 — Pattern recording equipment, with author Schroeder.

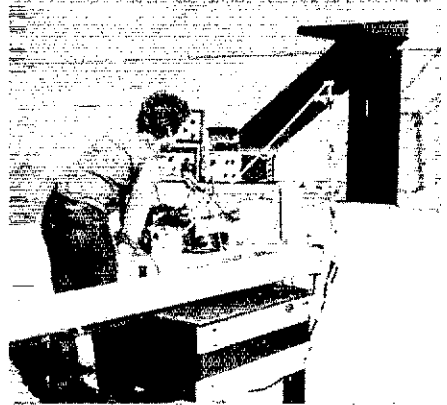


Fig. 7 — Impedance measurement in progress.

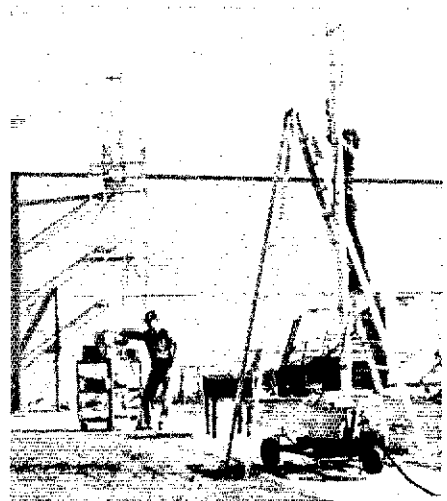


Fig. 8 — Antenna model being tuned on the pattern range.

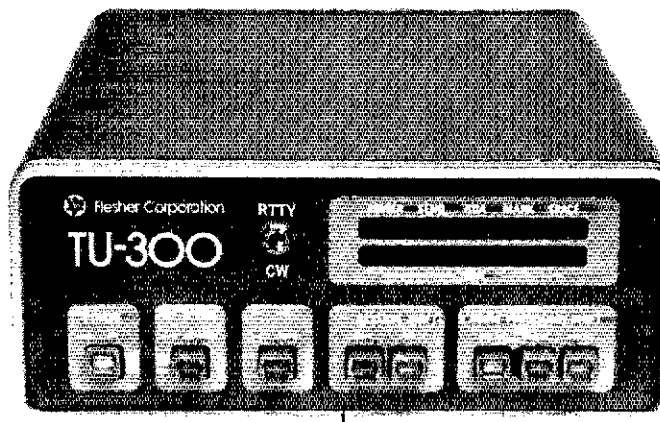
who provided considerable assistance in the experimental work, most particularly in the construction of the antenna model.

#### Notes

<sup>1</sup>G. Hall, ed., *The ARRL Antenna Book* (14th Ed.). Newington: ARRL, 1982, page 6-8.

<sup>2</sup>J. Lawson, "Yagi Antenna Design," *Ham Radio*, May 1980, p. 22.

# The TU-300 — Modified



Mating a computer, a TU and a transceiver can often be a stumbling block. This information should provide some ideas and prevent you from stubbing your toe!

By Paul K. Pagel,\* N1FB

Many radio amateurs have joined in on the computer-buying spree and are sharing the fun of RTTY and cw operation using their new-found "toy." I recently joined the crowd.

Right from the start, the new Amateur Radio/computer operator discovers it's generally not a matter of "plug and play" (although we're getting there!). Sooner or later (with any luck sooner!) you realize that you should take some precautionary measures to keep the computer and any units matched to it from electrically "fighting" each other. Usually when such a fight occurs, the computer is the loser. As a fighter is prepared for a match, the computer must be prepared to protect itself during these matches.

In my shack, I use an Apple II<sup>®</sup> computer, a Flesher TU-300 modem and a veteran TS-820S transceiver. For the computer, a first line of defense occurs at the ac-line connection. I've installed a Drake FL-6 line filter between the ac line outlet and the computer ac line input.<sup>1</sup> This filter/outlet strip combination provides brute-force line-filtering to keep rf energy

from leaving or entering the computer through the ac line. The filter also contains MOVs (metallic-oxide varistors) that suppress potentially harmful line-voltage transients.

When you are mating a computer to a transceiver or other peripheral equipment, accidental application of voltage levels harmful to the computer becomes possible. Isolation is the word to keep in mind, and optoisolators are a main ingredient in filling this requirement. These devices are simple to use, inexpensive and consume little power; they also provide a high degree of circuit isolation.

The optoisolators I use in the circuit consist of an LED that is optically coupled through a translucent insulator to a photosensitive output transistor. The insulating material between the LED and the photosensitive transistor has a voltage breakdown rating of about 7500 volts. Thus, it would require an exceptionally large voltage to puncture the insulating material for the two circuits to interact directly. If proper design procedures are followed, this type of failure should never occur.

## At the Transceiver

Before attempting an interface to the computer, I decided to eliminate one concern — the -65 V level present at the

TS-820S key jack. That potential has the potential (pardon me!) of ruining a transistor. It would be redundant to adapt every external device to be able to handle the high voltage present at the key jack. A better approach is to modify the transceiver to be compatible with the rest of the low-voltage outside world. The change I made removes the -65 V level from the key jack and places a positive 4.4-V potential there.

The simple circuit shown in Fig. 1 does the job. A single high-voltage pnp transistor is mounted on a three-lug terminal strip secured to the bottom of the 5-V regulator "bathtub" heat-sink by one of the heat-sink mounting screws. R1 is connected between the appropriate terminal lug and the 5-V foil of the regulator board. The end of R12 (220 ohms) attached to the key jack is removed and connected to the transistor collector tie point. Wire the base of Q1 to the key jack and install R2 as shown. The key jack voltage is now essentially TTL compatible and is active low.

## On To the TU

### Physical Considerations

I initially thought I would mount the interfacing optoisolators on a small pc board supported by a bracket inside the TU-300. This would keep the computer inwards free of excess baggage. I'd also be able to derive the +5 V required for the

<sup>1</sup>Notes appear on page 40.

\*Assistant Technical Editor, ARRL



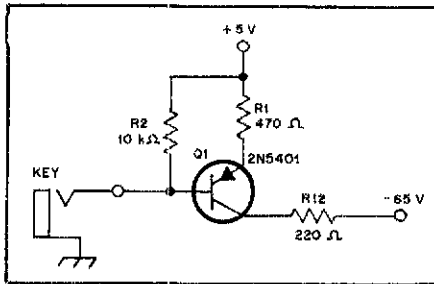


Fig. 1 — Schematic diagram of the TS-820S keying circuit modification. Q1 is a high-voltage pnp transistor. R12 is part of the original transceiver circuit. All resistors are 1/4-W, 5% types.

optoisolators from the '300 supply.

It was at this time that I had a chance to see the TU-470, successor to the '300. I noted that the '470 had some added transistor switches that enabled switching of positive and negative polarity PTT or other such lines. This feature is missing in the '300. There, the mechanical SEND/REC switch is used to perform such switching manually. Why not incorporate the '470 circuit modification into my '300?

It then struck me that there were two expansion slots in my '300 that were doing nothing at the time. (One was eventually filled with the cw demodulator board.) I could put the interface and transistor switching circuits on a small plug-in board that would occupy one of the expansion slots. That would certainly be a lot neater than a board secured to a chassis wall with a bracket.

The left-most expansion slot (8) was selected for the new board. Don't be tempted to use an empty filter-board slot. Those slots are connected to the signal buses. The expansion slots have no connections made to them other than  $\pm 12$  V and ground. This allows one to wire the other pins to any desired source or destination without the need for cutting pc-board traces.

### Circuit Description

Fig. 2 is a schematic diagram of the interface and PTT-line switching circuits. I've retained the individual equipment plug and socket numerical designations for clarity. As shown in Fig. 2, I use two optoisolators to interface my computer with the TU-300. These devices are connected to the computer game I/O socket, J15.

The RTTY/cw software I have delegates J15 pin 15 (AN0) as the RTTY/cw output port, pin 12 (AN3) as the T-R control line, and pin 2 (PB0 or SW0) as the RTTY/cw input port. The outputs, once the program has initialized them, are normally high during a no-signal, receive mode condition. When AN3 goes low, the TU-300 SEND N line is grounded, putting the TU into the transmit state. AN0 then toggles the afsk/fsk circuit of the TU or the cw key line, depending upon the position of S1.

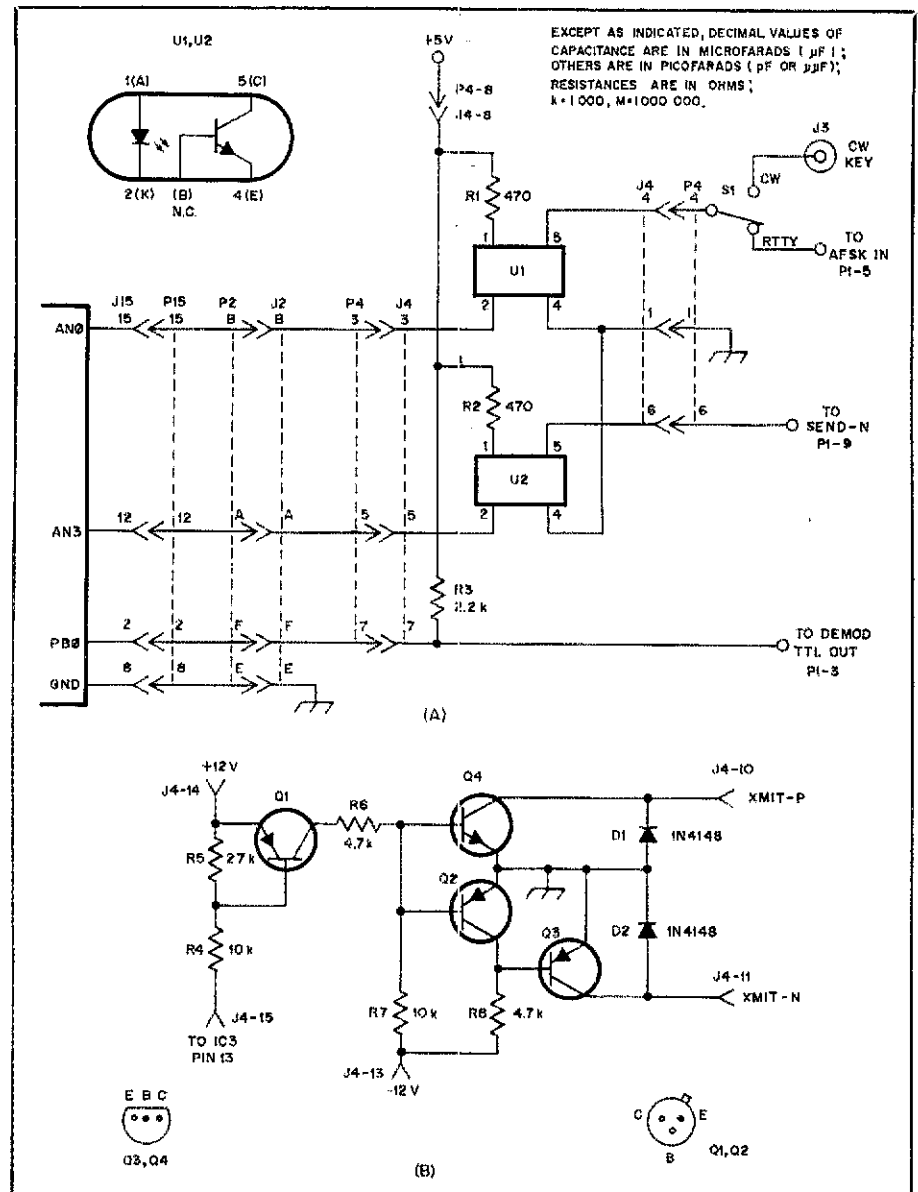


Fig. 2 — Computer/TU interface circuit and TU-300 keying circuit modification schematic diagram. All resistors are 1/4-W, 5% types.

- J1 — Part of TU-300 (DB-25P), not shown.
- J2 — Amphenol 126-192 or equivalent.
- J3 — Phono jack.
- J4 — 15-pin socket, Molex 22-15-2151 (gold-plated contacts, 22-15-2156 (tinned contacts) or equivalent.
- J15 — Part of computer (game I/O socket).
- P1 — Part of TU-300 (DB-25S), not shown.
- P2 — Amphenol 126-195 or equivalent.
- P4 — 15-pin SIP plug, Molex 22-03-2151 or equivalent.
- P15 — 16-pin DIP plug.

- Q1, Q2 — 2N4125, 2N2907 or equivalent.
- Q3 — MP5L51, 2N4888, ECG288 or equivalent (see text).
- Q4 — MP5L01, ECG194 or equivalent (see text).
- S1 — Part of 3pdt toggle switch (C&K 7301 or equivalent). The two poles not shown are used in the TU-300 cw/RTTY selection circuit.
- U1, U2 — ECG3041 optoisolators or equivalent.

During receive, the incoming demodulated cw or RTTY signal toggles PB0, the computer "does its thing" and displays the information on the screen.

The XMIT-P and XMIT-N outputs shown in Fig. 3 are keyed from two sources: the front panel SEND/REC switch, and the SEND N input. When either of these sources is keyed, IC3 pin 13 goes low. Q3 and Q4 are then driven into conduction and key the

respective XMIT-N and XMIT-P lines.

The transistors used at Q3 and Q4 have a high collector-to-emitter voltage rating (about 100 V). If the lines you intend to key are low-voltage ones, you may substitute transistors having correspondingly lower ratings.

### TU-300 Modifications

I replaced the front-panel RTTY/CW

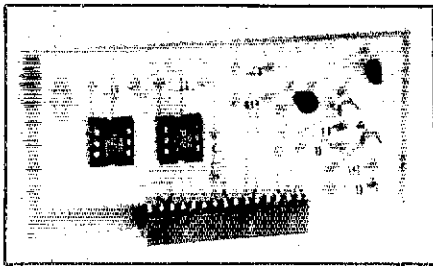


Fig. 3 — A view of the completed Interface circuit board.

Table 1

**Modification Interconnections**

Slot 8 Pin No.	Connected To
15	IC3 pin 13
14	+ 12 V
13	- 12 V
12	N.C.
11	XMIT-N
10	XMIT-P
9	N.C.
8	+ 5 V
7	P1 pin 3/J2, F
6	P1 pin 9
5	J2, A
4	S1
3	J2, B
2	N.C.
1	Gnd/J2, E

N.C. = not connected

selection switch (provided with the optional cw demodulator board) with a 3pdt toggle switch. The third pole of the switch is used as S1 of Fig. 2. Next, two foil cuts were made to adapt the XMIT-N/XMIT-P keying modification to the '300. (If this circuit addition is not to be made, these foil cuts are not needed.) The first cut is done on the top side of the board. Locate the trace that connects IC3 pin 13 to the fifth SIP (single in-line package) resistor lead. Cut this trace with a sharp instrument. To separate the TR-N line from the SIP resistor, another cut beneath the board is required. Find the trace that leads from D8 to the fifth SIP resistor connection. Cut this trace at a convenient point. Now connect the cathode of D8 to IC3 pin 13. No. 30 wire-wrapping wire is sufficient for this purpose and will serve to make most of the other modification changes.

I installed a phono jack in the upper-left rear-panel corner of the '300. This jack

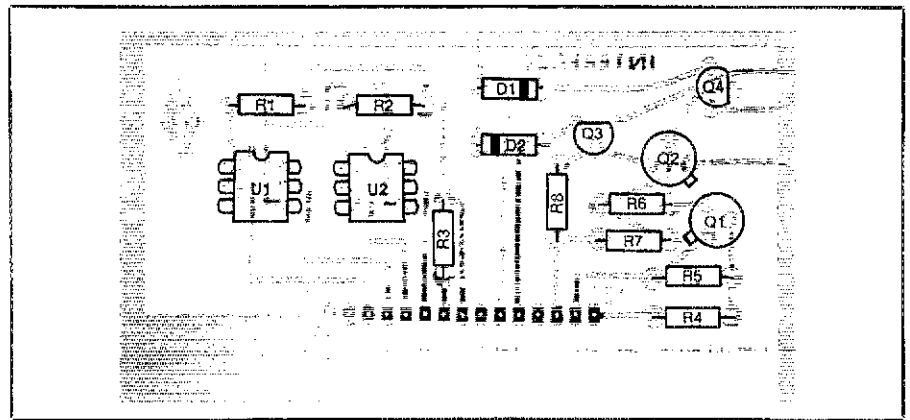


Fig. 4 — Parts-placement guide for the interface board. This view is from the component side of the board. Gray areas represent an X-ray view of the unetched foil. A circuit-board etching pattern appears in the Hints and Kinks section of this issue.

serves as the cw key line connector. A multi-pin socket is mounted at a convenient point next to the phono jack. This socket and its mating plug are used to interface the computer I/O lines to the TU. If your setup is similar to mine, you'll need at least four contacts on the connectors.

A 15-pin SIP male plug is soldered in place at expansion slot 8. A mating female pc-board socket, similar to those used on the Flesher boards, is required for the added board. After assembling the plug-in board, chassis wiring may begin.

Table 1 provides the information you'll need to wire the expansion slot to the rest of the TU. The slot 8 pin numbers are counted from the rear of the unit forward. (This procedure conforms to that used by Flesher in the cw demodulator modification.) Note that normally unused pins of P1 (actually a socket) are connected to the XMIT-P and XMIT-N lines. This leaves the SW1/SW2 mechanical switching arrangement undisturbed. Although the  $\pm 12$ -V leads are already connected to the expansion slot, you'll have to connect slot 8 pin 8 to +5 V with a jumper wire. When you have all the connections made, check for solder bridges, shorts and wiring errors. Having convinced yourself all is well, you can make the appropriate I/O wiring connections between the units and plug in the board.

**Interfacing**

I use a length of four-conductor ribbon

cable with matching connectors to interface the computer and the TU. A length of multi-conductor wire connects the TU to the transceiver. This keeps most of the wiring in two neat bundles.

Perhaps your software calls for different I/O assignments at the game port. The program may also toggle low to high instead of the high-to-low toggle required for this setup. If that's the case, probably the easiest thing to do is to modify the software. Find the I/O address locations within the program and shift them to suit your requirements. I had to do this with another program I have to make everything compatible. I wasn't about to switch plugs and other hardware around!

**Summary**

I hope these ideas will be of use to you. The project is one I consider worthwhile. It has made RTTY/cw operating much more sophisticated (at least from a hardware standpoint!) at my station. The computer keyboard is the sole controlling factor during operation. RTTY and cw transmissions are silent except for the click of the keyboard, or sound of the cw monitor tone. What a pleasure!

**Notes**

- 1. R. L. Drake Model LF2 and LF6 Line Filters, "New Products," *QST*, Jan. 1983, p. 27.
- 2. A circuit board and complete kit of parts is available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002.

**Strays** 

**SSC LOGO CONTEST UPDATE**

☐ Thanks for the great response to the Special Service Club (SSC) logo contest. There are only a few weeks left. The deadline for submissions is January 15, 1984. Get your entry in before it's too late.

(Complete rules are in October *QST*.)  
— Sally O'Dell, KB10, Club Program Manager, ARRL

**TIME/FREQUENCY MANUAL AVAILABLE**

☐ Haven't completed your Christmas shopping yet? How about a copy of *Time*

and *Frequency User's Manual No. 559* for the ham who has everything? Compiled by the National Bureau of Standards, this 256-page publication will be of interest to the casual reader as well as the laboratory engineer. Send \$6 to Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. Refer to Library of Congress No. 79-600169.

# Hints and Kinks

Conducted By Larry D. Wolfgang,\* WA3VIL

## AN AMPLIFIER FOR HIGH-IMPEDANCE VOLTMETERS

□ When I read the Beginner's Bench article in the Jan. 1982 issue of *QST*, I became interested in the high-impedance voltmeter project described there.<sup>1</sup> I already own a Heath VTVM, so I did not need another meter, but the project offered a convenient starting point for gaining some experience with op amps. I decided to build an amplifier to use with my VTVM instead. Now I can measure very small voltages with the meter.

The circuit I developed is shown at Fig. 1. I used a 741 op amp to provide an artificial ground for the signal voltage, which permits the use of a single 9-V battery to power the amplifier. My goal was to provide two amplification ranges:  $\times 10$  and  $\times 100$ . By using 5%-tolerance resistors, and allowing for the voltage-divider effect of the 1-M $\Omega$  resistor in the probe and the 12-M $\Omega$  unit at the amplifier input, the actual multiplication factors for my amplifier are 10.1 and 93. I decided that is close enough for my purpose.

The 2.2-k $\Omega$  resistor on the output of U1A provides a load for the op amp, as described in *The Radio Amateur's Handbook*.<sup>2</sup> I used the second half of the LF353N op amp to provide an adjustable zero function for my meter, as suggested in Collins' article. Ferrite beads were added as shown in Fig. 1 to cure a problem of self oscillation in my amplifier. The four beads that I used came from a "mystery" assortment that I had. Radio Shack beads (no. 273-098) should work. [Micrometals beads made from no. 73 or 75 material should also be effective. These are available from Amidon Associates, 12033 Otsego

St., North Hollywood, CA 91607. — Ed.]

To use the amplifier, I plug the test probe from my Heath VTVM into the amplifier, plug its output into the VTVM, short the probe to ground and zero the meter using the amplifier zero control. The circuit is very sensitive in the  $\times 100$  position. Just twisting around in my chair with the probe in my hand is enough to send the meter movement into fits from static buildup.

I have discovered some interesting applications for a meter with an amplifier like this one. For example, a signal as small as 0.01 V will deflect the movement in my VTVM. When the amplifier is connected and set to the  $\times 100$  position, this becomes 0.0001 V, or 100  $\mu$ V! Now it is possible to measure small currents flowing through a circuit — 0.1  $\mu$ A through a 1-k $\Omega$  resistor can be detected with no trouble.

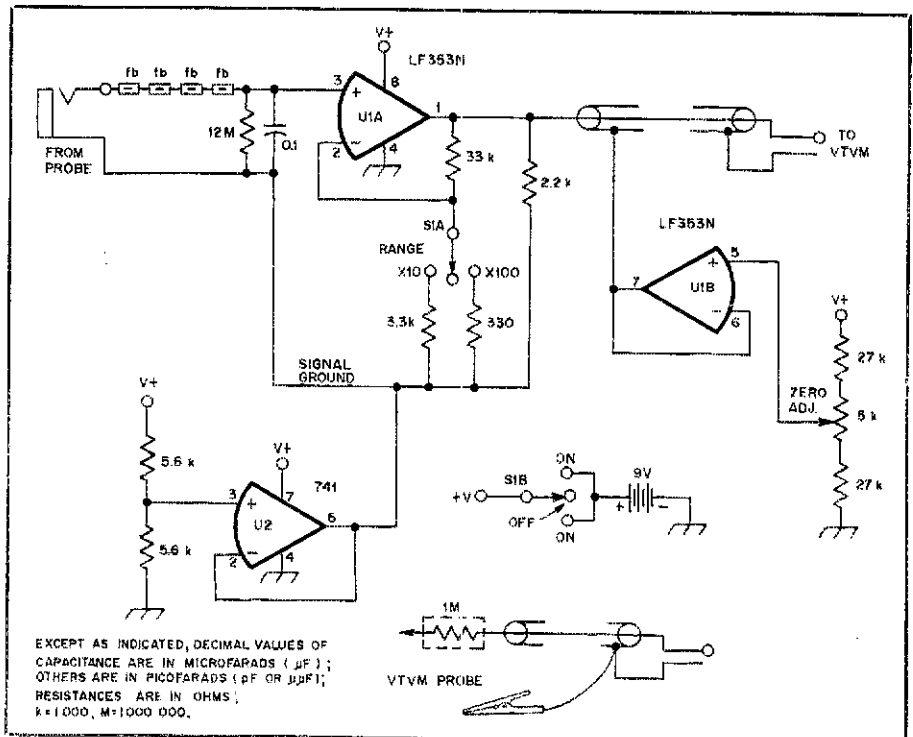


Fig. 1 — Schematic diagram of a high-impedance meter amplifier built by KR8L.

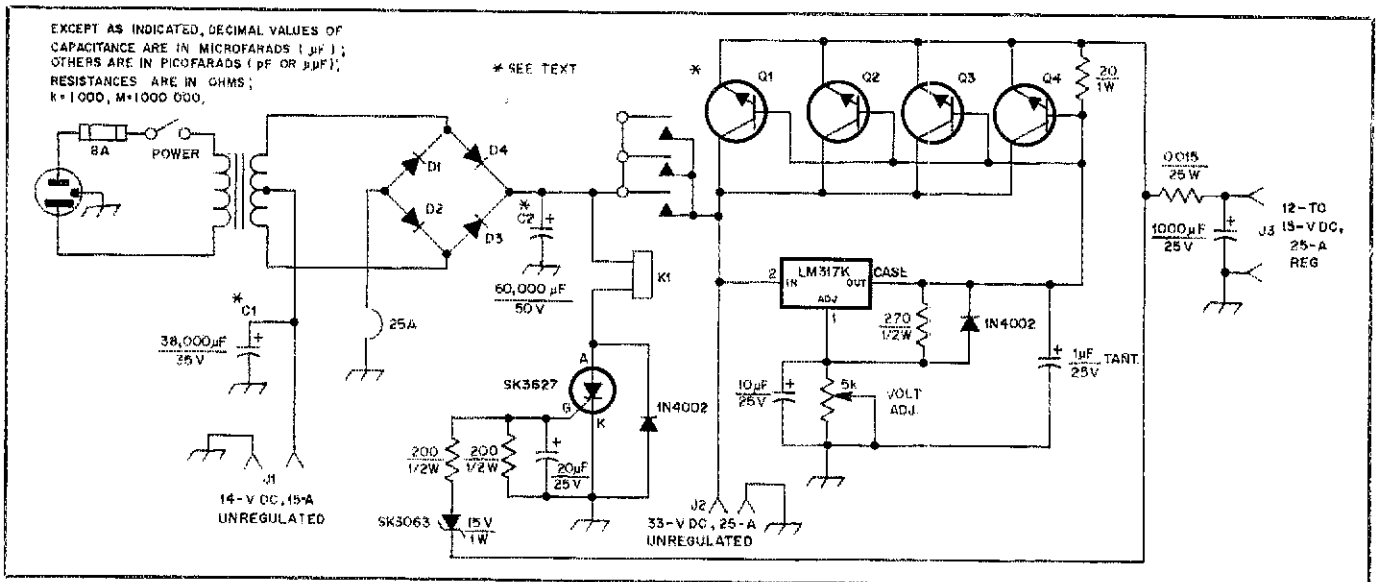


Fig. 2 — Schematic diagram of a 25-A power supply built from an automotive-type battery charger by K0UDZ.

D1-D4 — 25-A bridge rectifier (Radio Shack no. 276-1185) or individual diodes with 25-A

(or greater) rating (1N2155 or equiv.).  
J1-J3 — Power connector, builder's choice.

Q1-Q4 — 2N3055 or equiv.

Perhaps the most useful application I have found is for troubleshooting. I have an rf probe to use with my meter and amplifier. This combination provides a noticeable deflection of the meter with any signal much above S9 at the antenna terminals of my receiver. I can follow a signal like that all the way through the receiver now.

My amplifier is built into a small plastic box. It has a 1/4-in. phone jack for the probe and an 18-in. shielded wire with a 1/4-in. phone plug to connect to the VTVM.<sup>3</sup> The on/off and range switch is a single dpdt, center-off switch. A Radio Shack IC experimenter's board (no. 276-159) serves as the pc board. — *Bill Parmley, KR8L, Leslie, Michigan*

## POWER SUPPLIES FROM OLD BATTERY CHARGERS

I have seen old automotive-style battery chargers for sale at many flea markets. Most of these high-current devices sell for a few dollars, and they usually have a burned-out rectifier, a broken wire or some other minor fault. The 15- or 30-A ratings make them ideal candidates for power-supply parts. Fig. 2 is the schematic diagram that I used to build a high-current power supply. You can change the number of 2N3055 transistors and other component ratings to suit the supply you are building.

A 25-A bridge rectifier is available from Radio Shack (no. 276-1185). C1 and C2 are surplus units that I had on hand. The unregulated voltages at J1 and J2 will vary depending on the actual capacitance you use for these two components. Automotive parts stores have circuit breakers that are direct replacements for the automotive fuses. These are available in a variety of current ratings, and the price is only a few dollars each. I used a surplus relay for K1. It has three sets of contacts, rated at 10 A each, so I wired them in parallel to obtain the required current rating. — *Gene Wasson, K0UDZ, Rapid City, South Dakota*

## TUNABLE FILTER FOR THE CODE\*STAR CODE READER

After using a Microcraft CODE\*STAR code reader for a short time I realized the audio filter stage in the unit limits its usefulness.<sup>4</sup> The audio output from a receiver passes through an agc circuit in the reader, then goes through a narrow band-pass filter and finally on to the digitizing stages that produce the required alphanumeric display. The center frequency of the band-pass filter is fixed at approximately 750 Hz, and this filter has a bandwidth of less than 100 Hz. From an operator's point of view, there are times when a received signal produces comfortable audio copy, but with a tone that does not fall within the passband of the filter. When this happens, the code reader does not decode the signal.

Solving this problem proved to be quite simple. The filter must be modified to allow the center frequency to be tunable, while maintaining a fixed bandwidth and gain. After studying the schematic diagram for the CODE\*STAR reader and reviewing some basic circuit theory, I realized that only a minor change would be

needed.<sup>5,6</sup> By replacing each of two 6.8-kΩ resistors (R6 and R22) with a series combination of a 2.2-kΩ fixed resistor and a 10-kΩ potentiometer (see Fig. 3) I now have the desired filter action. Since both potentiometers must be adjusted simultaneously, I used a dual control, such as Radio Shack no. 271-1732.

I mounted this new control on the front panel where the TUNE LED was located previously. The hole had to be enlarged slightly. I drilled a new hole for the LED in the upper-right corner

<sup>3</sup>D. Lancaster, *Active Filter Cookbook* (Indianapolis: Howard W. Sams & Co., 1975), Ch. 7.  
<sup>4</sup>D. DeMaw, "Understanding and Using Audio Filters," *QST*, April 1983, pp. 45-48.

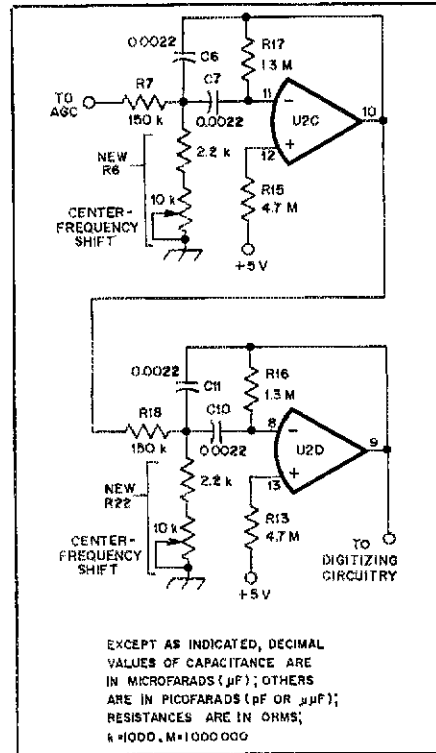


Fig. 3 — Schematic diagram of the band-pass filter section of the CODE\*STAR reader showing changes made by W4PRB to provide a variable center frequency. Part numbers refer to the manufacturer's schematic diagram.

of the front panel. I removed all of the ICs from the circuit board before unsoldering the resistors and installing the new components.

This modification allows the center frequency to be varied from about 600 Hz up to about 1200 Hz. I believe this will be adequate for almost all situations. To operate the code reader, a station is tuned in at a comfortable listening frequency, and the new TUNE control is rotated until the LED lights and the copied signal appears on the alphanumeric display. — *Allan Mense, W4PRB, St. Louis, Missouri*

## SELECTABLE CW FILTERS FOR THE YAESU FT-901DM

I have made two modifications to my Yaesu FT-901DM that make it more enjoyable for me to use on cw. My first complaint with the rig was that after installing a cw filter I could not operate with the wide (ssb) filter on cw. I wanted to be able to select either filter while operating cw. The automatic mike gain control (AMGC) is not functional on cw, and this is a dpdt switch, with both sections connected in parallel. Fig. 4 shows how I used one side of this switch, and connected three wires to the filter board. Now I can select either filter in the cw mode, but the ssb filter is selected automatically in the ssb mode. The AMGC operates normally on ssb. [Be sure to use shielded wire, and keep the leads to the filter board as short as possible to keep increased leakage around the filter to a minimum. — Ed.]

My second complaint about the '901 was that

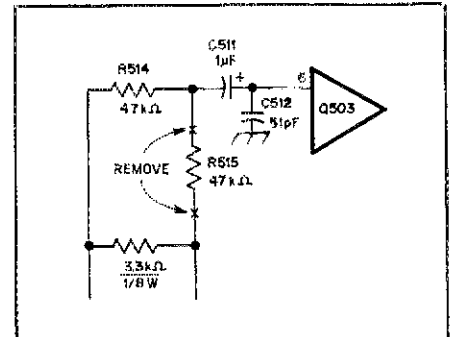


Fig. 5 — A simple modification for the FT-901DM to allow the af gain control to adjust the sidetone-monitor level. Part numbers refer to the schematic diagram in the owner's manual.

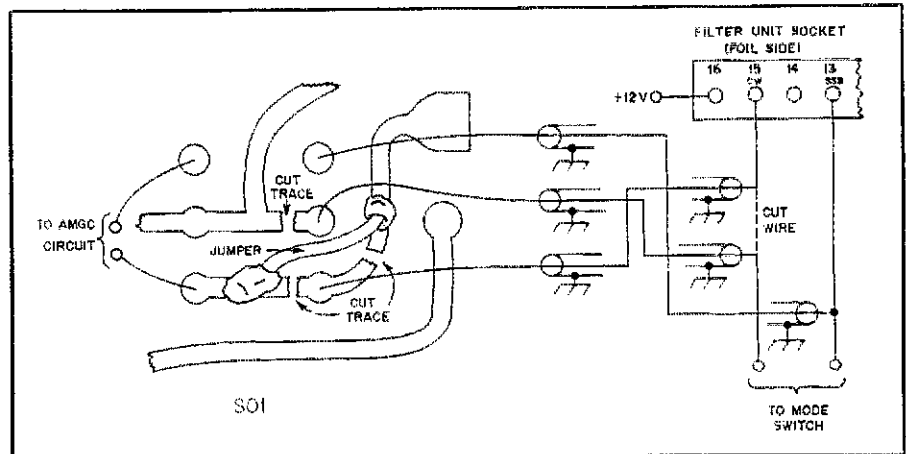


Fig. 4 — Diagram of the modification done by SV21L to allow the selection of either the cw or ssb filters in the cw mode on the Yaesu FT-901DM.

<sup>5</sup>mm = in. × 25.4.

<sup>6</sup>P. O'Dell, "Microcraft CODE\*STAR Reader Kit," *Product Review, QST*, July 1983, p. 45.

I prefer to be able to adjust the level of the sidetone monitor from outside the rig after the internal trimmer is set to an acceptable level. Fig. 5 shows a simple modification that allows the sidetone level to be adjusted by turning the af gain control. Remove R515 and replace it with a new resistor of 3.3 kΩ, but connect the top of this new component to the opposite side of R514, as shown. — *D. Vassiliades, SV2IL, Thessaloniki, Greece*

## RETUNING TRAPS FOR THE WARC BANDS

□ Now is the time to start looking for antennas to use on the 18- and 24-MHz WARC bands. You can learn about propagation on these bands by listening, even before they are opened for amateur use. The traps in a Hustler 4BTV or 5BTV are tunable, so it is easy to convert one of these antennas for coverage of the new bands.

To retune a trap, remove it from the antenna. If you remove more than one trap at a time, be sure you can read the label or have some other way to tell them apart. Couple a dip meter to the trap and check its resonant frequency. The method you use to couple to the trap may vary with the type of meter you are using. I simply connected a 5-pF capacitor between the inner end of the trap and the hot side of my dip-meter coil. Each trap should give an indication of resonance in the band it was intended for. If not, then you should take the trap apart and look for a damaged coil. The outer shell is one plate of the

resonating capacitor for these traps. If your trap checks out okay, readjust the resonant frequency by sliding the outer shell up or down the coil. The tuning range seems to be as much as  $\pm 20\%$  of the marked frequency. I moved the 10-meter trap to 24.8 MHz and the 15-meter trap to 18.1 MHz.

When you reassemble your antenna, you will have to adjust the section lengths for the new bands. The lengths I used are given in Table 1. Each length includes the length of the trap, to the bottom of the next trap or the top of the antenna. You may have to use some new tubing sections.

Joseph Boyer, W6UYH, wrote a series of articles in *CQ* about calculating the lengths of elements for multiband trap vertical antennas.

‘J. Boyer, “The Multi-Band Trap Antenna,” *CQ*, Feb.-May 1977.

I recommend that you read this series if you want to calculate the new lengths for other frequencies.

Mount the antenna and connect at least four radials, each one about  $\frac{1}{4} \lambda$  at the lowest operating frequency. Check the SWR and readjust the section lengths if necessary. Start with the highest frequency band. If you run out of adjustment range, you can use a capacitance hat to lower the resonant frequency. The Hustler design should give some ideas on this.

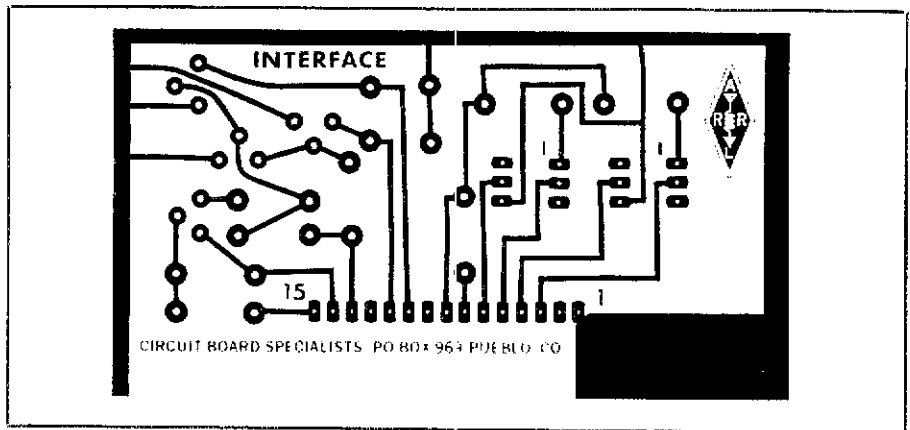
Some trap antennas do not use this type of trap. Some use sealed capacitors, and in others the entire trap is sealed. If your antenna uses traps with sealed capacitors, you should be able to retune them by rewinding the coils. Sometimes this requires using smaller wire to allow more turns to fit into the space. With care you should be able to retune most types of trap antennas. — *R. P. Haviland, W4MB, Daytona Beach, Florida*

Table 1

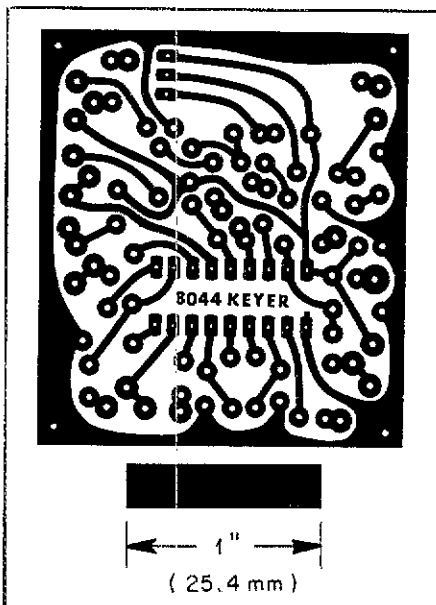
### Trap Vertical Element Lengths

Band (MHz)	Section Length (in.)
24	108
18	24
10	49

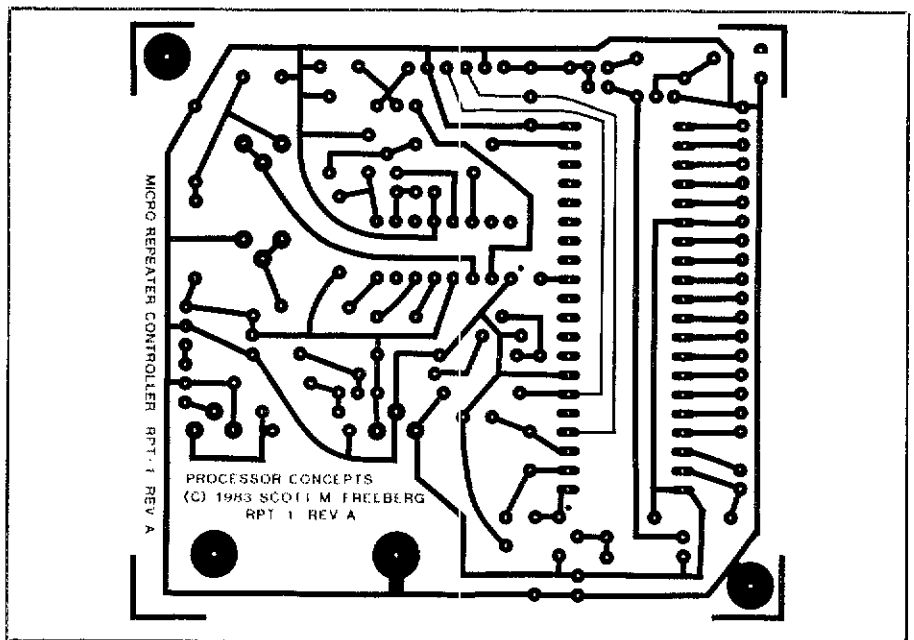
mm = in.  $\times$  25.4.



Etching pattern for the interface circuit board. Black represents unetched copper, viewed from the foil side of the board. The pattern is shown full size. A parts-placement diagram is shown in Fig. 5, page 40.



Circuit-board etching pattern for the Curtis-IC keyer. The pattern is shown full size from the foil side of the board. Black areas represent copper foil. The parts-placement guide appears on page 19.



A full-size etching pattern for the Microcomputer Repeater Controller. The board is shown from the foil side, and black represents unetched copper. A parts-placement diagram appears on page 31.

## The SRT 3000 Send/Receive Terminal

A versatile, self-contained unit that transmits and receives Baudot, ASCII and Morse code, the SRT 3000 is lightweight, has a 63-key keyboard and a built-in modem (terminal unit). Just three connections to your transceiver and one to a video monitor, and you're on the air in style!

The '3000 gives no external evidence of its tremendous capabilities. To access different functions, various keys are pressed in conjunction with the CTRL or CTRL and SHIFT keys. There are no codings or guides on the keyboard as to which key controls which function (except for a few standard functions such as REPEAT, CQ, AS, DE, KN, SK and ID). It will take time to develop proficiency in handling this unit.

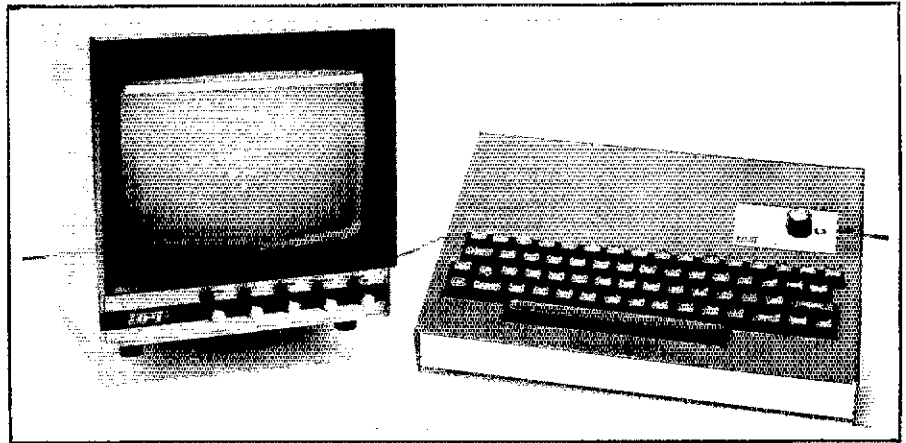
The SRT is best hooked up to a video monitor, (not included) although 5-V dc at 70 mA is provided for powering an rf modulator. Back-panel connections — all phono jacks except for the Morse keyed output, which is 1/4-in. phone — include cassette control and audio lines, RS-232-C lines for computer and printer, oscilloscope vertical and horizontal connections for tuning purposes, sidetone output and the standard lines such as audio in, afsk out, video out, and a PTT line for transceiver control.<sup>1</sup> A built-in 0.5-W audio monitor and a small speaker enhance the independent status of this unit. An internal battery is used to retain some selective programmable memories when the power is turned off.

### Innards

When the DGM and video monitor are turned on, the first thing you see is a status line displaying the information you need to know. Since the DGM contains a built-in modem, variables for different modes of operation are given. A tuning bar, which works like the "tuning eye" that was used on old receivers shows when the received signal is in optimal tuning range. During Morse reception, when the desired signal is correctly centered in the passband, a double asterisk (\*) will appear to the right of the tuning bar. The status line also shows the mode, speed, RTTY shift and T-R status, and a counter for the 1000-character buffer. More specialized functions are displayed at the right half of the status line. These include the 24-hour-clock readout and other functions, too many to be explained in this review. They are covered in the manual.

A series of selectable features makes versatile RTTY operation a reality: If for some reason you want to read the screen from across the room, you can select one of three different screen sizes. Page scrolling allows you to review a word or a sentence that has passed from view. A handy feature is the split-screen mode. It displays transmitted and received text on different halves of the video monitor, with reversed video to differentiate between the two.

One of the interesting aspects of the SRT is the ease of function selection. The instruction



manual calls this "toggling." Word wrap-around, carriage return, unshift-on-space, normal or reverse video — all are keyboard switchable with just the simple press of the CTRL and/or SHIFT key(s) and the correct key, mnemonically coded (i.e., CTRL Q = QBF message; CTRL SHIFT T = time display, etc.). Other keyboard controls adjust the built-in TU variables: Shift settings, tone pairs and normal or reverse shift are all changed easily.

Using a programmable 8-character code, the SELCAL functions of the SRT are activated. This allows two stations to automatically send messages to and receive messages from each other. [Note: Under FCC regulations, control operators are still required to be present at both ends of the circuit.] The SELCAL functions include printer and tape-recorder control so you can have a copy of the message sent to you. If you have a message for the other operator, the "Who Are You" (WRU) function will, upon reception of the correct code, activate your transmitter, transmit whatever is stored in MEMORY ONE and turn on the SELCAL for any possible response.

### Other Fine Points

- A 24-hour clock on the extreme right of the status line, and a time memory that sends not only the displayed time, but any other 36 characters of information you want (such as the date).
- Full-duplex operation, which makes use of the split-screen function to give you a truly interactive conversation, especially if you have a full-break-in transceiver.
- A break-in mode that allows you to transmit new information without disturbing what is already entered into the 1000-character buffer.
- A number of preprogrammed and programmable memories: Ten 80-character memories may be loaded. The capabilities of the SRT allow you to set up programming loops that cause one memory to include another, or to repeat by calling *itself* again (think of a flow chart).

A few "goodies" enhance Morse code opera-

tion with the SRT. Variable weighting and character spacing, an 800-Hz sidetone, and, for those of you with little to say during a QSO, an automatic idle that can be turned on to provide BT between characters.

### Impressions

The SRT is certainly a versatile machine. The complexity of the controls necessitated a "crippled" approach to operation for a few weeks until I memorized the various command combinations. For the duration of learning time, DGM provides a handy one-half page (!) synopsis of operating commands that may be taped in a convenient place. I used the terminal at my home QTH, W1AW and N3KZ — it's lightweight and portable. The SRT can't generate large character symbols, but with quick manipulation of the memories and tape-recorder controls (also from the keyboard), I was able to insert fancy labels and brag tapes whenever and wherever I wanted. Tuning in signals with the status line bar is not difficult. The combination of a receiver RTTY filter helped when available, but even with a 2.7-kHz (ssb) passband I had little trouble copying signals. The internal demodulator filters did a good job of keeping things in the clear. When a scope was available, I made use of the crossed ellipse tuning method, but it really was not necessary.

The Morse functions are superlative. When venturing down to the low end of 40 cw, I was able to "make like the big boys" — those ops who coast at 50 wpm. By adjusting the weighting and intercharacter spacing control for high-speed intelligibility (and by preloading the text buffer to compensate for my 45-wpm maximum typing speed), I could keep up with the best of 'em.

With a maximum speed of 99 wpm, meteor-scatter work on vhf was made a bit easier by loading up a few memories with the correct information and then increasing the code speed for transmission in the proper sequence. The same function was used for moonbounce work, but with the message slowed to the appropriate rate for that mode. Even with 600 W of 432-MHz

<sup>1</sup>mm = in. × 25.4

\*Assistant Technical Editor

ft five inches above the keyboard, no difficulties were encountered, and the SRT itself gave no RFI problems in any application — it's a well-shielded machine.

The manual is, for the most part, understood easily. Twenty-nine of its 35 pages are devoted to descriptions of the unit's capabilities. There's no explanation of the theory behind the SRT, but several pages consist of schematic and chip layout diagrams. A description of how to hook the SRT into a Microline 82A printer is also given. I never had problems with station equipment organization, for I could move the keyboard out of the way when it was not in use. The clean, sleek appearance and coloring (black, gray, silver) of the keyboard was much appreciated. When turning the unit on, I always made a few keystrokes to toggle and take advantage of those operating functions I like to use.

#### A Few Drawbacks

Despite its versatility and practicality, there are a few problems with the SRT-3000. The internal speaker faces out of the rear of the unit and gives a rather tinny sound. When used as a monitor for received signals, I found this limitation especially annoying, and feel there is no reason to use it as a substitute for your regular station speaker.

When switching into the split-screen mode, the monitor dims substantially, a result of the reverse video that sets off the transmit buffer display. The programmable clock must be reset every time the unit is turned on, a minor inconvenience. A feature included in many modern RTTY keyboards (but not the SRT) is an incremental QSO counter that would be perfect for contest operation.

When you are changing page-size formats, whatever is displayed gets erased. This is not a problem if you know what you want from the beginning of your operation. But if you decide to switch page sizes for any reason in the middle of a QSO, you'll lose whatever was there.

When you are selecting a speed for Morse code operation, the status indicator doesn't display the newly entered speed until you enter the transmit mode. This was a bit disconcerting at first.

The instruction manual organization is a bit strange, requiring one to read through the entire booklet before getting a truly composite idea of the SRT-3000 capabilities or even instructions as to how to turn the thing on. There is one typo in the digested command listing in the back of the book: The control commands used to turn on the random code generator for A-Z and for A-Z plus numbers and punctuation are reversed.

On the review unit, the detachable power cord unplugged a bit too easily from the rear of the keyboard, causing loss of the most recent commands and page memory. This happens, however, only when the unit is moved around. I quickly learned to hold onto the plug to keep it inserted properly when moving the keyboard.

The ac-line fuse is mounted internally, making access difficult; removing the cover is a bit of a chore. All in all, though, the advantages and pluses far outweigh these minor inconveniences.

The SRT-3000 is available from DGM Electronics, Inc., 787 Briar Ln., Beloit, WI 53511. Price class: \$795. — *Leo D. Kluger, WB2TRN*

#### AEA KT-2

□ After the thrill of making the first few 5-wpm cw QSOs, most Novices develop a growing urge to raise their code speeds to 13 wpm, 20 wpm and beyond. As any QRQ operator will tell you,

the true joy of cw lies where syllables, words and phrases are recognized at higher speeds with little effort.

How do you get from QRS to QRQ? Practice. Advanced Electronic Applications KT-2 Keyer/Trainer can help you along the journey.

The KT-2 is a high-quality, key-pad-programmable keyer and Morse code trainer. An attractive 2-1/2 × 4-3/4 × 4-3/8-inch black and charcoal-gray metal case encloses a single glass-epoxy etched circuit board on which all components are mounted. On the top, forward-sloping surface is an on-off/volume control knob and a 12-button key pad. The back panel has two phono jacks for positive or negative transmitter-line keying, a 1/4-inch stereo phone jack for paddle connection, a 3.5-mm mini-phone jack for headphones and a power jack for connecting 12-V dc. The right side panel is perforated over the internal speaker, and the case sits atop four rubber feet to prevent marring desk tops.

Packaged with the KT-2 are a power cord, three-wire paddle cord and transmitter-keying patch cord, all with appropriate, high-quality plugs. An optional wall-mounted power supply, external rechargeable NiCd battery pack and an automobile cigarette-lighter cord for mobile operation are available at extra cost.

#### The Keyer

One of the KT-2's two modes of operation is as a straightforward electronic keyer with programmable sidetone frequency and speed, and other features. At turn-on, the sidetone is set at 833.3 Hz, though the frequency can be increased or decreased with two keystrokes. The code speed, initialized at 20 wpm, can be set precisely at speeds from 1 to 99 wpm. Regardless of dot or dash ratios (also programmable), speed calibration is exact. AEA uses the FCC standard of 50 code elements per word, using the word "PARIS" as the reference (a code element is equal to the time of one space between within-character dots or dashes). In other words, the word "PARIS" is comprised of 50 code elements, and the number of times it is sent per minute is the code speed in words per minute.

When using the KT-2 as a keyer, you have several mode options. At turn-on, the KT-2 functions as an iambic keyer: When using a two-lever

paddle, holding the dot and dash paddles closed at the same time will cause alternating dots and dashes to be sent, a useful function when sending such characters as the letter C or a period.

Also, both dot and dash memories are enabled at turn-on; either one or both may be switched on or off from the key pad. Dot memory permits inserting a dot in a string of dashes by momentarily closing the dot paddle; conversely, dash memory permits inserting a dash in a string of dots.

For those who prefer semi-auto or "bug" operation, the KT-2 can be set up to form dots automatically, but generate a continuous tone for as long as the dash paddle is closed, mimicking a bug. Using this feature, you can also wire a straight key to the dash contact and use the Keyer/Trainer as a sidetone generator while keying a transmitter.

As mentioned earlier, dot and dash ratios (initialized at 1:1 and 3:1, respectively) can be programmed, each referenced to the length of an intra-character space. The dot-to-space ratio can be set from 0.5 to 1.5, and the dash-to-space ratio from 2.0 to 4.0.

The KT-2 will key just about any transmitter. Two diode-protected output jacks permit keying cathode-keyed and most transistor-keyed transmitters (+ jack) and grid-block-keyed and some other transistor-keyed transmitters (- jack).

Though certainly not a fault of the KT-2 in the literal sense, the jack wiring for the paddle connection is the reverse of that for some other common keyers. For the one-keyer user there is no problem; everything performs exactly as specified. The contester who uses the KT-2 and another keyer (one backing up the other) should note that several other commercial keyers have the dot and dash contacts wired the opposite way — to swap the paddle between keyers would require reversing the dot and dash wires. (See Hints and Kinks, *QST*, Jan. 1982, and "The CHIP (Cheap, Homemade Iambic Paddle)," *QST*, Oct. 1982, for ideas on how to solve this problem).

#### The Trainer

The KT-2 is a code trainer intended to be used by those who already know the code and who



want to increase their code speed. It is not intended to be a code teacher; you cannot drill on particular letters or subsets of Morse code characters. Once you are familiar with the code at a slow speed, the KT-2 offers an effective and intriguing method to improve speed quickly.

You set a comfortable starting speed, the desired ending speed and the length of time you want to spend on that session. Then, the KT-2 gradually increases the code speed from the starting speed to the ending speed over the programmed time limit. You can program any start/stop combination between 1 and 99 wpm as long as the speed is greater at the end than at the start. The duration can be programmed from 0.1 to 99.9 minutes. Alternatively, drill at a constant speed (no increase over time) is possible. At initialization, the starting speed is set at 5 wpm, ending speed at 20 wpm and duration at 10 minutes; this is simply the default condition and is easily changed from the key pad to suit a student's needs.

Within the trainer mode two code formats are possible. In the Farnsworth method, at the beginning of your programmed session characters are sent at the ending speed with inter-character spacing increased to yield the desired start speed. This is a proven method used at slow code speeds over WIAW and in ARRL code tapes. To increase the code speed over the duration of the session, the KT-2 gradually reduces the inter-character spacing. It is intended to prevent students from counting individual dots and dashes and to help them recognize entire characters as identifiable patterns, eliminating some of the plateaus that occasionally emerge.

Alternatively, you may select "slow code" method in which code is sent with the proper intra-character and inter-character spacings for the current speed. Again, you are cautioned that at speeds slower than 13 to 15 wpm, the slow code method is not recommended.

Code generation in the KT-2 is dubbed pseudo-random; it is not truly random in that the software reads characters from a 24,000-character table in ROM. Though finite in length, the table is large enough (!) that few, if any, users could commit it to memory. A student can select any one of 10 fixed starting points from the key pad or choose a random starting point. AEA will provide (for an additional \$2) a written listing of the entire character table with the 10 starting points clearly marked; thus, you can check the accuracy of your copy. Though a few of the starting point character sequences became familiar (i.e., predictable) over time, after 30 seconds or so into any of the sequences the characters were again unpredictable; the random starting points were never identifiable.

Another choice offered by the KT-2 is fixed five-character groupings or random-length groups. With the fixed groupings you know each group will consist of only five characters; with the random-length groups, "word" length is unpredictable. You may also choose between common code characters (26 letters, 10 numerals, the period, comma, fraction bar and question mark) or both common and less common code characters (adding more esoteric punctuation and prosigns).

The only problem evident with the KT-2 (with some start/stop/duration combinations) is an inherent delay between "telling" the training to start and its actually starting. For example, though the delay is unnoticeable under the initialization conditions, when the values are changed to start equals 15 wpm, stop 25 wpm and duration 10 minutes, a 7.5-second delay en-

sues until the Trainer starts sending Morse. With the same start/stop speeds, a duration of 99.9 minutes (admittedly longer than most users would choose) causes a delay of 75 seconds. Other combinations yield a variety of delays. As the manufacturer explained:

The condition . . . is indeed endemic to the KT-2. The pause is actually "thinking" time for the microcomputer to determine how fast to start sending the code and what rate of acceleration to use. The amount of delay is dependent upon the parameters entered by the user . . . The reason lies in the algorithm . . .

The delay is little more than a slight irritant that will gladly be tolerated. Once the practice begins, the short delay is of no consequence.

One option that would make the KT-2 an even more effective trainer were it to be incorporated would be decreasing code-speed practice. Each approach, increasing and decreasing code speed, has its advantages and disadvantages. An increasing-speed algorithm (as used in the KT-2) starts you at a level where you're comparatively comfortable and takes you to your target level. As you progress through a session, you're constantly fighting complacency or overcoming the "inertia" of comfort; as the speed increases, performance (characters copied successfully) decreases and the target speed feels fast. Nonetheless, this method does work and is far more effective than most other approaches.

A decreasing-speed algorithm, however, starts you at a speed well beyond your reach and brings you down to your target speed. It is similar to the fast-code practice transmitted over WIAW. As speed decreases, your performance in that session improves and the target speed feels slower than it would if you had approached it from slower speeds.

The disadvantage of this method is that you must initially have a higher tolerance for frustration because you'll probably copy few characters at the start speed. This approach would help many students reach their targets more quickly. A decreasing-speed feature is merely a subjective preference, but one I would have liked to have had as an option.

Using the KT-2, you'll quickly find yourself engrossed in an effective and rather enjoyable quest for QRQ skill. The KT-2 is available from Advanced Electronic Applications, Inc., P.O. Box 2160, Lynnwood, WA 98036. Price class: \$130. — Steve Place, WB1EYI

### KLM 21.0-21.5-6A "BIG STICKER"

□ When the opportunity arose to test KLM's 15-meter "Big Sticker," I jumped at it. The antenna definitely fulfills the "big" requirement. Its six elements are arranged along a 3-inch-OD, 36-foot boom, and it weighs in at 60 pounds.<sup>2</sup>

<sup>2</sup>m = ft × 0.3048; kg = lb × 2.2

### KLM 21-21.5-6A 15-Meter "Big Sticker"

*Manufacturer's Claimed Specifications*  
Frequency of operation: 21-21.5 MHz.  
Longest element: 25 ft.  
VSWR: Better than 1.5:1.  
Wind area: 8.5 sq. ft.  
Turning radius: 20 ft.  
Material: 6063-T832 seamless tubing.

Like most KLM antennas, this beam employs a dual driven element to achieve a low SWR across the entire band.

The boom comes in three 12-foot sections. Two of the boom sections are swaged at one end to fit inside the center section. A couple of 1/4-20 bolts secure each joint.

Each antenna element is made from two halves joined at the center by a Lexan® insulator. Each element half consists of a 6-foot section of 3/4-inch-OD tubing swaged at one end to accept a 1/2-inch tip of the appropriate length. A 6-inch piece of 7/8-inch-OD tubing reinforces each element half where it joins the insulator. Compression clamps hold the tubing sections together.

The reflector and director element halves are connected electrically by short aluminum straps. The two driven elements are interconnected by aluminum phasing straps. Because of the log-cell driven element, the feed-point impedance is 200 ohms. The review antenna came complete with KLM's model 3-60 4:1 balun, but making a balun from coaxial cable as explained in the instruction manual is easy.

Each element is secured to the boom by a single worm-gear hose clamp attached to the underside of the insulator with two 1/4-20 bolts. Sheet metal screws keep the clamps from twisting on the boom. The boom-to-mast plate and associated U bolts accept a 2-inch-OD mast. A steel truss cable running from a riser on the boom-to-mast plate to aluminum clamps near the ends of the boom provides support.

KLM supplies stainless-steel hardware to bolt the antenna together. They also include a generous supply of Penetrox®, a conductive paste used to ensure good electrical contact at the element joints and balun connections.

This antenna took about four hours to assemble. KLM's excellent instruction manual included a step-by-step assembly outline and detailed drawings with dimensions. Some of the assembly steps were more time-consuming than necessary because of ill-fitting parts. For example, some of the boom-to-element hose clamps didn't quite fit into their spaces on the insulators. Also, on some of the element halves, the machine screws that secure the elements to the insulators didn't quite fit through all of the holes. Eventually, with some filing and a lot of patience, I got the beam together.

My only serious complaint is that I found a wax-like film coating the inside of the swaged end of many of the 3/4-inch element sections. A VOM confirmed that this waxy substance does not conduct electricity, so I carefully scraped it off with a sharp knife and then used steel wool to clean up the inside of the element. Upon completion, I was mystified by a small handful of leftover hardware. A careful rereading of the instructions confirmed that I had put on every screw, nut and washer as specified.

Clarke Greene, K1JX, and I installed the beam atop 70 feet of Rohn 25. Clarke pulled while I followed the antenna up, and it was bolted in

### ARRL Evaluation

As specified.  
24 ft. 3 in.  
See Fig. 1.  
Not measured.  
22.7 ft.



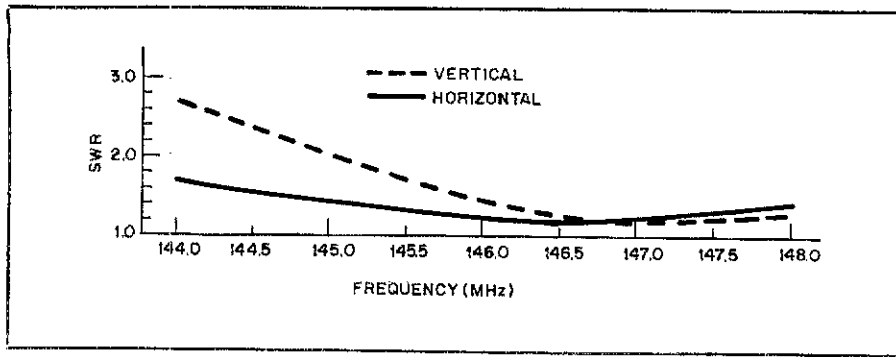


Fig. 1 — SWR curves for the Austin OMNI 2-m mobile antenna. In this installation, the horizontal elements of the test antenna were less than  $1/4\lambda$  from the car body (a compact station wagon).

place within 15 minutes of leaving the ground. Most of the weight is in the boom, the elements are short and the antenna is balanced, so installation is relatively easy. The beam is fed with 125 feet of RG-8/U.

On-the-air evaluation confirmed that this big antenna is a big performer. Some casual operation during the cw WPX contest, Field Day and the IARU Radiosport brought many unsolicited "tremendous signal" reports. Received signals were stronger on the KLM than on a 4-element beam at the same height on another tower 60 feet away. This antenna exhibits deep nulls off the back and sides, and I find myself making more small adjustments to the rotor to peak signals than with other 15-meter beams I've used.

Although it remains to be seen if this antenna can survive a New England winter, it has weathered several summer storms with wind gusts in excess of 50 mi/h that felled trees throughout the state. This Big Sticker certainly meets my idea of what a big antenna should do. If you're looking for a big antenna for 15, this one is worth considering. The 21-21.5-6A lists for \$500. Manufacturer: KLM, P.O. Box 816, Morgan Hill, CA 95037. — *Mark Wilson, AA2Z*

## AUSTIN OMNI 2-M ANTENNA

□ The question of antenna polarization in vhf mobile work has been with us almost since the first vhf gear appeared in cars. Vertical antenna polarization is favored for obvious aesthetic and mechanical reasons, but horizontal polarization has documented advantages of noise reduction and higher average signal levels in irregular terrain. A 1950s trend to horizontal polarization was reversed with the fm-and-repeaters boom of the 1960s. Since the late 1970s, the effectiveness of ssb communications has rekindled interest in the art of 2-m mobile communication over considerable distances, without the aid of repeaters, mainly through the use of horizontal polarization.

Why not use an antenna that can be changed readily from horizontal to vertical polarization without sacrificing the advantages of both modes? This question was responsible for the development of the OMNI 2-m mobile antenna by Dick Austin, K1QIZ.

### How It Works

The OMNI combines an old principle with some new mechanical ideas. It uses two half-wave elements fed in phase, matched to 50-ohm line by means of a corrective stub and a balun. Only the mechanical construction is new.

At the bottom of the antenna is an unobtrusive, chrome-plated cylinder. It is fitted with a threaded stud that can be screwed into a stan-

dard Hustler bumper mount or used with a matching 3/8-inch nut to attach the base to any kind of wraparound bumper mount.

The main vertical support is a tapered, white fiberglass tube with diameters of 7/8 inch at the bottom and 1/2 inch at the top. The matching network is entirely within the fiberglass tube. The 50-ohm coaxial feed line, also white, exits through a hole in a chrome-plated sleeve at the bottom of the whip. This sleeve makes a firm slip-on fit to the base assembly. The bottom edge is notched to fit around a steel pin in the base, preventing antenna rotation when the car is in motion. Note that the OMNI has its own transmission line. If you have an hf rig in your car, you do not have to disconnect it when the OMNI is installed.

At the top of the vertical support is a thick plastic sleeve that serves as a mount for the two half-wave elements. These are tapered slightly to give strength at the lower ends while reducing wind resistance. The fed ends of the elements are set into short lengths of solid brass rod that are held in place by means of wing nuts. Slots cut into the plastic mount in the vertical and horizontal planes permit the elements to be fixed

in place in a vertical or horizontal position, their alignment being kept at the proper angles by the slots.

For vertical polarization, the elements are aligned with the vertical slots (on opposite sides of the insulating mount), one pointing upward and the other downward. To change to horizontal polarization, loosen the wing nuts and turn the elements to the horizontal plane. The base support is oriented so one element is parallel to the long dimension of the car, pointing forward. The other element is parallel to the rear of the car. The preferred mounting position is at the left rear of the vehicle, as this keeps the elements on the side away from pedestrian traffic. Mounted in this way, the elements are approximately 52 inches above the rear bumper.

An incidental dividend of this antenna and mount design is that the antenna assembly can be removed in an instant for safe keeping. For this purpose, there is a soft plastic clip mounted part way down the fiberglass support and slotted to hold the collapsed elements in place, parallel with the supporting mast.

### Performance

Any mobile antenna is bound to be far less effective than even a small directive array mounted in the clear. Still, a vhf mobile enthusiast accustomed to the quarter-wave whip will be pleasantly surprised by results obtained with the OMNI in the vertical or horizontal mode. My first ssb contact while using the OMNI was initiated from my driveway on a small hill in Canton, Connecticut. My CQ was answered by a station on Long Island, about 65 miles away.<sup>3</sup> He was surprised to learn that I was using only 10-W output. Equally good reports have been received out to 75 miles or so over hilly terrain and under essentially normal conditions.

<sup>3</sup>km = mi.  $\times$  1.6

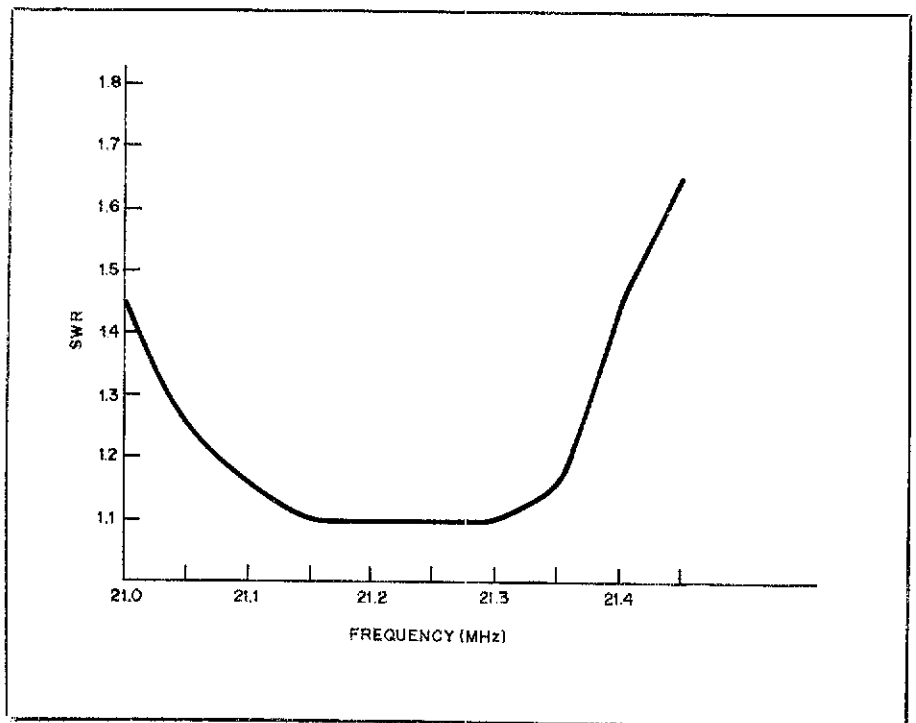


Fig. 2 — SWR curve for the KLM 21-21.5-6A.

Some of the review period was spent in central Florida where the reliable communications range with a 10-W rig, when working with well-equipped stations is contained with a circle roughly 80 miles in diameter. Experience in Florida and on the trip home showed that reliable communications ranges could be extended appreciably with the use of an amplifier; mine delivers 65 watts of output. "Grid" Gridley, W4GJO, also using an OMNI, had just over 100 watts of output available. We both found it possible to often work the Jacksonville and Miami areas about 150 and 230 miles distant, respectively. Gulf Coast tropo contacts out to 400 miles were made before the real season opened for this sort of thing.

Probably the most impressive demonstration of the capabilities of 2-m ssb operation with horizontal antennas was a four-hour continuous contact with W4GJO from his home in northwestern Georgia. This contact continued for 157 road miles (120 air miles) in the hill country of eastern Tennessee. Many other QSOs were held at distances of from 75 to 100 miles in the Shenandoah Valley of Virginia and the Pocono Mountains of Pennsylvania. Almost without exception, the person contacted volunteered the information that he had never worked a 2-m mobile station at that distance before.

The performance of the OMNI as a vertically polarized antenna, working direct and through several repeaters, compares with that of a through-the-glass-fed vertical whip antenna; there is little practical difference in their working range. There may be a difference in the timing of fades, but the signals average out to about the same level. Thus, I am getting good results with the OMNI in fm simplex and repeater work with the dividend of being able to have solid QSOs on ssb over better-than-average distances. The OMNI is a real plus compared with trying to work ssb and fm with a single antenna that favors one mode or the other.

The OMNI can be obtained from Austin Custom Antenna, 38 Terminal Rd., Providence, RI 02905. Price class: \$65. — *Ed Tilton, WIHDQ*

## SPEEDCALL 312-K TOUCH-TONE® DECODER KIT

⌈ The only hams who should be interested in a tone decoder are those building an autopatch, right? Wrong. Why? Because the Speedcall 312-K is actually a selective signaling device. Here are a few examples of its possible use: You want to be available for instant contact on the local repeater, but do not want to be distracted by the chatter of other stations in QSO; you're a DXer who wants instant notification when the rare one comes on; you may be in a RACES or ARES group that must respond in an instant, or you may be working in an extremely noisy environment and wish to receive a visual indication that someone is calling you. Many, if not most, amateurs active on the fm mode could make some use of a selective signaling device.

### The Circuit

Tone-decoder ICs have improved dramatically in the last few years. Until recently, an array of seven or eight 567s was typical for tone decoding in most amateur applications. Now we have available stable, false-free decoder ICs that decode all 16 digits. Speedcall's 312-K Decoder is an innovative circuit designed around the ITT 3201 Decoder/Filter IC.

The ITT 3201 is a complete two-of-eight

DTMF (Dual-Tone, Multi-Frequency) decoder/filter in a single 22-pin package, requiring a single +12-V supply. Audio for the ITT 3201 is taken from the receiver fm detector. Speedcall has made provisions for taking the audio off before or after de-emphasis.

After processing the received tones, the ITT 3201 produces a data valid signal and a hexadecimal character corresponding to any valid DTMF tone received. The hex output becomes the input for an NC 5200 logic array that functions as a field-programmable sequence decoder. Actually, it is only partially field programmable, and the programming done at the factory is what makes the Speedcall 312-K so versatile and useful. The field-programming portion is accomplished with wire jumpers and allows the user to determine the series of digits required to activate the output (address code). Any sequence consisting of three to eight digits (numbers and/or symbols) may be selected and programmed by the user.

When a valid address code has been detected, the logic array output is fed to an inverter, a latch and a 3-Hz oscillator. The oscillator output drives a transistor, causing it to turn an LED on and off at the 3-Hz rate. This transistor can also be used to drive any low-current 12-V device (such as a relay), to connect to additional signaling instruments, or the oscillator section can be bypassed to create a continuous output. In either case, the output will remain activated until the 312-K is reset manually with the reset switch or until it receives the COMMAND RESET signal, if it has been programmed for this function.

### Field Programming

Address code field programming is straightforward. The programmer simply inserts wire jumpers between sockets representing digit output and position (in the sequence) registers. The same digit may be used for more than one position in the sequence, e.g. the 312-K could be programmed to respond to 13356, with the digit "3" being used in the second and third registers (positions).

With the COMMAND RESET option programmed in, the calling operator may reset the 312-K from his station by entering the address code followed by the reset digit — whatever the user has programmed into the 312-K for this function. Thus, if an operator does not respond in a specified period of time, the calling operator may cancel the call and deactivate the signaling device.

The MASTERCALL option permits the sending station to substitute the MASTERCALL digit for any digit or digits in the address code. Suppose a receiving unit is coded for 1598 with # as the MASTERCALL digit. The sending station may send 1598 to address the unit, or he may send #598, ##98, ###8, ####, 1###, #5##, etc. This has uses in situations in which receiving stations can be fitted to some grouping. It could be used to alert selectively a group of DXers all needing the same country, or some subgroup of ARES. The COMMAND RESET option may be used in conjunction with the MASTERCALL option.

### Construction

The Speedcall 312-K is reasonably simple to build. If any difficulty is to be encountered, it would most likely be in finding the proper connection point in the receiver. Speedcall suggests that it be connected as near the fm detector as possible, which is not particularly difficult to do if you are familiar with your fm receiver. If not, you would probably be wise to enlist the

aid of a local radio technician.

The 3-3/4 × 2-inch circuit board might fit inside some fm transceivers. Connections required are +12 V, common, audio and audio shield (common). Once the device is connected to the receiver, the user is required to tune to a station sending a DTMF signal and adjust a potentiometer on the circuit board to provide a 500-mV signal to the input of the decoder IC. No other adjustments are required.

The unit I built and tested has performed flawlessly over the last few months. I added an external piezo buzzer purchased at Radio Shack. The basic kit is in the \$90 price class, while a deluxe version with case, switch and buzzer is in the \$105 price class. More information is available from Speedcall Corporation, 2020 National Ave., Hayward, CA 94545, tel. 415-783-5611. — *Peter R. O'Dell, KBIN*

## LOGBOOK

□ Hams do a lot of paperwork. We keep logs, we send, receive and record the sending and receiving of QSL cards, and, for various operating awards, we record states and countries worked and confirmed. Some of us spend as much time shuffling paper as we do rag chewing!

Today, many hams own Radio Shack TRS-80® personal computers. Jerry Crosby, WB8YUO, has written a program for the Models I and III that lessens the paperwork that the active ham encounters. Called "Logbook (Amateur Radio Computer Logbook Program)," the program allows you to log QSOs, search the log, extract data from the log for QSLing, and keep a record of your DXCC, WAS and 6-band WAS progress.

The log includes the QSO date, call sign of the station worked, operator's name, city, state and country of the station worked, frequency, mode and QSO time, exchanged signal reports, and other notes (such as QSL status). Once you have logged a QSO, a program-editing module allows you to make changes and/or corrections at any time.

Searching the log is a two-step process. Let's say, for example, I want to search my log for all contacts made on March 8, 1983. First, I use the indexing module to index the log according to date (the category I wish to search). Next, I use the search module to find all March 8 QSOs. (The search function works very quickly.)

The program provides 12 ways of outputting (to the CRT or a printer) the information found by the searching process. If you desire, you can output the whole log.

The QSL module of "Logbook" allows you to pull pertinent QSO data out of the log and print that data on tractor-fed, self-adhesive labels. The information printed on the label may be personalized by changing some program lines (the program is written in BASIC) to include your station equipment list.

"Logbook" works as advertised. A lot of thought went into the program. Since the program is written in BASIC, the adventurous user may modify the program to meet his or her requirements.

The program requires a minimum of 32K of RAM and one disk drive. It operates with most of the popular disk operating systems available for the TRS-80 Models I and III. "Logbook" is available from Jerry Crosby, WB8YUO, 6333 Willowdale Ct., Columbus, OH 43229. Full documentation and a program diskette are included for \$39. — *Stan Horzempa, WAILOU*

# Technical Correspondence

Conducted By  
Bob Schetgen,\* KU7G

The publishers of QST assume no responsibility for statements made herein by correspondents.

## AMTOR CONTROVERSY

□ I would like to correct an error in an otherwise excellent article by Paul Newland, AD7I ("An Introduction to AMTOR," July 1983 QST). Paul referred to four modes of operation in the AMTOR system: A, B, L and S. Mode S is not included in the definition of AMTOR, however, and I shall explain why.

Mode S, better known in maritime radio as SELFEC, is part of the maritime SITOR system from which AMTOR is derived. This mode enables a shore station to transmit a message to a specific shipboard station that cannot use Mode A because international maritime regulations prohibit hf transmitting while in a foreign port.

Paul describes this mode as, "like Mode B but with selective calling." Not only does it allow the specified receiving station to print only directed messages, it is so designed as to actively prevent reception of the message by *any* other station.

This feature is clearly outside the spirit of Amateur Radio, at least in the view of the licensing authorities in those countries where permission was first sought. The FCC has followed this line, as the recently approved rule change mentions specifically Modes A and B, with no mention of SELFEC. As far as I know, no presently active AMTOR stations have SELFEC mode, and the AMTOR units currently available do not provide this mode. Perhaps it is included in units designed for both amateur and maritime use.

I should point out that the absence of SELFEC in AMTOR does not prevent the use of Mode B with a selective call feature to prevent the reception of unwanted messages. The user can add a suitable hardware or software device to the AMTOR code converter in the same way as is already done with conventional RTTY. — *Peter Martinez, G3PLX, Hants, England*

*The author replies:* I think the major problem here is the definition of AMTOR. Once a definition of AMTOR is made, several additional problems fall out of the definition.

To the best of my knowledge, Peter was the first to coin the term AMTOR, in his article "Amtor, An Improved Radioteletypewriter System, Using a Microprocessor," in August 1979 *Radio Communication*. In my mind, that article defined the term AMTOR for use in the U.K., unless the local regulating administration later redefined it. In the USA, the Federal Communications Commission has defined AMTOR to be the protocol specified in CCIR Rec. 476-2 (1978). Allow me to quote from Sections 97.69[b] and 97.69[b](3) of the Commission's Rules and Regulations: "... the following digital codes, as specified, may be used: ... The International Radio Consultative Committee (CCIR) Recommendation 476-2 (commonly known as AMTOR), provided that the code, baud rate and emission timing shall conform to the specifications of CCIR 476-2 (1978) Mode A or Mode B." Let me point out that the FCC is referring to the CCIR's definition of Mode B, not my definition

of Mode B or Mode S. The CCIR's definition of Mode B, as stated in CCIR Rec. 476-2 (1978), is listed in Section 3.2 of that document as: "A synchronous system, transmitting an uninterrupted stream of characters from a station sending in the collective B-mode (CBSS) [I call this Mode B — PBN] to a number of stations receiving in the collective B-mode (CBRS), or from a station sending in the selective B-mode (SBSS) [I call this Mode S, PBN] to one selected station receiving in the selective B-mode (SBRs)." What I describe as Mode S is referred to by the CCIR in the Forward Error Correction (FEC) section as "Selective Broadcast." It is Mode B, as defined by the CCIR, as described in the protocol specification that the FCC has approved. Use of Mode S (FEC selective broadcast) is permitted by the FCC.

To avoid this confusion in the future, I recommend that administrations approve the use of "CCIR Rec. 476" (as the FCC has done), rather than the term AMTOR. If an administration wishes to restrict the use of some protocol features (although I don't know why they would), they should approve, "CCIR Rec. 476 less Sections 5 and 6," or whatever is appropriate. Without such wording, rules and regulations are subject to operator interpretation.

Peter's statement, "... not only does [Mode S] allow the specified receiving station to print only directed messages, it is so designed as to actively prevent reception of the message by *any* other station ...," is incomplete. I would finish his sentence with, "... using Mode B." What he is describing is like trying to monitor Mode A traffic without a Mode L code converter (recall that Mode L allows a third party to monitor Mode A traffic). To monitor Mode S, you need a Mode S code converter.

My station, and other stations using my firmware, can monitor Mode S traffic as well as send and receive it. There is the option of printing *all* Mode S traffic (on a channel) *regardless* of intended receiving station. It works well! There is no reason that amateur stations can't monitor Mode S traffic. The only reason existing equipment cannot monitor Mode S is that manufacturers haven't provided this capability. It should be a simple matter to update current AMTOR programs for Mode S monitor capability. (My firmware is available to radio amateurs for their own use at no charge. This firmware object code is available by calling N2DSY's computer bulletin board, tel. 201-943-7754.)

I view Mode S not as a facility to prevent others from reading my traffic, but as a facility to prevent other stations from wasting my teleprinter paper. (With my AMTOR converter, I can select whether or not I want to receive Mode B traffic.)

I should have been clearer in my original article,<sup>1</sup> and added the following to my definition of Mode S that appears on page 12: "This doesn't mean that other stations *cannot* print traffic intended for your station. It means they have the *option* of not printing traffic directed

to your station, and you have the *option* of not printing traffic directed to their station."

I hope all manufacturers of AMTOR equipment will provide Mode S with monitor capability. However, as I pointed out in note 3 of my article: "Not all (AMTOR) controllers include all modes. ... make certain the unit ... (you get includes) ... the modes you want to use."

Finally, Peter is correct when he points out that selective-call capability can be added, external to the AMTOR code converter, to those stations that require this capability (without resorting to Mode S). However, that usually requires an additional microprocessor system to implement the feature. Rather than add an additional processor, I chose to implement this feature in my converter.

Microprocessor chips themselves are inexpensive (less than \$5). But when you add the support chips, pc board, sockets, power supply, cabinet, and so on, that second micro can cost the same amount of money as a homebuilt AMTOR code converter! It is simply more economical to build SELFEC into an AMTOR converter in the first place.

I hope my comments help to clarify these issues. I should add that I, with other AMTOR users, will forever be in Peter's debt for his pioneering work with AMTOR systems. Thank you, Peter! — *Paul Newland, AD7I, Holmdel, New Jersey*

## SILENT VHF STATION CAUSES TVI

□ A recent TVI problem prompted me to write and share my experience. TVI was occurring, only on Channel 6, during 20-meter operation. It was equally strong using either 100 W or 1000 W of power. My station consists of an FT-102 with an Alpha 76 PA and a 204 BA antenna at 72 ft.<sup>2</sup>

A low-pass filter is used between the exciter and PA with another at the PA output. All cable is double-shielded RG-214/U. My 2-meter antenna is about 3 ft above the 20-meter antenna. As a professional communications engineer, I should have known what was happening.

Using a Motorola R2000 spectrum analyzer and a through-line sampler, I found my sixth harmonic to be approximately 0.7  $\mu$ V at 85 MHz. (TV Channel 6 is approximately 700- $\mu$ V field strength at my home.) Next, I measured signal strength with the analyzer connected to the TV antenna. Wow! The sixth harmonic was equal to the channel 6 signal.

The answer is obvious: Intermodulation distortion was being developed in the 2-meter radio and re-transmitted through the 2-meter antenna. I might add that the situation was worse when the 2-meter rig was off. A circulator at the output of the 2-meter radio cured the problem. However, moving the vhf and hf antennas apart, or disconnecting the vhf antenna, would be a less expensive cure.

Several 2-meter radios that use solid-state switching were tried, and *all* retransmit spurious

\*TIS Specialist, ARRL

<sup>1</sup>P. Newland, "An Introduction to AMTOR," July 1983 QST, pp. 11-13.

<sup>2</sup>m = ft  $\times$  0.3048.

products. Only a commercial vhf radio, which uses an antenna relay for switching, causes no trouble.

This may save a lot of hair pulling when TVI suddenly develops. Chances are that a new 2-meter 220-MHz or 440-MHz rig at your station is causing the problem. — Robert Findlay, W6NZX, Vista, California

## QUAD ANTENNA

□ When a new 3-element 20-meter quad was put into operation at W5DJ, a couple of problems were encountered. I believe that my experience will save future builders some headaches and needless tower-climbing exercise.

First, the SWR changed drastically with beam heading. When the antenna was pointing north, the SWR was about 1.15:1; turned to the west, it would rise to about 1.8:1. The new quad is supported on a guyed 70-ft tower that previously held a 3-element Yagi. The Yagi did not show any significant SWR change with beam heading. This fact helped hide the cause of the problem.

The tower is supported by two sets of guy wires. One set of three guys at the 25-ft level, and another set at 60 ft. All guy wires are broken into 12-ft sections by insulators.

The problem was eventually traced to the top guy wires, which were attached directly to the tower's anti-twist bars. Considering any pair of top guys, there was a 12-ft section connected to the anti-twist bar and (through the tower and anti-twist frame) to another 12-ft section. Once it was recognized that there was a continuous conducting length of 28-ft (roughly a half wavelength at 14 MHz), the solution was obvious. An insulator installed between each guy wire and the anti-twist frame cured problem number one completely.

This problem did not exist with the Yagi because the Yagi's driven element was above the top of the tower, some 15 ft from the top guys. With the quad, the bottom of the driven loop is within about 2 ft of the anti-twist frame's vertical position. (In the near field, field intensity varies inversely with the cube of distance from the radiator.) Thus, coupling into the top guy wires is several hundred times greater with the quad than it was with the Yagi.

SWR variation resulted primarily from the fact that the plane of the quad loop is perpendicular to the closest guy wires at some headings, and parallel at others. It is not necessary to install insulators at the lower anti-twist bars because their attachment point is 37 ft below the bottom of the quad; coupling is insignificant.

Problem number two proved to be as interesting to diagnose as the first, and more difficult to solve. The antenna was designed for 14,150 kHz, but SWR and noise-bridge measurements indicated resonance at 13,800 kHz. Wire lengths for the reflector, driven element and director had been correctly calculated from equations and accurately cut to those values.<sup>1</sup> Why, then, was the antenna resonant 350 kHz lower than expected?

Design equations and measurements were both known to be good. The only remaining cause was the type of wire used. I had used some 12-gauge, stranded, vinyl-insulated wire to improve mechanical fatigue resistance. (It is well-known that broken wires from continuous wind-induced flexing is a problem with quads.) My rationale was that the stranded wire is better able to with-

stand mechanical fatigue than solid wire — that much is correct. Further, I reasoned that the vinyl insulation would protect the tinned copper strands from corrosion and add some mechanical strength — this is also true.

However, I overlooked the electrical effect of the vinyl insulation. It finally occurred to me that dielectric loading of the insulation was probably the cause of my woe. To verify this, before lowering the 20-meter quad, I assembled a single, 10-meter quad loop using the same type of wire. A noise bridge indicated resonance at about 28,600 kHz. After the vinyl insulation was stripped off, resonance occurred at about 29,200 kHz. Clearly, dielectric loading of the vinyl insulation causes a drop in resonant frequency of about 2% — similar to the 20-meter quad behavior.

The quad was lowered and the insulated wires replaced with 14-gauge enameled copper-clad wires, cut to the same lengths. With the quad back on the tower, resonance is now at 14,050 kHz. Changing from vinyl-insulated to enameled wire resulted in an upward frequency shift of about 250 kHz. Although not exactly consistent with the design equations yet, a small adjustment will put resonance at 14,150 kHz.

I am not aware of any mention of this loading effect (caused by insulation on wire elements) anywhere in Amateur Radio antenna publications or engineering texts. This education compensated somewhat for the considerable effort required to lower, adjust and raise a quad antenna in near-100° F (38° C) weather! — John Kennedy, W5DJ, Dallas, Texas

## DIAL LINEARITY ERRORS

□ In appearance, the engine-engraved dial has no rival. Because amateur bands are narrow on a percentage basis, it is often possible to select components such that a linear dial indicates frequency exactly at the ends and shows intermediate values with good accuracy.<sup>2</sup> If a parallel L-C circuit is tuned by a semi-circular-plate variable capacitor, the actual frequency will be lower than the dial indication, except at the tuning-range ends.<sup>3</sup> It is difficult to find the position and value of the maximum error, but the mid-scale error is found easily from the expression

$$f_e = f_{\min} \left[ \frac{1 + K}{2} - \sqrt{\frac{2}{1 + \frac{1}{K^2}}} \right] \quad (\text{Eq. 2})$$

where

$$\begin{aligned} f_e &= \text{frequency error} \\ f_{\min} &= \text{low edge of tuning range} \\ f_{\max} &= \text{high edge of tuning range} \\ K &= \frac{f_{\max}}{f_{\min}} \end{aligned}$$

Using the 80-meter band as an extreme case, the dial will read a maximum of 24.99 kHz high at 47% rotation, whereas Eq. 2 yields 24.94 kHz. Most other tuning ranges have smaller percentage bandwidths so that Eq. 2 will more closely approximate the maximum error. Note that the mid-scale error decreases rapidly with K.

<sup>1</sup>F. Noble, "Finding a Pad," QST, Oct. 1981, p. 51.

<sup>2</sup>For a derivation of Eq. 2, send an s.a.s.e. to Frank Noble, W3MT, 10004 Belhaven Rd., Bethesda, MD 20817.

To minimize end-effect errors, a gear reduction of 2:1 may be arranged. The capacitor then operates in the middle half of its range, where the linearity of capacitance versus shaft angle is nearly perfect. — Frank Noble, W3MT, Bethesda, Maryland

## Feedback

□ In "New Ideas for the VHF Wattmeter" (Oct. 1983 QST) author Lamb has pointed out a few errors. Under the subheading "Calibration," all references to R3 actually refer to R1. The last sentence of the first full paragraph on page 13 should read: "... to that of the terminating resistor." Additionally, the unmarked capacitor in Fig. 4 should be marked C1.

□ Several readers have noticed an error in the wavemeter schematic diagram that appears in "The Ever Useful Wavemeter" (Sept. 1983 QST). Fig. 4 shows the connection of D1 and D2 at the cathode of D1. This junction should be moved to the anode of D1, so that the cathode of D2 is connected to the anode of D1 and the 5-pF capacitor. Connect the cathode of D1 to the 0.01-μF capacitor. A similar circuit and the theory of operation, are in *The Radio Amateur's Handbook* (Fig. 13, page 5-8).

□ OKIABB found an error in, "Go Class B or C with Power MOSFETs" (March 1983 QST). The detail drawing of T1 in Fig. 4 has leads E and C transposed. From left to right, the correct lead order is A, C, E/D, B, F.

□ Author Wayne Cooper points out an error in Fig. 1 of his article, "A New Mixer for the ASTRO 103 Receiver," which appeared in Hints and Kinks, Oct. 1983 QST, page 41. A connecting dot should be shown where the input lines to both voltage regulators cross, near the LM 317T.

□ In "Overvoltage Protection for 13.8-V Power Supplies" (Oct. 1983 QST), an error appears on page 40. The 7.5-V, 5-W Zener diode referred to in column one, 10 lines from the bottom of the page should be a 1N5343B.

□ There are several corrections to "The Pizza Clock: An Exercise in Wire Wrapping," (June 1983 QST). On the circuit-board patterns (available from ARRL for a large s.a.s.e.), U8 and U9 are transposed; U9 belongs in the 14-pin socket. Also, the 1-kΩ resistor at pin 6 of U1 has been eliminated; it may be necessary to break the trace and install the resistor if there are problems with the function of U1 (characteristics of some crystals will require the addition of the resistor for proper operation). The IC labeled U4 (on page 31) is actually U10. There are two pin 12s shown on U2. The real pin 12 is shown connected to pin 14 of U3; the other should be labeled pin 13, and is grounded, along with pins 8 and 15.

WA0PBQ informs us that the minimum PIV specification of most LEDs falls below the 8-V reverse bias used in the Pizza Clock. LEDs should be tested before use in the clock; those that fail can still be used if a 100-kΩ resistor is connected across their leads.

<sup>3</sup>J. Lindsay, Jr., "Quads and Yagis," QST, May 1968, p. 11.

# Another Step Toward Volunteer Examining

- FCC Issues Report and Order Finalizing Rules
  - VECs May Be National or Regional
  - General Class Question Pool Released
  - ARRL Preparations Moving Forward but Expense Recoupment Must Still Be Resolved

By Curt Holsopple,\* K9CH

The time has nearly arrived to say farewell to your favorite FCC examiner down at the Field Office. Your local FCC examiner has done a commendable job of administering thousands of Amateur Radio license examinations, but in recent years both budget and staff cuts have resulted in a level of service that radio amateurs have found to be unacceptable. Now, we are about to see a huge improvement in the examining program.

The Volunteer Examiner Program brings with it several specific benefits to radio amateurs. We will have test sites that are closer to home and more frequently and conveniently available. The new system brings with it vastly improved test security, improved test questions and removal of virtually all "test shock" factors that caused people to fail tests needlessly. Now that the Report and Order has been released, let's take a look at some details of the Commission's version of the Volunteer Examiner Program and the timetable for setting it up.

## When Will It Happen?

The FCC's Report and Order states that the rules establishing the Volunteer Examiner Program will go into effect December 1, 1983. The rules require that there be at least one Volunteer Examiner Coordinator (VEC) to oversee the program. (The ARRL is preparing to work as a national-level VEC, provided that the Communications Act is amended to allow a VEC to charge a mandatory fee to recoup necessary administrative costs. This provision will ensure that the expense of administering a fair and credible program will be borne by those who benefit directly from it.)

The ARRL Board of Directors went on record again at the October 1983 Board Meeting, affirming the League's intent to become a VEC once two necessary condi-

League participate as a Volunteer Examiner Coordinator; such participation, however, only to commence upon governmental authorization for recoupment of VEC expenses and approval of any agreement between ARRL and the Commission by the Board of Directors."

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*"At first, Volunteer Examiners will handle only Technician and General class examinations."*

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Many persons have already stepped forward indicating their desire to become Volunteer Examiners. While it is impossible to predict an exact start-up date for the Volunteer Examiner Program, we hope that VE-administered test sessions can begin sometime in 1984. For the ARRL to participate as a VEC in a manner that is responsible to its members, however, VEC recoupment of the program's costs must be assured.

At first, Volunteer Examiners will handle only Technician and General class examinations. The FCC will continue to administer Advanced and Extra Class tests through their Field Offices for several more months, depending on when the new questions pools are completed and the Volunteer Examiner Program has proven its ability to handle the load. VECs eventually will coordinate exams for all license classes except Novice, with the Novice written exam (Element 2) additionally administered to unlicensed applicants seeking a Technician or higher examination. See September 1983 *QST*, p. 56, for a description of the new Novice testing program.

## Some Details of the Report and Order

The Report and Order for PR Docket

No. 83-27 establishing the rules for the Volunteer Examiner Program runs a lengthy 27 pages, too much to reproduce here. You may get a copy by sending a request to the ARRL Headquarters asking for "Report and Order for PR Docket 83-27." A dollar for postage will help!

The FCC addressed eight main issues in its discussion section of the Report and Order:

- 1) Number of examiners per session
- 2) Will there be enough Volunteer Examiners?
- 3) Conflict-of-interest provisions
- 4) Fees
- 5) Public announcements
- 6) Telegraphy examinations
- 7) Procedure in case of failure
- 8) Administrative sanctions

These points are summarized below.

1) *Number of examiners.* The Commission has retained the proposed plan to use a team of three examiners for each test session, but did ease up slightly on the requirements for that team's makeup. Now, a team of three Advanced class accredited Volunteer Examiners may give the Element 3 examination, which is the written test for the Technician and General classes. The new rules state that the 13-wpm code test be given by a Volunteer Examiner team of *three Extra Class licensees*. FCC Field Office statistics indicate that written Element 3 (Technician/General) is the most frequently administered test.

The Commission also decided to have the Volunteer Examiners return the test answer sheets to the VEC that issued those tests to allow the VEC to do needed data analysis. This is another means for the VEC to supervise the VE team activity accurately.

2) *Will there be enough Volunteer Examiners?* Despite one commenter's allegation that there would not be enough Extra Class licensees willing to participate as Volunteer Examiners, the FCC expressed its confidence that the Amateur Radio community would rise to the challenge. In-

\*Manager, ARRL Volunteer Examiner Program



precluded with certain structural separations, sometimes called "Chinese Walls."

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***"The controversial proposal barring co-employee relationships between applicant and examiner does not appear in these new rules."***

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In the case of the VEC that is also a book publisher, the FCC states:

... where an organization seeking to be a VEC also has publishing interests, we will accept its services as a VEC only upon a persuasive showing that preventive measures have been taken to preclude any possible conflict of interest ... An organization, seeking to be a VEC, which manufactures or distributes equipment intended primarily for use by amateur radio operators, may become a VEC only upon a similar showing.

4) *Fees.* Volunteer Examiners will not be permitted under this Report and Order to charge for their services in administering tests. This is based on specific language in Public Law 97-259, better known in Amateur Radio circles as "The Goldwater-Wirth Bill," passed and signed into law last year.

(The ARRL membership made it plain to the Board of Directors that the League should be a Volunteer Examiner Coordinator only with some means of recovering the unavoidable printing, distributing and administrative costs. The FCC Private Radio Bureau has supported the ARRL's proposed legislation to allow a VEC to recoup from applicants on a mandatory basis those costs necessarily and unavoidably incurred. A VEC must have the resources to fulfill the duties of administering and coordinating the program, providing the high quality of service that the Amateur Radio community needs. Volunteer Examining is *not* a profit-making enterprise for a VEC.)

5) *Public announcements.* The new rules will require that Volunteer Examiners make public announcements of forthcoming examination sessions. This ensures the broadest candidate participation in the program, and also acts as a "daylight requirement" to avoid secret test sessions in which abuses might occur. The VEC may also require its Volunteer Examiners to require applicants to register in advance. This procedure has been used by many FCC Field Offices all along, and allows the exam team to order the test materials in sufficient number to meet the needs of the applicants. Test-by-appointment also is a security measure that prevents various forms of deception from occurring. It will not be possible for a VE team to get test papers until their test session has been registered with their VEC. That session will also be

on record with the appropriate FCC Field Office. A session made public can be monitored for unusual test scores, and presents the opportunity for unannounced "drop-in" inspections.

Besides providing additional security to the testing program the public announcements tell persons in your area that a test session is available. Test-site and scheduling information will be available through the VEC. Each FCC Field Office will be kept informed by the VEC of sessions in the area at least 30 days in advance of the registration deadline.

The rules do not specify exactly how test sessions are to be publicized. That is left up to the Volunteer Examiner Team. The whole point is to provide test opportunities of maximum availability and convenience. The VEC and the FCC Field Offices will also be able to refer applicants to available test sessions in their area.

6) *Telegraphy examinations.* The code tests may be formulated in the field by the Volunteer Examiner Team, or prepackaged code tests may be provided by the VEC. The rules state that the applicant must be responsible for knowing, and may be tested on, all 26 letters of the alphabet, the numerals 0 through 9, the period, the comma, the question mark, the slant bar, and the prosigns AR, SK and BT.

The most recent FCC Rules still require both a sending and receiving test, although in recent years the Field Office examiners have generally used receiving tests *only*. The Commission's discussion on this matter stated: "... we will accept as valid telegraphy examinations based upon receiving tests, just as we do today." The sending test requirement, while still in the Rules, may be exercised at the option of the Volunteer Examiners.

7) *Procedure in case of failure.* If an applicant fails a test administered by a Volunteer Examiner Team, the procedure is essentially the same as now exists in the FCC Field Offices. The tests are graded immediately on completion during the examination session; those candidates who fail are informed of that fact before they leave the test site and their FCC Forms 610 are returned to them.

All candidates (passed or failed) are entitled to receive their test scores for the test element, but will not be told which questions or topical areas caused them problems. The test scores for each element shall be reported as a percentage of correct answers.

The answer sheets will be forwarded to the VEC that originally issued the test to that particular exam team. The VEC will use the answer sheets to monitor the performance of the Volunteer Examiner Program, so even those answer sheets from failed tests will provide important data. Forwarding the completed test materials back to the VEC also releases the Volunteer Examiner Team from the burden of stor-

ing the test papers for a year. The Commission will continue to require candidates who fail a test Element to wait 30 days before applying to retake the failed test element(s).

8) *Administrative sanctions.* The FCC will not allow someone to become an accredited Volunteer Examiner whose Amateur Radio license has ever been revoked or suspended. This is to ensure the highest integrity in the Volunteer Examiner corps.

The new Rules also specifically authorize suspension or revocation of the license of a Volunteer Examiner who participates in a fraudulent examination or who accepts payment for administering an Amateur Radio operator examination. Though other sanctions already exist in the Rules to deal with all kinds of violations, this updates the Rules specifically for the Volunteer Examiner Program.

The FCC retains the right to have a person reexamined in cases of suspected fraud or abuse. The rules state that the FCC will specify who will administer the retest in this case.

#### **Volunteer Examiner Coordinators**

The FCC rejected the argument that having a Volunteer Examiner Coordinator (VEC) injects an unnecessary "bureaucratic layer" into the process. The FCC stated that the VEC would add no burden or inconvenience as perceived by a candidate who wanted to take an Amateur Radio examination. In fact, the VEC will lend consistency and coordination to the program, relieving the FCC's Field Operations Bureau of the administrative burden of overseeing thousands of examiners, while providing a flexible and responsive test-session schedule for the Amateur Radio community.

A VEC that is also a publisher of Amateur Radio-related study guides will not be allowed to benefit commercially by virtue of having access to confidential VEC information about the specific makeup of examinations. If, for instance, the ARRL becomes a VEC, sufficient safeguards are required by the FCC to avoid prohibited communication of privileged information from the VEC division to the publishing division.

In the final Report and Order, the Commission added a new concept to the program. While a VEC may be national in scope, the Rules also allow smaller-scale regional VECs to contract with the FCC to provide the VEC function for one or more call districts. While entities such as the League may elect to have one VEC contract to cover *all* U.S. call districts, the way is open for other entities (such as large clubs, hamfest associations and the like) to serve as VECs on a smaller scale throughout their call areas.

The whole point of the Volunteer Examiner Program is to bring the oppor-

tunities for Amateur Radio license testing closer to the Amateur Radio community. The prospect of more than one VEC serves that end. Regional VECs will be organized along the same geographical lines as the present call districts, with the Alaskan, Pacific and Caribbean districts being three additional and separate call districts and VEC regions.

### The Pools of Test Questions

The FCC has adopted a new procedure for constructing the written tests. In April 1983, the latest release of the FCC Syllabus for Amateur Radio examinations contained a message soliciting new test questions from licensed radio amateurs. To be eligible to submit a question, a person must be a licensed radio amateur and submit a question for a class of license *lower* than the one he or she holds. The exception to this, of course, is that Extras may submit Extra Class questions.

The FCC's Private Radio Bureau then collects and edits the questions, and releases a pool of 500 approved test questions for each written element. The question pools are in the public domain, so any person may see the exact wording of the questions in advance of taking the tests. Absorbing the specific answers to 500 questions is such a large task, however, that studying the books and understanding the material will remain the most effective approach. Memorization is *no shortcut*.

Releasing the question pools publicly removes the "test shock" factor of an applicant's being faced with unfamiliar wording on an exam. Having the entire question pool available as a study guide also helps applicants spend their study time efficiently. Likewise, publishers of study materials will now be able to produce more reliable and to-the-point information. Please note that the question pools contain 500 questions for *each* class of license (Tech/General-Element 3, Advanced-Element 4A and Extra-Element 4B.) A person studying for the Extra Class examination will either need to memorize 1700 questions (including the 200 for the Novice class test) or go ahead and learn the material.

Another desirable feature of public question pools is that faulty or ambiguous questions will have been under public scrutiny long before the first test session. The FCC invites feedback on the question pool. You may either suggest how to modify a question already in the pool or submit a replacement question. The full story on the makeup of the question pools is contained in PR Bulletin 1035 (April 1983), available either from FCC Field Offices or ARRL Headquarters for an s.a.s.e.

This public-question-pool approach has been used with good success by the Federal Aviation Administration for their pilots' licenses; their tests are administered in a program similar to our new Volunteer Examiner Program. It is a proven approach.

The Novice question pool was released in August 1983. The General class question pool was released just before this article went to press. You may have a copy by sending an s.a.s.e. to either an FCC Field Office or ARRL Headquarters. Ask for "PR Bulletin 1035-B (October 1983) Questions for Element 3."

### Phasing in the Program

Since the Advanced and Extra Class question pools have not yet been finalized, the FCC will continue to handle tests for those two license classes through the Field Offices. Test sessions are getting more scarce all the time, so be sure to contact the Field Office nearest you if you plan to take an examination during the next six months.

Work is progressing on composing the Advanced and Extra Class question pools, although no specific dates have been set for the release of these questions. The Amateur Radio Service deserves high quality examination materials, so the composing and editing process is necessarily somewhat slow. Once the Advanced and Extra Class questions have been made public by the Commission, it is likely that the Volunteer Examiner Program will absorb the responsibility for giving tests for those classes of license.

### The Transition Period

The year 1984 will be a time of transition, as many have pointed out. FCC-administered test opportunities will thin out, with many Field Offices cutting back their exam schedule to just a few times a year. It is understandable that all parties want the Volunteer Examiner Program to pick up the load as soon as possible, but it must be allowed to do so in an orderly manner with proper preparation. It is important for a VEC to provide dependable and high-quality service for the long-term benefit of the Amateur Radio Service. In this instance, *haste* might not only bring *waste*, but could bring unnecessary problems.

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***"It is important for a VEC to provide dependable and high-quality service for the long-term benefit of the Amateur Radio Service."***

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After December 1, 1983, the FCC is free to enter into an operating agreement with a VEC. Only Tech/General tests will be handled at first, with Advanced and Extra class tests to follow later when the program

is ready to handle the load.

There are several things you can do to help the process along. First, if you are a licensed *Advanced or Extra Class* operator, and are interested in becoming an accredited Volunteer Examiner, just send a note, QSL card or brief letter to ARRL Headquarters stating your full name, license class, call, mailing address and telephone numbers. This must be done for each individual, although you may certainly get together with others and include several registrations in one letter.

The ARRL Volunteer Examiner Program office already has a large list of prospective Volunteer Examiners. We will begin the formal accrediting process once the FCC and ARRL have signed the VEC operating agreement. In the meantime, we are preparing to serve *any geographical location* where an accredited team of Volunteer Examiners wants to give tests.

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***"Tests may be given anywhere in the world as long as the Volunteer Examiners are duly accredited and the applicant is qualified to take the test."***

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As of this writing, we have good potential Volunteer Examiner coverage (as shown in Fig. 1). We have also received inquiries, plus a few registrations, from other locations, such as Puerto Rico, Guam, Germany, Japan, Australia and New Zealand. Tests may be given anywhere in the world, as long as the Volunteer Examiners are duly accredited and the applicant is qualified to take the test. Presently, a qualified applicant is a person who is not an agent of a foreign government, and can provide a U.S. address (a geographical location, not a box number) for the "station location" portion of the FCC Form 610.

All U.S. Territories and Possessions are included in the definition of allowable station locations. Clubs, hamfest associations or independent groups of Volunteer Examiners should consider including test sessions into next year's activities on a tentative basis. Prospective Volunteer Examiners who are accredited by the ARRL, if it is a VEC, will receive a training manual that includes helpful suggestions on how to set up test sessions. We recommend that the tests be coordinated with any training classes in your area, and suggest offering test sessions at least three or four times each year. Of course, your group may offer Amateur Radio examinations more often,



which may be desirable in more populous areas of the country.

More than one team will likely offer examination sessions in metropolitan areas. This should present no problem. The VEC will act as a clearinghouse to coordinate sessions; this will help to ensure cooperation and sharing of the load.

### Examinations by Appointment

When FCC examiners conducted test sessions in the Field Offices, they sometimes allowed applicants to take the tests on a "walk-in basis" without a previous appointment. Now, many Field Offices with more traffic or less available resources require that tests be taken by appointment only. When Field Offices sent examiners on the road to the quarterly, semiannual and annual examination points, these test sessions were all conducted by appointment only. The primary reason was to ensure that the examiner had enough test papers on hand for each applicant, since all supplies were taken along with the examiner.

Under the new Volunteer Examiner Program, the VEC will be responsible for supplying these test materials to the teams of Volunteer Examiners. The ARRL as VEC wants to provide for an examining program that has security and integrity, while keeping the costs of the program as low as possible.

The FCC Rules provide for frequent reselection of the lists of 50 questions that make up particular versions of the written tests. Huge printing cost and security problems are involved in each Volunteer Examiner team's having stockpiles of all possible tests on hand prior to each test session. If examinations were given by appointment only, the exam team would be assured of having all the needed test papers available for a given test session. Examinations by appointment enable the VEC to print tests in sufficient quantity and distribute them shortly before the test session, thus improving test security and minimizing unnecessary cost and storage for the Volunteer Examiners.

### Prior Publicity for Test Sessions

The new rules for the Volunteer Examiner Program require that the FCC Field Offices be kept informed of test sessions being scheduled in their administrative district. For the VEC to be able to supply this prior notice to the FCC, some planning will be required to set up a test session. This has the necessary and desirable effect of making test session schedules available to exam applicants well in advance at both the VEC and the FCC Field Offices.

This prior notice also allows the VEC to perform its FCC-required duty of supervising the performance of the VE teams. Because test sessions will be known to the public, undesirable situations in which

abuses could occur (such as secret test sessions for the purpose of obtaining licenses by fraudulent means) can be avoided.

The FCC does not *require* that examinations be given by appointment under this program. Such matters as providing for test security (including the requirement of tests by appointment *only*) are left to the discretion of the VEC. This leaves the door open for a VEC to allow walk-ins under certain circumstances, such as large hamfests or conventions.

### Getting an Exam Team Together

In many cases, persons who have written to the ARRL indicating their interest in being Volunteer Examiners have signed up individually. The ARRL Volunteer Examiner Program office has placed pins into a U.S. map to locate these prospective Volunteer Examiners. Coordination will undoubtedly be needed to bring together the required three-member teams in less populated areas, but most of the country now appears to have plenty of available Extra and Advanced class three-member teams.

It is probably a good idea for VE teams to provide at least one alternate Volunteer Examiner to ensure that the test session is carried out successfully in the event that one of the Volunteer Examiners is unable to appear at the last minute. Moreover, teams need not be formal, permanent groupings; any three accredited VEs may form an adhoc team as long as prior announcement and any pre-registration requirements have been met for the session.

Some persons are concerned about being able to get three Extra Class accredited Volunteer Examiners together for a test session. The three-member team is *required* by the FCC, which mentioned examiner availability in its discussion on this proceeding.

We anticipate no shortage of volunteer examiners. As the ARRL indicated . . . thousands of amateur radio clubs meet regularly nationwide, and a crowded calendar of hamfests and conventions spans the entire year . . . We expect that such forums will play a significant and consistent role in providing opportunities for large numbers of willing volunteers to step forward and assist others in the amateur community seeking to advance themselves.

Significantly, the ARRL VE Program office has received many letters from clubs indicating that they have large teams of prospective Volunteer Examiners ready to go. It is quite evident from our large pool of names that there will be no problem getting three-member teams together to serve the Amateur Radio community at a level that is better than the FCC's present Field Office examination schedule. In those cases in which population density is thin, the ARRL has already been actively searching for potential Volunteer Examiners.

Some applicants will still probably need to travel some distance to an examination

site, but such travel will occur much less frequently and require shorter travel distances than what is presently required. Not *everyone* can have a three-member Volunteer Examiner team in his or her home town, but the new Volunteer Examiner Program comes much closer to that ideal than has been the case.

Those few "prophets of doom and gloom" who have predicted chaos and poor service under the new Volunteer Examiner program are not looking at the facts. The Amateur Radio Service has a long history of excellent organization of volunteer activities. There is no reason to expect that we will fall apart now. The crowded calendar of club meetings, hamfests and conventions is ample proof that there will be plenty of opportunities to find Volunteer Examiners. Both the FCC Field Offices and the VECs will have test session information readily available.

### VE Accreditation Criteria


The FCC Rules require that a VEC set up adequate standards for accrediting Volunteer Examiners to ensure their integrity. Rule 97.31 lists the Commission-required accreditation criteria, stating that a Volunteer Examiner must

- be at least 18 years of age;
- not be related to the applicant;
- not own a significant interest in, or be an employee of a business deriving its income from Amateur Radio, unless the prospective VE is not in direct communication with that part of the company dealing in Amateur Radio-related business;
- not have a record of Amateur Radio license suspensions or revocations.

It is likely that a VEC would require all of its prospective VEs to study a training manual thoroughly, and to take an open-book test covering the contents. ARRL plans to require that several amateurs cosign a VE nomination, and that the VE candidate provide several forms of positive identification. VE prospects will be screened for a record of violations by the VEC in cooperation with the FCC. Assuming all goes well the accrediting process should only take a few weeks.

### You Can Act Now

*QST* will continue to provide detailed information about the Volunteer Examiner Program as details emerge. Important developments will also be carried in W1AW bulletin transmissions and the *ARRL Letter*.

For further information, or to register your interest in becoming an accredited Volunteer Examiner for Technician and higher Amateur Radio license classes, contact the American Radio Relay League, Attn: Curt Holsopple, K9CH, Volunteer Examiner Program Manager, 225 Main St., Newington, CT 06111. Please send your name, call, license class, address and telephone number. 

# ARRL Board Sets Policies, Goals for 1984 and Beyond

Meeting in Houston in early October, the Board tackled the Volunteer Exam Program, the license-class restriction against running for various League positions and, would you believe, WARC '92!

By W. Dale Clift,\* WA3NLO

The 1983 Second Meeting of the ARRL Board of Directors gave those involved an opportunity to sample Texas hospitality. It was also the setting for hard work and deliberations of Amateur Radio issues that affect us all. The meetings were held October 5 and 6 at the Astro Village Hotel in Houston, Texas, the site of the 1983 ARRL National Convention the following weekend. Before adjourning to the Convention for some fun and relaxation, however, the directors had to consider issues likely to have an impact on the Amateur Radio Service for years to come. Furthermore, the directors had to keep in mind that the ways in which the League and the federal government deal with these issues could forever change the face of the Service.

For those readers unfamiliar with the ARRL, a brief summary of the League's governing structure is in order. The 16 voting members of the ARRL Board of Directors are elected on a geographic basis by the membership. They elect the officers of the League and hire a general manager to run ARRL Hq. This same Board sets policy and makes the decisions that ultimately determine the direction of the ARRL. A list of the current ARRL directors can be found on page 8 of *QST*.

*U.S. Technician class, Canadian Amateur Certificate holders, eligible as League director, officer, section manager.*

At Minute 18 the Board adopted a fundamental change in the governing structure of the League. Until this change, only U.S. General class licensees and higher, and only Canadian Advanced Certificate holders, were eligible to hold the offices of ARRL president, vice president, secretary,



An impromptu committee discusses the wording of a planned motion. From left to right are W4RH, W8RC, WA2DHF and W2IHA. (photos by K1ET)

treasurer, director or vice director. By unanimous vote the Board changed By-Law 9 so that such eligibility is now extended to U.S. Technician class licensees and Canadian Amateur Certificate holders.

At Minute 19 the Board adopted a similar change in the Rules and Regulations of the ARRL Field Organization. It extended eligibility for the elected office of section manager to U.S. Technician class and all Canadian Amateur Certificate holders. The rationale for both changes was that the voting membership at the ARRL division or section level should be free to make a selection from a wide field of potential candidates; if the candidates' class

## ARRL Organizational (regarding Articles of Association and Bylaws)

Minute	Purpose	Disposition
18	Amend By-Law to permit U.S. Technician class amateurs and Canadian Amateur Certificate holders to be eligible for ARRL director, vice director and officer	passed
43	Ad Hoc Committee on Washington Presence to study possibility of getting U.S. Congressional charter for ARRL	passed
66	Amend Articles of Association of ARRL to better reflect basis and purpose of League, emphasize tax-exempt status	passed
76	Amend By-Laws regarding ARRL membership categories	passed
<b>Other ARRL Organizational Matters</b>		
19	Amend Rule 4, Rules and Regulations of ARRL Field organization to permit U.S. Technician class and Canadian Amateur Certificate holders to be eligible for section manager	passed
45	Permit section managers to appoint more than one person to SEC, STM, OOC, ACC, PIO, SGL, TC and BM	to committee
46	Memorandum of understanding between ARRL and APCO	passed
47	Advisory Committee to study combining activities of RACES and ARES	passed
52	Investigate implementation of Life Membership fee based on life expectancy	passed
54	Early preparation for possible WARC in 1990s	passed
57	Memorandum of understanding between ARRL and QCWA	passed
69	Study benefits of merging function of ARRL Foundation in parent organization	defeated
72	Amend procedures for obtaining ARRL affiliation approval	passed
73	Amend Rules of ARRL Field Organization regarding contact with director	tabled
82	Study ways to encourage bequests to ARRL Foundation	passed
83	Study and improve way League responds to members' requests for legal assistance	to committee
84	Memorandum of understanding Between ARRL and REACT	tabled
87	Appoint committee to establish desirability of computer based message system to handle ARRL matters	passed

\*Assistant to the General Manager, ARRL

## Amateur Radio Operations

### Minute Purpose

Minute Purpose	Disposition
49 RTTY DXCC endorsements	tabled
50 Access to new WARC bands at 18, 24 and 902 MHz	passed
51 F1 emissions for digital communications on 160 meter band	passed
56 Committee to draft standards and procedures for operation of on-the-air computer-based message systems	passed
65 Study expansion of phone privileges on 40-meter band	passed
67 Study possible recognition of repeater coordinators with section-level appointment	tabled
79 Investigate ways to improve ARRL cooperation and support regarding frequency-coordinating groups	passed
81 Policy statement regarding band plans to be printed in ARRL Repeater Directory	passed

### Legal and Regulatory (non-operating)

33 Agreement between FCC and ARRL regarding volunteer monitoring	tabled
53 Conditions of ARRL participation as Volunteer Examiner Coordinator	passed
68 Task force to get federal legislation to preempt amateur antenna restrictions imposed by state and local governments	passed
85 Get FCC to adopt federal RF protection guidelines to preempt state and local governments	passed

### Publications/Media

58 Study feasibility of 10-year QST index	passed
60 Implement credits for members who buy League publications	passed
61 Public Relations Advisory Committee to develop Amateur Radio handout for press	passed
62 Membership Affairs Committee to study present training materials and materials sent to prospective amateurs	passed
63 Public Relations Advisory Committee to develop handouts about Amateur Radio suitable for general public	passed
64 Forward Planning Committee to study overall publishing strategy	passed
74 Ad hoc committee to study output of Club and Training Department	tabled
80 Public Relations Advisory Committee to develop slide and sound show	passed

### Miscellaneous

20 ARRL Letter made available to section level appointees at reduced cost	passed
44 Change in date of ARRL 1985 National Convention	passed
48 Hq. to write rules for conducting Morse code contests	passed
59 \$100 donation to Statue of Liberty fund	passed
78 Study creation of a host program for foreign amateurs visiting U.S. and Canada	passed
86 Appreciation expressed to Houston Com-Vention	passed
88 ARRL 1986 National Convention in San Diego, California	passed



George Diehl, W2IHA, Hudson Division Director, emphasizes a point.

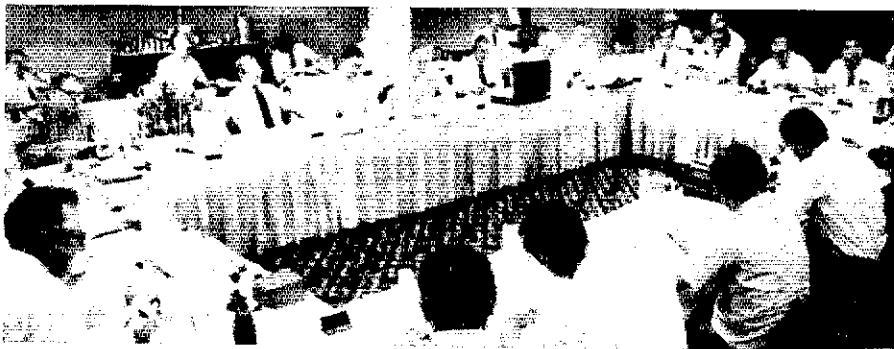
both League members and non-League members. The Board believes this financial burden should be borne by those receiving the direct benefit; i.e., those taking the tests. (See the article "FCC Approves Volunteer Examining" in November 1983 QST, page 68, and the article beginning on page 51 of this issue, for information about the Volunteer Examiner Program.)

### New WARC bands, planning for new WARC

In recognition that the United States had, on September 6, officially ratified the Radio Regulations and Final Protocol adopted by the World Administrative Radio Conference, Geneva, 1979, the Board resolved at Minute 50 that the League's officers and staff continue their efforts to have the new WARC bands at 18, 24 and 902 MHz released to the Amateur Radio Service as soon as possible. Recognizing that there may be another General WARC as early as 1990 or 1992 (see Minute 6), the Board at Minute 54 directs the General Manager to include such budgeting support, subject to annual Board review, as will ensure ARRL's continued encouragement of the work of the International Amateur Radio Union (IARU). The Board also went on record as endorsing early preparation for a possible general WARC in the next decade.

### ARRL Letter at reduced cost for SM appointees, club editors

The Board, at Minute 20, voted that the ARRL Letter, produced and mailed first class every other week from ARRL Hq., be made available at a reduced subscription rate to the following section-level appointees: Section Emergency Coordinator, Section Traffic Manager, Official Observer/RFI Coordinator, State Government Liaison, Technical Coordinator, Affiliated Club Coordinator, Public Information Officer and Bulletin Manager. The same motion also makes the reduced rate available to ARRL affiliated club newsletter editors. The General Manager has since established that reduced rate at \$10 per year (26 issues); the regular rate is \$19.50. If you



The ARRL Board of Directors in session.

of license is important to the members, they may express this through the voting process.

### ARRL participation in Volunteer Exam Program

A key decision by the ARRL Board involves the League's participation as a Volunteer Examiner Coordinator. Just five days before the start of the Board Meeting the FCC released its decision in the Volunteer Exam Proposal, PR Docket 83-27. Our Counsel's office in Washington quickly reproduced the document and had copies flown to Houston for the directors.

At Minute 53 the Board makes it clear that the League wants to be a volunteer examiner coordinator. The Board just as clearly, however, resolves that League participation shall only commence upon governmental authorization for recoupment of VEC expenses and approval of any agreement between ARRL and the Commission by the Board of Directors. The Board feels that if there is no provision for out-of-pocket recoupment, ARRL's participation would impose a heavy and unfair financial burden on the membership. It would mean that ARRL members would be paying for the administration of tests to

are eligible and already are receiving the *ARRL Letter* at the full rate, you must tell us if you want the reduced rate. Hq. will extend your subscription the appropriate

number of issues to make up the difference.

Charts summarizing the actions taken by the ARRL Board of Directors appear earlier in this article. References are to

minute numbers; if a particular minute interests you, you are encouraged to turn to that minute in the pages immediately following this article.

# Moved and Seconded...

## MINUTES OF THE 1983 SECOND MEETING OF THE BOARD OF DIRECTORS, THE AMERICAN RADIO RELAY LEAGUE, INC. OCTOBER 5-6, 1983

### Agenda:

- 1) Roll Call
- 2) Moment of Silence
- 3) Consideration of the agenda for the meeting
- 4) Approval of minutes for the 1983 Annual Meeting
- 5) Supplementary reports by the officers
- 6) Receive reports and consider recommendations of the committees
- 7) Acceptance of reports
- 8) Directors' motions
- 9) Selection of site for the 1986 ARRL National Convention

1) Pursuant to due notice, the Board of Directors of the American Radio Relay League, Inc., met in second session at the Astro Village Hotel, in Houston, Texas, on October 5, 1983. The meeting was called to order at 9:08 A.M. CDT, with President Victor C. Clark, W4KFC, in the Chair and the following directors present:

Thomas B.J. Atkins, VE3CDM, Canadian Division; Frank M. Butler, Jr., W4RH, Southeastern Division; Lys J. Carey, K0PGM, Rocky Mountain Division; George A. Diehl, W2IHA, Hudson Division; Paul Grauer, W0FTR, Midwest Division; Jay A. Holladay, W6EJJ, Southwestern Division; Clyde O. Hurlbert, W5CH, Delta Division; Mary E. Lewis, W7QGP, Northwestern Division; Edmond A. Metzger, W9PRN, Central Division; Gay E. Milius, Jr., W4UG, Roanoke Division; Leonard M. Nathanson, W8RC, Great Lakes Division; Tod Olson, K0TO, Dakota Division; William J. Stevens, W6ZM, Pacific Division; John C. Sullivan, W1HHR, New England Division; Hugh A. Turnbull, W3ABC, Atlantic Division; Raymond B. Wangler, W5EDZ, West Gulf Division.

Also in attendance as members of the Board without vote were Carl L. Smith, W0BWJ, First Vice President; Larry E. Price, W4RA, Vice President; Garfield A. Anderson, K0GA, Vice President; Richard L. Baldwin, W1RU, International Affairs Vice President; and David Sumner, K1ZZ, General Manager. Also in attendance at the invitation of the Board as non-participating observers were the following vice directors: Richard P. Beebe, K1PAD, New England Division; Thomas W. Comstock, N5TC, West Gulf Division; Evelyn D. Gauzens, W4WYR, Southeastern Division; George W. Hipsley, K2KIR, Atlantic Division; Howard S. Huntington, K9KM, Central Division; John C. Kanode, N4MM, Roanoke Division; Howard Mark, W0OZC, Dakota Division; Stephen A. Mendelsohn, WA2DHF, Hudson Division; Marshall Quait, AG0X, Rocky Mountain Division; and George S. Wilson, III, W4OYI, Great Lakes Division. There were also present Honorary Vice Presidents Robert York Chapman, W1QV, and Wayland M. Groves, W5NW; Counsel Christopher D. Imlay, N3AKD; Canadian Counsel B. Robert Benson, QC, VE2VW; Assistant to the General Manager W. Dale Clift, WA3NLO; Communications Department Manager John Lindholm, W1XX; Technical Department Manager Paul Rinaldo, W4RI; Membership Services Department Manager Harold M. Steinman, K1ET; and Washington Area Coordinator Perry F. Williams, W1UED.

2) The assembly observed a moment of silence in recollection of Past Vice President Max Arnold, W4WHN, and other amateurs who have passed away since the Annual Meeting of the Board.

3) The Chair welcomed, as first time attendees at the meeting, Vice Director Howard Huntington, K9KM, Assistant to the General Manager Dale Clift, WA3NLO, and Technical Department Manager Paul Rinaldo, W4RI. The regrets of Treasurer James E. McCobb, K1LLU, who was unable to attend because



From left to right are WA3NLO, Assistant to the General Manager; K1ZZ, General Manager; W4KFC, President and Chairman of the meeting; and W0BWJ, First Vice President.

of business commitments, were communicated to the group.

4) Item 9, selection of site for the 1986 ARRL National Convention, was added to the agenda. Whereupon, on motion of Mr. Nathanson, seconded by Mr. Atkins, it was unanimously VOTED that the agenda is adopted as amended.

5) On motion of Mr. Stevens, seconded by Mr. Sullivan, an error in the Minutes of the Committee of the Whole, 1983 Annual Meeting, was corrected. Whereupon, on motion of Mr. Milius, seconded by Mr. Metzger, the minutes of the 1983 Annual Meeting of the Board of Directors were approved in the form in which they were issued by the Secretary.

6) Supplementary reports of the officers were presented here. President Clark urged that priority be given to the establishment of the Volunteer Examiner Program. He reported on the recent conference in Japan which he and Vice President Baldwin had attended, remarking especially on the presence of Richard Butler, Secretary General of the International Telecommunication Union. Mr. Butler pointed out that forces were at work which might bring a general World Administrative Radio Conference as early as 1990 or 1992. In his written remarks, the President urged effective action to gain access to WARC-79 frequencies now that the treaty has been signed by President Reagan. Other topics: close and cooperative working relationships within the International Amateur Radio Union; proliferation of consumer products that both react to and emit radio frequency energy; cable television interference; reorganization of the ARRL field organization; and the work of the Forward Planning Committee.

7) Continuing Agenda Item 5, First Vice President Smith reported on the Triennial Conference of Region 2 at Cali, Colombia; his report summarized the material in October 1983 *QST* at page 49.

8) Vice President Price reported briefly on his work as a member of several committees and in attending conventions. Detailed reporting on the committee work was reserved for the appropriate place in the agenda.

9) Vice President Anderson's written report covered his work on several committees, again to be reported more fully later in the agenda.

10) International Affairs Vice President Baldwin presented an extensive written report on trips to Friedrichshafen, Germany, and Geneva, Switzerland, and to Tokyo for the World Amateur Radio International Conference. In his oral remarks, Vice President Baldwin outlined the history of amateur participation in world conferences. The process begun in 1972, with adoption of goals in the amateur community for WARC-79 and then communication of those goals to each government by the amateur radio society of that country, proved to be very successful at the 1979 conference. It should be repeated when preparations begin for the next regular conference.

11) General Manager Sumner summarized briefly an

extensive written report covering the healthy state of ARRL finances; personnel changes, including the appointment of Dale Clift as the Assistant to the General Manager and of Paul Rinaldo as Manager of the Technical Department; publications, highlighting preparation of a supplement to *Tune in the World* to reflect the new Novice exam procedure and preparation of a new Technician/General Class License Manual; membership promotion, with some 4500 new memberships having resulted from the March mailing; the scheduled flight of Dr. Owen Garriott, W5LFL in the space shuttle Columbia on the STS-9 mission, and related efforts to bring Amateur Radio to the attention of the public; recruitment of new amateurs, especially among youth; changes in the "Product Review" system for *QST*; and publication pricing strategies to encourage members to buy ARRL publications.

12) In the absence of Treasurer James E. McCobb, Jr., K1LLU, his brief written report was presented by the president. It shows a healthy growth in ARRL net worth; stable membership figures following a period of decline; and a conservative policy of League investment.

13) Counsel Imlay presented highlights from an extensive written report, including filing of comments with FCC on behalf of ARRL concerning volunteer examinations, extension of license terms to ten years, phone band expansion, the no-code amateur license proposal, cable tv interference (RM-4040), possible lifting of the 10-meter linear amplifier ban through proceedings in Docket 83-114, additional RACES frequencies, proposed additional ten-meter repeater frequencies, and revised procedures for Novice Class examinations. Counsel discussed ARRL assistance in Antenna/RFI cases, malicious interference problems, the Cerritos, California, litigation, permissible third-party public service communications, and potential sharing with other services in the 220-225 MHz band.

14) Canadian Counsel Benson commented briefly on the Canadian Volunteer Counsel Program, litigation, trademark matters, volunteer examiners in Canada, and *QST* mailing problems.

15) Mr. Chapman, as President, presented a report for the ARRL Foundation, Inc., beginning with an overview of ARRL Foundation history and a listing of its present officers and directors. He then elaborated on a written report covering the updating of the Foundation brochure, activities of the Scholarship Committee, and grants made by the Foundation, particularly one of \$10,000 to be presented at the National Convention to the Radio Amateur Satellite Corporation (AMSAT) in support of the OSCAR (Orbiting Satellite Carrying Amateur Radio) program. The Board was in recess from 10:40 A.M. to 11:00 A.M.

16) Turning now to agenda item 6, Mr. Carey, as Chairman, presented a brief oral report from the Plans and Programs Committee, noting that motions reflecting the work of the Committee would be offered later.

17) Mr. Sullivan, as Chairman, presented the written report of the Membership Affairs Committee and highlighted several subjects: production of reproducible material to be made available to affiliated club newsletter editors; recommendations against a "conflict of interest" clause for Section Managers; improvements in distribution of information to ARRL officials; and the study of possible expansion of ARRL-sponsored insurance programs.

18) Mr. Sullivan moved, seconded by Mr. Butler, that By-Law 9 concerning eligibility for officer and director be amended by substituting the term "Full Member" for "member", striking out the word "General" and inserting therefor the word "Technician" and by striking the word "Advanced" from the phrase, "Canadian Advanced Amateur Certificate." After discussion, it was moved by Mr. Stevens, seconded by Mr. Nathanson, that the motion be amended to read as follows: "By-Law 9 is amended



President Vic Clark, W4KFC, left, enjoys the company of Astronaut Owen Garriott, W5LFL, the Board's guest at dinner on the eve of the Board Meeting.

by substituting the term 'Full Member' for 'member,' and by striking all after 'League.' " A roll call vote on the amendment being required, the amendment was rejected with 7 votes in favor, and 9 opposed. Messrs. Atkins, Diehl, Mrs. Lewis, Messrs. Milius, Nathanson, Olson, and Stevens voted in the affirmative; Messrs. Butler, Carey, Grauer, Holladay, Hurlbert, Metzger, Sullivan, Turnbull, and Wangler voted opposed. The question then being on the original motion, the same was decided in the affirmative, with all directors voting in favor. Accordingly, By-Law 9 now reads: "9. No person shall be President, Vice President, Secretary, Treasurer, Director or Vice Director of the League unless, at the time of nomination, he has reached his 21st birthday and is a Full Member of the League and a holder of at least a Technician Class Amateur License or a Canadian Amateur Certificate."

(9) Further moved by Mr. Sullivan, seconded by Mrs. Lewis, to amend Rule 4 of the Rules and Regulations of the ARRL Field Organization by substituting the phrase "Full Member" for "member," striking out "General" and inserting therefor "Technician" and by striking "Advanced" from the phrase, "Canadian Advanced Amateur Certificate." A roll call vote being required, the question was decided in the affirmative, with Messrs. Atkins, Butler, Diehl, Holladay, Hurlbert, Mrs. Lewis, Messrs. Metzger, Nathanson, Olson, Sullivan and Turnbull voting in favor and Messrs. Carey, Grauer, Milius, Stevens, and Wangler voting opposed. Accordingly, by a vote of 11 to 5, the Rule was AMENDED to read: "4. Any candidate for the office of Section Manager must have been both a Full Member of the League for a continuous term of at least two years and a licensed amateur of Technician Class (or Canadian Amateur Certificate) or higher preceding receipt of a petition of nomination."

(20) On motion of Mr. Sullivan, seconded by Mr. Holladay, after discussion it was unanimously VOTED that the ARRL Letter be made available at reduced cost to ARRL affiliated club newsletter editors and to the following section level appointees: Section Emergency Coordinator, Section Traffic Manager, Official Observer/RFI Coordinator, State Government Liaison, Technical Coordinator, Affiliated Club Coordinator, Public Information Officer, and Bulletin Manager.

(21) It was moved by Mr. Butler, seconded by Mr. Sullivan, that all applications for ARRL club affiliations shall require the approval of both the Division Director and the Section Manager prior to submission to the Executive Committee. After discussion, on motion of Mr. Milius, seconded by Mr. Nathanson, it was VOTED to lay the matter on the Table. During the course of the above, Mr. Wilson took the seat for Mr. Nathanson from 12:03 to 12:06 P.M.

(22) Mr. Stevens, as Chairman, presented the report of the Management & Finance Committee, and highlighted these points: the committee was pleased to concur in the selection of Dale Clift, W3ANLO as Assistant to the General Manager; work in response to Minute 52 of the 1983 Annual Meeting is continuing. The review of expense authorizations for volunteers directed at Minute 57 of that meeting also is continuing. By-Laws 1 to 6 have been redrafted and proposed amendments will be presented later in the meeting. The Employee Conflict of Interest Policy, as revised by the General Manager, has been approved by the Committee and has been adopted. The Committee has prepared a plan under which four-year terms for directors could be phased in gradually, and the Board members were asked to consider the desirability of such a change between now and the 1984 Annual Meeting. The Committee also reviewed capital spending, supervised the work of the Treasurer, served as a Board Audit Committee, prepared for revision of the Directors' Workbook, reviewed purchasing procedures, revised the travel expense form, reviewed staff work on the matter of a portable League booth, and considered ways of obtaining for the League exemption from local

property and state sales and use taxes.

(23) Mr. Butler, as Liaison, submitted the report of the VHF Repeater Advisory Committee. The Committee will continue to work on a band plan for 902-928 MHz, but will not finalize it until FCC has adopted rules permitting amateur use of this band. Additional work is being done on revisions to the band plan for 1215-1300 MHz; a recommendation will be offered at the first 1984 meeting. The committee feels that more frequencies are needed for ten-meter repeaters. Finally, the committee recommended that the League maintain its current position and profile on frequency coordination involvement. The Board recessed for lunch at 12:30, reconvening at 1:36 P.M. with all persons present.

(24) Mr. Olson, as Board Liaison, reported for the Contest Advisory Committee. Alternative codes of contest ethics are circulating among the Committee, but none has achieved consensus and therefore no proposal can be made at this time.

(25) Mr. Kanode, as Board Liaison, presented the report of the DX Advisory Committee. The Committee asks the Board to reconsider the question of allowing DXCC credit for valid 10 MHz contacts, while not altering the present policy prohibiting contests and single band awards. The DXAC is developing proposals for endorser DXCC awards for 160 and 80 meters, and for RTTY. Action on DX operating ethics is planned for December. Voting is underway on a proposal to delete the Spratly Islands from the DXCC List. On the other hand, Peter I Island will be added to the DXCC List when the first creditable operation takes place from there.

(26) Mr. Sullivan, as Board Liaison, spoke briefly for the Emergency Communications Advisory Committee, noting that the Chairman is Vice Director-elect of the Delta Division and a replacement will be required.

(27) Mr. Mendelsohn, as Board Liaison, reported briefly for the Public Relations Advisory Committee, noting that implementation of color coding and targeting of ARRL publicity handouts was still in progress.

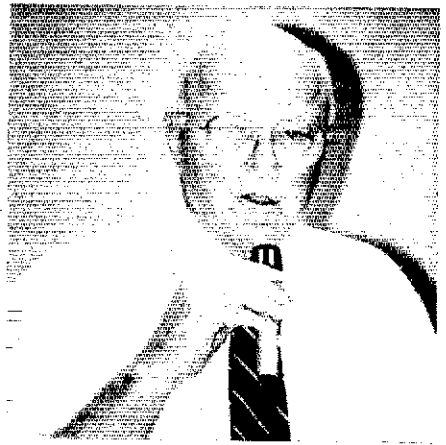
(28) Mr. Holladay, as Board Liaison, presented the report of the VHF/UHF Advisory Committee. Studies continue on band plans for 902-928 and 1215-1300 MHz. In both cases, input from the membership has been small, and there is uncertainty about the future status of both bands, pending completion of the FCC Docket on WARC implementation.

(29) Moving to reports from Ad Hoc Committees, Mr. Price, as Chairman, spoke briefly for the Ad Hoc Committee on the ARRL Interference Reporting System (AIRS). With the publication of the article in October QST, the Intruder Watch has been replaced by AIRS, but the new system is not yet completely on line because of a lack of input, and the need for a data base at Headquarters. The Board was in recess from 2:37 P.M. to 2:58 P.M.

(30) Mr. Smith, as Chairman, presented the report of the Ad Hoc Committee on Washington Presence. Responsive to Minute 25 of the 1983 Annual Meeting, Dale Clift has been named as staff backup to the Washington Area Coordinator, and a search has begun for a part-time employee resident in the Washington area to further strengthen the system. The Washington Area Coordinator presented a listing of ARRL's legislative and regulatory agenda, and interim plans for involving the membership in congressional contact when necessary. He also reported on the arrangements made to cover the Washington scene while the Board family is in Houston.

(31) Mr. Clark, as Chairman, presented the report of the Ad Hoc Committee on the Strengthening of CRRL, outlining progress toward the five-year goal of CRRL autonomy. Beginning with an election announcement on page 63 of October QST, all future elections for Canadian Section Managers will be handled wholly within Canada. Listings for "The Canadian Division" on page 8 of QST and in "Section News" now read simply, "Canada." New letterhead now being printed has the name of the Canadian Radio Relay League in English and in French, the latter replacing the words "Canadian Division of the American Radio Relay League, Inc." Finally, as workload is progressively transferred from Headquarters in Newtonton to CRRL, suitable quarters and the employment of staff will be required to augment the volunteer CRRL workforce. A CRRL staff position will be included in the General Manager's 1984 budget. At this point, First Vice President Smith assumed the Chair, at 3:11 P.M.

(32) Mr. Anderson, as Chairman, presented the report of the Ad Hoc Committee on Licensing and Monitoring concerning preparations for volunteers to begin administering examinations, and for volunteers to perform routine monitoring of the amateur bands on behalf of FCC. On motion of Mr. Sullivan, seconded by Mr. Metzger, it was unanimously VOTED to postpone discussion of recovery of costs by volunteer examiner coordinators until the first order of business on the morrow. The Chair appointed the following as a special committee to develop a basis for that discus-



Vice President Gar Anderson, K0GA, presents the report of the Ad Hoc Committee on Preparations for Monitoring and Licensing Activities.

sion: Messrs. Price (chairman), Anderson, Hurlbert, Sumner, and Imlay.

(33) It was moved by Mr. Anderson, seconded by Mr. Carey, that after careful appraisal of the draft of the Amateur Auxiliary Training Guide by the Board Ad Hoc Committee on Preparations for Monitoring and Licensing Activities, the General Manager is authorized to sign, on behalf of ARRL, the agreement between ARRL and the Federal Communications Commission's Field Operations Bureau with respect to amateur volunteers, so that the volunteer monitoring aspects of Public Law 97-259 can be promptly implemented by the ARRL Field Organization. After extensive discussion, on motion of Mr. Price, seconded by Mr. Nathanson, it was VOTED to lay the matter on the Table.

(34) Mr. Grauer, as Chairman, presented a brief interim report of the Ad Hoc Committee for ARRL International Humanitarian Award. A draft description of the award program is being circulated, and the Committee should complete its work prior to the 1984 Annual Meeting.

(35) Mr. Price, as Liaison, reported briefly for the committee on a scholarship honoring Senator Barry Goldwater, K7UGA. The work of the Committee is just getting underway.

(36) Mr. Holladay, as Chairman, presented a brief report for the Forward Planning Committee. Copies of Phase I and Phase II reports of the previous ARRL Long Range Planning Committee have been provided to FPC members and initial assignments have been made. A formal committee meeting will be held on November 12 in the Washington, D.C. area.

(37) Mr. Holladay, as Chairman, reported briefly for the Amateur Satellite Service Council touching on the successful launch of AMSAT OSCAR-10, progress on the PAC SAT project by AMSAT in cooperation with the Volunteers in Technical Assistance (VITA) and plans for construction of the PAC SAT spacecraft by AMSAT UK and the Satellite group at the University of Surrey.

(38) Mr. Turnbull, as Chairman, presented the report of the RFI Task Group covering attendance at a Society of Cable Television Engineers seminar in Melbourne, Florida, on cable leakage; the Ad Hoc Committee on Public Law 97-259 under Committee C-63 of the American National Standards Institute; and review of interference materials in ARRL publications. The written report was amplified by remarks concerning a proposed joint committee of the National Cable Television Association (NCTA), ARRL and FCC, and progress toward adoption of a joint NCTA/ARRL policy statement acknowledging the responsibility of cable companies to alleviate interference. The Chairman also reported that Hal Richman, W4CIZ, is updating the RFI Assistance List, and that the Committee is concerned about the interference potential of devices such as touch-controlled lamps.

(39) Mr. Wangler, as Chairman, presented the report of the ARRL Committee on the Biological Effects of RF Energy. After cataloging places in the country where local governments are attempting to regulate rf emitters, the report mentioned meetings with FCC Commissioners and industry representatives in which FCC was urged to adopt the new ANSI RF Energy Standard as an interim guideline for FCC licensees. The Massachusetts Department of Public Health has adopted regulations on public exposure to rf energy. A Committee member, David Davidson, W1GKM, has been appointed to the ANSI Committee which reviews

and revises the ANSI standard pertaining to human exposure to rf energy.

40) Mr. Quiat, as Liaison, presented the report of the ARRL Committee on Amateur Radio Digital Communication. The Committee is studying the increasing interest in RTTY mailboxes on the hf bands with a view to band planning, frequency coordination and review of FCC rules concerning automatic operation. The Committee has assisted with preparation of material for the Handbook chapter on specialized communications techniques.

41) Moving now to agenda item 7, on motion of Mr. Milius, seconded by Mr. Wangler, it was unanimously VOTED that the reports are accepted and placed on file.

42) The Board stood in recess at 4:27 P.M. for dinner, reconvening at 8:10 P.M. with all persons hereinbefore mentioned present, and with President Clark in the Chair.

43) As the first action on agenda item 8, "Motions of Directors," on motion of Mr. Hurlbert, seconded by Mr. Nathanson, the following resolution was ADOPTED without dissent:

WHEREAS, the ARRL is a corporation organized and existing under the laws of the State of Connecticut, and

WHEREAS the ARRL Charter was obtained under Connecticut Law in 1915, and

WHEREAS the ARRL is truly a National Organization, and

WHEREAS upon Canadian Radio Relay League initiative, the CRRL is being phased out of the ARRL, and

WHEREAS, a Congressional Charter as a national organization will vastly enhance the prestige of the ARRL, and remove the last vestige of provincialism, now, therefore,

BE IT RESOLVED that the Ad Hoc Committee on Washington Presence study all facets of the questions involved in obtaining a Congressional Charter for the ARRL, and report to the Board of Directors at the next meeting. Mr. Atkins abstained.

44) On motion of Mr. Nathanson, seconded by Mr. Holladay, the following resolution was unanimously ADOPTED:

WHEREAS the Board of Directors has approved the National Convention Site of 1985 as Louisville, Kentucky, and

WHEREAS the site committee has advised a one week delay in accessibility of the site,

BE IT RESOLVED that the date of the 1985 National Convention is set back one week to October 4, 5, 6, 1985.

45) It was moved by Mr. Diehl, seconded by Mr. Sullivan, that the Section Manager may, where in his/her opinion it is in the best interests of his/her section and his/her Division Director concurs, appoint more than one person to his/her team of assistants in the positions of SEC, STM, OOC, ACC, PIO, SGL, TC and BM; that is, each of these positions described on page 35 of the Long Range Planning Committee Report Phase II and adopted by the ARRL Board of Directors under Minute 76 at the March 1982 Board Meeting may be filled by two or more persons. After discussion, it was moved, by Mr. Nathanson, seconded by Mrs. Lewis, that the matter be placed on the table. However, by vote of 6 in favor to 10 opposed, the motion to table was lost. After further discussion, on motion of Mr. Holladay, seconded by Mr. Price, it was VOTED that the matter be referred to the Membership Affairs Committee.

46) On motion of Mr. Grauer, seconded by Mr. Butler, it was unanimously VOTED that the President is authorized to sign, on behalf of ARRL, the draft memorandum of understanding between ARRL and the Associated Public Safety Communications Officers, Inc. (APSCO), developed in response to Minute 92 of the April 1983 Board Meeting. Mr. Atkins abstained. During the course of the above, Mr. Huntington took the seat for Mr. Metzger, from 9:00 to 9:05 P.M.

47) On motion of Mr. Sullivan, seconded by Mr. Holladay, it was unanimously VOTED that the Emergency Communications Advisory Committee is requested to study possibilities for combining the activities of the ARES and RACES into a single organizational endeavor which would employ the best features of both, and to report its findings to the Board of Directors not later than the 1985 Annual Meeting.

48) On motion of Mrs. Lewis, seconded by Mr. Nathanson, it was unanimously VOTED that the Headquarters staff is instructed to prepare a set of rules that may be used in conducting code contests at ARRL sponsored conventions, and that such rules be so designed as to establish a uniform method of conducting sanctioned contests and establishing a standard word count of received text.

49) It was moved by Mr. Stevens, seconded by Mr. Diehl, that RTTY DXCC certificate holders may add endorsements similar to other modes of communication with cards for additional endorsements to be accepted 1 January 1984. After discussion, on motion of Mr.

Carey, seconded by Mr. Milius, it was VOTED, 10 votes in favor to 6 opposed, to lay the matter on the Table.

50) On motion of Mr. Milius, seconded by Mr. Sullivan, the following resolution was unanimously ADOPTED:

WHEREAS, the Radio Regulations and Final Protocol adopted by the World Administrative Radio Conference, Geneva, 1979, were ratified by the United States on September 6, 1983, and

WHEREAS, the Federal Communications Commission is expected to amend its table of frequency allocations, Part 2 of the FCC Rules, to reflect WARC-79 allocations, within the next few weeks, now, therefore,

BE IT RESOLVED, that the officers and staff continue efforts to have the new bands at 18, 24 and 902 MHz released to the Amateur Radio Service as soon as possible. Mr. Atkins abstained.

51) On motion of Mr. Carey, seconded by Mr. Milius, after extended discussion, it was unanimously VOTED that a petition for rulemaking be prepared by the General Manager with Counsel for filing with the Federal Communications Commission to amend Subpart (C), Part 97 of the FCC regulations as necessary to permit F1 emissions for digital communications in the 160-meter amateur band. Mr. Atkins abstained.

52) On motion of Mr. Butler, seconded by Mr. Stevens, it was unanimously VOTED that the Management and Finance Committee is requested to investigate implementation of an actuarial Life Member fee, based on age of applicant at time of filing, for any applicants 65 years of age or older. After adoption of the motion, the Board recessed at 9:30 P.M., reconvening at 9:00 A.M., October 6, 1983, with all present except Mr. Hurlbert, who joined the meeting at 9:13 A.M.



Speaking on the issue of ARRL publications is Vice Director Howard Huntington, K9KM, from the Central Division.

53) Mr. Price reported for the special committee named the previous day to develop an approach to the Volunteer Examiner Coordinator (VEC) issue. On motion of Mr. Anderson, seconded by Mr. Stevens, the following resolution was unanimously ADOPTED:

WHEREAS, the continued availability of amateur license examination opportunities and the integrity of the examination process are both vital to the future of the Amateur Radio Service in the United States, and

WHEREAS, in its Report and Order in PR Docket No. 83-27 the Federal Communications Commission has outlined a Volunteer Examiner Program in which ARRL participation as Volunteer Examiner Coordinator (VEC) is both desirable and appropriate, and

WHEREAS, legislation is to be introduced in Congress which, if enacted, will permit the recoupment of out-of-pocket administrative expenses of a VEC, such recoupment being essential to ARRL participation, now, therefore,

BE IT RESOLVED that the League participate as a Volunteer Examiner Coordinator; such participation, however, only to commence upon governmental authorization for recoupment of VEC expenses and approval of any agreement between ARRL and the Commission by the Board of Directors. Mr. Atkins abstained. During the course of the above the Board was in recess from 9:45 A.M. to 10:06 A.M.

54) On motion of Mr. Wangler, seconded by Mr. Sullivan, it was unanimously VOTED that the ARRL Board is on record as endorsing the concept of IARU commencing early preparation for a possible General World Administrative Radio Conference in the next

decade, and that the Board does hereby direct the General Manager to include such budgeting support, subject to annual Board review, as will ensure ARRL's continued encouragement of the work of the IARU.

55) On motion of Mr. Turnbull, seconded by Mr. Metzger, it was unanimously VOTED at 10:12 A.M. that the Board resolve itself into a Committee of the Whole for the purpose of discussing ARRL publications. The Committee rose and reported to the Board at 11:21 A.M. On motion of Mr. Turnbull, seconded by Mr. Nathanson, it was unanimously VOTED that the Board of Directors has reviewed and reaffirms the decision taken at Minute 74 of the April 1983 meeting, concerning a directory of amateur callsigns.

56) On motion of Mr. Olson, seconded by Mrs. Lewis, it was unanimously VOTED that the Ad Hoc Committee on Amateur Radio Digital Communication, in consultation with appropriately informed amateurs, is directed to draft procedures and practices covering the establishment, operation and use of computer based message systems, including recommendations suggesting those frequencies which are appropriate and/or desirable for such operation, the draft to be presented at the March 1984 Board Meeting. The Board recessed from 11:24 A.M. to 11:40 A.M.

57) On motion of Mr. Hurlbert, seconded by Mr. Nathanson, it was unanimously VOTED that the President is authorized to sign, on behalf of ARRL, an agreement with the Quarter Century Wireless Association, Inc., embracing a plan of mutual support and cooperation designed to promote the interests and objectives of the Amateur Radio Service.

58) On motion of Mr. Nathanson, seconded by Mr. Holladay, the following resolution was unanimously ADOPTED:

WHEREAS the December QST Annual Index is a valuable adjunct to the membership, and

WHEREAS, many members lose some index issues, RESOLVED that the General Manager is directed to study the feasibility of a 10 year QST index for the years of 1972 to 1982 with the index to be offered for sale to the membership, and to report to the Board at the 1984 Annual Meeting.

59) On motion of Mr. Diehl, seconded by Mr. Stevens, the following resolution was unanimously ADOPTED:

WHEREAS, the Statue of Liberty has for nearly 100 years stood as a symbol of hope, freedom and justice to the immigrants reaching our shores, and

WHEREAS, in 1986 this statue will be celebrating its 100th anniversary and suitable national recognition is being planned, and

WHEREAS, a refurbishing operation funded by contributions from the general public and others is in progress, now, therefore

BE IT RESOLVED that the American Radio Relay League recognizes this unique American symbol which is part of our heritage by contributing the sum of \$100 toward the refurbishing fund.

60) On motion of Mr. Sullivan, seconded by Mr. Milius, it was VOTED, 10 in favor to 6 opposed, that, to encourage ARRL members to purchase League publications in accordance with the objectives set forth by the Board at Minute 20 of its 1981 Second Meeting and reaffirmed at Minute 29 of the 1982 Second Meeting, the General Manager is instructed to implement a program of rebate credits for members as soon as practicable. The program would provide members who purchased League publications, either through dealers or direct, with credits which could be used to defray the cost of future membership renewals, publications, or other Headquarters services upon verification of their membership status.

61) On motion of Mrs. Lewis, seconded by Mr. Carey, it was unanimously VOTED that the Public Relations Advisory Committee is requested to develop a handout, suitable for use by the Professional Press, in consultation with Headquarters, and report back by the Annual Meeting of 1984 after circulation to the entire PRAC. During the course of the above Mr. Mendelsohn took Mr. Diehl's seat at the Table.

62) Mr. Diehl returned to the seat at the Table. On motion of Mr. Milius, seconded by Mrs. Lewis, it was unanimously VOTED that the Membership Affairs Committee study the present training material for Novices and the material sent to prospective new amateurs with a view to amending same to include therein more emphasis on the public service aspect of Amateur Radio.

63) On motion of Mr. Carey, seconded by Mrs. Lewis, it was unanimously VOTED that the Chairman of the Public Relations Advisory Committee is requested to develop one or more handouts suitable for presentation to the general public as introductory information about amateur radio. The expertise and resources of the Committee members are expected to be used in preparing the proposed handouts. The proposals should be available for review and decision at the March 1984 Annual Board Meeting.

64) The Board recessed for lunch at 12:30 P.M., reconvening at 1:32 P.M. with all present. On motion

of Mr. Olson, seconded by Mrs. Lewis, it was unanimously VOTED that the Forward Planning Committee consider the scope and magnitude of publishing that is appropriate and desirable for the ARRL and develop a strategy statement for such publishing activity. The strategy statement should be presented at the March 1984 Board Meeting.

65) Mr. Hurlbert, seconded by Mr. Stevens, moved the adoption of the following resolution:

WHEREAS, 7.0 MHz to 7.1 MHz is the only portion of the 40 meter band internationally allocated to amateur radio on an exclusive basis, and

WHEREAS, there are no frequencies available to U.S. amateurs below 7.1 MHz for 40 meter phone operation, and

WHEREAS, countries contiguous to the continental USA, specifically Canada and Mexico, permit phone operation by amateurs below 7.1 MHz, and

WHEREAS, American amateurs should not be treated as second class world citizens, it is

RESOLVED that the Plans and Programs Committee shall give further study to the proposition of expansion of, or the granting of, phone privileges on the 40 meter band below 7.1 MHz, and consider all options, including granting of exclusive RTTY, CW, or other special mode emissions on designated frequencies above 7.1 MHz in lieu of any frequencies devoted to phone operation below 7.1 MHz, and make appropriate recommendations to the ARRL Board at its next regular meeting. A roll call vote being requested, the resolution was ADOPTED with all directors voting in favor except Mr. Olson and Mr. Turnbull. Mr. Atkins abstained.

66) On motion of Mr. Hurlbert, seconded by Mr. Nathanson, Articles 2 and 6 of the Articles of Association were amended by striking the texts thereof and substituting therefor the following; new Articles 13 and 14 were adopted to read as follows; and the General Manager was directed to register these changes with the Secretary of the State of Connecticut:

Article 2: The purposes for which our corporation is formed are the following: the promotion of interest in amateur radio communication and experimentation; the establishment of amateur radio networks to provide electronic communications in the event of disasters or other emergencies; the furtherance of the public welfare; the advancement of the radio art; the fostering and promotion of non-commercial intercommunication by electronic means throughout the world; the fostering of education in the field of electronic communication; the promotion and conduct of research and development to further the development of electronic communication; the dissemination of technical, educational and scientific information relating to electronic communication; the printing and publishing of documents, books, magazines, newspapers and pamphlets necessary or incidental to any of the above purposes. No part of the assets or income of our corporation shall inure to the benefit of or be distributable to the members, the officers, or any of them, or to other private persons except that our corporation shall be authorized and empowered to pay reasonable compensation for services rendered and to make payments and distributions in furtherance of the purposes set forth herein.

Article 6: During the intervals between meetings of the Board of Directors, the affairs of the Corporation shall be administered by an Executive Committee consisting of the President, four Directors selected by the Board of Directors, and, without vote, the First Vice President and General Manager. The term of office of the Executive Committee members shall be for one year or until their successors are elected. The Executive Committee shall meet at the call of the President, but no less often than quarterly. The Executive Committee may in its discretion submit for determination or decision by members of the Board of Directors by mail vote any proposal pending before the Executive Committee. When such submission is made, it shall be in precise terms embodying the text of the proposed resolution. Such action shall be binding upon the Executive Committee.

Article 13: No substantial part of the activities of our corporation shall be the carrying on of propaganda, or otherwise attempting to influence legislation, and our corporation shall not participate in, or intervene in (including the publishing or distribution of statements) any political campaign on behalf of any candidate for public office. Notwithstanding any other provision of these articles, our corporation shall not, except to an insubstantial degree, engage in any activities or exercise any powers that are not in furtherance of the purposes of our corporation.

Article 14: Upon the dissolution of our corporation, the Board of Directors shall, after paying or making provision for the payment of all of the liabilities of our corporation, dispose of all of the assets of our corporation exclusively for the purposes of our corporation in such manner, or to such organization or organizations organized and operated exclusively for charitable, educational, religious, or scientific purposes as shall at

the time qualify as an exempt organization or organizations under Section 501(c)(3) of the Internal Revenue Code of 1954 (or the corresponding provision of any future United States Internal Revenue Law), as the Board of Directors shall determine. Any such assets not so disposed of shall be disposed of by a court of competent jurisdiction of the county in which the principal office of our corporation is then located, exclusively for such purposes or to such organization or organizations, as said court shall determine, which are organized and operated exclusively for such purposes. During the course of discussion, Mr. Comstock took Mr. Wangler's seat at the Table at 1:48 P.M., with Mr. Wangler returning to the Table at 1:53 P.M. A roll call vote being required, the motion was ADOPTED with all directors voting in favor.



Remember the guy on the left? That's Dick Baldwin, W1RU, former General Manager of ARRL Hq. (now Vice President for International Affairs), Atlantic Division Director, W3ABC is aghast because he's just noticed that Dick is wearing the exact same style and design tie!

67) Mr. Nathanson moved, and Mr. Hurlbert, seconded, the adoption of the following resolution:

WHEREAS the ARRL Board has enacted a repeater band plan, and

WHEREAS there exists a group of area repeater coordinators existing under different titles and sometimes outside ARRL coordination, it is resolved that the Membership Affairs Committee study the incorporation, through the Field Organization, possibly under the auspices of the Section Manager, of a new set of appointments recognizing and incorporating the repeater coordinators. After discussion, on motion of Mr. Holladay, seconded by Mrs. Lewis, it was VOTED that the matter is laid on the Table. During the course of the above Mr. Hippisley left the meeting at 2:00 P.M.

68) On motion of Mr. Nathanson, seconded by Mr. Holladay, the following resolution was unanimously ADOPTED:

WHEREAS the continuing problems of tower and antennas are arising in the field, and

WHEREAS the pre-emption of the field by the Federal Government would greatly benefit amateur radio, it is resolved that the President appoint a task force to pursue the implementation of Federal legislation that will pre-empt the field of tower and antenna regulation. It is further resolved that the task force shall be ongoing until legislation is achieved.

69) Mr. Nathanson moved, and Mrs. Lewis seconded, adoption of the following resolution:

WHEREAS the ARRL Foundation has no independent tax exempt status, and

WHEREAS in its present structure it requires additional expense of auditing and accounting, and

WHEREAS the Foundation is a derivative of the League, and

WHEREAS its functions can continue more economically and efficiently under the parent corporation, the Management and Finance Committee study the merger of the Foundation into the parent corporation and report to the Board no later than the first Board meeting of 1984. After extended discussion, a roll call vote being requested, the motion was DEFEATED with all directors voting opposed except Mr. Millius and Mr. Nathanson who voted in favor, and Mr. Atkins and Mr. Hurlbert who abstained.

70) Mr. Diehl moved, Mr. Grauer seconded, reconsideration of the motion to commit to the Membership Affairs Committee the motion concerning plural appointments by the Section Manager. The motion to reconsider was DEFEATED by the vote of 10 to 6.

71) Moved by Mr. Diehl, that the VHF Repeater Advisory Committee study ways in which ARRL can improve cooperation with and support for amateur radio frequency coordinating groups. But there was no second, so the motion was LOST.

72) On motion of Mr. Sullivan, seconded by Mr. Butler, it was VOTED, with 9 Directors in favor and 7 opposed, to lift from the table the motion concerning approval of ARRL affiliated club applications by both the division director and section manager prior to submission to the Executive Committee. Mr. Sullivan moved, seconded by Mr. Butler, to strike the text of the motion and substitute therefor the following:

Moved that the first sentence of paragraph 2 of the Rules and Regulations Concerning Affiliated Societies is stricken, with the following substituted therefor: "Any such society which suitably expresses its sympathy with and allegiance to the aims and policies of the League in accordance with these Rules and Regulations is eligible for affiliation. Applications for affiliation shall be submitted to the General Manager and referred to the respective Division Director who, in consultation with the respective Section Manager, shall determine that the society is worthy and well qualified. The application thereupon shall be referred to the Executive Committee for its approval. A suitable certificate shall be issued to the society in recognition of its affiliation." The Board was in recess from 2:43 P.M. to 2:57 P.M. On motion of Mr. Nathanson, seconded by Mr. Olson, it was VOTED, 11 in favor to 5 opposed, to amend the motion by adding the word "discretionary" before the word "consultation". The vote then being on the motion as amended, a roll call vote being required, the motion was ADOPTED, with all directors voting in favor except Mr. Carey and Mr. Metzger, who voted opposed.

73) Moved by Mr. Sullivan, seconded by Mr. Grauer, to amend Rule 7(d) of the Rules and Regulations of the ARRL Field Organization by striking "keeps informed on matters of policy which affect section level programs" and inserting "maintains close contact with the Division Director in matters of League policy which affect section level programs and activities." On motion of Mr. Olson, seconded by Mr. Nathanson, it was VOTED, 11 in favor to 5 opposed, that the matter is laid on the Table.

74) Moved by Mrs. Lewis, seconded by Mr. Carey, that an Ad Hoc Committee be appointed to study, make recommendations, and oversee the output of the Club and Training Department. On motion of Mr. Grauer, seconded by Mr. Wangler, it was VOTED, 13 in favor to 3 opposed, that the matter is laid on the Table. Mrs. Lewis requested to be recorded as voting opposed to the motion to Table.

75) Moved by Mrs. Lewis that accurate minutes be kept of each ARRL Board meeting, and to insure that such is done the General Manager be instructed to audio record the reading of each motion, the rationale for the motion, discussion of the motion and action taken on the motion. But there was no second, so the motion was LOST.

76) Moved by Mr. Stevens, seconded by Mr. Wangler, that in order to implement that portion of the report of the Management and Finance Committee assigned by Minute 81 of the 1983 Annual Meeting of the Board of Directors, By-Laws 1-6 dealing with membership are stricken and replaced with the following language:

#### Members

1. Pursuant to Article 10 of the Articles of Association, the following membership categories are established:

(a) Full Membership. To be eligible, an applicant must be a resident of the United States, its possessions, the Commonwealth of Puerto Rico, or of Canada, or a United States or Canadian citizen temporarily resident elsewhere, and the holder of an unexpired amateur radio operator's license or reciprocal operating authorization issued by the United States or Canada.

(b) Associate Membership. Any person who is not eligible for Full Membership, but who is interested in amateur radio, is eligible for Associate Membership.

2. Applications for membership shall be submitted to the Secretary. In the case of any applicant whose character, reputation or conduct might make him an undesirable member, the Secretary shall refer the application to the Executive Committee for review; in all other cases, the Secretary shall have the authority to grant membership.

3. The Secretary shall notify members of the expiration of their membership not less than thirty days prior to expiration. In determining eligibility for office, memberships renewed within thirty days of expiration shall be regarded as continuous.

#### Dues

4. The dues of Full and Associate Members shall be \$25 annually worldwide, payable in advance. For members outside the United States, the General Manager shall assess such additional mailing costs as are consistent with the postal rates for destinations outside the United States. Members choosing to pay dues for more than one year in advance, but for no more than five years, may be entitled to lower rates as determined periodically by the General Manager and as

published QST.

5. A member who has reached the age of 65 years may request an annual dues rate equivalent to 80% of the rate set forth in By-Law 4.

6. A member who has not reached the age of 18 years may request an annual dues rate equivalent to 80% of the rate set forth in By-Law 4. This rate shall not be available for Life Membership.

6A. The special dues rate of \$2.00 annually, with all membership privileges except the receipt of QST, shall apply to any Full or Associate Member who meet either of the following criteria:

(a) is legally blind; or

(b) is the husband or wife, brother or sister, son or daughter, or father or mother of another member who lives at the same address and is either a Life Member or is paying dues in accordance with By-Law 4 or 5.

#### Life Membership

6B. Life Membership in the League is available upon payment of twenty-five times the annual dues rates set forth above.

6C. Life Membership is not transferable.

6D. Should a Life Member who paid dues at a multiple of the special rate established in By-Law 6A cease to be eligible for the special rate, his membership shall cease and the amount paid shall be creditable toward a Life Membership, including receipt of QST, at the then-current rate.

After extended discussion, a roll call vote being required, the motion was ADOPTED with all directors voting in favor.

77) Moved by Mr. Stevens, seconded by Mrs. Lewis, that the previous motion concerning RTTY DXCC be lifted from the Table, but the motion was LOST with 8 directors voting in favor, 8 opposed, and the Chair voting opposed.

78) On motion of Mr. Milius, seconded by Mr. Olson, it was unanimously VOTED that the Membership Affairs Committee study the desirability of creating a program under which U.S. and Canadian amateurs and their families can serve as hosts for visiting foreign amateurs and their families.

79) On motion of Mr. Butler, seconded by Mr. Holladay, it was VOTED, 9 votes in favor to 7 opposed, to lift from the Table the previous motion concerning repeater frequency coordination. On motion of Mr. Nathanson, seconded by Mr. Holladay, it was unanimously VOTED to strike the text of the previous motion and to substitute therefor the following: Moved, that the Membership Affairs Committee investigate ways to improve ARRL cooperation with and support for Amateur Radio frequency coordinating groups. The question then being on the motion as amended, the same was unanimously ADOPTED.

80) Mr. Kanode took Mr. Milius's seat at the Table at 3:43 P.M. On motion of Mr. Butler, seconded by Mr. Atkins, it was unanimously VOTED that the Public Relations Advisory Committee is requested to produce a proposal, including funding levels, for a slide and sound show designed to show potential user organizations such as Red Cross, etc., the potential advantages and limitations of ham radio participation in their public service event.

81) On motion of Mr. Holladay, seconded by Mr. Butler, it was unanimously VOTED that, following coordination by the General Manager with appropriate parties, the following policy statement be printed adjacent to the band plans published in future editions of the ARRL Repeater Directory: "The ARRL supports regional frequency coordination efforts by amateur groups. Band plans published in the ARRL Repeater Directory are recommendations based on a consensus as to good amateur operating practice on a nationwide basis. In some cases, however, local conditions may dictate a variation from the national plan. In these cases, the written determination of the regional frequency coordinating body shall prevail and be considered good amateur operating practice in that region." During the course of the above the Board was in recess from 3:49 P.M. to 3:57 P.M., reconvening with Mr. Milius in his seat at the Table.

82) On motion of Mr. Holladay, seconded by Mr. Sullivan, it was unanimously VOTED that the Management and Finance Committee study and make recommendations for a program to encourage requests to the ARRL Foundation for the preservation, promotion and advancement of Amateur Radio.

83) On motion of Mr. Holladay, seconded by Mr. Carey, it was unanimously VOTED that the ARRL Executive Committee, together with League Counsel, study the current manner in which the League responds to members' requests for assistance in legal cases and make recommendations to the Board for improvements in this area.

84) Moved by Mr. Sullivan, seconded by Mr. Butler, that the President is authorized to sign, on behalf of ARRL, the draft memorandum of understanding between ARRL and REACT International, Inc.,

developed in response to Minute 75 of the April 1983 Board Meeting. But, after discussion, on motion of Mr. Nathanson, seconded by Mrs. Lewis, it was VOTED, 9 in favor to 7 opposed, that the matter is laid on the Table.

85) On motion of Mr. Wangler, seconded by Mr. Nathanson, it was unanimously VOTED that the Ad Hoc Committee on the Biological Effects of RF Energy assist the General Manager in drafting and filing a formal request to the FCC to adopt ANSI-C95.1-1982 as an interim RF protection guideline and thereby establish Federal preemption of local regulatory agencies' efforts to restrict Amateur Radio station operations.

86) Mr. Wangler yielded his chair at the Table to Mr. Comstock. On motion of Mr. Comstock, seconded by Mr. Butler, it was unanimously VOTED that the Board of Directors and Officers of the American Radio Relay League express their appreciation to the Houston Convention '83 Committee members for their work in setting up the facilities for the Board Meeting and for hosting the ARRL National Convention.

87) On motion of Mr. Olson, seconded by Mr. Carey, it was unanimously VOTED that the President appoint an Ad Hoc Committee to assess the desirability of a computer based message system to handle ARRL matters. If deemed desirable, the Committee should establish system objectives and priorities for objectives, and in conjunction with Headquarters staff establish the costs and operational impact of achieving the proposed objectives. The Committee should report no later than the second Board Meeting of 1984. During the course of the above, Mr. Comstock left the meeting at 4:15 P.M., and Mr. Wangler resumed his seat.

88) Mr. Comstock returned to the meeting at 4:22 P.M. The Board then turned to agenda item 9 concerning the selection of a site for the 1986 ARRL National Convention. The Board had before it applications encompassing four sites: Atlanta, Georgia; Dallas, Texas; Portland, Oregon; and San Diego, California. On motion of Mr. Smith, seconded by Mr. Turnbull, at 4:27 P.M. it was VOTED, 12 in favor and 2 opposed, with 2 abstentions, that the Board resolve itself into a Committee of the Whole for the purpose of selecting a site for the 1986 ARRL National Convention. The Committee rose and reported to the Board at 5:05 P.M. On motion of Mr. Holladay, seconded by Mr. Olson, it was VOTED that the 1986 ARRL National Convention be held in San Diego, California on Labor Day weekend.

89) There was discussion concerning Board Meeting dates and the format of Board meetings, during which time Mr. Wilson took Mr. Nathanson's seat at the Table from 5:09 to 5:11 P.M. The Annual Board Meeting of 1984 will be held in the vicinity of Hartford, Connecticut on Monday and Tuesday, March 26 and 27, 1984. There being no further business before the Board, on motion of Mr. Nathanson, seconded by Mr. Anderson, it was unanimously VOTED that the Board adjourn sine die at 5:35 P.M. Total time in session as a Board: 11 hours, 39 minutes; as a Committee of the Whole: 1 hour, 47 minutes; total direct authorizations: \$100.

Respectfully submitted,

David Sumner, K1ZZ

Secretary

#### MINUTES OF EXECUTIVE COMMITTEE

No. 409

October 6, 1983

#### Agenda

1. Approval of minutes of September 10 meeting
2. Recognition of new Life Members
3. Affiliation of clubs
4. Approval of conventions
5. Consideration of amendments to ARRL Pension Plan
6. Funding for Forward Planning Committee
7. Funding for newly established Ad Hoc Committee on Computer Based Message Systems
8. Review of local antenna/ffi matters
9. Date of next meeting of Executive Committee

The Executive Committee of the American Radio Relay League, Inc., met at 8:55 P.M. Central Daylight Time, Thursday, October 6, 1983, at the Astro Village Hotel, Houston, Texas. Present were President Victor C. Clark, W4KFC, in the Chair; First Vice President Carl L. Smith, W0BWJ; Directors Paul Grauer, W0FIR, Jay A. Holladay, W6EJJ, Gay E. Milius, Jr., W4UG, and Leonard M. Nathanson, W8RC; and General Manager David Sumner, K1ZZ. Also present for all or part of the meeting were the following: Vice Presidents Larry E. Price, W4RA, and Gar Anderson, K0GA; Directors Frank M. Butler, Jr., W4RH, Lys J. Carey, K0PGM, George A. Diehl, W2IHA, Mary E. Lewis, W7QGP, Edmond A. Metzger, W9PRN, Tod Olson, K0TO, William J. Stevens, W6ZM, and John C. Sullivan, W1HHR; Vice Directors Richard P. Beebe,

K1PAD, Evelyn D. Gauzens, W4WYR, John C. Kanode, N4MM, Howard Mark, W0OZC, and George S. Wilson, III, W4OYI; Counsel Christopher D. Imlay, N3AKD; Assistant to the General Manager W. Dale Clift, WA3NO; Technical Department Manager Paul L. Rinaldo, W4RI; and Membership Services Department Manager Harold M. Steinman, K1ET.

1) On motion of Mr. Milius, the Minutes of the September 10 meeting (No. 408) were accepted in the form in which they are distributed.

2) On motion of Mr. Milius, the Committee recognized the names of 46 newly elected Life Members, and directed the General Manager to list their names in QST.

3) On motion of Mr. Nathanson, the affiliation of the following Category I clubs was approved:

Buena Park Amateur Radio Club, Buena Park, CA; Lake Repeater Association, Inc., Tavara, FL; Metro Atlanta Ladies ARC, Atlanta, GA; Milton Amateur Radio Club, Milton, FL; United Airlines Mainliner ARC, Millbrae, CA.

With this action the League has the following number of active affiliated clubs: Category I, 1715; Category II, 11; Category III, 187.

4) On motion of Mr. Nathanson, the Committee approved the holding of the following ARRL conventions:

Florida State	March 9-11, 1984	Orlando, FL
Georgia State	June 16-17, 1984	Atlanta, GA
Southwestern Division	Aug. 30-Sept. 1, 1985	Long Beach, CA

5) Mr. Sumner presented a proposed amendment to the League's Pension Plan, drafted in accordance with the instructions of the Management and Finance Committee in discharging its responsibility under Minute 52 of the Second 1982 Meeting of the Board. On motion of Mr. Nathanson, it was RESOLVED that, in accordance with Article XVII of the said Plan, the "Fourth Amendment to The American Radio Relay League, Incorporated, Restated Pension Plan" is adopted, effective October 6, 1983, and that the General Manager is instructed and authorized to execute said Amendments for and on behalf of the Corporation.

6) On motion of Mr. Holladay, the General Manager was authorized to reimburse up to \$8,000 in expenses of the Forward Planning Committee incurred prior to the 1984 Annual Meeting of the Board.

7) On motion of Mr. Nathanson, the General Manager was authorized to reimburse up to \$3,000 in expenses of the Ad Hoc Committee on Computer Based Message Systems incurred prior to the 1984 Annual Meeting of the Board.

8) Mr. Imlay reported on the status of negotiations for a presentation by ARRL before the City Council of Cerritos, California. After discussion, on motion of Mr. Nathanson, it was VOTED, with Mr. Holladay abstaining, that the proposal for a presentation be withdrawn if it is not accepted within 45 days.

9) The date of the next meeting of the Executive Committee was tentatively established as Saturday, January 14, 1984.

On motion of Mr. Holladay, the meeting was adjourned, at 9:53 P.M.

Respectfully submitted,

Victor C. Clark, W4KFC

President

David Sumner, K1ZZ

General Manager

#### Life Member Applicants

September 28, 1983

H. L. Allen; Ken Achee, N5AKZ; Charles B. Arnold, W8MNT; Fritz A. Berendsen, DC4IF; Wayne L. Boule, KB5XO; Thomas J. Chwalek, WB2IMB; Robert E. Cregar, KB5ZT; James E. Dawson, W9NNE; Ricky E. Dean, KA5LRF; W. Arthur Dent, W3ROK; Charles Wayne Frazell, WD5FRN; Victor Fung, VE3LIV; Pat Goldbach, KN5US; Andrew J. Hewett, N6EPB; Jimmy S. Horn, KA7GKP; Edward Jones, WA5CHT; Michael J. Keane, K1MK; Steven Korn, K2MDD; Milton E. Lamb, Jr., WA5JZL; Robert K. Lawson, WD8KMY; Ping Lee, AB8J; Elizabeth O. Lilly, N4IYF; Howard C. Linnenkohl, K6SDD; Steven May, N6BPK; Kenneth W. Mayhank, KA7GVD; Robert L. McCoy, KB7DA; Duane Meadows, AJ8T; Robert R. Migliorino, KX9T; Lawrence Dean Miller, N0BNT; Emily Neves, WB6ZEL; Shigeo Nonaka, JA6CCQ; Timothy F. Nordland, WB6MOQ; James J. Orjoff, WD9CYU; Johnny Ott, WA8WFI; Theodore Scott Park, K6KN; D. Brian Rockhold, K5BW; Fred W. Scott, WB6SFF; Aree S. Shreve, K7RKC; James A. Sladek, WB4UBD; Robert J. Spencer, KA8OHJ; Harold Stangeland, N8ACH; Walter J. Tolson, W4ICN; Roland Verledens, ON6FT; Linda G. Walworth, KA5FUI; Charles P. Wilhelm, W8PAQ; Stephen E. Wraga, WA2BYX.



# A Glimpse at the National Convention

By Harold M. Steinman,\* K1ET

Many of you know the fun and excitement of attending an ARRL Convention or Hamfest. The ARRL *National Convention* is something special, a privilege to sponsor and attend. The 1983 National Convention held in Houston October 7-9, was sponsored by the Houston Ham Conventions, Inc., with Tom Taormina, K5RC, as Chairman/President.

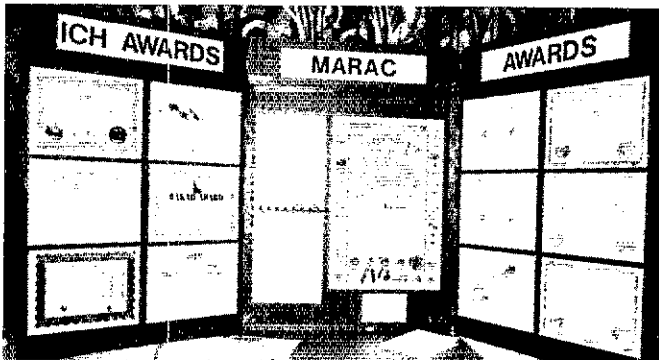
In addition to the large number of excellent and well-attended forums, covering topics ranging from emergency response to county hunting to Amateur Radio in medicine to RFI, a special feature of the 1983 ARRL National was all-day "symposiums" on subjects of particular interest. The Texas Six Meter International Radio Klub (SMIRK) arranged an outstanding group of VHF/UHF seminars featuring speakers from all over the world, including HC1MD, W6JKV, WA8OGS, W1HDQ, K9EID, WA8ONQ and VK8GB. The Texas QRP Committee organized a major QRP program with such renowned QRPers as G3RJV, W7ZOI, G4BUE, GM3OXX and W0RSP. Finally, the First International DX and Contest Symposium featured workshops on controversial topics such as excessive power, use of spotting nets and DX lists. Forum speakers included K8CW, K1MM, W6KG, W6QL and W6AM.

The 4000 attendees came from as far away as Australia and South Africa. But we know a lot of you could not attend, and this photo story is for you. We hope through these photographs to convey some of the excitement of an ARRL National Convention. Mostly, we hope to convince you to attend one of the many Conventions and Hamfests sponsored by the ARRL each year. You'll find them listed under Coming Conventions and Hamfest Calendar each month.

\*Manager, Membership Services, ARRL



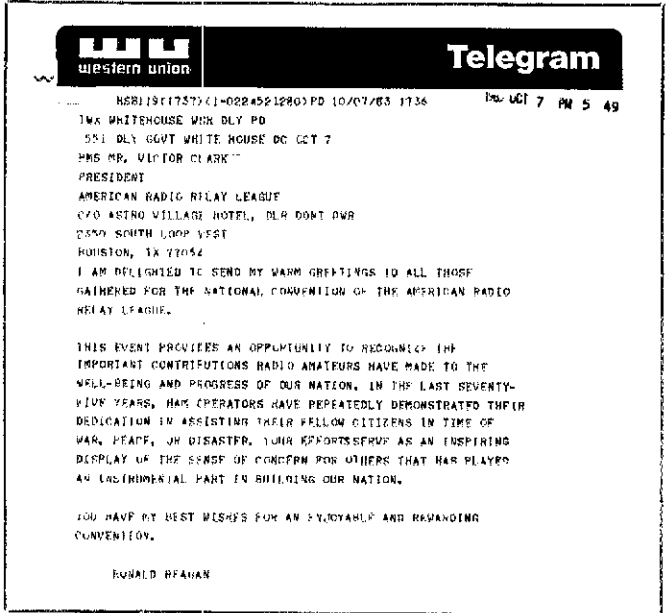
Some of the scores of commercial exhibits in the massive exhibit hall.



The International County Hunters had a forum of their own: County Hunting — What's It All About, moderated by Bill George, WA5YSC.



The excitement of the flea market.





Tom Taormina, K5RC, welcoming a full house to the Saturday night banquet.



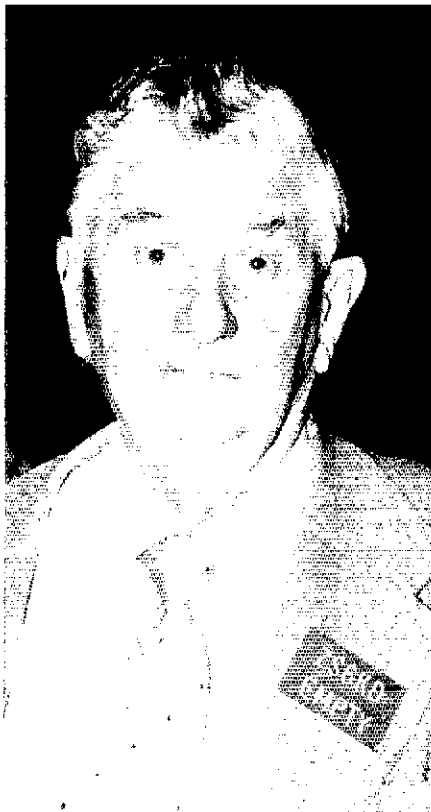
Southeastern Division Director Frank Butler, W4RH, and Publication Sales Manager Lorry Evans, KA1KQY, during a "quiet" moment at the ARRL booth.



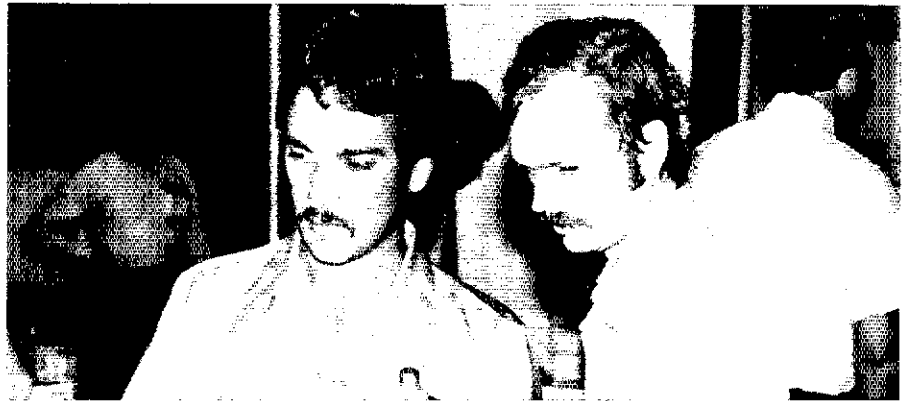
Forums led by ARRL Senior Technical Editor W4RI are always well attended. Here, he speaks on Computers and Amateur Radio — and at 8 A.M., no less!



Other Convention-goers of note: (l-r) Perry Williams, W1UED, ARRL Washington Area Coordinator; Ray Kowalski, Chief of FCC's Special Services Division, Private Radio Bureau; Ellen White, W1YL, QST "How's DX?" editor; Northwest Division Director Mary Lewis, W7QGP; Past West Gulf Division Director Roy Albright, N5RA, and West Gulf Assistant Director Art Kay, W5APX.



A convention-goer from afar.



Who are these people? They're convention-goers just like you and me. They're having fun; after all, it's *their* convention. (photos courtesy K1ET)

# Nominations Open For Maxim Memorial Award

Nominations are hereby solicited for the 1983 Hiram Percy Maxim Memorial Award (*QST*, August 1983, p. 54). The Award is to be given annually to the licensed radio amateur under the age of 21 whose accomplishments and contributions are of the most exemplary nature within the framework of Amateur Radio activities, including, but not limited to, the following:

- 1) participation or leadership in organizational affairs at the local or national level;
- 2) technical achievement;
- 3) operating record;
- 4) recruitment and training of new amateurs;
- 5) public relations activities.

In keeping with the tradition of the award when it was first established in 1936, formal nominations will be made by the respective ARRL Section Managers (see list on page 8 of this issue). Suggestions and supporting information, including the endorsement of ARRL affiliated clubs and elected or appointed League officials, should be submitted to your Section Manager as soon as possible, with a copy, if possible, to: Chairman, Maxim Award Panel; c/o Secretary, ARRL, 225 Main St.,



If you know, or know of, a deserving young licensed amateur, send his or her name, call, address and 1983 Amateur Radio accomplishments to your Section Manager. Your nominee could win the reinstated Maxim Memorial Award. (NTAPI photo)

Newington, CT 06111. In consultation with the appropriate ARRL Division Directors, an Award Panel consisting of a chairman to be designated later, ARRL President Victor C. Clark, W4KFC, ARRL Foundation President Robert York Chapman,

W1QV, and two additional members will review the nominations received from Section Managers and select the winner. The winner will receive a cash award of \$1000, a suitably engraved plaque, and travel and accommodations expenses to enable him or her to attend an ARRL convention at which a formal presentation will be made.

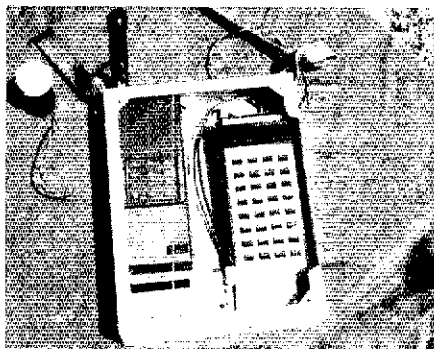
Nominations should document as thoroughly as possible the Amateur Radio achievements and contributions of the nominee during calendar year 1983. Additional information concerning the character of the nominee is welcome. The initial nomination should be as complete as possible; owing to time constraints, it will not be possible for the Award Panel to engage in correspondence to supply missing information.

The Hiram Percy Maxim Memorial Award is intended to provide encouragement, and a tangible reward, for outstanding young amateurs. It should also provide an opportunity for Amateur Radio, and its many benefits for young people, to be brought to the attention of the public. Your assistance in finding qualified nominees will help make the program a success!

## Strays

AMRAD WANTS TO PUT A HEX ON YOU

- The Amateur Radio Research and



Remember the Hand-Held RTTY station for deaf persons described on page 60 of September 1983 *QST*? To cure an RFI problem, Elton Sanders, WB5MMB (who donated some of the equipment used in the original project), repackaged the system in an aluminum chassis. Nancy Sanders, KB4DAJ, claims to be the first deaf ham to operate RTTY horseback mobile using the system. (photo courtesy WB5MMB)

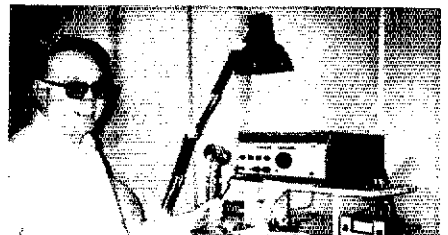
Development Corporation has four main interests: packet radio, spread spectrum, RTTY and communications for the deaf. With the latter, AMRAD operates the Handicapped Educational Exchange (HEX), which is an electronic bulletin board for persons with disabilities, including the deaf. It can be accessed on TTY and on Bell 103 modem (300 baud) at 301-593-7033. Also, AMRAD has developed personal computer interfaces for Telecommunications Devices for the Deaf (TDD) and a 2-meter TTY rig for the deaf.

If you are interested in forming a special-interest group for deaf persons within AMRAD, or in joining an RTTY net on hf or a slow-cw net for Novices and Technicians, write to Barry Strassler, KA3KDF, 5702 Forest Rd., Cheverly, MD 20785.

### 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.



Even though his duties as IEEE President this past year kept him quite busy, James B. Owens, N9CLO, of Lake Forest, Illinois, always found time to get on the air, particularly to ragchew with amateurs overseas. First licensed while in high school, as W5FWB, Jim currently is active on 10, 15 and 20 meters on both cw and ssb.

# Mark Barettella, KA2ORK — Grenada Story

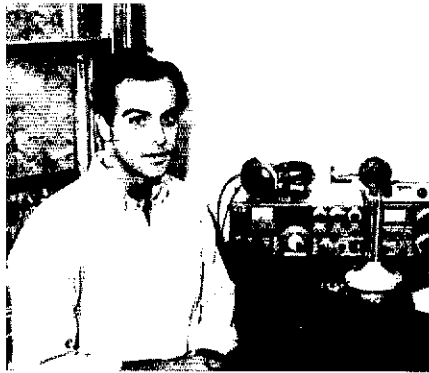
By Carol L. Smith,\* AJ21

**O**n October 25 and 26, U.S. troops stunned the world when they landed on the island of Grenada. Not since Vietnam had this country sent its soldiers on a major military offensive. And not since the earliest days of wireless had much of the world been riveted on the words of an Amateur Radio operator. That ham, Mark Barettella, KA2ORK, of Ridgefield, New Jersey, gave via Amateur Radio an eyewitness account of those dramatic events in the Caribbean.

Mark, a 22-year-old student at St. George's University School of Medicine, was at times the only non-military source of information from Grenada. (His live ham radio accounts, in fact, also inadvertently aided U.S. troop movements.) He and his radio became the primary link between worried parents and medical students, and between concerned mainlanders and American citizens then on the island. In the process, Mark and his Amateur Radio transmissions captured worldwide media attention.

That attention has not subsided. Now safe at home, Mark remains stable, unassuming and articulate despite incessant telephone calls and daily deliveries of cartons of mail. His family, too, is besieged by Mark's new fame. His sister, Donna,

finds it difficult to concentrate on her nursing studies. Mrs. Barettella now functions primarily as an efficient private secretary,



Having been safely evacuated from Grenada, Mark Barettella, KA2ORK, is glad to be home. His Amateur Radio operation from the Island brought him unexpected media attention and instant call-sign recognition among U.S. and Caribbean hams. (photos by Karl Townsend)

fielding the unending demands and offers coming her son's way. (She still does this graciously, overwhelmed in gratitude that

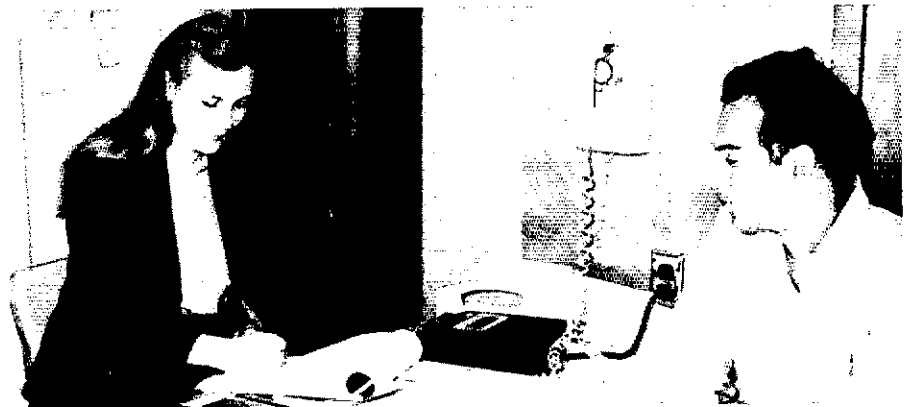
Mark and his friends are safely home. "You wouldn't believe it, but we really are a quiet family," Mrs. Barettella explains.)

What next for Advanced class licensee Mark Barettella, KA2ORK? This heroic young man hopes that life will return to "normal" again soon. Mark is focusing on returning to his medical studies, which presently poses some difficulties as the school works out arrangements for studying stateside. Mark, who rode on a bicycle to his summer job in the ambulance corps, is figuring out how to get to classes, how to replace his radio, textbooks and other belongings left in Grenada, etc. (Yes, it's true — those Americans rescued from the island had to pay their fares home from South Carolina.)

Here is Mark's story, in his own words, as related in early November over coffee and cookies in the Barettella's sun-filled kitchen. Mark and his Amateur Radio activities are spotlighted — other media have emphasized political and military aspects of the event. Doing the interview was a rewarding experience. Reading Mark's story will, I hope, have a similar effect. Mark and his family made me proud to be an American and an Amateur Radio operator. All of us have gained through the efforts of this impressive young man.

*QST:* Mark, how did it happen that you had an Amateur Radio station in Grenada?

Barettella: I found the radio down there, at least part of it. I brought down meters and cables. The transmitter itself I found more or less in the audiovisual repair department at school. Someone had left it there. People at school said the radio was inoperable (the power supply was blown out and it didn't transmit). I said, "Well,



KA2ORK recalls events surrounding the hiding of his amateur transceiver: "No one really knew I had the radio. I started a rumor that the radio had been confiscated."

let me take a look at it." So I fixed it. All it needed was finals and neutralization, and it was all right. By the way, it was a Swan 500CX. I tried to work cw for a time, but the only thing I had to use was a spoon. I made a keyer out of a stainless-steel spoon. It worked for a while but my wrists got too tired using it.

Last semester I got a 5-band trap dipole. I had to practically put it up using bubble gum and Popsicle sticks because we didn't have a mast big enough. You couldn't just go to the store and buy a piece of wood. That would cost you a fortune — much more than you could buy a metal mast for here. So I found all the pieces of wood, and more or less nailed them all together. I managed to get the center up about 10 feet off the roof. I trimmed the antenna as well as possible, but it wasn't really near resonant on many frequencies.

*QST:* Then you met Steven Lomazow, N2DRA, your stateside amateur contact on the air?

Barettella: Yes, I did meet Steve on the air. We set up a once-a-week schedule, every Monday night on 14.250, and that continued. As soon as I heard about the coup I made arrangements to contact him if there were an emergency.

*QST:* And there soon was an emergency?

Barettella: Yes. We heard planes and gunfire. The school administration got hold of me. They knew I was the only guy who had a radio, and they asked me what I thought was going on.

No one else on the island really knew I had the radio because I started a rumor that the radio had been confiscated. The government had quite a few factions at this point, and I was concerned with hiding the radio until I really needed it. I went to the anatomy lab, which was the best place because the Grenadians are very afraid of the anatomy lab. They wouldn't go in there. I hid it in the lab next to a cadaver, and kept it there for about two weeks. My rumor that the radio had been confiscated, as a matter of fact, got all the way back to the States. I would get on the air sometimes on schedule with Steve to let him know everything was okay, then I would put the radio away again. Steve used to say that they keep telling me that your radio has been confiscated, but I'm talking to you, so it must not be.

*QST:* So you knew you had a reliable means of communication.

Barettella: Steve knew that I was to call him in case the Telex went down and there was no other means of communication. He knew that if he was getting a call it was serious. So around 3:45 in the morning on Tuesday the 25th I was awakened by someone sent by administration. "What's going on here," I thought. They told me the Telex just went down, the phone lines are all

down, there are these planes circling over head. Can you do something? The school office in Bayshore, New York, doesn't know anything about what's going on here. They don't know what's happening.

We started hearing some fire, artillery over the island. It was in the distance, fortunately. So I said, "Okay, that's it." Click, on with the radio.



Steven Lomazow, N2DRA, had a weekly schedule with Mark, and was one of the first stateside hams to learn of the invasion. Detailing his concerns for the safety of the American medical students on Grenada, Steven remembers the tense hours of Mark's off-the-air times.

I caught somebody in Georgia (I can't remember his call sign). He was talking to some guy in Texas. I broke in on 40 meters because 20 was dead. As a matter of fact, 40 meters was dead except for these two guys. At first I think the Georgia ham thought I must be a nut. I said, "Look, we have an invasion down here. I have to get hold of N2DRA in New Jersey. Here's his phone number. Just get him on the radio as fast as possible." It was about 4:15 A.M. The ham reminded me that we don't have a third-party agreement with Grenada. I just said to call Steve, and he'll take all the responsibility. They're firing at each other here. It's an emergency! So he contacted N2DRA.

*QST:* And that started things?

Barettella: Yes, Steve and I got on 40 meters, and I explained to him exactly what was going on. Of course, the news media began to catch on. [Mark at one point turned down a request for an on-the-air interview with Dan Rather, which caused something of a sensation in the news media. — Ed.]

So we just kept this contact up. More or less everything I said on there was fact. We kept watch out the window, off the roof. We had people on the roof watching with binoculars, looking, watching to see how many ships were out there. That was the

type of thing we were doing — more or less just giving a description of everything that was going on and trying to keep the students' parents informed. If they hadn't had our link for two days, they wouldn't have had any idea where we were and when were we possibly getting out of there. I'm sure that helped.

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*"We are anxious to see an American military face, preferably a Marine."*

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*QST:* Mrs. Barettella, how did you feel after hearing Mark's voice?

Mrs. Barettella: I felt good and so did all the students' parents. They called here every hour on the hour to make sure everything was okay. When we really started getting nervous was when he went off the air.

Barettella: They shouldn't have gotten so upset because I told them I wasn't going to be on the air for a while. It wasn't like I just shut the radio off. I needed some rest.

*QST:* That's when "Mark II" was on the air?

Barettella: Yes. He was my roommate, Mark Polimeni, and he more or less watched me for two semesters operating the radio. So he clinically knew what to do, how to just check in. I said, "Okay, you check in. I'm going to get 2½ hours of sleep." It was pretty quiet at the time. I told him that if anything at all happens, just kick me and wake me up. Not very long after, maybe an hour or two (it's hard to sleep when you hear these large fireworks going off!) he woke me up. I think "Mark II" got me up because 20 meters was fading, and he didn't know how to change bands.

*QST:* Then there were some problems with the power?

Barettella: After about six hours of operation our power went out. The school was equipped with a diesel generator that could run lighting, but not all the air conditioners in both buildings. It could run all of them in one building, so everybody was consolidated in the building toward the beach. We were just waiting there. We got the generator running, but unfortunately there was no oil for it, so it could only run for about 18 or so hours before it froze up. Then we had a little Honda, which could barely produce enough current for the radio. I knew we had to try it out. I put it on the balcony, and cranked it up.

## Grenada Diary

Tuesday, October 25, 1983

7 A.M.: I opened the daily meeting of the International Assistance and Traffic Net (IATN) on 14.303 MHz. As stations checked in (from the U.S. National Traffic System, the Caribbean, Pan American Assistance Net and Australian Traffic Net) and listed traffic, this promised to be just another routine day.

Routine traffic may seem like tame fare for a net whose concept was fostered by natural disasters: Hurricane David's devastation to the island of Dominica in 1979, Hurricane Fredrik's destruction along the U.S. Gulf Coast and to Mobile, Alabama that same year, and 1980 Hurricane Allen, which struck the island of St. Lucia. But the result of these storms pointed up a need for an international net of amateurs versed in handling formal, written traffic.

In October 1981, IATN began to fill that void when liaison was established with the ARRL National Traffic System (NTS), expanding NTS to worldwide capability. Amateurs in countries allowing third-party traffic readily absorbed the ARRL format for written traffic. The IATN cadre of amateurs conducted Simulated Emergency Tests with Jamaica and Australia, held informal meetings, made plans and had been cited as a primary source of communications for the Office of Disaster Assistance, U.S. Department of State (DOS).

8 A.M.: A phone call alerted me to the news that armed forces from the United States and the Organization of Eastern Caribbean States had landed on the island of Grenada. I returned to the shack, switched on TV and fired up the transceiver. I watched as President Reagan and Dominica Prime Minister Mary Eugenia Charles made their announcements to the world and press.

8:30 A.M.: Knowing there was a medical school on the island with many Americans enrolled, I scanned 20 meters seeking a possible contact with Grenada. The television set droned on as the newscaster attempted to piece the story together, and I thought about all the Health and Welfare traffic that was sure to come.

About this time my phone rang with an ever increasing number of calls. The news media had my number.

9 A.M.: Found KA2ORK/J3 in contact with N2DRA and KC2PK on 14.250 MHz. Mark was giving a graphic, running description of what was happening from his vantage point. He said no American soldiers had made it to Grand Anse, a few miles south of St. George's. However, they had liberated the True Blue campus, further south near the Point Salines airstrip. Complying with prearranged procedure, I notified DOS in Washington that IATN was being held in abeyance, but that I was monitoring Grenada.

9:30 A.M.: Word was passed within DOS to the Grenada Task Force, and one of the officials phoned wanting a status report from the "ham on Grenada." I patched the official direct to KA2ORK/J3. Mark gave him an update on the situation, describing a pass-over by helicopter gunships and answering gunfire from the ground. Though all the students in the building were okay, Mark expressed some concern that the invasion forces had not yet arrived at Grand Anse. He was assured that every effort was being made to reach that objective. Cautioning the students to stay behind cover, away from the windows, and not to open the door unless they were sure the person outside was a member of the U.S. military, the DOS official concluded the patch.

10 A.M.: Encumbered by fading signals and inquiring amateurs breaking on the frequency, Mark and his two control stations moved to 15 meters (initially at 21.300 and later at 21.375 MHz).

11 A.M.: Health and Welfare inquiries addressed to KA2ORK/J3 were arriving on the frequency in increasing number, but Mark had no way of checking any of them. By now amateurs, obviously prompted by the news media, were asking questions about the situation. KC2PK handled them capably in an effort to keep an open channel for Mark.

3 P.M.: Understandably, pressure from hams, locating Mark at 21.375 MHz and wanting word about numerous students, at times went beyond good operating procedure. Considering this and anticipating that 15-meter signals would deteriorate with approaching sunset, I decided to activate IATN. I informed KA2ORK/J3 and his control, KC2PK, of my intention, asking them to send Health and Welfare requests to 14.303 MHz. I further advised that we would hold that frequency open for them against the time they felt a move to 20 meters would be advantageous.

3:15 P.M.: IATN activated on 14.303 and NTS traffic handlers gathered quickly to take the traffic. Our plan called for the receive stations to hold the Welfare traffic until we got a decision from FCC about a temporary Grenada U.S. third-party-traffic agreement.

3:45 P.M.: Received Bulletin 101 from ARRL Hq. with the notification

that FCC had granted a waiver of third-party-traffic restrictions to Grenada.

4:30 P.M.: Contacted DOS to brief them on the operation of IATN. With the present conditions on Grenada, I anticipated difficulty locating a ham on the island to help us with the volume of Welfare messages being received. DOS affirmed that they would have a list of the evacuees as they were airlifted from Grenada and I requested a liaison with the DOS Amateur Radio Club, W3DOS, to work with IATN.

6 P.M.: IATN was notified that KA2ORK/J3 and his control stations had returned to 20 meters, but declined to use 14.303 MHz to carry on their operation.

Wednesday, October 26, 1983

8 A.M.: Following the daily routine traffic, the IATN went into an extended session and continued to take Grenada Welfare traffic. Again a fine group of NTS traffic handlers took the inquiries, putting the traffic into working form and referencing a message number to the station of origin.

8:30 A.M.: Outstanding in the events on this second day was our contact with J88AR, in Kingstown, St. Vincent. He relayed the names of six medical students, living off campus, who were safe at the home of J37AQ.

4 P.M.: IATN received notification of ARRL Bulletin 102, which cancelled the emergency frequency, special operating privileges and the third-party-traffic waiver with Grenada. At this point, the FCC cancellation did not affect IATN operation because W3DOS was in liaison with the net and making plans to contact our NTS traffic stations to verify the students' names with the State Department list.

Thursday, October 27, 1983

8 A.M.: IATN again accepted Grenada Welfare traffic. NN3SI maintained our DOS liaison while W3SWD, operator of W3DOS yesterday, was at the State Department preparing to contact the IATN receive stations to check the names on their traffic.

1 P.M.: With the establishment of a DOS hotline telephone number for the public to inquire about Grenada evacuees, the amount of Welfare traffic on the net dwindled to a trickle and we concluded this phase of our Grenada operation.

On into Thursday evening and continuing Friday morning, W3DOS contacted all NTS stations with traffic, by 5 P.M. Friday most of the 115 messages received on the net were answered and the replies were on the way back to the originating station through NTS.

The regular members of IATN knew this was only the initial part of the net's involvement with Grenada. Plans formulated in a July 1983 meeting at the State Department involving the IATN, ARRL, FCC, Office of Disaster Assistance in the Agency for International Development (AID), and other amateur emergency organizations, placed us in a position to provide primary communications into any area of disaster.

So on Monday, October 31, IATN began its second phase of the operation when we contacted Paul Bell, the AID representative on Grenada, who would operate as J37AID. In subsequent days, IATN maintained a daily schedule and some special contacts, with Paul and Tony, J39CM, passing relief traffic to and from the Office of Disaster Assistance in the State Department.

The Grenada 2-meter repeater was badly damaged in the military action, and W1XX played an important role by researching and assisting Washington in placing the order for quick delivery of a new repeater and other equipment to enable Paul to communicate with all areas of the island, thereby speeding his mission on Grenada.

What makes an operation like the International Assistance and Traffic Net function so ably is the individual dedication of the "team" amateur: The ones who spend hundreds of hours handling dull, routine traffic; the ones who meet the daily challenge of weak signals and limiting propagation, learning tactical use of relaying; and the ones who persist to get the traffic passed even if it is only a "happy birthday." They are the ones who are amateurs by hobby terminology only. Otherwise, in my book, they are pros!

Not one of us wants hurricanes, earthquakes, floods or military action, but we all realize the inevitability of unfortunate events, so we work and plan, stacking the chips against the day we will be called upon to use these skills to aid our fellow men and women. As the IATN Net Manager, I thank all on our team by paraphrasing the A-Team's Hannibal Smith: "Don't you just love it when a plan comes together!" — George H. Nafzinger, W4PPC, Miami, Florida

We had about five gallons of gas left (this was the last five hours or so of transmission), and I had to turn the mike gain down. I had no choice, but I got as much out of it as possible.

QST: Many people monitoring your

transmissions were puzzled by their sometimes cryptic nature. What was that all about?

Baretella: Okay, at that time I was speaking to Fred Jacobs, KC2PK. Fred had been down there quite a few times in the past so

both of us could talk to each other about something in the area, and we both knew where it was immediately. When he was talking to the State Department, they would tell him where our soldiers would be coming from, and then he would tell me exact-

ly what we students should see and hear.

By knowing the area both of us could tell exactly what Fred was talking about. This way we wouldn't give any positions away. We worried we were being monitored, and we didn't want to reveal any strategic information.

*QST: How worried were you and the others at the school?*

Barettella: Toward the end we started getting a little jittery, but most of the people were taking it pretty well. A few people got out of hand. We had assigned people to security so no one could leave the building and no one could come in the building unless they were checked. It came to points where physical force was needed to keep some people from running down the beach, but for the most part everybody was pretty good.

Knowing that the radio was there helped them out a lot because they were certain that their friends and families knew they were okay. Students were really worried about what their parents were thinking, and they just wanted to let them know that they were okay.

*QST: What did you think of the stateside amateur operations?*

Barettella: I thought they were pretty good overall. The amateurs did a really excellent job up here. They were too willing to help in some cases, but I guess I can see their point there. We had everyone we needed. As a matter of fact there were two guys down in Florida who had a phone patch running to Bayshore, New York, for 36 hours straight! It was unbelievable! If a student wanted to talk to her parents she just had to pick up the phone and talk.

*QST: What about the evacuation, and where is your now-famous radio?*

Barettella: The State Department kept asking me from Washington to bring my radio. Then the amateurs kept saying that I could leave my shoes, but I'd better bring that radio and microphone. I said I would if I could. I said to myself I had to get this radio back, with the spoon key and all. So I left everything else and got the radio ready. As soon as I shut down, I mean as soon as we pulled the generator plug out, U.S. artillery started hitting the beach. The evacuation helicopters were approaching the beach and the [opposition] was trying to keep them off, so they were firing over our heads. It was boom, boom, and we were right on the beach. The resistance was trying to keep U.S. helicopters off the beach, and our troops were shooting back at them trying to get on the beach. It was quite loud.

George, who was in charge of security, and I were the only people on the second floor. Everybody else was down in the first five rooms. We were instructed to be on the floor. George and I were more or less lying

on the floor, trying to get out as much as possible until it was no longer possible. They sent a person up from the first floor who told us that our rescuers were coming, and we had to go down. On the air I said "Okay, I'm going off. I'll get in touch with you as soon as possible." That's all I really could say because at this point we really didn't hear the helicopters approaching. But as soon as I pulled the plug the helicopters came. It was so quiet up until that point. Immediately, right as I pulled the plug, everything happened. I just grabbed everything, the ground wires,

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***We were just lying there waiting. Then the door was kicked in and we heard, "American soldiers! Freeze!"***

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everything just came out of the back of the radio and I threw it into this nylon suitcase, which wouldn't even close. Stuff was hanging out — the meter was on the floor. I started to run to the first-floor room and then there was this gigantic boom at the end of the building, at the next building! Boom! I ran down the other stairs, and at that point one of the helicopters was landing on the beach with the military. I could see that from the door on the first floor.

Meanwhile, I'm trying to bring this stuff down, and the radio was thrown into the corner in the hallway. (Of course I had this label "radio" all over the thing!) I was shoved into a room on top of about 40 other people on the floor, right on top of them. We're just lying there for a couple of minutes. The doors were closed (we were instructed to do that), and we heard the helicopter finish landing and the troops coming off. They came and screamed, "American soldiers! Freeze!" And they started kicking in the doors.

At this point a lot of people are wondering if these are really Americans or somebody else. We hadn't seen U.S. soldiers up until this point. Here we are on the ground, just listening, waiting for the door to get kicked open. We heard them kick each door open. They would come and kick the door open and have their guns ready just in case anybody was holding us hostage. As a matter of fact that is what they were expecting. So they found us and asked how we were doing. Then they said, "Let's go, let's get out of here." They took us all in the hallway, and lined us up in a row.

They made me leave the Amateur Radio. I said, "Let me take the radio even if I

don't take my medical equipment." But no. If any of us even had anything on our belts they would just pull it off. Anything that was sticking out that would hinder you from getting caught on the helicopter. They lined us up, blocking out a certain number of people at a time. They let those people run along a line created with the soldiers all the way out to the helicopter, which was halfway in the water. You just ran as fast as possible when they called you to the helicopter. I jumped in, and that jet helicopter just lifted off. By the end of the day my stomach had just had it.

The back of the helicopter was open. They didn't close it. The resistance was shooting at us. Both sides had machine guns. It took about four or five helicopters to get us all out of there. They took us to the Point Salines airport on the other side of the island, and we just waited there. That's why there was a big lag in time while amateurs were waiting to hear from me again.

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***"They took us to the Point Salines airport and we just waited there. That's why there was a big lag in time while amateurs were waiting to hear from me again."***

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It took 15 minutes for them to evacuate about 200 of us. It took approximately 2½ hours before they got the Air Force jet off the island, so we were just hanging around. There were no phones, nothing. Our troops were on the ridges all around watching for snipers.

*QST: At that point were you still worried about your safety?*

Barettella: Yes; no one knew what was going on. We were still on the island, but we felt safe with all the troops around. It took 2½ hours to get out of there and about a ½ hour to get to Barbados. By this time it was already 11:30 or 12 at night, and we stayed in Barbados for two hours to refuel. Again, there were no phones.

Finally I said, "This is it. I have to get in touch with these guys on the radio. They're probably sitting there waiting for me to get on." I figured that if I couldn't get on the phone I'd get back on the radio. Somewhere they had to have a radio that

(continued on page 80)

- **Station, Operator License Terms Changed**
- **10-Meter Amp Ban, ARRL Reply Comments**
- **"Woodpecker" Update**

## Ten-Year Operator and Station License, Two-Year Grace Period Okayed

In a Report and Order in PR Docket 83-337, issued in October and *not effective until December 15, 1983*, the Commission granted the extension of operator and station license terms to 10 years. It also made two years the grace period for expired station and operator licenses. (See June *QST*, p. 60, and Sept. *QST*, p. 63, for background information.)

Comments received from individual amateur operators and from Amateur Radio organizations generally favored the proposed action. Most felt that the extensions would be a benefit to both the amateur operator and to the Commission. Most commenters, however, opposed extending the term of current licenses by a blanket Order because it would be confusing. In fact, the ARRL opposed the idea of blanket extension of current license terms because "it will create a great deal of confusion among licensees, which, in turn, will prompt numerous inquiries to the Commission."

The Commission concluded that "it is in the public interest to amend Part 97 to authorize 10-year operator and station license terms and a two-year grace period for renewal of expired station and operator licenses in the Amateur Radio Service. We estimate a savings to the public of over 1000 paperwork burden hours annually. In addition, there will be a decreased administrative burden on the Commission and the saving of resources as a result of extending the license term and changing the grace period for the renewal of expired station and operator licenses. We believe that a 2-year grace period for the renewal of expired station and operator licenses, in addition to the 10-year license term, will satisfy the amateur operator's needs with respect to inadvertently lapsed licenses. Finally, we are persuaded that a blanket Order extending the terms of existing licenses would be confusing to both amateur licensees and foreign licensing authorities and would result in numerous inquiries that would be a drain on Commission resources."

New license term periods will be phased in as licenses are modified or renewed after the effective date. New licenses will also reflect the change. Specific changes in Part 97 include:

§97.13 Renewal or modification of operator license.

(d) If a license is allowed to expire, application for renewal may be made during a grace

period of two years after the expiration date. During this grace period an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's expired license or a photocopy thereof.

§97.59 License term.

(a) Amateur operator licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license.

(b) Amateur station licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license. All amateur station licenses, regardless of when issued, will expire on the same date as the licensee's amateur operator license.

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***"It is in the public interest to authorize 10-year operator and station license terms and a two-year grace period for renewal of expired station and operator licenses in the Amateur Radio Service." — FCC***

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Though the Report and Order is effective December 15, 1983, Commission sources say that actual implementation may not get underway until next year. The culprit — changes in the Commission's computer programming operations to accommodate this Order. *QST* and WIAW bulletins will carry details as they become available.

### **PARTIAL VICTORY IN CIVIL "JAMMER" CASE**

A New York trial court has awarded the Radio Amateur Repeater Association of Staten Island

damages against an unlicensed individual who, the club proved, has been responsible for jamming its repeaters. Richmond County Judge Horowitz awarded the club actual damages in the amount of \$200. According to Judge Horowitz, "It is clear from his own admission that the defendant Christopher Busacco intended to harass the plaintiffs by jamming their repeaters."

In dealing with the issue of federal preemption, Judge Horowitz's opinion clearly recognizes that matters of radio-frequency interference are within the exclusive jurisdiction of the federal government and are addressed by FCC rule section 97.125. It was the *intentional infliction of harm* by Busacco that the court found actionable.

According to the Judge, the case is "clearly an instance where prima facie tort is applicable." Citing another case heard by the New York Court of Appeals, the Judge stressed that "the key to prima facie tort is the infliction of intentional harm, resulting in damage, without excuse or justification, by an act or series of acts which would otherwise be lawful." In other words, the court based its decision not on the issue of interference per se, which is preempted; rather, it based its decision on the fact that Busacco intended to inflict harm and that the harm caused the Amateur Radio club damages. The decision further shows that the court does not care whether transmissions of Busacco were themselves lawful or unlawful. It is the intentional infliction of harm that is being addressed.

According to Preston Douglas, WA2IFZ, attorney for the repeater club, the bottom line of the Judge's 10-page decision is that there is a private cause of action in New York State against intentional jammers. It is necessary for the plaintiff to prove actual damages, however, and in this respect the club could show only that it had to spend \$200 to purchase additional equipment to deal with the interference (presumably for limiting repeater access to persons equipped with PL). Damages for alleged mental distress and resulting personal injury were specifically disallowed. Douglas said that in hindsight the club could have documented its case against Busacco better. As a test case the decision was, nonetheless, a success.

*Radio amateurs are cautioned against bringing similar cases to state courts unless they are represented by an attorney.* A failure to appreciate the sophistication of distinguishing between (1) an action based on interference and (2) one based on prima facie tort, could result in



establishing legal precedent harmful to Amateur Radio. — *W. Dale Clift, WA3NLO*

## WOODPECKER STILL GOING STRONG

According to an article by Rolf L. Larsen in the Oslo *Aftenposten*, the Norwegian Federation of Trade Unions is asking its sister organization in the Soviet Union to help in making the "Russian Woodpecker" stop. The "Woodpecker," a transmitter in Kiev, decreased its transmissions after earlier contact between Norwegian and Soviet organizations.

"After these contacts, the noise diminished, but it has now increased again. The Kiev transmitter is a military installation and regardless of its purpose, it must be stepped down. It represents both a health and a security risk for radio dispatchers on ships and airplanes," said Kaare Sandegren, international secretary of the Norwegian Federation of Trade Unions. "We do not rule out the possibility that the new activity may be connected with the deployment of medium-range missiles in Europe," Sandegren continued. "Regardless of the reason for this, the interference must stop." Interference from the "Woodpecker," which has been on the air since 1976, is "very intense" at the moment. "The transmitter interferes with almost a tenth of the radio traffic over the short-wave band in this country," asserted Karl Drablos of the Telecommunications Agency's station on Ski. [It was the Ski station that discovered the transmitter and reported its transmission to the Norwegian authorities in 1976. — Ed.]

Station staff report that "the radio signals from the Soviet Union are inexorable when they come through the [air]. They mess up a large part of the high-frequency bands on the shortwave. When the pulsing 'engine' noises start in, even the strongest shortwave stations have to give up for long periods of time."

## 10-METER AMPLIFIER BAN RECONSIDERATION: ARRL ISSUES REPLY COMMENTS

The League, in its comments in General Docket 83-114, asked that the Commission delete rules banning the commercial manufacture and sale of any external rf amplifier capable of operation between 24 and 35 MHz. (See Oct. *QST*, p. 59, for background information.) In its Reply Comments, the ARRL addressed a "minor concern expressed by a member of the Commission staff with respect to the deregulatory action requested by the League in its Comments."

Apparently, certain Commission staff are concerned that the elimination of the ban on manufacture and marketing of external rf power amplifiers capable of 24-35 MHz operations will send a false signal to the CB Service that the Commission has somehow approved use of such amplifiers in the CB Service. The League shares this concern, but feels that it could be overcome by careful wording of the Report and Order.

Current prohibitions of these devices exist in the CB Service. CB Rules 10 and 11 make it clear that external power amplifiers are not permitted in the CB Service. The ARRL also suggested that (1) a reference in the proposed amateur rules pointing out that power amplifiers are illegal in the CB Service or that (2) a public notice detailing the same proscription would leave little room for doubt in anyone's mind about the use of such amplifiers on the CB bands.

The League reiterated that the ban on exter-



Shown (l-r) at the recent dedication ceremony of the new Amateur Radio station NN3SI at the National Museum of American History in Washington, DC are ARRL General Manager K1ZZ, ARRL President W4KFC (station trustee), W1CF (M/A-COM), Museum Director Roger Kennedy, Atlantic Division Director W3ABC. A \$2500 donation to ARRL from M/A-COM made it possible to relocate the station to a more visible location. (photo courtesy National Museum of American History)

nal rf amplifiers capable of operation between 24-35 MHz is redundant and unnecessary. "[The ban] has never been necessary in order to keep external rf power amplifiers from being used in the CB Service," the ARRL purported, "as the type acceptance requirements alone are sufficient to ensure that commercially manufactured and marketed amplifiers cannot be so misused."

## LICENSE ALTERATION CAUSE FOR SUSPENSION

### Pietri, KP4BKC

The Amateur Radio Technician class operator license of Robert A. Pietri was suspended for 180 days because of alterations on his license. In the suspension order, the Commission stated that Pietri had "apparently violated Section 97.129 of the Rules by fraudulently altering his license document to show General class, rather than Technician class, operator privileges." In addition, the FCC pointed out that Pietri had submitted "the altered license document with his renewal application dated June 18, 1982." Pietri was granted renewal of his Technician class license, but that license was suspended for 180 days pending the outcome of the hearing.

Pietri's Suspension Order was issued in October 1982. Then came an unusual set of events. In November 1982, Pietri indicated that he would appear at a hearing. The hearing was held in February 1983, and the PRB submitted proposed findings and conclusions of law in April 1983. Pietri filed proposed findings in Spanish. The PRB told him that his findings would have to be filed in English as required by law. He did not provide an English translation, so no consideration was given to Pietri's Spanish submission.

The Commission found that when Pietri applied for license renewal "the face of the license had been altered to indicate that Pietri's license was one for General class privileges when the license had been issued by the Commission for only Technician class privileges." Pietri agreed that it had been altered. He suggested, however, that vandals must have changed it. (He was, in fact, working at an organization that was experiencing labor problems.) Additionally, when Pietri filed his renewal application, he left question 4A, which requested a designation of his

license class, blank. The form, however, did show a partial X in the box marked "General" under question 2.

Pietri claimed to have no motive to change the designation of his privileges since he operates only a few hours per week. Moreover, Pietri believes that the "alteration of his license was so obvious that it is clear that a person experienced in security, like he is, would have done a better job of changing the class of license."

The Commission found that "... Pietri offered no support for his speculation about the possibility of someone else having altered his license. Although [he] urges that he had no motive for altering the license and nothing to gain by doing so, receipt of a license with General class privileges may have been incentive enough. In any event, without some reliable evidence to support his theory that someone else altered the license, the most apparent conclusion is that he altered the license."

After citing precedent supporting the Rule prohibiting attempts to obtain a license by fraudulent means, the FCC affirmed the Suspension Order, and ordered that Pietri's operator license be suspended for 180 days. — *FCC Release*

## APPEALS COURT HAS BAD NEWS FOR AMATEUR

The State of Michigan Court of Appeals has affirmed a County Circuit Court denial of the variance sought by Harvey S. Ellis, WD8BCM. Ellis had asked for a variance from the Farmington Hills 25-foot antenna height restriction. (The ARRL also filed an amicus curiae brief in this proceeding.)

The Michigan Court of Appeals held that Ellis "had not met a basic prerequisite for obtaining a variance. Simply, a variance will not be allowed 'if it is . . . solely to relieve a problem which is personal to the applicant rather than one especially affecting the lot in question.'"

The Court also rejected Ellis's claims of denial of equal protection under the law in that seven other residents received height variances for their radio antennas. Also denied was the proposition that Ellis's antenna falls within a class of objects excluded from the height requirements. [EFC]

# Washington Mailbox

Conducted By Richard K. Palm,\* K1CE

## Evolution/RPT

Charles Darwin would have been pleased with our modern-day repeaters. These machines not only have withstood the test of time in a very dynamic Amateur Radio environment, but they have emerged as pillars of the amateur state of the art. They have survived, because they are fit.

Along with the repeater's adaptability in the new world of packet radio and MSOs (message storage operations), however, comes a plethora of new questions about how this type of operation fits into the Part 97 scheme of things. This month, we'll examine these questions by first looking at conventional repeater operation, recent rule changes, and, finally, the repeater's place in new frontiers.

### Q. What's a repeater?

A. A repeater normally consists of a transceiver, an antenna, a control box and a duplexer (a filter that allows use of a single antenna for simultaneous transmitting and receiving). A typical "machine" sits atop a mountain or tall building and automatically retransmits the "user's" signal from a small hand-held or mobile fm rig. The result is an increase in communications coverage for the users — some repeaters will extend coverage to entire states, and beyond. (Police and fire departments, forest services, taxis and other so-called land mobile services make extensive use of repeaters, too.)

### Q. How does FCC define repeater operation?

A. The FCC Rules define repeater operation as "radio communication, other than auxiliary operation, for retransmitting automatically the radio signals of other Amateur Radio stations" (97.3[1]).

### Q. Are control operators needed for repeaters?

A. Yes. Just as with every amateur station, when in operation, a repeater station must have a control operator to ensure that the repeater is operating properly (97.79[b]). However, there is one important exception called "automatic control."

Control refers to techniques for operating a station. One is called *local* control — the control operator has direct, physical control of the transmitter. The problem is that it's not very practical for those control operators who do not eat and sleep at the repeater site.

For those control ops who cannot leap tall buildings at a single bound, *remote* control offers some flexibility. Remote control is manual control with the control operator sitting at a control point that is located *elsewhere* than at the transmitter. The transmitter "knobs" are accessible through a *control link* — apparatus for effecting remote control between a control point and the remotely controlled station (97.3).

### Q. What is automatic control?

A. Most repeaters are operated automatically. Under automatic control, the control operator doesn't have to be at a control point at all times. This does *not* mean that the repeater need not be controlled. Automatic control is allowed when

devices such as locks and secure housings, and procedures such as limited disclosure of command codes and frequencies, are used so that a control operator does not have to be present at the control point *at all times*. Of course, the repeater station licensee is still responsible for the machine's proper operation. Ready access must be ensured. A fundamental requirement is that the repeater works just as well as if a control operator were present at the control point (97.85[e]).

### Q. What frequencies are available for repeaters?

A. Repeater may be operated on 29.5-29.7 MHz, 52.0-54.0 MHz, 144.5-145.5 MHz, 146.0-148.0 MHz, 220.5-225 MHz, 420-431 MHz, 433-435 MHz and any amateur frequency above 438.0 MHz. A repeater may not retransmit signals on more than one frequency in the same frequency band, from the same location (97.85[c]).

### Q. How about control link frequencies for radio remote control?

A. Stations used for controlling a repeater are in auxiliary operation; thus, control link frequencies are limited to 220.5 MHz and above (except 431-433 and 435-438 MHz).

### Q. Are there other special rules for remote-control operation?

A. Yes. Remember to post a photocopy of the license for the remotely controlled station at the repeater site. You must also note in your station records the names, addresses and calls of all authorized control operators and a functional block diagram of the control link with a technical explanation of its operation.

If radio remote control is used, a system network diagram showing the relationship of the associated stations must also be kept in the station records (97.88).

### Q. Are there special power restrictions for stations in repeater operation?

A. Yes. Power limits vary as a function of the transmitting antenna height above average terrain (HAAT). See Washington Mailbox, October 1983 *QST*, for a discussion of effective radiated power (erp), HAAT and the power limits.

### Q. Now that the Commission has eliminated logging requirements, do we still have to keep records of our repeater's antenna and power?

A. If your repeater's effective radiated power is greater than 100 W on frequencies between 29.5 and 420 MHz, or 400 W between 420 and 1215 MHz, then you must keep records of the location of the station transmitting antenna, HAAT, erp, maximum transmitter output, losses in the transmission line and gain of the antenna. See Sec. 97.85[g] for specifics. The purpose of this rule is to show how you determine that the repeater is in compliance with the power and HAAT rules.

Q. A local repeater has a special provision whereby it automatically retransmits a local NOAA weather reporting station broadcast on the hour. Is this legal?

A. No. The Rules specifically prohibit retransmission by automatic means of programs or signals emanating from any class of station other than amateur (97.113).

### Q. How do I-d my repeater?

A. Repeater may be identified by cw or voice. On cw, send your call followed by /RPT or /R. On voice, use the word "repeater." Repeater can also be identified by telegraphy using any code authorized by Section 97.69(b), AMTOR, ASCII or Baudot, when the particular code is used for transmission of all or part of the communication or when the communication is transmitted in any digital code on frequencies above 50 MHz. Amateur television repeaters may use video to identify if the U.S. standard 525-line system is used (97.84).

## Packet Radio MSOs

### Q. How does the FCC classify packet-radio systems?

A. Section 97.69 of the Rules says that "digital codes may be used for such communications as (but not limited to) radio teleprinter, facsimile, television, communications to control amateur radio stations models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called 'packet switching' systems . . .)" However, the FCC has no special rules for the operation of packet systems. These systems can fall into different categories of operation. If the system "retransmits automatically the radio signals of other amateur radio stations," then it is in repeater operation and must observe the rules that apply to repeaters. If the packet system is not in repeater operation (as in cases where the control operator manually directs the retransmission of other amateurs' radio signals, or where simple one-to-one communication occurs), it simply must comply with the general rules covering all Amateur Radio operation.

### Q. What are MSOs? Are they legal?

A. MSO is an abbreviation for message storage operation, which is a trade name of HAL Communications Corp. It is a type of CBMS (computer-based message system) that typically operates in the hf bands for storage of messages by one station and retrieval by another station. Above 52 MHz, some CBMS stations also operate under the repeater rules. Outside of the repeater subbands (including the hf bands, CBMS stations must be operated in the subbands designated for F1 emission and the control operator must have positive control over the CBMS station.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL, have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules. □]

\*Deputy Manager, Membership Services, ARRL



## KH5, KP6 — Palmyra, Jarvis Island

*Palmyra Island, one of the Line Islands, is at the northern end of a group about 960 miles south of Honolulu, in the central Pacific Ocean. Formerly a part of Honolulu County, Hawaiian Islands, it was excluded from Hawaii when the state was organized in 1960. Palmyra was discovered in 1802 by Captain Sawle of the American ship Palmyra, and annexed by the Kingdom of Hawaii in 1862 and by Great Britain in 1889. Palmyra, about 1 square mile, was formally taken over by the United States in 1912.*

*Jarvis Island (also Jervis Island) is also one of the Line Islands just south of the equator in the central Pacific Ocean, 190 miles southwest of Christmas Island, about 1.6 square miles. Worked by an American company for its guano in 1857-79, Jarvis was annexed by Great Britain in 1889 and later claimed by the United States in 1935.*

Just a few weeks ago, AD1S/KH5 was scheduled to open up with an all-band/mode Jarvis operation, sponsored by the Northern California DX Foundation. A series of news releases during October made interesting and even provocative reading, and form a goodly part of this month's How's DX? lead material.

The Palmyra/Jarvis KP6/KH5 listing has been an elusive one, with Palmyra being the easier operation location. It seems that Palmyra is now "off limits" (for what AD1S notes are "legal" reasons), leaving Jarvis the only one accessible for this DXCC listing. For years, Jarvis was frequently visited by the U.S. Coast Guard and Navy, and included licensed radio amateurs — but apparently none sufficiently imbued with the DXCC fever (no gear was brought along!). Ultimately, the weather station closed and the lighthouse was decommissioned, leaving Jarvis silent. The U.S. Department of the Interior is reluctant to grant permission for groups to land on this national wildlife refuge since it is a nesting ground for many exotic seabirds.

This speck of land is located about 1200 miles south-southwest of Hawaii. Along with nesting seabirds, it is a home for hermit crabs and feral cats (evidently a domesticated strain that has reverted to a wild stage). What had made this

planned November operation tenable was the fact that it included a U.S. Government biologist who was to study the bird population and feral cat activity while the hamming got underway. The biologist's expenses were to be underwritten by the DXpedition team.

It is a fact of our DX life that any operating group relishes the opportunity to activate a "rare" DXCC listing. But, even more than that, the ultimate thrill is to help qualify some speck of land as a "new" one. In line with that, one of the Jarvis October news releases was evidently trying to stir up the masses with the following "tune-in-for-an-answer-later" tidbit:

"Where is Jarvis, and will it count for a separate DXCC country? Is it possible that the upcoming expedition might qualify under the present rules? Does it qualify as part of an island group? If so, who decided that it was an 'island group' with Palmyra? Should it (instead) be part of the greater Hawaiian chain, leaving it as a separate entity? Is it really more than 500 miles from Palmyra, or is it separated from Palmyra by the New Republic of Kiribati? Does the Republic of Kiribati and its territorial claim separate Jarvis Island from its 'group island-mate' nearly 500 miles to the northeast?"

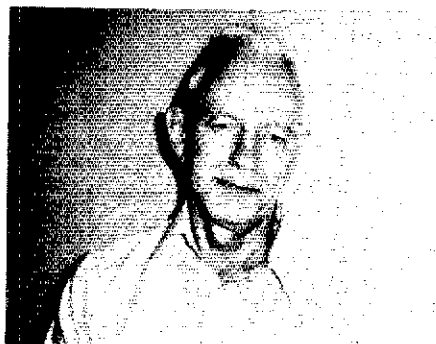
It seems reasonably sure that a case will be presented to the ARRL DX Advisory Committee should the operation succeed, but perhaps a few

comments might be considered in order at this time.' By a stroke of luck, former DXCC maestro W1CW happened to be available for an on-site discussion. A review of the current Webster's *New Geographical Dictionary* was in order. Their succinct description of the Line Islands shows that they extend from Kingman (north) to Flint Island (south). The very early decisions to show Palmyra and Jarvis as an entity on the DXCC listing were carried through to the post-WW II list, the early decision makers understanding that, geographically, both were considered part of the Line Islands and, as such, separate from the Hawaiian chain. The two bodies in question are considerably under the 500-mile requirement for separate listing (point 2b of the DXCC Countries List Criteria). An important point concerns the new boundaries of Central Kiribati (T31), which encompass the ocean area directly above Jarvis. Traditionally, however, in past reviews *only* an intervening land area was used for the definition of separation by foreign territory.

Interesting, indeed — and a welcome activity what with the sparse KH5 activity of late.

\*The DXAC chairman is W0SR, with Division members K3KA, VE3QA, N9MM, W0SFJ, K5YY, K8DB, W2QM, W1DA, W7GN, K6SSJ, W4FRU, N0RR, W4VQ, N6RJ and K5DB.

\*19620 SW 234 St., Homestead, FL 33031



DX speakers at the ARRL National Convention in Houston in October included (top row, l-r) renowned DXer and contester G3FXB (putting G4FOCW5 on the air), P42J (alias W1BIH) and LU7DZ. (Bottom row, l-r) G4BUE, RSGB *Radio Communication* DX scribe G3FKM (in front of a DX-type vehicle) and OT LX1JW, who was present in 1925 at the first formative meeting of IARU. (W'YL photos)

## TEXAS DX SOCIETY

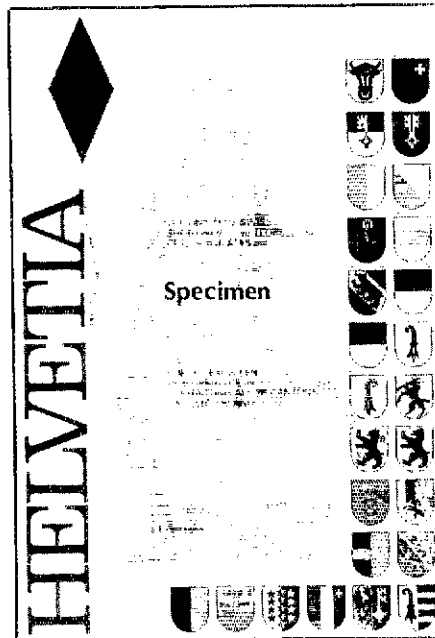
Special kudos are in order for the TDXS programs at the recent ARRL National Convention in Houston. This "First International Contest and DX Symposium" presented issues of concern to our fraternity, and should be a hallmark of quality conventions still ahead. Some of the subjects up for discussion were spotting nets, excessive power, pre-contest scheduling, DX lists and deletion of "inactive" countries from the DXCC List. All this was in addition to an extensive program covering such things as QRP, vhf/uhf and new techniques.

## THE HELVETIA AWARD

For many years, this attractive certificate was known as The H-22 Award, offered by the Swiss membership, the USKA, for working all the Swiss Cantons. Newly designed and called The Helvetia Award, it is offered to those who can confirm contacts with all the 26 Cantons and half-Cantons since January 1, 1979. Cross-mode/band contacts do not count. The award is issued in four classes with separate numbering: phone, telegraphy or mixed; all telegraphy, all RTTY and all slow-scan. Cards must clearly show evidence of the Canton where the station was located. Canton abbreviations are as follows:

AG	Aargau	NE	Neuchatel
AI	Appenzell Inner Rhoden	NW	Nidwalden
AR	Appenzell Outer Rhoden	OW	Obwalden
BE	Berne	SG	St. Gall
BL	Basle-Country	SH	Schaffhausen
BS	Basle-City	SO	Solothurn
FR	Fribourg	SZ	Schwyz
GE	Geneva	TG	Thurgau
GL	Glaris	TI	Ticino
GR	Grisons	UR	Uri
JU	Jura	VD	Vaud
LU	Lucerne	VS	Valais
		ZG	Zug
		ZH	Zurich

The usual signed list must accompany the card showing calls, locations, date, frequency and emission class. The award is free, but sufficient IRCs or equivalent to cover return postage for the cards must all go to Kurt Bindschedler, HB9MX, Strahleggweg 28, CH-8400 Winterthur, Switzerland.



## NCDXF

The summer 1983 newsletter from the Northern California DX Foundation contains a number of interesting items. One heading was titled "Who are the Members of the NCDXF and Where Do They Come From?" The text follows: "At the time of this writing, the NCDXF membership is over 2400 strong. About 500 new members have been enrolled in the past six months alone. All continents, all 50 U.S. states and 87 DXCC countries are represented. At the rate things are going, we should hit 100 countries before the next Newsletter is issued. As one might expect, most members are located in the United States — about two-thirds of them in fact. If we look beyond the U.S.

borders, some surprises appear. Who would guess that our second largest national group of members lives in Finland? Yep, we now have 133 OH members, primarily due to the organizational ability of our European advisor, Martti, OH2BH. If one takes into account that there are about 110 U.S. hams for every OH, it turns out that on a percentage basis, NCDXF members are about 10 times as numerous in Finland as in the U.S.! Our second most active group is DL, with 91 members. — W6CF, Secretary."

## LASTING ACTIVITY

In the bulletin noted above is an intriguing item from OH2BH that clearly indicates the sensible way to encourage DX activity: "Giving help, not asking for it, is the way to go — the way to promote amateur radio in rare countries. This will create activity lasting forever and not disappearing in the wake of a DXpedition. There is a new era in DX, and it involves offering gear and educational programs to the major educational institutions of rare countries. Everyone with valuable connections or traveling opportunities to the rare ones is welcome to participate."

## QSL Corner

Administered By Joan Becker, KA1FO

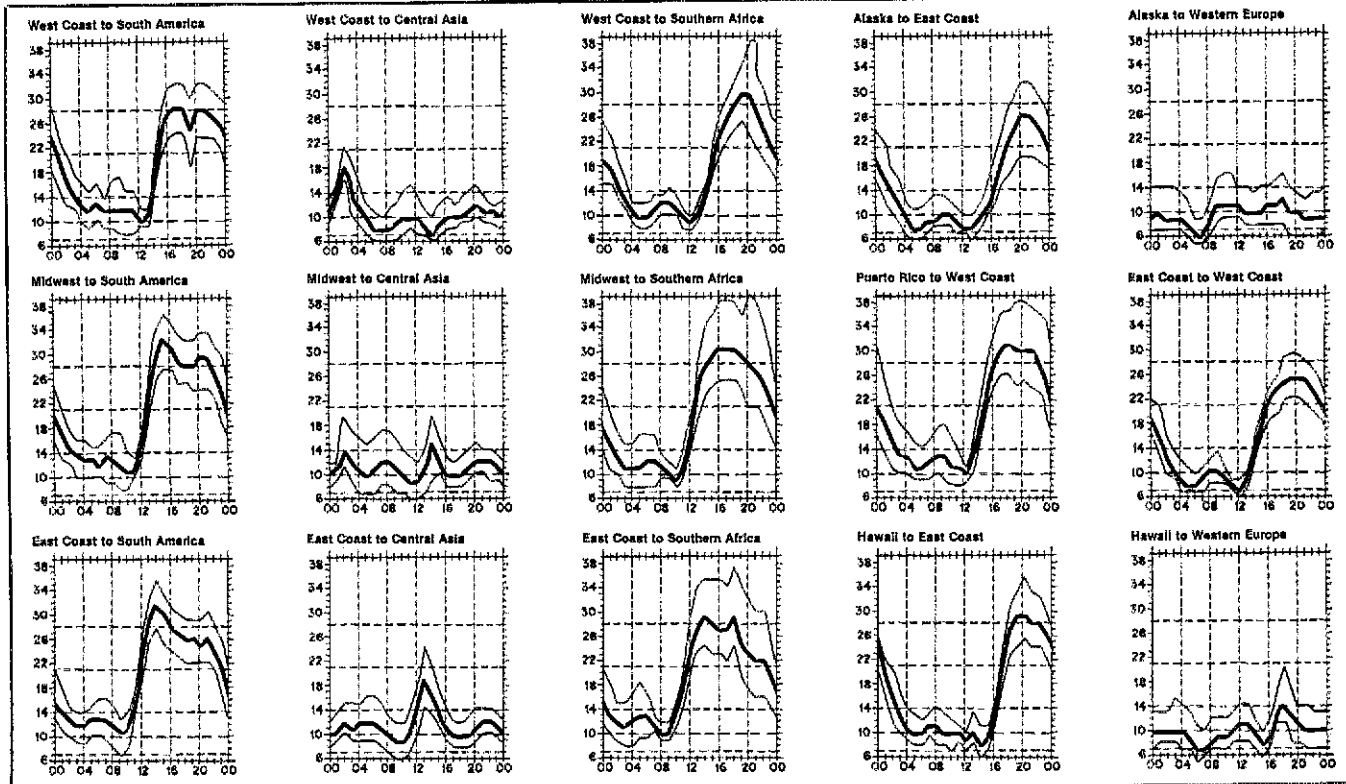
### The ARRL DX QSL Bureau System (Incoming)

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

#### How it Works

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

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



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

responsibility of handling from one to three letters of the alphabet.

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

#### Claiming your QSLs

- 1) Send a 5- x 7 1/2-in. s.a.s.e. to the bureau serving your district.
- 2) Neatly print your call sign in the upper left-hand corner of the envelope.
- 3) A preferred way to send envelopes is to affix a 20-cent stamp. If you expect to receive more than 1 oz of cards, please affix postage accordingly.
- 4) When requesting any information from the bureau serving your district, always include an s.a.s.e. for a prompt reply.

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

#### Helpful Hints

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

#### DOs

Do keep self-addressed 5- x 7 1/2-in. envelopes on file at your bureau, with your call in the upper-left corner, and affix at least one unit of First Class postage.

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

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

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

Do include an s.a.s.e. with any information request to the bureau.

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

Do be appreciative of the fine efforts of these volunteers.

#### DON'Ts

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

Don't send your outgoing DX cards to this bureau (see "ARRL-Membership Overseas QSL Service" in this column in September 1983 QST.)

Don't send envelopes to your "portable" bureau. For example, WA1SQB/2 sends envelopes to the W1 bureau, not the W2 bureau.

### ARRL DX QSL BUREAU SYSTEM

**First Call Area:** all calls\* — Hampden County Radio Association, Box 216, Forest Park Station, Springfield, MA 01108.

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

**Third Call Area:** all calls\* — Leon Lapkiewicz, K3GM, P.O. Box 6238, Philadelphia, PA 19136.

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

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

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

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

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

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

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

**Zero Call Area:** all calls\* — W0 QSL Bureau, Ak-Sar-Ben Radio Club, P.O. Box 291, Omaha, NE 68101.

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

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

**Canal Zone:** all calls — LPRA, P.O. Box 9A-175 Panama 9A, Republic of Panama.

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

**Alaska:** all calls\* — Alaska QSL Bureau, 4304 Garfield St., Anchorage, AK 99503.

**Guam:** AH2, KH2, WH2 and KG6 calls — MARC, Box 445, Agaña, Guam 96910.

**SWL** — Mike Witkowski, WDX9JFT, 4206 Nebel St., Stevens Point, WI 54481.

QSL Cards for Canada (VE and VO) may be sent to CRRL Central QSL Bureau, Kennebecasis Valley Amateur Radio Club, Box 51, St. John, NB E2L 3X1. Or, QSL cards may be sent to the individual bureaus.

VE1\* — L. J. Fader, VE1FQ, P.O. Box 663, Halifax, NS B3J 2T3.

VE2 — A. G. Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H3R 2E3.

VE3 — The Ontario Trilliums, P.O. Box 157, Downsview, ON M3M 3A3.

VE4\* — Larry R. Lazar, VE4SL, 30 Bathgate Bay, Winnipeg, MB R3T 0L2.

VE5 — Norm Waltho, VE5AE, 1547 Glendale St., W., Moose Jaw, SK S6H 7B3.

VE6\* — G. D. Holeton, VE6AGV, 4003 1st St., N.W., Calgary, AB T2K 0X2.

VE7\* — Burnaby ARC, Box 80555, South Burnaby, BC V5H 3X9.

VE8\* — Rolf Ziemann, VE8RZ, 2888 Lanky Ct., Yellowknife, NT X1A 2G4.

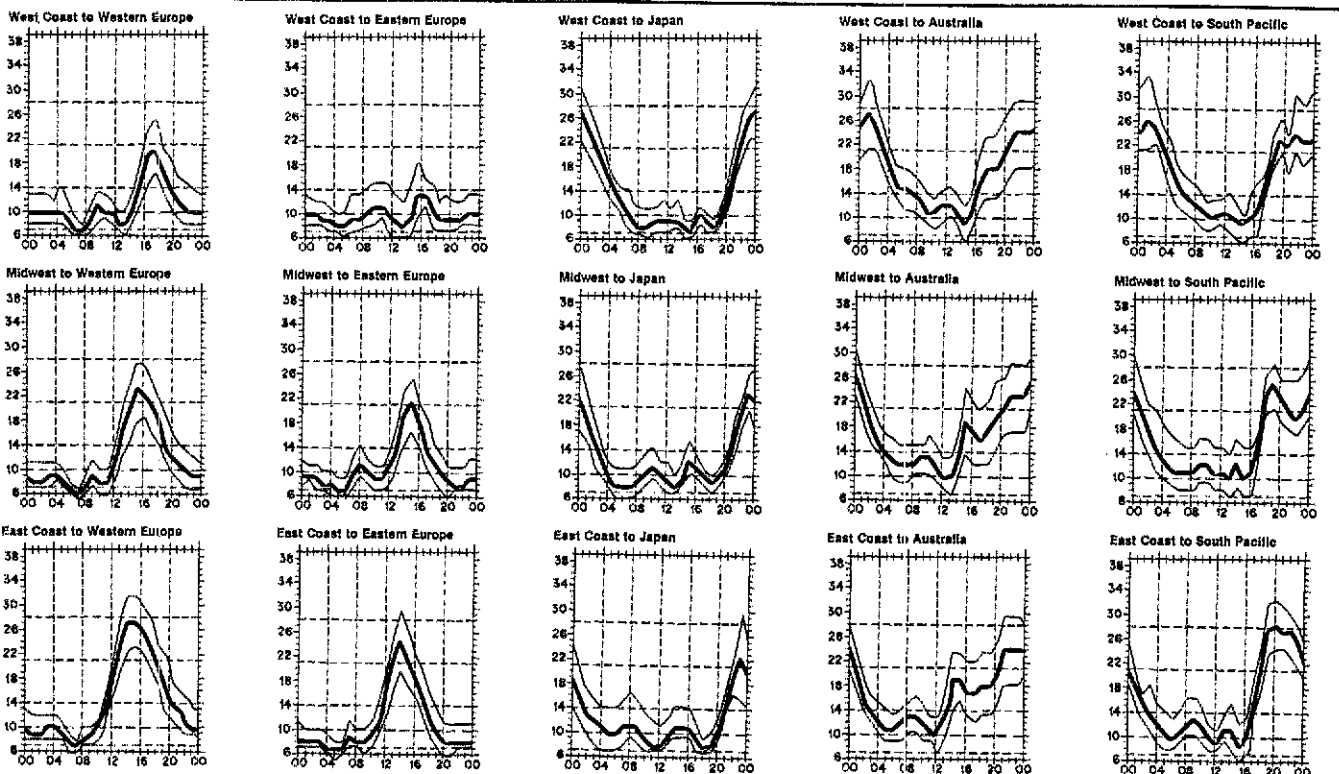
VO1, VO2 — CRRL VO QSL Bureau, P.O. Box 6, St. John's, NF A1C 5H5.

VY1 — ARRL QSL Bureau, W. L. Champagne, VY1AU, P.O. Box 4597, Whitehorse, YT Y1A 2R8.

\*These bureaus sell envelopes or postage credits. Send an s.a.s.e. to the bureau for further information.

#### Special Notes

□ September 1983 QSL Corner, page 71, contains information on the operation of the ARRL-Membership Overseas QSL Service. For information on bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.



lowest curve (optimum traffic frequency, or fof). 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 December 15, 1983 to January 15, 1984, assume a sunspot number of 76, which corresponds to a 2800-MHz solar flux of 126.



267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000

10680 AK1P G2B1H WDA46W G4E1F8 K1P10 K111H ON4D1H K6C7Y W9TK0 6441L W2R2L 918 W1000 K5F0K N121S 8421L K4K1K1 K7P1H W6YX W6R1N 27U W37H 6441K D5M21Z



Grid of numbers and letters, likely a crossword puzzle or a data table. The grid is organized in a regular pattern with some cells containing numbers and others containing letters. The text is dense and spans the entire page.



## How to Update the Boxes

Last month's column dealt with the Standings Boxes and their importance in documenting accomplishments on the bands above 50 MHz. This month, I will discuss the best ways to submit updates for the boxes and mention some of the criteria I have been forced to adopt in order to make them as meaningful as possible, as well as to prevent them from completely overrunning the QST space available to The World Above 50 MHz.

First, as I have said many times before, it helps a great deal if the reports are on my special reporting forms. The next best approach is a homemade or computer-generated list that follows the general format of the forms. The least desirable method, as it is the most difficult for me to process, is claims buried in letters or post cards. What can happen to these is that, try as I might, I can forget to put them in the proper file after reviewing their contents for possible use in the column. A similar problem can befall updates to the boxes with several bands reported on a single sheet of paper. First, I must decide which file to put them in. Then, I must remember to put them in another file after processing them for the box being updated at the time. My schedule does not permit me to process them as they come in. They go into files and are processed when I am updating a particular box. For those updates that are for more than one band, I must then remember to put them back into the proper file for the next band to be updated. This provides another opportunity for me to foul up. When updates for the EME Annals or the Six Meter DX box are included along with States boxes, the situation is particularly bad, as these go into files separate from those used for the States boxes. I do not have a copy machine, so it is impractical for me to make copies to put into the various files.

The reporting forms are very straightforward and easy to obtain. All it takes is an s.a.s.e. to the address given at the bottom of this page requesting the specific forms needed. There are two types: one for the Six Meter DX box and another for the other boxes. When you receive them, it would be well to make a few copies to put away for future use. Then, enter the data requested, using a separate form for each band and for the EME Annals. Before returning the completed form to me, make a copy for your own records. Later, when you update your information, do so on that copy. Again, make another copy for yourself before mailing the update to me. In this way, you always have a record of what you submitted last, and I can readily determine your current total. I can also easily check your total number of call areas in the case of the State boxes, and WAC for these and the Six Meter DX box.

Often, I receive notes to the effect that "I have three new states" or "two new countries on 6." Unless I am sure the number I published last

represents the number to which the update should be added, I have a problem determining the correct total. It is always possible that an earlier update was lost in the mail or even mislaid in my pile of paper. And please, remember to provide all of the vital information, such as name, address, call and date of the update. Your geographical coordinates are optional and nice to have for future reference, but not absolutely necessary if you don't know them.

Be particularly careful to include your call on each sheet! Believe it or not, some forget this important piece of information altogether. This can lead to some very time-consuming detective work, which all too often I find must be done at 2 A.M. the night before the manuscript has to be in the mail to Newington.

Aside from the reporting aspect, a few other things should be said about the Standings Boxes. First, they are listings, not awards. This means that the rules that govern awards need not necessarily apply to them. The rules for the boxes have evolved over the years with the help of input from readers and space constraints placed on the column. One significant departure from the norm long established for awards is that proof of contacts (QSLs) is not required for listing in the boxes. This is one of the most frequently asked questions. That's one reason I would like to have actual lists of stations contacted — one per state, country, etc. — not just a piece of paper stating the number of states or countries worked.

The other justification for this approach is that it helps me determine things such as the number of call areas worked or whether a symbol for WAC should be added. Many still do not include such information. Particularly in the case of the Six Meter DX box, it enables me to check for inclusion of countries for which credit cannot be given. Examples of this are contacts with stations operating in defiance of their governments' known policy with respect to the use of the band. Some include as separate countries such prefixes as VY1, VO1 and VO2. I have even found a few instances in which the U.S. or Canada are not listed when, obviously, these countries have been worked many times. I normally give these people the benefit of the doubt and add to their lists accordingly. If all I am provided is a total number of countries, I obviously cannot know whether these countries were included.

The other area in which a rule governing the boxes departs significantly from those established for ARRL awards is in the so-called DXCC Rule 9. For DXCC purposes, that rule was changed several years ago to state that all contacts made from within the same DXCC country count toward DXCC. Previously, Rule 9 had required that all contacts be made from within a 150-mile circle. For purposes of the box, I have been sticking with the old rule, believing that, with it, the box better reflects what can be done on the band. A number of letters have supported this approach. It is obvious that if one had spent considerable time over the past few years operating on the East Coast and then moved to California, he or she could have run up a very

impressive country total. What can be worked on 6 meters from the two coasts is completely different, whereas this is not nearly so true in the case of the hf bands. This may be an extreme example, but I think it illustrates the point. On the other hand, I know that imposition of the 150-mile rule works a hardship on some who have been forced by their work to move around.

One suggestion that has been advanced is that the total number of countries be listed, but that a symbol be included to indicate that multiple locations more than 150 miles apart were involved. Comments on this approach are invited. Of course, if someone actually attains 100 confirmed countries on 6 meters, the current Rule 9 must apply to issuance of the DXCC award.

Despite the fact that I always endeavor to get more vhfers to submit input for the boxes, the problem of available QST space dictates some limitations on how many stations can be listed. I am sure that no one wants the entire column devoted to lists of calls. Therefore, I have been forced to set some minimum standards for making the list. In the case of the Six Meter DX box, carried last month, it is 15 countries for U.S. and lower-tier Canadians unless the individual has WAC. For the states boxes, coming up with such a minimum standard is much more difficult, as it must vary with the part of the country. What I try to do is hold the number of listings for each call area to about 25. I have found it difficult to make this a hard-and-fast rule, however. There are just too many meritorious cases in which exceptions must be made. Therefore, I use this as a guideline not a rule.

One rule I have found necessary to institute is that of regular reporting. When I took over The World Above 50 MHz in April 1975, I found many listed in the boxes had not been on the vhf bands in over 20 years. They had run up very enviable records for the time they were active, but including them was taking up space that I felt could be devoted better to listing the achievements of currently active people. Thus, I instituted a new rule that those whom I had not heard from in the past two years would be dropped from the states box listing, unless they had achieved WAS.

Since that time, I have received letters from a number of old-timers asking why their call is no longer listed and would I please put them back in. My response is that I certainly will. What is required is a demonstration of continuing interest. It is not mandatory that a new state be worked in order to qualify for reinstatement, but I must be informed that you are still active on vhf and wish to remain in the standings.

Some have suggested that the states boxes be converted entirely to grid squares. This may be appropriate in view of the fact that they are of nearly equal size throughout the populated part of the earth; this tends to make the game fairer for more vhfers. I solicit reader response on this idea. Another approach would be to list both grids and states worked. I tend to favor this tack, but to date, very few have provided me with their grid totals, so I haven't begun such a dual listing. This

\*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

information is earnestly sought. The official forms have a place to designate grid-square totals.

Over the years, many have asked about publication schedules for the various boxes. They point out, and I agree, that knowing this would help them know when to submit updates. Again, because of space limitations and the way important news often breaks, it is next to impossible to hold to a rigid schedule. In general, I try to update the 2-meter, 1 1/4-meter, 70-cm and 23-cm



Some of the featured speakers (clockwise from left) who addressed the vhf sessions at the 1983 ARRL National Convention: W1HDQ, JA1RJU, VK8GB, AL7C and W6JKV.

## VHF AT THE NATIONAL CONVENTION

In this conductor's opinion, the 1983 ARRL National Convention was one of the best ever. Perhaps the major contributor to its success was the fine vhf program put on by SMIRK under the stewardship of Tex Kennedy, N5TX, Roy Albright, N5RA, and Ray Clark, K5ZMS. A well-balanced schedule of talks was available for all interested in the world above 50 MHz.

In the realm of vhf DXpeditions, W6JKV presented a very interesting slide program featuring his many travels, from The Gambia to the far Pacific. Jim emphasized that his journeys are not over. By the time you read this, he will have completed a trek to CEØ with K6MYC. For next summer, he has a visit to Greenland and possibly Navassa in mind. W6JKV is anxious to continue going to places most needed by the vhf gang. Now that he has had a taste of 2-meter EME, he may feel more disposed to include that mode in his equipment suite on many future trips. He is soliciting information on what countries are needed most by the 6-meter gang. Send any suggestions to me and I will pass them on.

Another interesting 6-meter DX operation — that of HC1MD to the Galapagos as HC8VHF in November 1981 — was another highlight of the vhf program. Unfortunately, Rick could not be present because of professional commitments, but he sent his slides and an audio tape of his talk, so it was almost like having him there.

On the technical side, WA8OGS provided the lowdown on constructing large vhf Yagis, including information on proper stacking. WA8ONQ imparted his considerable knowledge on the design and construction of high-power amplifiers for the vhf bands. To this conductor, one of the most interesting presentations was that of the founder of this column, Ed Tilton, W1HDQ. Ed discussed high hf and vhf propagation and how it is affected by events on the sun. Also in the area of propagation, AL7C presented a very interesting talk on aurora, including some beautiful color slides taken in KL7-land. As another vhf program highlight, VK8GB provided a good insight into propagation from his area of northern Australia. Graham displayed an excellent knowledge of the general subject of exotic vhf ionospheric propagation, especially with respect to some of the types taking place in and across the equatorial region.

As good as the formal sessions were, they were not the high spot of the Convention as far as I am concerned. The most enjoyable thing was being able to meet so many vhfers from this country and throughout the world. Among the vhf DX dignitaries present were KH6IAA, KL7NO, AL7C and his XYL AL7FH (ex-KL7HMH), VK8GB, LU7DZ, ZLIMQ, JA1RJU, G3FXB and EI9D, who represented EI2W and ably presented a talk that Harry had prepared for the Sun-

states boxes twice per year, and the 6-meter DX box and the EME Annals once per year.

Beginning in 1984, I will try to adhere to a schedule for updating the 2-meter box in January and July, the 1 1/4 box in February and August, the 70-cm box in March and September, and the 23-cm box in April and October. The EME Annals is to be run in December, and the 6-meter DX box in November each year. Absolute deadline for each column is the 15th of the sec-



day morning SMIRK breakfast.

Add all of these vhf goodies to a fine job done by those who organized the general program, which included a tour of the Johnson Space Center, a first-class women's program and a wide variety of talks on DX to QRP, along with an ample helping of Texas hospitality, and you had an excellent National Convention.

## ON THE BANDS

**6 Meters** — Early indications are that we may be in for some interesting times this fall, after all. Many had written off 50-MHz F<sub>2</sub> propagation as something we might experience again in 1990. But, reports received as of early October tell of several good South American openings, and not just to the Southern states. K1DH near Hartford, Connecticut, reports working LUs 8DIO, 9AEA, 6DLB, 4DGN, 2DEK, 7DZ and 3EX between 2230 and 2340Z September 20. Don said that 4s in Florida were coming in well at the time, so an E-to-TE linkup could have been responsible. He indicated that others in the local area were unable to hear the Argentine stations, although they were receiving the 4s. There are also reports (not directly to me) that several 2s worked into Chile during the same period. W8MVE Republic, Ohio, reports working LU7DZ on the same date at 2120Z. From farther south, W9AGH/5 Houston says that September 25 brought a QSO with LU8YYO at 2027Z and the HC2FG beacon was heard. In a report passed along by W5DZF/4, K1FJM/4 got in on another opening to LU on October 3 about 2100Z.

K8EFS passes along the results of the late June DXpedition to St. Kitts. Using the calls VP2KBB, KBI, KBJ and KBK, the group racked up 244 6-meter QSOs in 18 states and 10 countries during their 17-day stay on the island. Best DX was K7KV Seattle. Strangely, no 5s, 6s or 9s were worked. Andy says that, as this is being written in early October, the QSLs are at the printer.

A very interesting vhf DXpedition is reported in the 4-2-70 column in the October issue of *Radio Communication*, the journal of the Radio Society of Great Britain. In late July, G8APZ took gear to Andorra to operate under the call C31XV. Through a stroke of good fortune, he was given permission to work 6 meters. Luck also smiled in terms of propagation, as an after-TV-hours E<sub>s</sub> opening produced two-ways with G5KW, G13ZSC and GW3MHV, as well as a number of crossbands. In addition, G4IJE, G4HUP and G3W3LDH picked up the rare new country via m.s.

**2 Meters** — If there were such a thing, WA6MGZ wonders if he does not qualify for the Region 2 144 MHz DX record via EME. His contact with ZS6AYL is noteworthy, in any case. The distance is about 10,670 miles, which does not provide much com-

ond month preceding the QST cover date. For example, this column is being written in October. I cannot promise to maintain this publication schedule to the letter, since major happenings on the bands must take first priority. But it is my intention to follow the schedule if possible. As always, comments are invited on the fairness and applicability of these "rules" and publication schedule as well as the general administration of the boxes.



mon visibility time. Chuck's antenna system is very interesting. It consists of six 13-element KLM Yagis in a circular configuration mounted on a 54-foot crank-up tower. Sharing the same mount are a 5-element 6-meter beam, a 14-element 1 1/4-meter beam, two stacked 19-element RIW Yagis for 70 cm, a 4-foot dish for 23 cm and a 2-foot dish for 13 cm. He sent me a drawing of the whole installation. Anyone wishing a copy should drop me an s.a.s.e.

In response to many complaints on how 144.2 is used, KC5IJ suggests a new approach. Len recommends that each area establish its own meeting frequency. Thus, when attempting to work into that area, one would select that frequency. During massive openings, such as E<sub>s</sub> or tropo, activity would naturally be spread out instead of being bunched up on one frequency as usually happens under current operating habits. KC5IJ notes that he is now the treasurer for SWOT. All membership correspondence should be addressed to him at 1704 Glenn, Fort Worth, TX 76131.

**The Higher Bands** — W5DFU Tulsa, Oklahoma, passes along some information concerning his operating on 70-cm ATV and his 23-cm operation. Even though it occurred last summer, I think it of sufficient interest to include it at this time. Last June 30, a local called to tell Warren that WA9BTT Vermont, Illinois, wanted to try to work him on ATV. He immediately fired up on 439.25 and exchanged usable pictures, including color, over the 500-mile path. The two maintained communication on 144.340 ssb during the half-hour ATV QSO. Despite good conditions, neither could scare up any other TV stations. Both stations use MBM-88 J Beams. W5DFU's ATV transmitter runs 300 W, while that at WA9BTT puts out about 100 W. This is believed to be the first ATV two-way between Oklahoma and Illinois.

W5DFU's activity is not confined to ATV, although it is one of his major interests. A week after his QSO with WA9BTT, he worked W9ZIH near Chicago on 432.1 ssb. Conditions were good enough to encourage them to try to work on 1296.1. A blown GaAs FET at W5DFU prevented contact that evening, but they made it the next. On 23 cm, W9ZIH runs 400 W to four 32-element loop Yagis, while Warren's homebrew pair of 7289s puts out 150 W to a single 45-element antenna of similar design. One very interesting aspect of his 23-cm installation is that he uses "G-Line." His is the first use of that type of feed line this conductor has heard of in many years.

An example of how the activity on the higher bands is increasing can be gleaned from the September QSO Party summary of W2SZ/1. The group, operating from Mount Greylock in western Massachusetts, took advantage of a Sunday evening tropo opening to the Midwest to work a number of 8s and 9s on 70 and 23 cm. In all, they had 185 QSOs in 41 grids on 70 cm, and 47 QSOs in 24 grids on 23 cm. Even up to 3 cm, they had 9 QSOs in 8 grids.

# Canadian NewsFronts

Conducted By Harry MacLean,\* VE3GRO



## CRRL Officers and Directors

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## National ARES Program

ARES, the League-sponsored Amateur Radio Emergency Service, is active in most parts of Canada, ready to supply backup communication in times of local or regional emergency. What would happen, however, if an emergency were national in scale? What would happen, for instance, if a winter storm were to take out normal channels of communication in over half of Canada? Would we be ready?

At Minute 6 of CRRL Board Meeting No. 4, held on July 4-5, 1982 in Saskatoon, Saskatchewan, the CRRL Board of Directors appointed Jack Strangleman, VE3GV, to become CRRL National Emergency Communications Advisor with responsibility for developing a national ARES program. Jack keeps busy as Ontario Section Emergency Co-ordinator, but he's taken time to do some homework. He sees the national program as developing in four stages:

### 1) Establishment of a Central Canadian

*ARES File.* This would include the names, addresses and telephone numbers of key personnel in all Canadian Sections, information about Section nets and details of Section ARES activities. Such a file would be of great value when making representations to national organizations, such as Emergency Planning Canada, and indispensable in time of emergency.

### 2) Implementation of a Canadian ARES Net.

This net would bring together Section Managers, Section Emergency Co-ordinators and Section Traffic Managers for planning, and be a means by which ARES personnel could co-ordinate their efforts in time of emergency.

### 3) Development of a Canadian ARES Plan.

This would be for later — when personnel in the Sections become comfortable working with each other, when they agree on what they can and should be doing in time of emergency.

### 4) Possible Extension of the Canadian ARES Net to Become a Canadian Emergency and Traf-

*fic Net.* This is a controversial proposal. Many Canadian amateurs want such a net. They say they would take pride in moving Canadian point-to-point traffic totally within Canada. However, NTS, the bi-national National Traffic System, continues to serve Canada well. Also, it seems doubtful that there would be enough operators to support a new traffic link. More discussion will be needed on this proposal.

This is not the first program along these lines that has been tried in Canada. Why should this one succeed while others have failed? Basically because it's not starting from scratch. ARES is active in most parts of Canada. All that's really needed is some careful co-ordination of what's already in place and working well.

Still, it's an ambitious project. Jack Strangleman is to be commended for taking it on. Its success could be vital. We hope Jack receives every support.

## SPECIAL CALL SIGNS FOR SABLE AND SAINT PAUL'S

Early in September DOC rejected a CRRL request for permanent special prefixes for Sable and Saint Paul Islands, two unique parts of Canada that have DXCC "country" status. As a result of further discussions with CRRL Atlantic Director Andy McLellan, VE1ASJ, however, DOC reconsidered the matter and agreed to create two special permanent call signs for use by DXpeditions: CY9SAB for Sable and CY0SPI for Saint Paul's. (The numerals 9 and 0 were chosen so the call signs could not be mistaken for special-event call signs in VE1-VE8.)

The CY0SPI call sign got a real workout during the last week of September. Andy McLellan and a group of VE1 and W1 amateurs operated 160 to 2 metres using cw, phone and RTTY, making a total of 20,186 contacts during a 10-day DXpedition to Saint Paul's. Much of their success was because of the special call sign provided by DOC.

## CRRL AMATEUR OF THE YEAR

Bill Gillespie, VE6ABC, of Edmonton, Alberta, is CRRL Amateur of the Year. Bill is Alberta Section Traffic Manager, a District Emergency Co-ordinator, manager of two traffic nets and an Official Bulletin Station. He operates the Alberta Tube Bank and maintains a Western depot for CRRL supplies and materials. During winter months, he provides on-the-air code practice that has helped amateurs all over Western Canada to get their tickets. Despite all this, Bill always seems to find time to take on "one more job" to help others. Bill will be presented with his award this month, likely at an early meeting of Northern Alberta Amateur Radio Club.

## CRRL NEWS

At presstime, the CRRL Board of Directors plans to meet by conference telephone call on November 20.

Among the topics scheduled for discussion are the national ARES program, production of new CRRL licensing manuals and questions and answers book, possible CRRL sponsorship of the annual Can-Am contest and long-range plans.

That videotape with the accent on space communications, *Amateur Radio's Newest Frontier*, is receiving excellent use across Canada. To borrow a copy, contact one of these CRRL reps and workers: VE7CSD, VE5WM, VE3GSO, VE3CDM and VE2FNK. Locations and telephone numbers are listed in last month's Canadian NewsFronts.

CRRL membership is holding steady at just under 5000. This is excellent considering the difficult economic times experienced by many amateurs, and the fact that CRRL membership dues have increased twice during the past two years.



August 27, 1983: the Brooks/CJME Downtown Dash in Regina, Saskatchewan. With runners approaching, Bill Wood, VE5AEJ, sends a progress report through the VE5RRG repeater. Twelve members of Regina Amateur Radio Association assisted in this event. (VE5WM photo)

## DOC EXAM DATES

Planning ahead? DOC will hold its 1984 Amateur Radio exams across Canada on February 4, April 18, June 20 and October 17. Applications must be submitted by January 11, March 21, May 23 and September 19, or about one month before the date of each writing. Remember, all examinations will now be based on the revised version of DOC's new TRC-24.

## NOTES FROM ALL OVER

About 50 amateurs attended the CARF National Symposium held in Halifax, Nova Scotia, October 14-15. CRRL was represented by Maritime-Newfoundland Section Manager Don Welling, VE1WF. Don found the atmosphere friendly and the discussions productive. We'll report on some of the recommendations next month.

It's likely a new record for Canadian amateurs. On October 2, VE1BCZ and VE2s AQU, DUB, DWG, HAK and XL completed a 122-km 10-GHz contact between Mount Mansfield, Vermont, and the Westmount lookout on Mount Royal, Montreal, Quebec. Equipment included 6 metre dishes at both ends. Co-ordination was via 2 metres.

On August 27, members of the Regina Amateur Radio Association provided radio communications for the "Brooks/CJME Downtown Dash" — an event hosted by Regina's Market Square, and officially sanctioned by the Saskatchewan Track and Field Association. Race director was Audrey Perra, assisted by the Pile O'Bones Striders. The first annual 10K and 5K event attracted 565 runners from 4 to 70 years of age, and the way things went, it appears that amateurs will be part of the "Downtown Dash" from now on.

In co-operation with DOC, and British Columbia and Yukon industry, the British Columbia Arts, Science and Technology Centre put on a special display to mark World Communications Year. CRRL Pacific Director Bill Kremer, VE7CSD, and amateurs in the Greater Vancouver area set up the Amateur Radio display and operated special-event station VE7WCY.

Finally, on behalf of the CRRL Board of Directors and your CRRL reps and workers across the country, a happy holiday season to all. Hope 1984 is your best year ever.

\*163 Meridene Crescent West, London, ON N5X 1G3, tel. 519-433-1198

### Waveguide-to-Coax Transitions

From time to time, it is useful to have a waveguide-to-coax transition available. Some uses for such a piece of equipment are to couple the output of a waveguide transmitter to the input of a TWT amplifier (often coaxial even at 10 GHz) or to couple together two pieces of a waveguide system with a flexible link (most waveguide isn't very flexible!).

Fortunately, a waveguide-to-coax transition is very easy to build. Fig. 1 shows a drawing of such a transition. It consists of a coax socket (usually a type N socket is used, though an SMA would also be good) mounted on the broad face of the waveguide, with the center pin extended into the guide as shown. With the dimensions given in Fig. 1, a reasonable match to a 50-ohm coaxial line should be obtained.

It should be noted that the dimensions given in Fig. 1 are in units of  $\lambda_g$ , the wavelength in the waveguide. This is not the same as the free space wavelength ( $\lambda$ ) but is modified by a factor  $\lambda_c$ , the waveguide cutoff wavelength. The relationship between the two is given by

$$\lambda_g = \frac{\lambda}{\sqrt{1 - \left(\frac{\lambda}{\lambda_c}\right)^2}} \quad (\text{Eq. 1})$$

$\lambda_c$ , the cutoff wavelength of a waveguide, is given simply by

$$\lambda_c = 2a \quad (\text{Eq. 2})$$

#### REGION 1 RECORDS

In the August 1983 New Frontier column, I reported the New Zealand 3300-MHz DX contact of 545 km and commented that it was believed to be a new world record. I recently received a letter from Rolf Niefind, DK2ZF, the vhf editor of *CQ-DL*, pointing out that this is not correct since the current Region 1 record is 566 km. The QSO was made on October 30, 1981 between DL7QY and DF9LN. Thanks to Rolf for the correction.

#### LEAF ATTENUATION

As anyone who lives around trees will have found out, leaves absorb rf energy — particularly microwave energy. While it is not possible to predict exactly how much attenuation leaves will cause, it is possible to give an average of a number of different determinations to

\*103 Division Ave., Millington, NJ 07946

**Table 1**  
Dimensions for Waveguide-to-Coax Transition

Band	Freq. (MHz)	Wavelength $\lambda$ (cm)	Waveguide EIA	ID (In.)	$\lambda_c$ (cm)	$\lambda_g$ (cm)	D (mm)	L (mm)	d (mm)
1.5 cm	24,192	1.239	WR42	0.42 × 0.17	1.239	1.522	1.83	2.44	0.041
3 cm	10,368	2.891	WR90	0.90 × 0.40	4.572	3.733	4.48	5.97	0.100
6 cm	5,670	5.205	WR187	1.872 × 0.872	9.510	6.219	7.46	9.95	0.166
9 cm	3,456	8.679	WR284	2.840 × 1.340	14.43	10.854	13.24	17.37	0.291

ID = Inside dimensions  
 $\lambda_c$  = Waveguide cutoff wavelength  
 $\lambda_g$  = Wavelength in the waveguide

D = Distance from shorted end to probe center  
 L = Probe length  
 d = Probe diameter

where  $a$  is the internal dimension of the broad face of the waveguide.

The insertion loss of a transition of this type should be less than 1 dB. The transition may be tuned for minimum loss by adjusting the dimensions. This is greatly facilitated by the use of an adjustable waveguide short rather than a fixed rear wall located  $0.12 \lambda_g$  from the probe. Alternatively, the wall can be located  $0.62 \lambda_g$  from the probe, and a tuning screw inserted in the waveguide.

Dimensions for the most commonly used waveguides for the bands from 1.5 to 9 cm are given in Table 1. The basic dimensions of the waveguide-to-coax transition are taken from the *RSGB Microwave Newsletter*, No. 09/82.

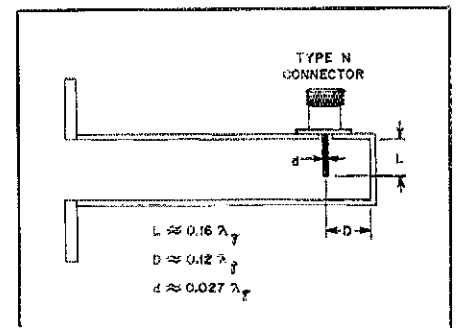


Fig. 1 — Construction of a waveguide-to-coax transition.

get some idea of the magnitude of the effect. The following table lists values of leaf attenuation for the amateur microwave bands. The results are for average leaf density on an average tree (the definition of which is left to the reader!).

Frequency (MHz)	Attenuation (dB/meter)
1296	0.17
2304	0.34
3456	0.54
5670	0.95
10,368	1.85

Attenuation will probably increase for wet leaves, and decrease in the fall as the leaves dry out. If any readers have made measurements of leaf attenuation, I would be most interested to hear of the results.

#### 13-CM EME NEWS

More activity is developing on 13-cm EME. I use the

designation 13 cm rather than 2304 MHz since the European activity is now exclusively at 2320 MHz (2304 MHz is no longer an amateur frequency in some European countries). G3WDG has been taking part in listening tests with DF0EME (nice call sign!). He reports "armchair copy" using a 13-ft dish and a 1.6-dB preamp with DF0EME running 1 kW, and "O" copy with them running 150 W. The fading on the lower power signals was reported to be much more rapid than is usually heard on lower-frequency EME signals, without the "pings" and "nulls" often heard on the lower bands. It is reported that VE4MA, G3WDG/G4KGC, DF0EME, LX1DB, OK1KIR, OE9XXI and W4HHK have listening and/or transmitting capabilities for 13-cm EME. Several other stations (YU, SP, OZ and W) have expressed active interest in 13 cm EME. Currently, the DF0EME group is running tests with horizontal linear polarization on 2320.200 MHz, but circular polarization will probably be available soon. They are using a 30-foot-diameter dish for their 13-cm EME tests.

### Strays

I would like to get in touch with...

□ any hams associated with a 4-H group. Leo Kluger, WB2TRN, Recruitment Program Manager, ARRL, 225 Main St., Newington, CT 06111.

□ other Quakers who are interested in forming a net. R. Z. Plasencia, W0RPV, P.O. Box 1195, Cedar Rapids, IA 52406.

□ amateurs with a station aboard any retired or decommissioned naval vessel. Sunset Empire ARC, RFD 3-Box 75, Astoria, OR 97103.

**QST congratulates...**

□ Roanoke Division Director Gay Milius, Jr., W4UG, on being elected President of the Virginia Council of Chapters of The Retired Officer's Association.

□ W. D. "Doc" Bemmels, W0KLL, of Ottawa, Kansas, on receiving the Kansas Amateur of the Year Award from the Kansas-Nebraska Radio Club.

□ Dr. Thomas Linde, KZ0T, of Knoxville, Iowa, on being one of five winners of the Rose and Jay Phillips Award, presented annually by the Courage Center to individuals who have achieved vocational success despite severe handicaps.

□ Felix Karpinski, WB4AOG, on being appointed Emergency Radio Communications Director for the City of Zephyrhills, Florida, Civil Defense/Emergency Preparedness.

□ John B. White, W3VJF, of Natrona Heights, Pennsylvania, on being elected Vice President of Glass Technical Services at PPG Industries.

## Bored with HF Competition? Try VHF!

Have you noticed a recent decline in DX pileups? Is it getting more difficult to add to your DXCC totals? Do you miss the 10-meter DX openings? Is it no longer possible to maintain high contest QSO rates on 10 and 15 meters? With declining sunspot activity and lack of "new" DXCC countries (hardly any possibilities are left), satisfying the competitive nature of the active hf radio amateur is becoming more and more difficult.

Well, there is a solution. Utilizing the "200 meters and down" spirit and initiative of yesteryear that opened up the "useless" short-wave portion of the spectrum, many more amateurs are turning their competitive drive loose on 6 meters and down. It is not uncommon now to hear the 300-plus-countries DXer practicing competitive skills above 50 MHz. Without readily available equipment, vhf has heretofore been primarily inhabited by tinkerers. With the marketplace now producing a variety of vhf ssb/cw radios, those more inclined to practice the operating arts are now more in evidence on vhf. As K2RIW said on his 432-MHz VHF QSO Party entry: "I believe the availability of equipment is causing the beginning of an exponential increase in activity."

It is no longer unusual to hear the DX Contest winner of yesteryear exhibiting the same skills on 144 MHz learned while digging out the weak ones on 80 meters. And the hardware specialists who previously put up 40-meter Yagis are now building multi-bay arrays for 432 and 1296 MHz. Concurrently, the League's operating program has kept pace to nurture this operating revolution.

A significant factor in stimulating this new operating enthusiasm on vhf/uhf has been the introduction of the grid square locator, so long successful in promoting activity in Europe.<sup>1,2</sup> This and other ARRL VHF contest enhancements have been the result of the efforts of the Ad Hoc Committee for vhf/uhf Contesting. The activities of this committee have been previously documented in QST.<sup>3</sup>

The most recent contest modification instituted by the Committee has been the introduction of the Maidenhead grid square as the multiplier in the August UHF Contest and the September VHF QSO Party. Comments on logs have overwhelmingly favored this move. Here's just a small sample: "Grid squares turned a boring contest into an exciting one" — K2LWR. "Love the grid square exchange. Greatest thing since my neighbor sold his 2-meter ssb rig" — KC4EG. "Grid squares are a real incentive to get people on the air from less populated places"

— K7ICW. "Grid squares added a lot of excitement" — AJIE. "Callers now persist to work both VE7 mountaintop groups, because they are in different grids. Under the old Section multiplier, we were just another QSO" — VE7ASI. "Look forward to using grid locator exchange in all VHF contests someday" — WASYOU.

In its continuing effort to improve the contest program, the VHF Contest Committee has a couple of straws out in the breeze. It has been suggested by some that the September QSO Party be moved to August to take advantage of the Perseid meteor showers. This would necessitate moving the UHF contest to September. The

criticism offered is that this puts the more popular VHF Party too close on the calendar to the June Party, and in the heart of vacation time. Also under study is the amount of QSO point-spread necessary to encourage microwave activity, as well as the role of channelized contest communication. Your thoughts on these and any other vhf/uhf contest matters are desired by the Committee. A letter via ARRL Hq. gets full Committee distribution. We want to hear from you!

And if you're looking for new operating worlds to conquer (how about the new VHF/UHF Century Club award?), why not turn your sights to the very high frequencies?

### W1AW Schedule

October 30, 1983 — 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	Fast Code Practice	Cw Bulletins	Teleprinter Bulletins	Voice Bulletins
	MWF: 0300, 1400; TThS: 0000, 2100; Sn: 0300, 2100	MWF: 0000, 2100; TTh: 0300, 1400; S: 0300; Sn: 0000	Dy: 0100, 0400, 2200; MTWThF: 1500	Dy: 0200, 0500, 2300; MTWThF: 1600	Dy: 0230, 0530
EST	Slow Code Practice	Fast Code Practice	Cw Bulletins	Teleprinter Bulletins	Voice Bulletins
	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.	Dy: 9:30 P.M., 12:30 A.M.
CST	Slow Code Practice	Fast Code Practice	Cw Bulletins	Teleprinter Bulletins	Voice Bulletins
	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.	Dy: 8:30 P.M., 11:30 P.M.
PST	Slow Code Practice	Fast Code Practice	Cw Bulletins	Teleprinter Bulletins	Voice Bulletins
	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.	MWF: 1 P.M., 7 P.M.; TTh: 8 A.M.; TThSSn: 4 P.M.	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.	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.

Slow code practice is at 5, 7-1/2, 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 15 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 7:30 A.M. to 1 A.M. EST and on Saturday and Sunday from 3:30 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 December 25 and 26, January 1 and 2, February 20 and April 20. 

<sup>1</sup>J. Lindholm, "VHF/UHF Century Club Awards," QST, Jan. 1983, p. 49.

<sup>2</sup>J. Lindholm, "Grid Locators for South America," QST, Oct. 1983, p. 52.

<sup>3</sup>Operating News: QST, Nov. 1982, p. 98, Feb. 1982, p. 86, and Aug. 1981, p. 80.



**President:** Richard L. Baldwin, W1RU  
**Vice President:** Carl L. Smith, W0BWJ  
**Secretary:** David Sumner, K1ZZ  
**Assistant Secretary:** Naoki Akiyama, JH1VRO/N1CIX

**Regional Secretaries:**  
**C** Eric Godsmark, G5CO  
Secretary, IARU Region 1 Division  
"Pebblemead", The Old Court  
Mantle Street, Wellington,  
Somerset TA21 8AR  
England

**Alberto Shaio, HK3DEU**  
Secretary, IARU Region 2  
9 Sidney Lanier Ln.  
Greenwich, CT 06830  
USA

**Masayoshi Fujioka, JM1UXU**  
Secretary, IARU Region 3 Association  
P.O. Box 73, Toshima  
Tokyo 170-91  
Japan

The International Amateur Radio Union — since 1925, the federation of national Amateur Radio societies representing the interests of two-way Amateur Radio communication

## 1984 RSGB National Convention

If you're traveling to Great Britain next spring, you might want to include the RSGB National Convention in your plans. It will take place on April 28-29, 1984, in Birmingham. The exhibition site is only, we're told, a two-minute walk from Birmingham Airport (that's mighty close, friends!) or a five-minute drive from British Motorway M6. Or, take British Rail from Euston in downtown London, and an hour and a half later be at Birmingham International. RSGB expects more than 10,000 visitors, and there will be a comprehensive trade show and lecture program. For further information you can write to RSGB, Alma House, Cranborne Rd., Potters Bar, Herts. EN6 3JW, England

### HL1IJ

We regret to report that Lim Sang-Ki, HL1IJ, was one of the passengers onboard KAL Flight 007, which was lost on September 1, 1983.

### DARC-WCY AWARD

A reminder that the DARC WCY-Award is sponsored by the Deutscher Amateur Radio Club in commemoration of World Communications Year 1983. Work 15 special WCY stations on hf (or five on vhf), any mode, any band. Send your list of WCY contacts (confirmed by two other radio amateurs) along with a fee of 5 DM, or \$3 U.S. or 10 IRCs, to the DARC WCY-Award Manager, Hans-Peter Günther, DL9XW, Am Strampel 22, D-4460, Nordhorn, Federal Republic of Germany. Contacts have to be made prior to the end of 1983.

### IARU PIONEERS

Until recently, there were, to the best of our knowledge, only two persons left alive who had attended the original organizational meetings of IARU in Paris in 1925. One was Col. William C. Borrett, VE1DD, who died at the age of 89 on July 18, 1983. VE1DD was the founder of the first commercial broadcasting station in Nova Scotia and was active in many civic affairs. He took part in some of the very first transatlantic QSOs and was a leader in ARRL activities in the Halifax area during the early days.

We are glad to report that Jean Wolff, LX1JW, now the only surviving member of the



Pedro Seidemann, YV5BPG (center), was elected President of IARU Region 2 at the Call Conference in June. Pedro has also served Region 2 as Secretary for the past three years and was one of the members of the IARU WARC-79 team in Geneva. With him are Region 2 Vice President YN1FI (left) and Region 2 Secretary HK3DEU. (photo courtesy LCRA)

1925 IARU meetings, is alive and well. He attends every important Amateur Radio meeting in Europe, and is a frequent visitor to the States. No one who has an opportunity to chat with LX1JW should pass it up.

### ILLEGAL MARITIME MOBILE OPERATION

We are receiving an increasing number of comments of concern relative to the illegal use of Amateur Radio by sailing enthusiasts. We are, of course, delighted that Amateur Radio is such a useful service and that it can provide vital communications for those who travel beyond the horizon.

But, at the same time, we must be concerned that illegal practices or operation do not in any way jeopardize the high respect in which we are held internationally. Those administrations that reportedly issue amateur licenses with the only requirement being the payment of a fee should be urged not to continue that practice. Those individuals who simply appropriate what they think to be an unused call sign and operate without benefit of any amateur license should be urged to go through the relatively painless process of obtaining an amateur license in the customary fashion. No one wishes to deny vital



Ham Fair '83 was held in Tokyo August 19-21, and JARL had invited ARRL to participate. The ARRL booth was right next to those of IARU Region 3 and JARL. ARRL staffer N1CIX (seated, with JARL President JA1AN to his left) manned the ARRL booth, while IARU Region 3 Secretary JM1UXU and JARL External Affairs Manager JA1CLN manned the other two booths, making a neat WCY block. About 38,000 enthusiasts attended Ham Fair '83, including 55 visitors from 16 countries.

communications to those who need them, but neither do we want the actions of a few to jeopardize the privileges of the majority.

\*President, IARU



## Angels and Eagles

In the early days, Norfolk Island was referred to as suitable only for "angels and eagles." This has since changed with the airstrip built during WW II. Today, the island attracts 20,000 tourists each year. Norfolk Island's area covers three by five miles; it's very hilly and dominated by Norfolk Pine (Aurokaria). The population lives on the plateau, about 200 feet above sea level. The island slopes on the south side, where you can drive to sea level and find beautiful beaches. Emily Bay is the most popular beach, a nice lagoon with crystal clear water and no sharks.

### Norfolk Island's One and Only YL

Kirsti Jenkins-Smith, VK9NL, is Norfolk's only YL Amateur Radio operator. If you haven't had a QSO with VK9NL, perhaps you have worked her from Samoa as 5WIDK, or from Sarawak in East Malaysia as 9M8NL, or from Heard Island as VK0NL (the first YL operator from that island). Any one of these Amateur Radio calls would be a thrill for anyone to hold — just for a few days! Kirsti, at the young age of 47, has held them all. As a young girl, Kirsti wanted to travel — that's where it all began.

After WW II, ship radio operators were in short supply, so women were welcomed to help in filling the ranks. By the time Kirsti finished high school, women shipboard operators were an acceptable phenomenon. She wanted to travel, preferably by ship, and had no doubt as to what would come next in her life. She left home to attend a Maritime College. Kirsti looked with some misgivings at all the paraphernalia she was supposed to learn to operate, service and repair by the time she left college. The students were force-fed radio theory, Morse code, regulations and English (this was in Norway) from 8:30 A.M. to 3 P.M. every day of the week except Sunday. This was coupled with stacks of homework. Most students survived it and were snapped up as licensed operators as soon as they became available.

Then followed four years at sea. Kirsti started on an old iron ore carrier in 1956. The first trip left Liverpool, England, bound for Monrovia, Liberia. She was terrified at finding herself in charge of the ship's radio station with no one to ask for advice. The station was old and "inclined to play up." It wasn't a matter of switching on the rig in those days. First, the converter, located under a table, had to be started in order to convert dc to ac for the necessary transmitter voltages. Next, the transmitter had to be tuned up, with all the meters being watched carefully. Kirsti used cw exclusively aboard that ship.

In addition to being radio operator, she served as the Captain's secretary, a job having nothing to do with shorthand. Rather, it was being paymaster as well as preparing ship's papers for arrival in port, and meeting with immigration and health authorities. The radio duties included



Kirsti Jenkins-Smith, VK9NL

normal traffic, weather forecasts and radio press. Watch was kept on the international distress and calling frequency of 500 kHz. Navigational warnings, information on other ships in the region and sudden gale warnings were all learned via this frequency.

Kirsti enjoyed her years at sea, but since it had no future for a mother, she eventually retired. She, along with her husband and their first-born, returned to Norfolk Island in 1963. Her husband was an "islander," and the island was his home. Being an islander means you are a direct descendant of the *Bounty* mutineers. The island has had quite an influx of new blood over the years, but "islanders" retain their traditions and their own language (a mixture of English and some Tahitian).

In 1980, some time after Joe, her first husband, had passed away, Kirsti decided to take up Amateur Radio. Their three children, John, Arne and Ruth, were growing up and she needed a hobby. Later, she met and married Jim, VK9NS, and their ham life has been hectic ever since. They are both fairly active on the air, resulting in much of their time being spent with QSL chores. They mail hundreds of cards each month. When they go on holidays, they usually take along their rig.

### From One Rare Spot to Another

For DXpeditions to tropical paradises — places easily accessible by air, with electricity "on tap" and good restaurants around the corner — Kirsti feels are no hassle. This sort of DXpedition is good fun and not much of a strain. The only problem is carrying the heavy luggage with one arm while sometimes balancing an antenna under the other. Western Samoa and Sarawak fall into this category. Western Samoa is everything one expects from a South Sea Island. Kirsti and Jim stayed at Aggie Gray's hotel in Apia. It was comfortable, attractive and surrounded by a lovely garden with little stone paths and an abundance of tropical flowering shrubs and palms. The swimming pool was large enough to warrant its own desert island with a lonely

palm. Kirsti felt that the Garden of Eden must have been something like it.

Sarawak was a little different. Here, they rented a flat in the bustling town where the narrow streets were lined with Chinese shops. Unspoiled by commercial tourism, Sarawak was a pocket of old world charm with friendly, hard-working people.

Before you visit such places, it helps to contact local hams. You will find them extremely helpful with bits and pieces. Proper planning is important no matter where one goes DXpeditioning. Licenses must be obtained beforehand and, of course, it is important to ascertain that proprietors do not object to guests who want to set up antennas. Properly organized, such DXpeditions to inhabited places do not meet with too many problems.

Then, there was Heard Island. Just getting there was complicated. It involved weeks of traveling through what have been termed the roughest seas in the world. The fact that the island is uninhabited meant that everything had to be brought in — everything from a box of matches and a "tin" opener to generators and gas cylinders, food, radio equipment, antennas, lamps, furniture, and on and on. Months went into the planning. The voyage took weeks, and they were there for 11 days. The climate on Heard Island was miserable — cold, wet and windy. The wildlife, with penguins and seals dominating the shores, is unique.

Heard Island is so remote and isolated that expeditions are rarely undertaken. The cost, the problems, the risk, the time factor — they're all just too much. But, Kirsti wouldn't have missed it. Being the first YL on Norfolk Island just happened that way. Being the first YL operator from Heard Island was something else; it required much more and, in Kirsti's view, so it will be for the second YL, the third YL and any other who may one day find herself on that island. You must be prepared to rough it and be grateful if you have a roof over your head at all. Heard Island is not the place for "airs and graces."

One of these days, Kirsti hopes that a ready-made YL will move to Norfolk Island. She has been unable to interest other island women in Amateur Radio. The young girls leave school at 16 and go away for further education or to learn a trade. Mothers are busy with their children's activities, and older women have their church groups or the like. A very active member of Red Cross, Kirsti is qualified in first aid and serves with the island's emergency team. A librarian for seven years and an Immigration clerk for two years, she now helps her OM Jim with his electronics services business. Mostly a cw operator, but not exclusively, Kirsti could easily be the only DXpeditioner who uses her faithful 1940-model straight key. She chases DX, but refuses to get up at 3 A.M. Says Kirsti, "No one is that rare — hi!" She and Jim may live on a three-by-five-mile island once suitable for "angels and eagles," but thanks to Amateur Radio and many worldwide friends, they don't for a minute feel isolated.

\*Country Club Dr., Monson, MA 01057

# Silent Keys

It is with deep regret that we record the passing of these amateurs:

WB1EXC, Nolan D. Godsoe, Sr., Newport, ME  
WAINAN, Lester J. Shuman, North Dartmouth, MA  
WINPE, William E. Jones, Taftville, CT  
K1ZEO, Ernest Blanchard, Hampstead, NH  
K1ZL, Robert S. Woodbury, Dover, MA  
W2BZA, Robert P. Oilweiler, Park Ridge, NJ  
W2FII, Joseph D. Brown, Atco, NJ  
W2GYY, Jack M. Ward, Plainfield, NJ  
W2HSS, Stanley Markun, Vineland, NJ  
WB2HXQ, Louis H. Stutz, Riverhead, NY  
K2IFW, James R. Fallon, Sayville, NY  
K2ISO, Hugh B. Wilson, Arcade, NY  
W2JML, George H. Hinkley, Vestal, NY  
W2KOF, Alfred L. Allee, Paramus, NJ  
WA2POO, Howard Bach, Jr., Binghamton, NY  
WB2QAX, John M. O'Neill, New Hartford, NY  
KB2SB, Theodore Wright, Rochester, NY  
WA2YUV, Karol A. Myers, Binghamton, NY  
W3JJD, John J. D. Miller, Mt. Rainier, MD  
WB3KSV, Alton W. Hopkins, Newton Square, PA  
K3LHK, Charles F. Elterich, Washington, PA  
W3MGP, Paschall K. "Webbie" Webb, Mahaffey, PA  
W3MJ, Addison P. Marsh, Monroeville, PA  
WA3QWO, Earl W. Downs, Jamison, PA  
W3QY, Eugene E. Pearson, Laguna, CA  
W3WAS, Joseph R. Chesluk, Plymouth, PA  
W3WOS, Earl L. Shenberger, York, PA  
KM4A, Cecil Brant, Daytona Beach, FL  
W4AA, Francis A. Saxon, Augusta, GA  
W4APY, Donald C. Geegan, St. Petersburg, FL  
W4AUL, John N. Ellis, Florence, SC  
W4BOL, Lamar Hill, Cochran, GA  
WB4BZL, James S. Cook, Sarasota, FL  
K4CIX, Otey C. Powell, Waynesboro, VA  
W4CPX, Green H. Giebner, Greenville, SC  
WA4ELT, Raymond H. Brock, Highland Hts., KY  
W4JAM, Luther H. Nunnally, Jr., Birmingham, AL  
WA4JWK, H. Fletcher Bates, Melbourne, FL  
W4LUK, Arthur C. Lane, Winter Park, FL  
WA4MHN, Reuben F. Dubson, Augusta, GA  
WB4NKD, Charles W. Dobbins, Jr., Crozet, VA

K4OTE, John C. Miller, Jr., Tullahoma, TN  
W4PIY, Marshall H. Gillespie, Jackson, MS  
W4SM, Manuel Fernandez, Greenville, SC  
W4WSS, David D. Jacobs, Sarasota, FL  
WB4YER, Earl Taunton, Thomaston, GA  
WA4YTD, Howard W. Whitaker, Jr., Savannah, TN  
W5CYV, Thomas J. Pitman, Dewey, OK  
W5HWL, Richard D. Henley, Lubbock, TX  
W5IV, Frank A. Cain, Homer, LA  
W5JK, Frank M. Lynn, Winslow, AR  
W5KIT, Wilburt T. Scaggs, Fort Worth, TX  
KA5PAG, Claud L. Trinkle, Spurger, TX  
WB5PWZ, Robert A. White, Oklahoma City, OK  
W5QWI, Lanola E. Putnam, McAllen, TX  
WB5SXS, Robert C. Buck, Las Cruces, NM  
W5TIX, John W. Shipe, Honey Grove, TX  
W5UNE, Cyrus D. Parks, San Antonio, TX  
W5VAQ, Alton E. Broussard, Lafayette, LA  
W5WVH, Rex W. Ely, Tyler, TX  
K5YRY, George P. Stewart, Las Cruces, NM  
W6AIZ, Gordon H. Coles, Pomona, CA  
W6CKW, Joseph G. Brown, Huntington Park, CA  
W6EIB, Herrin E. Randle, Morro Bay, CA  
WD6EPN, Carl T. Hansen, Vernon, CA  
W6EVO, Grover L. Stoudt, Los Angeles, CA  
K6EZZ, Maynard R. Born, Poway, CA  
K6HK, Charles H. Vincent, Palm Desert, CA  
W6LOR, Francis N. King, Santa Barbara, CA  
W6MPG, Wesley R. Perry, Santa Barbara, CA  
WA6PNY, William Gay, Laguna Hills, CA  
W6SZE, Robert E. Johnson, San Diego, CA  
W6TEV, Cyrus S. Knowlton, Elsinore, CA  
W6TRF, Albert F. Segars, Needles, CA  
K6UJR, Leon Grabowski, Concord, CA  
WB7DSR, Laurence M. Hawley, Spokane, WA  
W7JEU, Edward T. Mathews, Cedar City, UT  
K7LRV, Richard A. Gamlin, Las Vegas, NV  
WB7WIA, Martin G. Ware, Coeur d'Alene, ID  
W7ZK, Vernon J. Bird, Vancouver, WA  
\*N8AQK, William J. Harbaugh, Newark, OH  
W8DRF, Francis E. Sheets, Logan, OH  
W8FGC, Ralph J. Thompson, Broadway Heights, OH

W8GBF, Donald J. Shirer, Canton, OH  
W8PK, Robert J. Banks, Grand Rapids, MI  
WA8RBL, Delano F. Stuart, Lodi, OH  
WA8WQB, Frank T. White, New Miami, OH  
W8YJB, Edward J. Woody, Westchester, OH  
W8ZWM, Harry E. Heller, Traverse City, MI  
W9CHG, John H. Roe, Cassville, WI  
W9CUA, Eugene G. Kersten, Sussex, WI  
W9CW, Russell W. Groth, Park Ridge, IL  
K9JDN, Hiatt J. Selby, Centerville, IA  
K9THM, William E. Tarte, Rantoul, IL  
K9UWO, Frank N. Reiter, Rockford, IL  
WA0AGI, Floyd L. Cook, Scott City, KS  
W0DCQ, Albert H. Maller, Omaha, NE  
W0GEF, Fred L. Whitson, Jackson, MO  
W0NJO, Ronald Economakos, Denver, CO  
W0PSB, Rex R. Schweers, Greeley, CO  
WB0WSY, Frederick C. Dewey, Lincoln, NE  
W0YKY, Gerald F. Lee, Rapid City, SD  
KC6RT, Byrd H. Brunemeier, Saipan, CM  
VE1BHF, Wilbur F. Ruggles, St. Steven, NB  
VE1DD, William Borrett, Halifax, NS  
VE3JU, William G. Crawford, Burlington, ON  
VE7AEX, Lawrence W. Crowcroft, Shawnaigan Lake, BC  
CX5BT, Homero C. Abella, Montevideo, Uruguay  
HB9ALF, Walter Blattner, Locarno, Switzerland  
HL1IJ, Sang-Ki Lim, Seoul, Korea  
ON4JO, Jules Leblanc, Plainevaux, Belgium  
OZ7AO, Bent Johansen, Farum, Denmark

## \*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

## December 1933

- Jim Lamb and Ed Handy jointly point out that present superhets are okay for sensitivity and selectivity, but with no r.f. stage the images are very bad. They offer a preselector design to solve the problem.
- Separately, Jim takes us voice operators to the woodshed, saying that overmodulation is causing genocide, that more frequencies are not the answer, and that if modulation were kept within bounds we'd double our effective QSO space.
- Further help is offered by W1SZ in the form of a "break-in" system, which is really push-to-talk — but still a large step forward in improving phone operation.
- W2BRO of RCA shows us a five-band, four-stage rig taking advantage of the new tubes and circuits — a '59 tri-tet to start, and a pair of push-pull 800s in the final.
- Kansas National Guard station CX7, operated by amateurs during a month-long training session, handled more than 7000 messages through skeds with 36 stations in 22 cities. [Operation in the ham bands was legal in those days. — Ed.]
- Amateurs from Delaware to Texas performed extensive emergency communications during a series of tropical storms in August and September.
- At the Chicago World's Fair, a W9USA attendant was showing the equipment to an illustrious visitor — Guglielmo Marconi. "But it was built by just an amateur," the young lad said in modesty. "Ah," responded the great inventor, "I am only an amateur myself!"
- Two dozen stations around the country are taking part in a volunteer program of sending code practice

to help aspirants acquire the necessary 10 w.p.m. proficiency for their licenses.

- George Grämmer has built a 50-watt (output) amplifier, using the new RK-18, to add to last month's exciter unit. Judicious placement of parts keeps wiring to a minimum.
- The new ham license form is labeled a "funny-looking thing" of 3- x 5-inch cardboard, with station license on one side and operator on the other. Nowhere near as impressive as the former documents we proudly put in frames on the shack wall.
- Get ready for the Sweepstakes, a nine-day, round-the-clock marathon, requiring sending at least one (though short) message in A.R.R.L. form before the contact can count.
- Broadcast station WLW's new transmitter is 500 kw., but modulated by the same Class B circuit principles hams brought into practical use only two years ago from QST articles.

# 25 Years Ago

## December 1958

- "SimpleX Super" is short for a basic, three-tube, crystal-filter superhet receiver by W1DX, who states it will out-perform the "inexpensive" commercial receivers, which are really useful only for short-wave broadcast reception.
- Still on the "simple" theme, W1ICP shows Novices how to use a 6146 as a crystal-oscillator transmitter for 50 watts on 80 and 40 meters.
- Thousands of amateurs sent QSL card wishes to

triode tube inventor Lee deForest on his 85th birthday.

- Most wire-wound resistors have too much reactance to give accurate readings in dummy loads, but WA2ANU finds that corrective inductance (or capacitance), along with adequate shielding, produces satisfactory results.
- W6JIC believes he can avoid the horror stories of cubical quad beam damage by careful joining of aluminum angle stock, EMT thin-wall conduit and 5/8-inch wood dowels for element supports.
- Understanding the new maser and reactance amplifiers is way beyond most of us, but W4AO and W4LTU describe the basics and show how important the low-noise feature of these devices will be in future v.h.f. work.
- A small furor erupted on the voice bands when someone learned the League had filed in agreement with the removal of the 21,000-Mc. band (to another spot in the spectrum). Seems many jumped to the wrong conclusion that it was the 21-Mc. band involved!
- The usefulness and measurement of fed-through power in a grounded-grid amplifier have long been subject to arguments, which G. Grammer attempts to settle with some basic explanations and practical calculations to apply to your rig.
- K2ITP attempts to spur ham interest in ionospheric scatter by explaining basically what it is, what kind of gear is necessary for success and how to go about achieving QSOs.
- K6LMW describes the gear used to make several 2000-mile 10-meter voice contacts using only 75-milliwatts or less — from solar power.
- More than 11,000 amateurs turned out for the June Field Day, with sideband and v.h.f. activity at new peaks, but with auroral blackouts keeping scores way down.
- An early DXpeditioner, VP2VB, reports on his event-filled Yasmie voyage to Aves Island to provide a "new one" for country-hungry hams. — W1RW

# Club Corner

Conducted By Sally O'Dell,\* KB1O

## 100% CLUBS

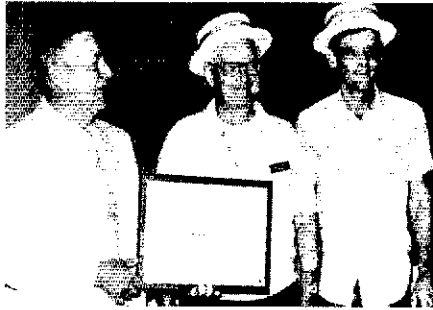
The month of December bestows upon us a legacy of traditional rituals. Family gatherings, religious observance and resolutions for the new year are all familiar to us. For those of you not acquainted with this column, each year we also set aside this month to recognize our affiliated clubs that have achieved 100% ARRL membership. This year we are proud to list 81 clubs that have accomplished this milestone. Each club listed will receive a certificate of appreciation for their unanimous support of the ARRL.

The clubs that qualify for this certificate are: Acadiana DX Assn., Cade, Louisiana; Arkansas DX Assn., North Little Rock, Arkansas; Alamo DX Assn., San Antonio, Texas; Albuquerque DX Assn., Albuquerque, New Mexico; Azalea Coast ARC, Wilmington, North Carolina; Arizona DX Club, Scottsdale, Arizona; Beacon Radio Amateurs, Philadelphia, Pennsylvania; Candlewood ARA, Danbury, Connecticut; Central Arkansas DX Club, North Little Rock, Arkansas; Central Florida DX Assn., Casselberry, Florida; Central Kansas ARC, Inc., Salina, Kansas; Central Virginia Contest Club, Richmond, Virginia; Charles River Wireless Society, Medway, Massachusetts; Chicago Radio Traffic Assn., Berwyn, Illinois; Chippewa Hills ARC, Weidman, Michigan; Cincinnati Buckeye Netters, Cincinnati, Ohio; Colorado County ARC, Columbus, Texas; Communications Club of New Rochelle, Hartsdale, New York; Connecticut DX Assn., Andover, Connecticut; Connecticut Wireless Assn., Burlington, Connecticut; Crystal Radio Club, Valley Cottage, New York; Dixie DXers, Peachtree City, Georgia; Dunsmuir Amateur Radio Club, Dunsmuir, California; DX Assn. of Connecticut, Plantsville, Connecticut; Flambeau Amateur Radio Club, Phillips, Wisconsin; Frankford Radio Club, Stockton, New Jersey; 111-Wind Contesters, Schaumburg, Illinois; Kankakee Area Radio Society, Kankakee, Illinois; Kansas City DX Club, Kansas City, Kansas; Kendall Amateur Radio Society, San Antonio, Texas; Lake Amateur Radio Association, Inc., Leesburg, Florida; Lake Area Radio Klub, Watertown, South Dakota; Lake Cumberland ARC, Somerset, Kentucky; Lake Superior DX Assn., Duluth, Minnesota; Limestone Amateur Radio Club, Athens, Alabama; Manhattan Ave. of Americas Radio Club, N. Woodmere, New York; Marquardt Amateur Radio Club, Van Nuys, California; Megabertz Manor Maniacs, Marshalltown, Iowa; Memphis DX Society, Memphis, Tennessee; Mid-South DX Assn., Germantown, Tennessee; Moose Horn Amateur Radio Club, Kenai, Alaska; National Capital DX Assn., Derwood, Maryland; New Mexico Big River Contesters, Albuquerque, New Mexico; North Alabama DX Club, Huntsville, Alabama; North Augusta-Belvedere Radio Club, Aiken, South Carolina; North Florida DX Assn., Jacksonville, Florida; North Jersey DX Assn., Morris Plains, New Jersey; Norfolk County Radio Assn., Walpole, Massachusetts; Northeast Mississippi ARC, New Albany, Mississippi; OBP #1 Amateur Radio Club, St. Louis, Missouri; Pacific Radio Amateur Transmitting Society, Kane Ohe, Hawaii; Paul Bunyan Wireless Assn., Merrifield, Minnesota; Paynesville ARA, Paynesville, Minnesota; Phoenix Amateur Radio Technical Soc. of L.I., Uniondale, New York; Pickens Amateur Radio Club, Jasper, Georgia; Potomac Area VHF Society, Damascus, Maryland; Quad County Radio Club, Springfield, Illinois; Raritan Bay Radio Amateurs, Inc., Sayreville, New Jersey; Rio Hondo ARC, La Mirada, California; Rochester DX Assn., Rochester, New York; St. Louis Amateur Radio Club,

## 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:

<b>Anne Arundel Radio Club, Inc.</b> c/o P.O. Box 804 Glen Burnie, MD 21061 Club membership — 225	<b>Lower Columbia IIRA, Inc.</b> c/o P.O. Box 905 Longview, WA 98632 Club membership — 62	<b>Paul Bunyan Wireless Assn.</b> c/o Box 43 Merrifield, MN 56465 Club membership — 26
<b>Barstow Amateur Radio Club</b> c/o P.O. Box 451 Barstow, CA 92311 Club membership — 45	<b>Mid Range Amateur Radio Club</b> c/o Rte. 1, Box 178 Pengilly, MN 56465 Club membership — 25	<b>Pikes Peak Radio Amateur Assn.</b> c/o Box 16521 Colorado Springs, CO 80935 Club membership — 83
<b>Garland Amateur Radio Club</b> c/o 1019 Austin St. Garland, TX 75040 Club membership — 178	<b>New Ulm Amateur Radio Club</b> c/o 7 Sunrise Dr. New Ulm, MN 56073 Club membership — 29	<b>Radio Central ARC</b> c/o P.O. Box 680 Miller Place, NY 11764 Club membership — 165
<b>Hollywood Amateur Radio Club</b> c/o Box 6306 Hollywood, FL 33021 Club membership — 50	<b>North Florida ARS</b> c/o P.O. Box 9673 Jacksonville, FL 32208 Club membership — 192	<b>Triple States Radio Amateur Club</b> c/o Box 240, RD 2 Adena, OH 43901 Club membership — 600
<b>Johnson City Radio Association</b> c/o 2805 Avondale Dr. Johnson City, TN 37601 Club membership — 28		



Atlantic Division Director W3ABC presents a 50-year affiliated-club certificate to the South Hills Brass Pounders and Modulators. Left to right are W3ABC, W3MML and WA3ZNP. (photo by W3KVS)



Midwest Division Director Paul Grauer, W0FIR (third from left), presented a Charter of Affiliation recently to members of the St. Louis Repeater Club of Washington, Missouri.

Inc., St. Louis, Missouri; Selma Amateur Radio Club, Inc., Selma, Alabama; Shelby Amateur Radio Club, Shelby, North Carolina; Skagit Amateur Radio Club, Kirkland, Washington; Skokie Six Meter Indians, Skokie, Illinois; Smoky Mountain ARC, Maryville, Tennessee; Southeastern LA University ARC, Hammond, Louisiana; Southern California Contest Club, Simi Valley, California; Southwest Oklahoma Repeater Assn. Inc., Altus, Oklahoma; Texas DX Society, Houston, Texas; Twin Cities DX Assn., Minneapolis, Minnesota; Vermillion ARC, Ely, Minnesota; Virginia Century Club, Chesapeake, Virginia; W/K ARC of Greater Milwaukee, Cudahy, Wisconsin; Wapsi Valley ARC, Park View, Iowa; WENS, Philadelphia, Pennsylvania; Western Kentucky DX Assn., Adairville, Kentucky; Wildcat Amateur Radio Society, Fresno, California; Windblowers VHF Society, Hawthorne, New Jersey; Wisconsin Nets Assn. Ltd., Wisconsin

Rapids, Wisconsin; Woodland Baptist ARC, Louisville, Kentucky.

## NEW VIDEOTAPES

Two new videotapes are available from the ARRL Film Library. VT-25 is a 12-minute lecture on "Amateur Radio Technology," given by Paul Rinaldo, W4RI, at the FCC Office of Science and Technology. This tape is in black and white, and comes in U-Matic or VHS format: VT-27 is called "Bob Swanlund, W0WYX, Squaw Mountain, Colorado." This 13-minute, color film features W0WYX as a dedicated amateur moving away from his beloved mountain station.

Please use form CT-20 to borrow from the film library, and be sure to indicate the format of video tape needed. For forms, a film catalog or further information, write to Karl Townsend, ARRL Film Library, 225 Main St., Newington, CT 06111.

## Strays



### I would like to get in touch with...

anyone who worked in the Engineering Division of the USS Eldorado AGC-11 between 1958 and 1961. Dick Bard, KK8V, 103 Bishop Dr., Westerville, OH 43081.

anyone who has a maintenance manual for an Alda

103/103A hf transceiver. Fr. Joseph Vaughan, KC2LJ, Frontier Rd., Churubusco, NY 12923.

any hams belonging to the United Pentecostal Church who are interested in starting a net. Harold Deitz, WB9VMY, 7520 NW 10th, No. 204, Oklahoma City, OK 73127.

former members of the Clemson University ARC, WD4EOG (ex-WA4ZUK). Randy Davenport,

KA4NMA, Box 9457, Clemson University, Clemson, SC 29632.

other Russian-speaking hams living outside of the USSR. Edward Kritsky, KA2MXO, P.O. Box 715, Brooklyn, NY 11230.

U.S. and foreign teachers, students and members of school radio clubs interested in joining a net. Michael Henderson, N6JFD, Box 331, Somis, CA 93011.

# 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

## ARRL NATIONAL CONVENTIONS

July 20-22, 1984  
New York, New York

October 4-6, 1985  
Louisville, Kentucky

August 29-31, 1986  
San Diego, California

# Hamfest Calendar

By Marjorie C. Tenney,\*  
WB1FSN

**Indiana:** The South Bend Swap and Shop will be held on Jan. 8, at the Century Center downtown, on U.S. 33, *ONEWAY* north between St. Joseph Bank Bldg. and river. Half acre on carpeted floor. Industrial history museum in same building. Four lane highways to door from all directions. Talk-in on 52 and area repeaters. Sponsored by Repeater Valley Hamfest Committee. Contact: Wayne Werts, K9IXU, 1889 Riverside Dr., South Bend, IN 46616, tel. 219-233-5307.

**Michigan:** The Oak Park ARC presents its annual Swap-a-Shop on Sunday, Jan. 8, from 8 A.M. to 3 P.M. at Oak Park High School, Oak Park. Activities include seminars on packet radio, OSCAR 10. FCC Novice exams will be given at 11:00 A.M. Refreshments and free parking. Talk-in on 52. Admission is \$2.50; tables available for \$8. For further information, send s.a.s.e. to: Oak Park ARC Swap and Shop, 14300 Oak Park Blvd., Oak Park, MI 48237.

\*Convention/Travel Coordinator, ARRL  
†ARRL Hamfest

**Wisconsin:** The 12th annual mid-winter swapfest sponsored by the West Allis RAC will be held on Saturday, Jan. 7, at the Waukesha County Expo Center Forum. Starting time is 8 A.M. and admission is \$2 in advance or \$3 at the door. Tables are \$3 reserved until 11 or \$4 at the door (first come-first served). Also featured is our delicious food. Directions: I-94 to Co. F, south to FT, west to Expo. For tickets or info, write with s.a.s.e. to WARAC, P.O. Box 1072, Milwaukee, WI 53201.

[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.]

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.

# In Training

Conducted By Jonathan Towle,\* WB1DNL

## NEW NOVICE PROCEDURES REVISITED

The new Novice examiner procedures, in effect for a few months now, seem to be operating smoothly. Intended to make it easier for prospective hams to get started at the Novice level, the new procedure started August 31. This does not mean the questions on the exam are now easier but rather that the FCC has simplified the exam routine to create less paperwork and decrease the processing time. Earlier restrictions preventing employer-employee or employee-employee relationships with the applicant have now been eliminated (see Part 97.31).

Now, examiners give the code test, consisting of letters, numbers, basic punctuation and common prosigns, just as before (see Part 97.27). Then, they give the Element 2 theory examination from questions published by the FCC (see Sept. 1983 QST, pp. 56-59). The FCC has left it to the examiner to decide which questions to select from the pool and how best to administer the exam. The test may consist of an interview, short-answer essay, or true/false or multiple-choice questions.

To help with these new procedures, we have put together 200 multiple-choice questions based on the FCC's question pool. These questions should be looked at as suggestions and not absolutes by any means. We believe them to be well-written and educationally sound

\*ARRL Training Program Manager

in their present form. We are also aware of a few typographical errors and questions that are no longer valid due to recent rule changes. Nonetheless, we invite your questions and suggestions so we can make improvements.

All instructors registered with the Training Branch were sent a copy of these questions so they would be prepared to give examinations soon after the program went into effect. These questions are also available with copies of *Tune In the World with Ham Radio*. Furthermore, we have put together several 20-question tests that are available from ARRL Headquarters for an s.a.s.e. We'll send a copy and ask that you duplicate it in sufficient quantity to meet your needs.

When an applicant successfully completes the exam, the examiner then returns the Form 610 to the FCC with the changes indicated in the September QST article. Don't forget to check one of the boxes after you add the required text! It will be returned if you don't. Examiners should send only the Form 610 to the FCC but must keep a record of each examination for one year. Though the FCC has not specified what type of records must be kept, we suggest you retain the list of questions given to the applicants with their responses, or an actual copy of the exam if true/false or multiple-choice questions are used.

A suggestion for a club-meeting program or classroom discussion is that you go over all 200 questions. As a club function, it will bring everyone to the same level of understanding. This will make it easier to grade examinations and (we all hope) avoid arguments. As a classroom review activity, it can point out misconceptions and indicate where further dis-

cussion is necessary. Don't worry about students memorizing the answers; most learning at this level is by rote. The question pool is an effective training aid that can be used easily by your group.

## INSIDE THE TRAINING BRANCH

The Training Branch keeps in touch with more than 6000 registered instructors by sending out a newsletter four times each year. If you are teaching a class or Elmering someone and would like to become a registered instructor, let us know. We will put your name on our referral list and will send you names of prospective hams as well as training materials as they become available. Also available from the Training Branch are instructors' guides, slide sets and code tapes for classroom use.

For those who register (tell us about) their class, we have Graduation Packages for your students. You can also get First Contact Club Certificates to give to a station if you are that station's first contact on the air. If you are a new amateur and would like to present something to your instructor or someone who has been especially helpful in getting you on the air, simply request the ARRL Elmer Award.

The Training Branch enjoys hearing from you. We use the information you send to improve our program by discussing current topics in this column or in the *Instructor's Newsletter*. Your help has also been invaluable when we have revised or written a new text. It is important to us to be able to produce materials that are accurate and easy to use and that get the job done!

# Special Events

Conducted By Bill Jennings,\* K1WJ

**Chesapeake, Virginia:** Pearl Harbor Survivors Net members will operate Dec. 7 to commemorate the surprise attack on Pearl Harbor in 1941. Operation on the following times/frequencies: 1230-1430Z/7.280; 1630-1930Z/14.283; 2000-2300Z/21.363; 2100-2300Z/28.875.

**Bethlehem, Indiana:** Clark County ARC will operate W9WWI/9 from 1700Z Dec. 10 until 0300Z Dec. 11 and 1400 to 2000Z Dec. 11. Frequencies: 3.905 7.240 14.290 21.365. Certificate with Bethlehem postal hand stamp via P.O. Box 532, Jeffersonville, IN 47130.

**Bethlehem, West Virginia:** Triple States RAC will operate WD8DDL/8 from 1400 to 0200Z Dec. 16 and 17. Frequencies: phone — 7.275 14.325 21.425 28.550;

cw — 7.110 14.075 21.110 28.110; RTTY — 14.095. Certificate via 26 Maple La., Bethlehem, Wheeling, WV 26003.

**Christmas, Florida:** Coronado Wireless Assn. will operate K4HML from 1400 to 2200Z Dec. 17 and 18. Operation 10 kHz up from lower General class band edges. QSL via Box. 1, Edgewater, FL 32032.

**Thompson, Ohio:** The Burn family (N8EVE, KD8EO, N8EVF and KD8EV) will operate from 1400 to 2000Z Dec. 17 and 18 in the 40-meter General class band. Certificate for working all four family members via 6215 Clay St., Thompson, OH 44086.

**College Park, Maryland:** K3RD will operate from 1500 to 1900Z Dec. 17 and 1700 to 2100Z Dec. 18 from College Park Municipal Airport in honor of the 80th anniversary of the Wright Brothers' first powered flight. Frequencies: 7.120 14.029 14.280 21.130. Certificate via 9308 Bandera St., Lanham, MD 20801.

**Wilton, Maine:** Sandy River ARC members will operate the Chester N. Greenwood memorial station in honor of the inventor of the ear muff. Operation 0001 to 2359Z Dec. 18 about 10 kHz up from the 80, 40, 20 and 15-meter General class band edges, and 28.600. Certificate via P.O. Box 533, Wilton, ME 04294.

**Laurel, Maryland:** Comm Center and Volunteers in Technical Assistance will operate N3SC from 1700 to 0100Z daily Nov. 28 to Dec. 5 during the Space Shuttle mission. Frequencies: phone — 14.260 and 21.375; RTTY — 14.083. Certificate and QSL via The Comm Center, Attn: Barbara, 9624 Fort Meade Rd., Laurel, MD 20707.

**Feilding, New Zealand:** ZL2JAM will be active from Jan. 2 to 10, 1984, during the 10th New Zealand Scout Jamboree. Frequencies: 3.740 3.940 7.090 7.290 14.290 21.360 28.990. Some RTTY, SSTV and OSCAR operation possible.

\*Assistant Communications Manager, ARRL

# Amateur Satellite Program News

Conducted By  
Bernie Glassmeyer,\*  
W9KDR

## FIRST ANNIVERSARY OF ASPN COLUMN

It has been a wonderful year for Amateur Radio satellite activity. Reporting the news of this activity in a timely and informative way will continue to be my goal. I hope you have enjoyed the column and will continue to support the amateur satellite program. The next year looks exciting, so stay tuned and get involved.

## AMSAT-OSCAR 10 Status Report

Mode L use on Wednesday (UTC), one hour before and one hour after apogee, has been extended to include the same time period on Saturday (UTC). Mode B operation will also be extended during perigee times. Monitor the General Beacon for updated announcements.

Bill McCaa, KØRZ, reports the following Mode L activity: "Mode L has been a challenge. I am presently using a pair of 28-element loop Yagi antennas on 1269 with about 120 W of rf. This, with feed line losses, should give me about 20 kW erp. On 436, I'm using a pair of 20-element Yagi antennas with a GaAs FET preamp at the antennas. The antennas are horizontally polarized. The signals are quite stable, and I hear no evidence of spin modulation. So far, I have worked the following stations.

No.	Date	Time (UTC)	Call	His/My RST	His 1269 Equip.
1	9/21/83	1940	F9FT	539/529	150 W, 4 x 23 Yagi
2	10/5/83	2149	DJ5BV	549/519	400 W, 16 x 23 Yagi
3	10/5/83	2211	VE7BBG	56/55	2.5 W, 20-ft dish
4	10/5/83	2229	K8MYC	56/419	20 W, 16-ft dish
5	10/5/83	2241	W8YIO	429/529	10 W, 4.2-ft dish
6	10/8/83	1946	DJ3OS	559/559	Unknown
7	10/8/83	2014	VE7BBG	57/56	2.5 W, 20-ft dish
8	10/8/83	2037	DJ8QI	579/559	20 W, 16-ft dish
9	10/8/83	2055	W8YIO	529/539	10 W, 4.2-ft dish

"I am capable of receiving my own signal about 529 cw or 52 ssb, about 8 dB above the noise. I am able to hear my return from the satellite with an erp of 3 kW. The beacon is about 30 dB out of the noise. The cw beacon seems to pump the transponder and significantly modulates my return signal by about 6 dB or more. The transponder is more sensitive when the beacon is off."

## Monthly Orbit Schedules

With the inclusion of AMSAT-OSCAR 10 apogee times in the monthly orbit schedule, your return envelopes now require 37 cents postage. Since this is a free service to ARRL members only, we hope you will help us with an additional 17 cent stamp for each envelope you have on file at this time. Presently, we have been adding the extra postage, which requires a lot of extra work by mailroom employees. Please help us continue this free membership service by updating your envelope postage.

## OSCARLOCATOR Second Revision

The new updated OSCARLOCATOR should be available during January. This second revision will contain plotters for UoSAT-OSCAR 9, AMSAT-OSCAR 10 and the Soviet RS satellites. The OSCAR 10 locator will not have a complete ground track overlay because it will have to be updated every 2 to 3 months. The updated track will be listed in this column starting next month. It will require the user only to trace the small ground track curve directly to the overlay provided in the package. The price of the new package will be announced in January.

## UoSAT-B Spacecraft Project Status

Work continues apace at UoS, USA and Canada on the development of UoSAT-B spacecraft sub-systems and experiments. Discussions continue with NASA-GSFC and MDAC, and latest information specifies a launch no earlier than March 1, 1984.

## The Keplerian Orbital Elements

What follows is a list of the classical Keplerian elements and their definitions.

**EPOCH Time, T:** While not strictly an "orbital element," a time reference is needed in any element set to indicate an instant at which the remaining numbers are all valid. This number can be chosen arbitrarily by the individual generating the element set, but it is usually chosen somewhere near the middle of the radar or other observation times used to generate the elements.

**Mean Motion, N:** The number of complete orbits the satellite makes in one day. The reciprocal of N is the period (P), the amount of time required to complete one orbit. Also, once the Mean Motion is known, a quantity called the Semi Major Axis (SMA) can be computed. This is defined as one half the straight line distance between the apsides (i.e., the apogee and perigee). Occasionally, the period or SMA will be given in place of the Mean Motion.

**Mean Anomaly, M:** An indication of where the satellite is along its orbit at the EPOCH time. Specifically, it is a measure of time since perigee, expressed as an angular quantity, with 360 degrees (one full revolution) being equal to one orbital period. For example, a Mean Anomaly of zero says that the satellite is at perigee; a Mean Anomaly of 90 degrees indicates that the satellite is one-quarter period past perigee. Another way of looking at Mean Anomaly is as the time integral of Mean Motion. (Equivalently, Mean

Motion is the time derivative of Mean Anomaly.) Since Mean Motion is a positive constant (excepting drag effects), Mean Anomaly increases linearly with time.

It must be emphasized that since a satellite in an elliptical orbit does not move at a constant rate, the "angle" represented by the Mean Anomaly does not correspond to any measurable, physical angle. However, knowing the Mean Anomaly and the Eccentricity (described below), you can compute the True Anomaly,  $V$ , which is the angle as seen from the center of the earth between the perigee point and the satellite's current position, measured in the direction of satellite motion. Likewise, knowing the True Anomaly and the Eccentricity, you can compute the Mean Anomaly.

**Eccentricity, E:** The degree of "lopsidedness" of the orbit.  $E = 0$  would be a perfect circle,  $0 < E < 1$  is an ellipse,  $E = 1$  is a parabola and  $E > 1$  is a hyperbola. Now, we have determined the size and shape of the orbit. Next, we need to specify how the egg-shaped orbital ellipse is rotated within its orbital plane with respect to an external reference.

**Argument of Perigee, W:** The angle, as seen from the center of the earth and measured in the orbit plane in the direction of motion of the satellite, between the equator and the perigee point. An argument of perigee between 0 and 180 degrees indicates that apogee occurs in the Southern Hemisphere; a value between 180 and 360 degrees represents an apogee in the Northern Hemisphere.

Next, the orbital plane must be oriented with respect to an external reference frame. Two numbers are needed to do this.

**Inclination, I:** The angle between the orbit plane and the earth's equator. An inclination of zero means that the satellite is always above the equator; an inclination of 90 degrees indicates that the satellite passes over both poles on each orbit.

**Right Ascension of Ascending Node, RAAN, or capital omega:** The angle, measured along the equator, between the first point of aries (a reference celestial longitude) and the point on the orbit plane where the satellite crosses the equator going northward. The first point of aries is defined as the point at which the sun crosses the equator into the Northern Hemisphere at the first instant of spring. Right ascension is necessary here because it is fixed in space; longitude measurements would depend on the position of the rotating earth.

## Perturbations

If one assumes perfect two-body motion, implying

the absence of external perturbations such as the nonspherical shape of the earth, gravitational tugs from the moon and sun, thrust and atmospheric drag, all of the above elements except for Mean Anomaly would remain constant for all time. Of course, the real world isn't so ideal, but several of these effects are easily compensated for.

The most important factor for most satellites is the non-spherical shape of the Earth. This causes both short-term and long-term changes in the Argument of Perigee and Right Ascension of the Ascending Node. Additionally, for low-altitude satellites, drag can be an appreciable factor. The first factor is easily computed from the other orbital elements; the second can only be approximated at best. The Drag Factor,  $N - \text{Dot}/2$ , indicates the rate of orbital decay by its effect on the Mean Motion, N. A drag-free orbit has a constant N; atmospheric drag will remove energy from the satellite and increase its Mean Motion at the rate of  $2^*N - \text{DOT}$  revolutions per day each day. Of course as the satellite drops into a lower orbit, atmospheric drag will increase. Therefore, predictions based on just a single drag term are, at best, approximations. Effects of solar and lunar perturbations can usually be ignored for low-altitude satellites. More sophisticated models do exist, however. They take into account these effects and are very useful in the operational planning of geostationary satellites.

For further reading on the details of orbital mechanics and prediction, I would recommend the following, to start:

1) "Basic Orbits," by Tom Clark, W3IWI, *ORBIT* no. 6. This describes Tom's now-famous orbital prediction program, written in BASIC, that has been adapted to many different personal computers. Disk or cassette copies of this program are available for a nominal donation from AMSAT Software Exchange, P.O. Box 27, Washington, DC 20044.

2) "Introduction to Astrodynamics," Dover, \$6.50. This excellent paperback is designed for a college-level introduction to the subject. Included are sections on orbital element generation that I used to determine the OSCAR 10 orbit after the kick-motor burn. (tnx K.A.Q.)

## 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.

ARRL members only: Send a 4 x 9-in. self-addressed, stamped envelope with your call sign to ARRL Hq. Club and Training Department for a complete, monthly orbit schedule for all operating amateur satellites. A year's supply of s.a.s.e.'s may be sent at one time; be sure to include 2 units of postage for each s.a.s.e.

Further information on the Amateur Radio Satellite Program can be obtained free of charge from ARRL Hq. QST

## 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
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160-Meter Contest Rules	Nov. 1983, p. 104

\*OSCAR Program Manager, ARRL

## Reading the Mail

Hams are known to "read the mail," so while we're at it, let's read some of my mail, too. Perhaps, something here will answer a question you have been trying to solve. If that is so, we will both save postage — you won't have to send the question to me and I won't have to dream up an answer and sent it to you. (By the way, if you do write to me, please send your note to my home address [see bottom of this column] and enclose an s.a.s.e. to expedite the answer.)

### Computer to Computer

*How can I transfer programs between my Atari 800 and my TRS-80® Model III?*

Transferring programs between computers requires hardware and software. If the computers are at different locations, each computer requires (1) a modem and (2) an accessible telephone line. The computer is connected to the modem (usually by means of an RS-232-C interface), and the modem is connected to the phone line.

If the computers are at the same location, each computer requires an RS-232-C interface. A cable to connect the interfaces is also required. This cable must not be longer than 50 feet, according to RS-232-C rules. Longer runs (up to 200 feet) are at your own risk. The cable can be wired as follows:

Computer A	Computer B
Pin 1 (ground)	to Pin 1 (ground)
Pin 2 (transmit data)	to Pin 3 (received data)
Pin 3 (received data)	to Pin 2 (transmit data)
Pin 4 (request to send)	to Pin 5 (clear to send)
Pin 5 (clear to send)	to Pin 4 (request to send)
Pin 6 (data set ready)	to Pin 20 (terminal ready)
Pin 7 (ground)	to Pin 7 (ground)
Pin 20 (terminal ready)	to Pin 6 (data set ready)

The cable is wired in this manner because the signals on pins 2 and 3, 4 and 5, and 6 and 20 are complementary. For example, pin 2, the transmitted data circuit of computer A, must be connected to pin 3, the received data circuit of computer B. The circuit will not function if you connect computer A's transmitted data circuit to computer B's transmitted data circuit.

Wherever the computers are located, each will need "terminal," "telecommunications" or "data communications" software. With the hardware installed and the software up and running, proceed as follows:

- 1) Check that both computers are set at the same parameters (data rate, word length, start and stop bits, parity, etc.).
- 2) At computer A, command the terminal program to load the data you wish to transfer.

### MINIMUF UPDATE

Dear Stan,

I wrote the following improvement to the MINIMUF program. I hope that you will find it interesting.

Solar activity used in the MINIMUF program is stated in terms of sunspot numbers. Most amateur get current values of solar activity from station WWV, but the activity is given in terms of solar flux. To relate solar flux values to sunspot numbers, one had to estimate by using a graph. Instead of using this method, you can modify the MINIMUF program to accept solar activity values directly in terms of solar flux.

In 1971, the Office of Telecommunications in Boulder, Colorado, published a series of volumes titled

### PX

#### TI-Fever

A few months ago, John Davis, WB4KOH, purchased a Texas Instruments TI-99/4A computer for \$99. Ever since, he's been busy at the keyboard. This installment of PX presents some of John's programs; they should help satisfy some of the demand from all the TI hackers out there.

Program number 31 is WB4KOH's "Morse Code Generator" for learning and improving cw skills. It requires Extended BASIC, 32K RAM, and a voice synthesizer.

Program number 32 is John's "TV Dot Generator." (This and the remainder of John's programs are written in TI BASIC.)

Program number 33 is a TI version of W6ZGN's "Computer Model for VHF/UHF Propagation" (July 1983 QST).

Program number 34 is the contest "Dupe Call" program originally written by WA1PCJ (Dec. 1982 QST).

Program number 35 is John's version of KC5JH's "PI Network Design" program (Aug. 1983 QST).

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.

3) At computer B, command the terminal program to get ready to receive data.

4) At computer A, command the program to send the data to computer B.

5) At computer B, command the program to save the received data.

That's all there is to it!

### Juggling Data

*I am secretary of the Podunk Amateur Radio Club and I need a program that will handle the club membership records. Any suggestions?*

Almost any "data base management" program will do the job. They are available for most personal computers, and they can be used for a variety of ham radio functions, including logging and recording QSLs and radio club members.

Most data base management programs may be configured to your specific needs. Once you get one running, it can sort, delete, update, search, print and juggle data in any way you desire.

### Modems on the Air

*I am very interested in being able to couple my modem to my radio station, but I am not sure how to proceed. Since ASCII is now legal, I'd like to try my hand at transmitting and receiving. I have tried unsuccessfully to copy WIAW ASCII RTTY bulletins from my modem via a phonepatch. What's wrong?*

There is more than one possible solution to your inability to copy WIAW using a telephone modem:

1) The frequency of the RTTY tones used by WIAW and your modem are different. WIAW uses a standard frequency shift of 170 Hz. Your modem, assuming it is 300-baud, uses the standard "Bell 103" telephone modem mark and space frequencies (either a 1270-Hz mark and a 1070-Hz space or a 2225-Hz mark and a 2025-Hz space, depending on whether the modem is in the "answer" mode or the "originate" mode). In either mode, the frequency shift is 200 Hz.

Some hams have copied ASCII radio transmissions successfully using telephone modems. This requires tuning your receiver slowly across the ASCII signal to find the right spot at which the received 170-Hz-shift signal falls in between the 200-Hz-shift modem tones.

2) The parameters of the signal sent by WIAW and the signal that your computer expects to receive may be different. These parameters include the data rate, the number of bits per character, the number of stop bits and parity.

WIAW ASCII transmissions are sent at 110 bauds using one start bit, seven character bits, one space bit (no parity) and two stop bits. Setting your computer to WIAW's parameters may be accomplished via hardware (switches) or software, depending on your system.

3) Some folks use telephone modems on the air, so communicating with these stations should be relatively easy once you have determined what parameters they are using. However, you may find it difficult to transmit to a station using a RTTY modem for the same reason that you find it difficult to receive transmissions from WIAW.

*Ionospheric Predictions.* In Volume 1, an equation relating solar flux (F) to sunspot number (S) is stated as

$$F = 63.75 + 0.728 S + 0.00089 S^2 \quad (\text{Eq. 1})$$

To be used with MINIMUF, the equation must be solved for S. The quadratic equation may be applied to Eq. 1, with this result:

$$S = \frac{-0.728 + \sqrt{(0.728)^2 - 4(0.00089)(63.75 - F)}}{2(0.00089)} \quad (\text{Eq. 2})$$

Eq. 2 gives the desired positive root of the first quadratic equation. This second equation may be easily programmed. I incorporated the following routine into my Apple II version of MINIMUF:

```
100 PRINT "ENTER SOLAR FLUX"
110 INPUT SF
120 IF SF > 63.75 THEN GOTO 140
130 GOTO 170
140 PRINT "INVALID SOLAR FLUX, MUST BE GREATER THAN 63.75"
150 PRINT "REENTER SOLAR FLUX"
160 GOTO 110
170 H = 4 * 0.00089 * (63.75 - SF)
180 H1 = 0.728 * 0.728
190 H2 = H1 - H
200 H3 = SQR(H2)
210 S9 = (H3 - 0.728) / (2 * 0.00089)
```

The variable S9 is used for the sunspot number in the MINIMUF program. These BASIC steps will run on most microcomputers (I think!).

73,  
Robert Foster, K3QLA

\*75 Kreger Dr., Wolcott, CT 06716

# Results, Sixth Annual ARRL UHF Contest

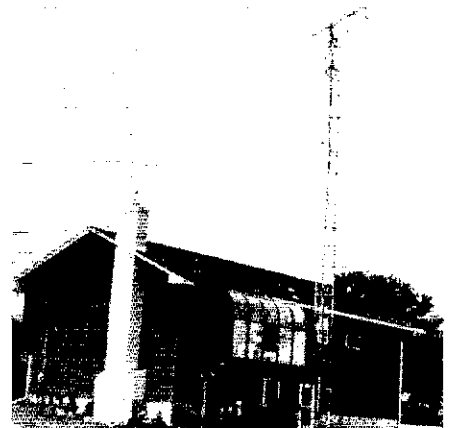
By Bill Jennings,\* K1WJ

Although the UHF Contest is a mere six years old, with the latest edition having been held on August 6-7, 1983, the contest exchange/scoring format has undergone more changes recently than a chameleon in a kaleidoscope. The original format featured an exchange/multiplier of  $1^\circ \times 1^\circ$  latitude/longitude blocks. In 1982, the scoring system utilized those same  $1^\circ \times 1^\circ$  blocks as multipliers, but with a premium placed on QSOs made over longer distances — Range scoring. The 1983 UHF Contest multiplier/exchange, upon recommendation of the ARRL Ad Hoc Committee for VHF/UHF Contesting (based on input from you, the vhf/uhf contest participant), was changed to use the  $1^\circ \times 2^\circ$  (latitude/longitude) grid squares of the Maidenhead grid square system (see Jan. 1983 QST, page 49). Because of its popularity and tie-in to the new ARRL VUCC awards program, this format will probably become permanent, although the Ad Hoc Committee will certainly consider future changes as the wants and needs of UHF Contest participants dictate.

Since the size of the multipliers has effectively doubled and the range scoring system is no longer in effect, it would be difficult to make score com-



WB3ESS, submitted a single-band 432 score from EPA. John uses a homebrew transverter on 432 to his TS-830S. John's skyhooks include eight KLM 16-element beams on 432 at 50 feet, an 8-element quagi on 220 MHz and a single 12-element KLM beam on 2 meters.



parisons between the 1983 contest and any of its predecessors. We'll take these contest results and make them the basis of comparison in the future.

We can say with certainty that, with 126 entries received, the 1983 contest ranks fourth in terms of participation among the six UHF Contests held to date. The QSO and multiplier statistics stand out very clearly in the score listings, and we invite you to use them to make

whatever comparisons or statistical analysis you care to make.

The Ad Hoc Committee on VHF/UHF Contesting and we here in the ARRL Contest Branch of the Communications Department welcome your ideas, suggestions and comments. You are invited to send your input to us here at ARRL Hq. Certificates are scheduled to be mailed by December 15. See you next year.

\*Assistant Communications Manager, ARRL

## Multiplier Leaders

<b>220 MHz</b>		W3CCX* 18	W3IP 26	VE3LNX* 8	W7TYR 1	VE2KW 2
W2SZ1* 33	K2GK 16	WA8TXT 25	WA8TXT 25	K7HSJ 1	VE2DUB/2 2	VE2DUB/2 2
K8DIO 22	K2OS 16	K8DIO 25	2300 MHz	WA3RMX 1	W3CCX* 2	W3CCX* 2
VE3LNX* 21	<b>432 MHz</b>	WA2SNA* 25	W2SZ1* 9	W7UDM 1	W1TKX* 2	W1TKX* 2
WA8TXT 21	WB8BK 39	<b>1296 MHz</b>	W3CCX* 5	<b>5700 MHz</b>	K6TZ* 2	K6TZ* 2
WB8BK 20	W2SZ1* 35	W2SZ1* 19	VE3LNX* 2	W2SZ1* 7	<b>24 GHz</b>	W2SZ1* 1
WABVPD 20	WB9SNR 34	K2UYH 17	WA8TXT 1	W7TYR 1	W3CCX* 1	W3CCX* 1
WA2SNA* 20	WB9SNR 34	W3CCX* 12	W7TYR 1	WA3RMX 1	W2SZ1* 1	W2SZ1* 1
WA1STO 20	AB4L* 31	WB8BK 12	K7HSJ 1	W7UDM 1	<b>48 GHz</b>	W7TYR 1
W1JR 19	K2UYH 28	WB9SNR 10	WA3RMX 1	WB7UNU** 1	W7TYR 1	WB7UNU** 1
VE3CRU 18	WB3ESS 28	W2VC 10	W7UDM 1	<b>10 GHz</b>	W7TYR 1	WB7UNU** 1
	W3CCX* 27	WA2FGK 10	<b>3400 MHz</b>	W2SZ1* 8	W2SZ1* 8	
		N6CA 9	W2SZ1* 8			
		VE3CRU 8				

\*multioperator stations

\*\*stations operating from more than one location

## SOAPBOX

432 was just hot. Got almost everything that I heard, including W4s (VE3BFM). How about subsquares for frequencies above 1296 (VE2DUB/2). Hams in the Adirondacks and Green Mountains take note: There were five Gumplexer-equipped stations active on 10 GHz in the Montreal area in this contest. Forty-mile QSOs were made within a minute of switching the rig on. Such places as Mt. Mansfield, Vermont, and Whiteface Mountain, New York should be a snap. Everyone here is using a 30-MHz i.f. with about a 200-kHz bandwidth (VE1BCZ/2). . . missed 432 tropo opening while active off the moon on 1296; you just can't win (K2UYH). Sure wish that people would tune around more for those of us who are "rock-bound" (K3AKR). WOW! Six states on 1296 MHz from Minnesota during a contest, and I didn't even work the three adjacent states (W6OHU). Worked my first parachute mobile on 220 MHz — KC4MG at 10,000 feet. I heard him work a number of stations at 8600

feet, 7200 feet, 5100 feet, etc. He was running 150 mW. I included him in the log, but did not count him for contest credit (W8DJY). Good band conditions and activity for a change (WABEUU). Like the grid squares much better than the lat./long. reports (KC4EG). I can't believe the number of ops I heard call "CQ," get an answer, then ragchew until they QSB'd back into the noise (K8TL). I prefer 24-hour contests to 48-hour contests. This allows less chance of a band opening, which favors good equipment over good operators. The good operators will disagree with my preference for short contests, but 48 hours is a bit rough (K2RIW). My first time on 1296. Heard more stations than I worked. The 432 equipment didn't arrive in time. 220 was extremely slow on fm mode (KA2BTD). Sure wish that operating time would include more evening hours and not so much mid-day time. Extend ending time to 0300Z (WB8ZJP). I would like to see the contest committee state clearly the purpose of the UHF Contest. My personal feeling is that it ought to be something other than an imitation of the vhf contests. It ought

to reflect more of uhf and shf experimentation, with plenty of time for setting up and/or moving microwave locations. It should give recognition to distance between grid squares. If it were run from 1800Z Saturday to 0300Z Monday, it would increase the chances for extended tropo and aurora contacts. Anyone can make QSOs. I hope we would be gaining some useful knowledge in the process (K7HSJ). 220 MHz is *not* uhf (KL7WE). Only able to operate for one hour, but worked more stations than I did in the June contest. Guess that amplifier helps (WA8LLY). Amazed that I could work so far with a 432 antenna that is lower than the roofs of the houses around it (W8TN). I think that I was the only station active on 220 in Georgia during the contest because I did not work anyone in my own state. I did work seven other states, however, and had only seven different grid multipliers (WB4NMA). Portable operation at Four Peaks, Arizona. Heard lots of meteor pings on N6CA's signal on Sunday morning (WB5TGO). I noted with interest W1XX's comment in the January '83 article on grid squares about

DXpeditions to San Clemente Island. Caution should be exercised in doing this since San Clemente is used as a Navy target range (has been for years). On the other hand, Santa Cruz Island, where we set up a remote solar-powered uhf station each year, is now in

the same grid square as greater Los Angeles and no longer provides much incentive as a "rare" grid square. It's possible that instead of backpacking 400 pounds of equipment, water and other essentials up that island mountain, we'll carry a two-day supply of beer and watch the ships dodge oil platforms all weekend

(WA6VNN/K6TZ). My UHF Contest participation was as a DX-pedition. My QSOs on 432 and below were made from Sylvan Hills in Portland, Oregon and above 432 the QSOs were made from Parrot Mountain, near Sherwood, Oregon (WB7UNU).

### Scores List:

Call sign, total score, QSOs, multipliers, bands operated (C = 220 MHz, D = 432 MHz, E = 1296 MHz, F = 2.3 GHz, G = 3.4 GHz, H = 5.7 GHz, I = 10 GHz, J = 24 GHz, K = 48 GHz and ARRL Section. Example: VE3CRU had a total score of 14,352, with 34 QSOs and 18 multipliers on 220 MHz, 48 QSOs and 20 multipliers on 432 MHz, and 12 QSOs and 8 multipliers on 1296 MHz. He is located in the Ontario Section.

Canadian Division	Central Division	Hudson Division	GISDS	147- 4- 4-C-R1	Roanoke Division
VE3GRU 14,352-34-18-C-UN -46-20-D -12- 8-K	WB9SNR 17,548-21-15-C-IL -53-34-D -12-10-E	W2VGC 10,974-88-21-D-NNJ -76-10-K 7170-3-13-C-ERY	W1WFF 105- 3- 3-D - 3- 3-D-CT	W317/4 9555-15- 8-C-VI -52-20-D -12- 7-K	
VE3BFM 8436-22-13-C-ON -38-19-D - 8- 5-E	W9SK 7736-26-16-G-IL -17- 9-D 2622-17- 8-C-IL	W2TIF 7170-3-13-C-ERY -47-17-D	W2S2/1 14GIM,AGYX,AK4L, K2NR,KA1DZU,W2ARX, WA2s,AAU,SPL,WABUSA, WB1OBH,oprs)	WA6Z1A 3905-10- 8-C-NC -77-19-D - 5- 4-E	
VE2SH (296- 5- 4-C-PQ -14- 8-D - 4- 4-E)	W9OE 2622-17- 8-C-IL -21-15-D	K2RWR 5865-85-23-D-MLI K2MLR 7175-65-15-D-NNJ	W127,200-78-33-C-WMA 132-35-D -18-19-E - 7- 9-F - 3- 8-G - 2- 2-H - 4- 8-I - 1- 1-J	W9OLF 3180-29-14-D-VA -12- 8-E W4GAW 1860-31-20-D-NC W9TW 75- 3- 3-D-NEV W4AL (+RB4NT,W44,1VF,PG1, WB4x,SSS,ZJC)	
VE2FUT 702- 9- 7-C-PQ - 9- 6-D	W9NTL 1080-24-15-10-IL W1LTD 390-13-10-C-WI W9UT/9 297-11- 9-D-IL K9XY 90- 3- 3-C-WI	K2OVS 702-9- 9-D-ERY K2ZBU 225- 3- 3-C-NNJ - 6- 2-E	W1TKZ (+RJA,TK,UR,W1CPB, W2AWG,VE3GGJ,W1GUL, W1PQY,oprs.)	W9Q1E 3680-11- 8-C-VA -49-11-D - 1- 1-E	
VE2KW 504- 3- 2-C-PQ - 5- 2-D - 5- 2-E	<b>Dakota Division</b> W9OE 4350-12-23-D-NN - 9- 7-E	W2SNA (+K2JG,K2ZND,ZMUJ, W2RS,W2RFB,oprs.) 23,250-51-20-C-NNJ -16-25-D -14- 5-E	K1FO (+ACLT,W1RWJ) 10,440-120-29-D-CT K1BXX (+K1GX) 7664-27- 9-C-CT	W4T4 (+WA4BPJ,W4GT0D,W4GEBK) 2792- 5- 3-C-VA -25-19-D - 3- 2-F	
VE2CUA (VE2DDB,oprs.) 311-11- 7-D-PQ VE2DUB/2 96- 4- 2-1-PQ VE1BZ/2 24- 2- 1-1-PQ VE2AQU/2 24- 2- 1-1-PQ VE3LNX (+VE3ADJ) 18,650-31-21-C-ON -48-19-D -12- 8-K - 2- 2-F	<b>Delta Division</b> WA4QYK 1566- 8- 7-C-TN -11- 8-D - 5- 4-E	N2BOW (+KA2KDK) 7488-18-13-C-NNJ -22- 9-D - 6- 4-E	W4WZQ/4 (+WA4ZP,W4GLQ) 2376-12- 6-C-NC -24-18-D	<b>Rocky Mountain Division</b> W7HC 3- 1- 1-D-UT	
<b>Atlantic Division</b> K2UYH 22,842- 7- 2-C-9NJ -95-28-D -50-17-E	W4DGF 210-10- 7-C-TN	<b>Midwest Division</b> W8PTK 1638- 8- 6-C-IA -16-14-D - 1- 1-E	<b>Northwestern Division</b> 47TYR 2448-14- 5-C-OR -12- 5-D - 3- 1-E - 3- 1-K - 1- 1-G - 1- 1-H - 2- 1-I - 1- 1-K	<b>Southeastern Division</b> W4CJO 1083-19-19-D-GA W4RMA 213-13- 7-C-GA W4JOV 270-10- 9-D-GA FL7IG/4 48- 7- 4-D-FL	
W3LP 15,444-17-11-C-MDC -72-16-D -14- 7-E	W8BKC 35,997-42-20-C-MI -74-39-D -22-12-E	W8QZLP 1376-20-15-D-MI - 3- 3-E W8RAP 1197-19-18-D-IA - 1- 1-E - 15- 6- (+C4) - 2- 1-I - 1- 1-K	K7HSJ 1408-18- 2-C-OR -12- 8-D - 2- 1-E - 1- 1-F - 1- 1-G W4SRMX 1150- 7- 2-C-OR - 7- 2-D - 2- 1-E - 3- 8-F - 3- 1-G - 1- 1-H - 1- 1-I	<b>Southwestern Division</b> N6CA 648-12- 9-E-LAX AC6G 504- 6- 3-C-ORG - 4- 8-D - 1- 1-E W6LNN 306-10- 3-C-SB - 7- 3-D W8TGO 72- 6- 7-E-AZ K2DNR/7 45- 1- 1-C-AZ - 4- 4-D 26T2 (N6SG,W4BR,HBZ,VNN,oprs) 4932-33- 8-C-EK -18- 8-D -10- 5-E - 2- 2-I	
K2KC 8073-23-18-C-WNY -38-16-D - 4- 7-E	K9WW 22,152-88-17-D -25-15-E	W8CCH 15- 6- (+C4) W8BQM (+K4GCI,W8RAW,W8GPH) 12- 2- 2-D-EK	K7HSD 546- 6- 2-C-OR - 4- 2-D - 1- 1-F - 1- 1-G - 1- 1-H - 1- 1-I	<b>West Gulf Division</b> K5SW 1008- 5- 5-C-OK -10-11-D W8RRY/5 W44-19-12-D-OK W5NZS 120- 1- 1-D-OK - 7- 4-D	
W7EIF 6642-30-12-C-SNJ -32-10-D -10- 5-E	W8TXS 21,060-37-21-C-OR - 1- 1-E -19-13-E - 1- 1-E	<b>New England Division</b> W1JR 11,224-26-19-1-E -58-12-D -16- 7-E	W7UDM 1188-16- 6-C-WA -13- 7-D - 1- 1-I - 1- 1-J - 4- 2-D - 1- 1-F - 1- 1-G - 1- 1-H - 1- 1-I	<b>Expedition</b> WB7UNU 240- 5- 1-C-OR - 1- 1-D - 1- 1-I - 1- 1-I - 1- 1-E	
W8EBS 6468-77-28-D-EPA W8LJK 5124-18-14-C-MDC -61-15-D - 1- 1-E	W8DJY 13,652-27-15-C-OR -20-24-D - 9- 8-E - 1- 1-I	W1PT 5928-26- 9-C-NH -16-12-D - 5- 4-E - 1- 1-E W1EJ 1630-19- 4-C-NH -26-10-D - 5- 3-E	W4BHB 1044- 7- 3-C-NH -12- 6-D - 1- 1-F - 1- 1-G - 1- 1-H - 1- 1-I	<b>Checkdogs</b> A16T 546-26- 7-D-SCV K8LX 240-20- 4-D-SCV W4BLY 140-10- 4-D-SF	
K3HP 4860-37- 9-C-EPA -36- 9-D - 9- 2-E	W8VPD 11,088-34-20-C-MI -36-20-D - 7- 4-E -40-25-D	W1EM 1364-18- 8-C-EMA -25-10-D - 6- 4-E W1STO 3000-30-20-C-CT W1JOF 2115-43-13-D-EMA - 2- 2-E K1CZR 1384-44-12-D W1FAL 1428-13- 7-C-CT -19- 3-D AC1J 1064- 7- 3-C-NH -12- 6-D	W4BND 2970-18- 6-C-SCV -26- 6-D -11- 3-E W16CHL 2340-12- 7-D-EB -26- 8-D - 7- 4-D 408-10- 4-C-EMA - 7- 4-D 408-17- 8-C-EMA 360-10- 6-E-CT 16- 3- 3-C-EMA - 4- 1-D - 1- 1-E		
W3CL 2444-29- 7-C-EPA -38- 9-D	K8DLO 10,293-33-22-C-OR -40-25-D -13- 9-D	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			
SZOS 1200-25-16-C-WNY W1AKR 1140-10- 7-C-MDC -13- 5-D	K8MD 3978-24-13-C-MI -13- 9-D W8IDU 3807-14-10-C-MI -21-11-D - 6- 6-E -14- 8-C-MI	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			
W8JNQ 1080- 4- 1-E-EPA -32- 9-D	W8IDU 3807-14-10-C-MI -21-11-D - 6- 6-E -14- 8-C-MI	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			
EC3CL 1035-23-15-C-WPA W2BRW 830-21-10-D-SNJ W2BPK 510-17-10-D-WNY	W8EJU 3588-14- 8-C-MI -24-11-D - 7- 4-E	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			
W3CCX (AAZT,AK30,K2SB, RD6KD, N3s, GCW, GK, W2NH, W3s HQT, 11T, WA2s DPU, OMY, WA3s 3XV, JUP, WB2s NPS, RVX, V1A, WB3JVO,oprs) 51,870-85-C-EPA -90-27-D -77-12-F - 6- 5-E - 1- 2-E - 1- 1-J	KC4EG 2880-22-12-C-KY -18-12-D K8DW 2280-13- 8-C-OK -13- 8-D - 6- 4-E	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			
W3LP (W3s GFN,JUZ,W4JUD,oprs) 1224-11- 8-C-EPA -21- 7-D	K8WKZ 882-21-14-C-MI W8BYE 798-19-14-D-MI W4APCS 660-20-11-C-KY W4SZCO 660-12- 7-C-MI - 8- 4-D K8TL 61- 7- 3-D-OR W8BKY (+N8UKH) 1767- 8- 5-C-MI -23-14-D	W1XW (W1XG,oprs) 3498-18- 8-C-EMA -25-10-D - 6- 4-E			

## Strays

I would like to get in touch with...

- amateurs with multiple sclerosis who are interested in joining a net. Gayle Sabonaitis, WA1OPN, 11 Maxwell St., Worcester, MA 01607.
- amateurs interested in old cars, particularly Studebakers, who would like to join a net. George Kream, KY0N, 1248 Esther Ct., Iowa City, IA 52240.
- any Safeway Stores, Inc., employees interested in establishing a net. Lou "Val" Vallis, KD6KV, 756 Duke Circle, Pleasant Hill, CA 94523.
- a retired ham in the W6 or W7 call areas who is interested in an exchange visit with a ham on the Isle of Man. Jack Etherington, GD5UG, 66 Douglas St., Peel, Isle of Man, England.



It must be a record for the largest single shipment of QSL cards from one ham to the ARRL Outgoing QSL Bureau. You won't get any argument on that from Quint Goodrich, KM1V, anyway, as he unpacks the 3500 or so cards sent in by Bill Keller, W2RQ, of Newton, New Jersey. (KH6WZ photo)



Ed Aho, WA7RQS, of the Sunset Empire ARC, mans the club's station aboard the decommissioned U.S. Coast Guard Lightship Columbia, the largest exhibit at the Columbia River Maritime Museum in Astoria, Oregon. Ed is the station trustee and chairman of the Lightship Committee. (W4KFC photo)



# Rules, 1984 ARRL International DX Contest

To the serious DX contester and the casual country hunter alike, the third full weekend in February (18-19, for cw) and the first full weekend in March (3,4 for phone) bring the challenge and excitement of the ARRL International DX Contest. For these two weekends each year, the bands spring to life with DX aplenty. An operator can choose to go all out in the competition for a top score, or leisurely chase those last few countries needed to finish the requirements for the 5-Band DXCC award.

If you participated in the 1983 ARRL International DX Contest, you are that much ahead of the pack. The rules for the '84 contest are exactly like those of the '83 'test.

Use of official entry forms makes the post-contest paperwork a snap for you and makes the job of compiling the results a lot easier at our end. To receive your set of entry forms, send a self-addressed, stamped, business-size envelope (for W/VE amateurs) or a self-addressed envelope and 2 IRCs (for DX amateurs) to ARRL Hq. Mail early and avoid the last-minute delay.

Complete contest rules are listed below. If you have any questions on any aspect of this contest, get in touch with us at Hq., and we'll do our best to help you out. Good DX!

## Rules

1) **Eligibility:** Amateurs worldwide.

2) **Object:** W/VE amateurs work as many amateur stations in as many DXCC countries of the world as possible on 1.8 to 30 MHz, excluding the 10-MHz band. Foreign amateurs work as many W/VE stations in as many states and provinces as possible.

3) **Dates:**

(A) **CW** — Third full weekend in February (February 18-19, 1984).

(B) **Phone** — First full weekend in March (March 3-4, 1984).

4) **Contest Period:** 48 hours each mode (separate contests). Starts 0000 UTC Saturday; ends 2400 UTC Sunday.

5) **Categories:**

(A) **Single Operator** — One person performs all operating and logging functions. Use of spotting nets (operator arrangements involving assistance through DX-alerting nets, etc.) is not permitted. Single-operator stations are allowed only one transmitted signal at any given time.

(1) **All band.**

(2) **Single band** (one only). Single-band entrants who make contacts on other bands should submit logs for checking purposes.

(B) **Multioperator** — More than one person operates, checks for duplicates, keeps the log, etc.

(1) **Single transmitter.** One transmitted signal at any given time. Once the transmitter has made a contact on a given band, it must re-

main on that band for at least 10 minutes. Multioperator, single-transmitter stations must keep a single, chronological log for the entire contest period. Violation of the 10-minute rule or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(2) **Two transmitter.** A maximum of two transmitted signals at any given time, on different bands. Once either transmitter has made a contact on a given band, it must remain on that band for at least 10 minutes. Both transmitters may work any and all stations; the second transmitter is *not* limited to working new multipliers only. Each of the two transmitters must keep a separate, chronological log for the entire contest period. Violation of the 10-minute rule by either or both transmitters or improper logging will result in an entrant's reclassification to the unlimited multi-multi class (see below).

(3) **Unlimited.** A maximum of one transmitted signal per band at any given time. Unlimited multi-multi stations must keep a separate, chronological log for each band for the entire contest period.

(C) **QRP** — Single operator, all band only. QRP is defined as 10-W input or less (or 5-W output or less).

6) **Contest Exchange:**

(A) W/VE stations (includes 48 contiguous United States and does not include Canadian islands of St. Paul and Sable) send signal report and state or province.

(B) DX stations send signal report and power (three-digit number indicating approximate transmitter input power).

7) **Scoring:**

(A) **QSO Points** — W/VE stations count three points per DX QSO. Foreign stations count three points per W/VE QSO.

(B) **Multiplier** — W/VE stations: sum of DXCC countries (except U.S. and Canada) worked per band. Foreign stations: sum of U.S. states (except KL7/KH6) and VE1-7, VO, VE8/VY1 worked per band. Maximum of 57 per band.

(C) **Final Score** — QSO points  $\times$  multiplier = final score.

8) **Miscellaneous:**

(A) Call signs and exchange information must be received and logged by each station for a complete QSO.

(B) All operators must observe the limitations of their operator licenses at all times.

(C) Your call sign must indicate your DXCC country station location (KH6XYZ/WI in Maine; FG0AAA/FS on St. Martin, etc.).

(D) One operator may not use more than one call sign from any given location during the contest period.

(E) The same station may be worked only once per band — no crossmode, crossband or repeater contacts.

(F) Aeronautical and maritime mobile stations

outside the U.S. and Canada may *not* be worked for QSO or multiplier credits by W/VE stations.

(G) All transmitters and receivers must be located within a 500-meter-diameter circle, excluding directly connected antennas. This prohibits the use of remote receiving installations. Exception: Multioperator stations may use spotting nets for multiplier hunting only.

9) **Reporting:**

(A) All entrants are encouraged to use official forms available from ARRL (s.a.s.e. or 2 IRCs) to report contest results.

(B) Logs must indicate times in UTC, bands, calls and complete exchanges. Multipliers should be clearly marked in the log the first time worked. Entries with more than 500 QSOs total must include cross-check sheets (dupe sheets).

(C) All operators of multioperator stations must be listed.

(D) Entries must be postmarked within 30 days of the last contest weekend (April 4, 1984). Logs not postmarked by the deadline will be classified as checklogs; no extensions, no exceptions. All stations are requested to send their entries in as early as possible. Entries received after mid-July will not make QST listings.

10) **Awards:** Plaques will be awarded in the following categories for both the cw and phone contests.

(A) Top W/VE scorer in each entry category — single operator-all band, single operator-single band (1.8-28 MHz), QRP, multi operator-single transmitter and multioperator-multi-transmitter.

(B) Top scorer in the single operator-all band category worldwide and on each continent. In addition, worldwide leaders in the single operator-single band, QRP, multi-single and multi-multi categories will receive plaques.

(C) Additional special plaques will be awarded as sponsored. See October 1983 QST for the current list and February 1984 QST for any additions.

(D) Certificates will be awarded to top single-operator, all-band entries from each country and ARRL Section; top single-band entries in each U.S. call area and each country; top multioperator entries (both single and multi-transmitter) in each country, U.S. call area and in Canada. Additional single-band and multioperator certificates will be awarded if significant effort or competition is displayed. DX entrants making more than 500 QSOs on either mode will receive certificates.


11) **Club Competition:** ARRL-affiliated clubs compete for gavel on three levels: unlimited, medium and local clubs. Details will be listed in January 1984 QST.

12) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, by regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualification: An entry may be disqualified if the overall score is reduced by more than two percent. Score reduction does not include correction of arithmetic errors. Reductions may be made of unconfirmed QSOs or multipliers, duplicate QSOs or other scoring

discrepancies. An entry will be disqualified if more than two-percent duplicate QSOs are claimed for credit. For each duplicate or miscopied call sign removed from the log by ARRL, a penalty of three additional QSOs will be deleted. The penalty will not be considered

as part of the two-percent disqualification criterion. If a participant is disqualified, that operator will be barred from entering the contest on that mode the following year. The calls of all disqualified participants will be listed in the QST contest results. 

# Rules, January VHF Sweepstakes

As the vhf/uhf bands come to life on the weekend of January 14-15, we will mark the 37th running of the ARRL January VHF Sweepstakes. All of those neat contest format changes made for the 1983 contest are still in effect for 1984. Official entry forms are available from Hq. for a business-size s.a.s.e. with one unit of First Class postage. These forms not only make our job easier, but make it a snap for you to compute your score.

Note that there is a *one hour* later starting time for the 1984 contest to bring the VHF SS into line with the policy of a uniform start time for all major ARRL VHF contests.

Remember that ARRL-affiliated clubs compete in the January VHF SS. Check with your radio club secretary to see if your club is going to make an aggregate entry. If your club is not ARRL-affiliated, contact the Club and Training Department at ARRL Hq. to find out how to join the ranks. Club secretaries take note: Be sure to read the rules in January 1984 QST governing affiliated-club competition. Each affiliated club wishing to enter the club competition must submit a current club roster showing the calls of *all* club members eligible to submit their scores for the club. Now is the time to start planning for a successful participation in the VHF SS.

Good luck!

## Scoring Example

Band (MHz)	QSOs	QSO Points
50	25(x 2)	50
144	40(x 2)	80
220	10(x 4)	40
432	15(x 4)	60
1215	5(x 8)	40
2300 +	1(x 16)	16
Totals	96 QSOs	286

Final score = (QSO Points) x (ARRL Sections + 10).

## Rules

1) **Object:** To work as many amateur stations in as many ARRL Sections and countries as possible using authorized amateur frequencies above 50 MHz. Foreign stations work W/VE amateurs only.

2) **Contest Period:** Begins 1900 UTC Saturday, January 14, and ends at 0400 UTC Monday, January 16.

### 3) Categories:

(A) **Single Operator** — One person performs all transmitting, receiving, spotting and logging functions.

(B) **Multioperator** — Those obtaining any form of assistance, such as the use of relief operators, loggers or spotting nets.

4) **Exchange:** W/VE amateurs exchange signal report and ARRL section. Foreign stations give country name instead of ARRL Section (U.S. Caribbean possessions are in the West Indies Section; Hawaii and U.S. Pacific possessions are in the Pacific Section).

### 5) Scoring:

(A) **QSO points** — Count two points for complete two-way QSOs on 50/144 MHz; four points on 220/430 MHz; eight points on 1215 MHz; and 16 points on 2.3 GHz or higher.

(B) **Multiplier** — Total ARRL sections plus VE8/VY1, plus foreign countries *worked during the contest*, plus 10 — *not* Sections per band.

(C) **Final score** — Multiply QSO points by multiplier total. See scoring example.

### 6) FM Restrictions:

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted.

(B) Only those recognized simplex frequencies may be used: 144.90 to 145.10; 146.49, .55 and .58 and 147.42, .45, .48, .51, .54 and .57 MHz. This restriction prohibits use of all repeater frequencies, including 146.76 and .94. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(C) Use of the national simplex frequency, 146.52 MHz, is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting contest QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

### 7) Miscellaneous:

(A) The same station may be worked on different bands or in different Sections for QSO credit.

(B) Crossband QSOs are not permitted.

(C) Only one signal per band (50, 144, 220, etc.) is permitted at any given time; single-operator stations are allowed only one transmitted signal at any given time.

(D) Multioperator stations must locate all transmitters and receivers within a 500-meter-

diameter circle, excluding directly connected antennas.

(E) While no minimum distance is specified, equipment in use should be capable of real communications (i.e., able to communicate over at least a mile).

(F) A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest (except for family stations where more than one call is assigned to one location by FCC/DOC — and then for family members only).

(G) Multioperator stations may not count QSOs with their own operators except on 2.3 GHz and up, and a complete different transmitter, receiver and antenna must exist for each QSO under these conditions.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

### 8) Reporting:

(A) Entries must be postmarked no later than 30 days after the end of the contest. Use ARRL VHF SS forms or a reasonable facsimile.

(B) Logs must indicate time in UTC, bands, calls and complete exchanges. Multipliers should be numbered clearly in the log the first time they are worked. Entries with more than 200 QSOs total must include cross-check sheets (dupe sheets).

### 9) Awards:


(A) Top single-operator stations in each ARRL Section or foreign country.

(B) Top multioperator station in each ARRL Section where exceptional effort or competition is evidenced.

10) **Club Competition:** ARRL-affiliated clubs compete for gavels on three levels — unlimited, medium and local clubs. Details will be listed in January 1984 QST.

### 11) Conditions of Entry:

(A) Each entrant agrees to be bound by the provisions, as well as the intent, of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excess duplicates and call sign/exchange errors. See January 1984 QST for complete details. 

## A Fair Dose of Amateur Radio

Take one large parcel of land in Sedalia, Missouri. Add paved walkways. Stir in carnival rides, clowns, balloons and a generous helping of live entertainment. Sprinkle with commercial and agricultural buildings. Finally, fill with people of all ages. Result: the annual Missouri State Fair, a superb location for a living, breathing ham shack on display.

For about a decade, fairgoers had annually been treated to Amateur Radio in action, thanks to the generosity of the Sedalia ARC and, later, the Warrensburg ARC. Thousands of individuals all over the U.S. had been presented with a tiny slice of the Missouri State Fair through the many radiograms sent out over the years. But early in 1983 this happy picture changed. The Warrensburg club announced that they had neither the time nor personnel to operate the State Fair station in 1983.

To most central Missouri clubs, this came as no surprise. The 10 days of the State Fair is a rigorous demand for any club, as Fair rules require all booths to be manned from 9 A.M. to 9 P.M. every day for that organization to renew its contract for next year. Over the years, the Sedalia and Warrensburg ARCs had performed admirably, getting no less than a grade "A" rating from the Fair board. Relief from this duty had been long-awaited.

However, unlike as in the past, no new clubs waited in the wings to continue the State Fair station. If the administration did not receive a renewal soon, the booth and its advantageous antenna site would be lost for five years at least, with no hope of renewal in the near future.

Missouri ARRL Section Manager Ben Smith, KØPCK, wasn't about to let the fair station go under without a fight. Taking this dilemma to his home club, the Central Missouri Radio Association (CMRA), he found the original response to be less than enthusiastic. After all, 68 miles stand between Columbia, home of the CMRA, and the fairgrounds at Sedalia. Getting operators for the 10-day Fair could prove difficult.

Finally, after much deliberation, the CMRA agreed to financially underwrite the State Fair station, but not to be responsible for its management and operation. Ben would have to coordinate the personnel himself.

This reprieve gave Ben the time he needed to formulate his plans for the 1983 State Fair station. Financial support (about \$500 to rent the booth) comprised the least of his worries — many clubs statewide long ago had gotten into the habit of writing a check to the club supporting the Fair station each year. The CMRA would have no problem recouping its expenses. Warm bodies, however, presented another problem. Past experience showed that a handful of hams burn out quite quickly when faced with a week and a half of State Fair duty.

The success of this project, reasoned KØPCK,

### Tips for Successful Operation at Fairs or Other Public Events

- 1) Set your site up beforehand and *check it out!* The old "ounce of prevention" adage may be comball, but it's sure true. By using effective antennas, quality equipment and filters, you will save numerous headaches.
- 2) Choose congenial, personable people in your club to man the station. Try to have a variety of ages and both sexes at your booth to attract a wider audience. Make sure that if you plan to handle traffic, someone in the group is proficient enough at message handling to put the other operators at ease.
- 3) Amazingly enough, you may discover that teenagers and elderly ladies are a more receptive audience than any other group. (Ironically, the group that makes up the main populace of Amateur Radio, 35-50 year-old males, usually are ultra-suspicious of a booth offering "free" radiograms!)
- 4) Don't get bent out of shape when someone exclaims, "Look at the CBS!" Honestly, that's the closest thing the public associates with Amateur Radio. Force yourself to smile, and explain what Amateur Radio is, not what it isn't.
- 5) Answer all questions accurately, but simply. For example, the number one question at a booth offering radiograms is, "How does the addressee get my message?" A simple "We send your message via Amateur Radio to an amateur in the town of the addressee. He calls the addressee on the phone and delivers the message," will suffice. Don't try to give a dissertation on the workings of the National Traffic System or the Podunk repeater. People tend to turn off easily upon hearing deep loads of "ham speak."
- 6) Bring plenty of writing material and writing utensils; pens and pencils have a tendency to "walk off," even when tied down.
- 7) Make plenty of posters and other audio-visual aids to decorate your booth. Educators all over the country agree that a variety of audio-visual stimulation will hold one's attention more effectively.
- 8) Most important of all, the best way to make your hobby look enjoyable is to actually have fun! Don't be afraid to admit that the reason most of us became hams is because it's fun! — K7BY

rested with Missouri hams and their ability to share the burden of operating the station. Ben put out a call for all clubs in the state to book operators for each day of the Fair. By arranging for a given club to operate for one day, he could prevent State Fair burnout, as well as give area hams a chance to visit the Fair.

Missouri hams responded admirably. Operators from CMRA, Sedalia ARC, Macon County ARC and Kansas City-area clubs, such as the PHD ARA, Northland ARC and the Heart of America Radio Club, all filled slots in the 10-day operation, as well as individual operators lending hands to operate.

Using the CMRA club call, WDØDVG, the 1983 Missouri State Fair station originated about 700 pieces of traffic going to almost every state in the U.S. from interested fairgoers. To facilitate movement of this overwhelming load of traffic, members of the Missouri CW Net (MON), the Missouri Operations and Weather Net (MOW) and the Missouri Single Sideband Net (MOSSB) provided liaison at regular intervals to enter messages into the National Traffic System. In addition, Kansas City-area hams provided a much needed 2-meter link for the large amounts of KC traffic received.

Of those 700 messages, only 33 were serviced back as undelivered. The efforts of WDØDVG's numerous operators earned it the coveted BPL award, in the short space of August 11-21, with a total traffic count of 1418. These operators logged 265 special events hf contacts in 36 states and three countries, exchanging over 100 QSL cards as confirmations of "attendance" at the Missouri State Fair. One hundred and eighteen amateurs signed the guest book while visiting.

Success of "Missouri's ham shack" can also be measured by its appeal to the general public. Operators distributed over 500 of ARRL's "Amateur Radio — the World at your Fingertips" leaflets, as well as visiting at lengths with TV/radio journalists, dignitaries and fairgoers.

what was to be an all-night vigil. A ship with W4MTW aboard on frequency was being pursued by what was believed to be a hostile vessel. W4MTW's ship was on a course from Jamaica to Panama when another vessel was discovered to be on a collision course with them. The ship veered to avoid a collision, only to have the

Young and old alike filled out message blanks as they got a first-hand dose of the magic world of ham radio. As an outgrowth of this interest, many fairgoers specifically asked for more information on how to become an amateur.

Finally, WDØDVG's success can be measured by its profound effect on two people in particular. On opening night, a man came over to the booth and sent a very interesting version of ARRL Radiogram Fifty Six to Belton, Texas. His ARL Fifty Six read, "Congratulations on your divorce, a most worthy and deserved achievement."

The following Monday, a lady wandered by the station, looked over the numbered radiogram list and picked out ARL Sixty Three: "Victory or defeat, our best wishes are with you. Hope you win."

Puzzled, KØPCK asked her if she knew someone who had won a softball tournament or some such thing.

"No," she replied, "my brother and his ex-wife are getting remarried."

Noting the Belton, Texas, in the address block of the message, Ben recalled the odd message to the same place on opening night. "You haven't sent a message here before, have you?" he inquired.

A strange smile crossed her face. "That was my brother," she explained sheepishly. "He came over here Wednesday night and sent a message to his ex, congratulating her on their divorce. Well, when she got the message, it upset her so much that she called him at my house and asked him if maybe they ought to start over again. He left for Texas Sunday to get back with her!"

Maybe not all State Fair stations can patch up broken marriages, but it's a sure bet that the magic of a fair, coupled with the magic of Amateur Radio, can breed a powerful form of enchantment. — Maria L. Evans, KTSY, ARRL Missouri Affiliated Club Coordinator/Public Information Officer

offending vessel take on another heading toward them. At one point, a visual sighting of the hostile vessel with its running lights showing was confirmed on the horizon. At this stage, the hostile vessel was within one mile of W4MTW/MM.

After the vessel had passed by W4MTW's ship, it

### HIGH SEAS CHASE

At 0342 UTC October 9, 1983, while monitoring the Seafarer's Net on 14.313 MHz, I became involved in

\*Deputy Communications Manager, ARRL

came about and began pursuing to overtake W4MTW/MM. At this point, WA3HLP acted as a relay between W4MTW and the Jamaica Coast Guard. Also on frequency at this time were 6Y5DZ, N5EW (net control), XE1UUC and WH6ANH.

After U.S. and Jamaica Coast Guard authorities had been contacted, they requested that W4MTW/MM come about and return to Jamaica. This move would have placed the vessel in serious jeopardy, however, as they would have had to try and maneuver past the vessel to return. Wishing to avoid any physical confrontation, the Captain and crew of W4MTW's ship opted to attempt a heading for Panama in hopes of out-distancing the hostile ship.

At 0430 UTC, W4MTW/MM reported his ship's position as 16° 33' 24" N by 76° 47' 64" W. At this point, I was advised that a steering problem was developing aboard his ship. The hostile vessel was still on radar approximately six miles aft (to the rear), staying with them in course and speed.

It was also reported at this time that a fixed-wing aircraft had departed from Manly International Airport on Jamaica to investigate the incident and was operating on 122.3 MHz. After some time had elapsed, there was some question as to whether the aircraft had indeed departed from the airport. The control tower was contacted via Jamaica Coast Guard to confirm flight departure. Upon returning to 14.313, the Coast Guard advised us that the aircraft was returning to base to pick up two Coast Guard representatives.

A propagation check was made with the vessel at 0515 UTC. At 0524 UTC, W4MTW/MM reported they were pulling away slightly from the hostile vessel. Again contact was attempted with the aircraft on 122.3 MHz, but with no luck.

At 0538 UTC, contact was made with the Jamaica Coast Guard. It was confirmed that the aircraft had returned to pick up two Coast Guard representatives.

At 0551 UTC, W4MTW/MM reported that the hostile vessel was making a move and coming up on their starboard (right-hand) side, approximately six miles out. W4MTW/MM was at this time 120 miles from Jamaica.

At 0606 UTC, W4MTW/MM reported a position of 16° 16' N by 76° 56' W. The ship's Captain and navigator calculated for the search aircraft a bearing of 190° true out of Kingston, Jamaica. When the Jamaica Coast Guard questioned the precise location of W4MTW's ship, a recalculation was made using Loran and their last reported position was confirmed. VHF contact was again attempted with the aircraft, but once more with no success.

At this time, 6Y5MC came on frequency to assist with a direct phonepatch to the airport control tower. This patch was an immense help in clarifying the information from those who were in direct contact with the search aircraft. Through this patch, we were directed to go to a new frequency of 121.9 MHz. The aircraft was at 5.5 miles search altitude when at 80 miles out, it was reported to have broken off the search and was returning to base because of poor visibility. When contacted to confirm visibility, W4MTW/MM reported it to be almost unlimited in the search area.

On frequency at this time were K2BHC, KG4DX at Guantanamo Bay, Cuba, and a W9 station. The W9 suggested that as a last measure the vessel use the international aircraft distress frequency of 121.5 MHz in an attempt to contact a commercial flight in the area.

As all this was taking place, KG4DX was checking with his personnel to see if any military aircraft were available. Upon returning to 14.313, he reported that no aircraft with sufficient range were available to reach the vessel.

At approximately 0700 UTC, W4MTW/MM reported the hostile vessel to be 15 miles out. At 0731 UTC, the hostile vessel was at 22 miles out. Contact was lost at 0800 UTC but reestablished at 1400 UTC, with W4MTW/MM confirming that the hostile vessel was no longer on radar and that the apparent pursuit had been broken off. A silent sigh of relief went out from all those monitoring 14.313 at the time. All things considered, once again the most valuable radio aboard the vessel turned out to be the Amateur Radio. — Randy B. Maurer, WA3HLP, Ephrata, Pennsylvania

In accordance with the Zone 4A ARES emergency plan, units responded to predefined fixed and spotter locations. The Amateur Radio positions at Stormont-Vail, St. Francis Memorial and Veterans Administration hospitals were manned quickly, and the hospital net convened on the 146.34/94 (WR0ACG) repeater. A station at the Shawnee Ambulance Service was also readily established for coordination with the hospitals on patient load and was operating on the medical net. At the same time 1 (N0BLD) arrived at the National Weather Service station, and the Topeka-Shawnee County Civil Defense Emergency Operating Center (EOC) was activated so information could pass quickly between the Weather Service radar meteorologist and spotters in the field. (The EOC acts as the Net Control Station for all emergency weather nets.) AM-COM 1, the Kaw Valley Amateur Radio Club's mobile command post carrying hf and vhf Amateur Radio equipment and commercial equipment for civil defense, police, fire and ambulance frequencies, was also manned on standby at the Topeka Fire Academy. All was in place within the 30-minute lead-time period customarily given us by the National Weather Service.

Spotters in the field routinely reported significant weather information, which was coordinated with the radar operator. The EOC relayed a sheriff's report of a tornado in the southwestern part of Shawnee County. Verification was immediately given by an amateur in the area. Based upon the two reports, a "Tornado Warning" was issued for Shawnee County. By this time, several spotters just to the west of the storm began reporting clear and sunny skies. The SKYWARN training earlier this spring told us that a "classic" storm, with the tornado appearing at the tail end in the rain-free base, was approaching the capital city. A sheriff south of Topeka reported a tornado at 45th and U.S. 75 moving northeast. Shortly, reports of damage to a trailer court on the south edge of Topeka were received from local officials (it was later determined that two trailer courts were involved).

Radar still did not indicate a particularly severe storm, although only one line of storms was present within its operating radius. Suddenly, N0DDW, atop Burnett's Mound (the hill in southwest Topeka that, contrary to Indian legend, failed to deflect the massive killer tornado in June 1966) reported amidst the blare of an outdoor warning unit that he could see rotation on the ground near Lake Shawnee, some six miles east of his location. No vortex was visible. WA0ARO observed the tornado pass between his house and another one while he headed to his basement. (He suffered a minor injury while trying to escape the storm.) WB0QFD, on the east side of Lake Shawnee, then reported the tornado had become a waterspout as it crossed the lake and proceeded in a northeasterly direction.

After just a few minutes, the storm was gone and the sky cleared. Families emerged from their basements, where they had taken shelter, and began to survey damage. It was all over for many people — just another storm — but not for medical, law enforcement, disaster relief and Amateur Radio personnel.

At the first report of damage, the AM-COM 1 van, manned by WA0VRS, Chairman of Disaster Communications planning for the Topeka-Shawnee County Civil Defense, and WB0TXI, an off-duty Topeka police dispatcher, rolled to a staging area about midway between the two major stricken areas to stand by for any possible call for assistance. The van was already acting as a clearinghouse for police department requests on frequency 4, as the Topeka Emergency Communications fire and police dispatching center (TECOM) was flooded with telephone and radio traffic. This intensive duty earned AM-COM 1 the unofficial temporary title of "TECOM 1" by many patrol units who were less familiar with the name than they were with the capabilities of the KVARC communications van.

AM-COM 1 was summoned to the Lake Shawnee area by the Shawnee County Sheriff to establish the command post for their security operation. Within minutes, AM-COM 1 was entering the stricken area under escort from Sheriff's officer N0CBI. The van was escorted to the actual command post site by the Sheriff, who was well familiar with the capabilities of AM-COM 1 following its use as a dispatching center during a recent power failure.

Once on site, the KVARC gasoline-powered generators (3 and 5 kW) were set up and the crank-up tower was erected. The generators powered AM-COM 1 and the club's floodlights. A mobile whip antenna from a sheriff's unit was appropriated for use atop the tower to extend their usable communications range.

While all this was going on, Net Control KA0BBP, a Civil Defense Radio Officer, was busy organizing initial assessment teams to check out damage at the trailer courts and continuing a weather net until we were released by the Weather Service. Traffic related to the operations around Lake Shawnee had been moved off to the 144.85/5.45 (W0CET) repeater, with the medical net following them. This left the 07/67 repeater

available for the much lighter traffic from the trailer park area and the outpatch. Most on-site communications at Lake Shawnee and between AM-COM 1 and EOC occurred on 146.00 simplex.

Traffic between the hospitals and the ambulance service was conducted according to plan. Fortunately, there was only one fatality (at a trailer park) and few injuries. The hospital net secured late Friday evening.

WB0YJT established the hf liaison on the Kansas Emergency Net (3.920 MHz) from the KVARC club station W0CET at the Red Cross building shortly after the storm struck, and fielded initial health-and-welfare inquiry requests. He also outlined the affected areas. Kansas Section Emergency Coordinator W0KL had been monitoring the 2-meter activity from his home in Ottawa, 53 miles southeast of Topeka, and activated the hf net at the first reports of significant damage.

Activity for the remainder of the night was predominantly from the Lake Shawnee area on behalf of the county sheriff's office. Administrative traffic between the sheriff and EOC related to the disaster was conducted on 2-meter simplex and repeater frequencies, as were communications relating to establishment of checkpoints and other disaster-site security measures, greatly lessening the traffic on the three public service frequencies available to the Sheriff.

Friday night, a small force of operators (20) was formed to assist civil defense and Red Cross in damage assessment the next morning. (Damage assessment was projected to be completed within 48-72 hours of the tornado.) These amateurs met at the staging area, where they received instructions from the Red Cross, the civil defense and the city assessor on how to access and report the damage. Ten two-person teams were available from this group of amateurs, as were a few Red Cross and Civil Air Patrol teams, bringing the total number of teams to approximately 15. WA0FNX provided his mobile home as the operating center for Red Cross officials at this site, and areas assessed were routinely marked "completed" on the maps as teams reported in. A few health-and-welfare inquiries were satisfied while the amateurs were surveying damage in the affected areas. By noon Saturday, less than 18 hours after the storm, the damage assessment was completed.

The remainder of Saturday, most activity was confined to health-and-welfare inquiries in the Lake Shawnee area and continued operation of AM-COM 1 and its generators. By noon Sunday, participation by Amateur Radio operators was completed, police and sheriff barricades were taken down, and AM-COM 1 and the KVARC station at Red Cross were secured.

— Marshall P. Reece, N0BLD, EC, Zone 4A, Kansas

## ARRL SECTION EMERGENCY COORDINATOR REPORTS

□ For September, 35 SEC reports were received, denoting a total ARES membership of 18,236. Sections reporting were: AB, AZ, DE, IN, KS, KY, ME, MN, MS, MO, NE, NH, NJ, NC, NF, OH, OK, ON, ORG, PAC, SDG, SJV, SC, SD, SFL, STX, TN, UT, VA, WA, WV, WMA, WNY, WPA and WY.

## NATIONAL TRAFFIC SYSTEM

Certificates were awarded to the following stations for their participation in their respective nets: 2RN/c2 — VE2FMQ, WA2JBO and WB2YQD; 2RN/c3 & 4 — W2YGW (2nd annual); RN6/c4 — W6PRI, K6PMG and N6CSM; 9RN/c4 — N9AEI, N9AUG, K9CZO, KA4BCM, K9BVE, N9BYK, W9CBE, K9CMA, W9CXY, W9EI, K24G, K9GDF, KA4GFU, N9HZ, WB9ICF, W9INZ, WD4YI, KJ9J, KW9J, KD9K, W9LSR, WB4NHO, W9NXG, KA9OBP, W4OGP, NW4P, WA9QCF, K4QCQ, W9QLW, K9SAO, K9SW, N9TN, K9UTQ, WB9UYU, KC4WN, K9WVJ, W9XD, W9YCV and WB4ZDU.

## September Reports

	1	2	3	4	5	6	7
<b>Cycle Two</b>							
<b>Area Nets</b>							
EAN	30	1189	39.6	.840	90.0		
CAN	30	859	28.6	.549	100.0		
PAN*	80	758	12.6	.430	99.4		
<b>Region Nets</b>							
1RN	60	537	8.9	.380	85.0	100.0	
2RN	59	435	7.4	.382	85.0	100.0	
3RN	30	208	6.9	.484	95.0	96.7	
4RN	60	495	8.3	.308	78.1	100.0	
RN5	60	609	10.1	.370	97.3	100.0	

## COMMUNICATIONS SERVICE OF THE MONTH

The spring evening's silence was broken by the sound of a 10-second 1050-Hz tone opening the speaker of an otherwise muted 2-meter rig. "This is WA0VRS. By authority of the National Weather Service, Topeka, the storm spotters are being activated at this time..." Thus began the announcement at 6:03 P.M. May 6, 1983 on the 146.07/67 (WA0VRS/R) Topeka, Kansas, repeater. The first weather callout of the season at first appeared to be routine. We would soon know differently.



# Contest Corral

## A Roundup of Upcoming Operating Events



Conducted By Bill Jennings,\* K1WJ

### DECEMBER

3-4

**ARRL 160-Meter Contest**, Nov. *QST*, page 105.

**Telephone Pioneers QSO Party**, Nov. *QST*, page 108. **EA DX CW Contest**, sponsored by the URE (Spain), from 1600Z Dec. 3 until 1600Z Dec. 4. 160 to 10 meters, excluding WARC bands. Single op and multiop, single transmitter classes. Work stations once per band. Exchange signal report and serial number (EA stations will send province code instead of serial number). Count 3 points per EA/EC QSO. Multiplier is the total number of Spanish provinces worked per band. Mail entry by Jan. 15, 1984 (must be received by Feb. 1) to URE, P.O. Box 220, Madrid, Spain.

6

**West Coast Qualifying Run**, 10-35 wpm, at 0500Z Dec. 7 (9 P.M. PST Dec. 6). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please include your full name, call sign (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

8

**WIAW Qualifying Run**, 10-35 wpm, at 0300Z Dec. 9 (10 P.M. EST Dec. 8). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.55 MHz. See Dec. 6 listing for more details.

10-11

**ARRL 10-Meter Contest**, Nov. *QST*, page 105.

11

**ARRL 50 MHz Sprint**, from 7 P.M. to 11 P.M. local time. See Oct. *QST*, page 98, for details.

27

**WIAW Qualifying Run**, 10-35 wpm, at 1400Z (9 A.M. EST) Dec. 27. See Dec. 8 listing for more details.

26-Jan. 1

**QRP Winter Sports**, sponsored by the G-QRP Club. Activity daily on the following UTC times/frequencies: 0900-1000/14.060; 1000-1100/21.060 and 28.060; 1100-1200/7.030; 1200-1300/3.560; 1300-1400/10.106; 1400-1500/3560; 1500-1730/21.060 and 28.060; 1730-2000/14.060; 2000-2100/7.030 and 10.106; 2100-2200/3.560; 2200-2300/14.060. For more information, contact Christopher Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW, England.

\*Assistant Communications Manager, ARRL

### JANUARY

Dec. 31-Jan. 1

**ARRL Straight Key Night**, 24-hour period UTC (from 7 P.M. EST Dec. 31 until 7 P.M. EST Jan. 1). This is a friendly meeting on the air using straight keys. Suggested areas of operation on 80, 40 and 20 meters are 60 to 80 kHz from the lower band edges and 10 kHz from the lower Novice band edges. When participating in SKN, use SKN instead of RST preceding the three-digit report to clue in passersby. Following SKN, send a list of stations worked plus your vote for best fist heard (not necessarily one you've worked) during that period. This is not a contest; quick contest-like exchanges are discouraged. Vote, too, for the most interesting QSO. Mail your report by Jan. 10 to ARRL Hq.

4

**West Coast Qualifying Run**, 10-35 wpm, at 0500Z Jan. 5 (9 P.M. PST Jan. 4). See Dec. 6 listing for more details.

7-8

**ARRL QSO Party**, cw, this issue, page 100.

**World 40-Meter and 75-Meter SSB Championships**, sponsored by 73. 40-meter contest 0000-2400Z Jan. 7 and 80-meter contest 0000-2400Z Jan. 7 and 80-meter contest 0000-2400Z Jan. 8. Contests are separate. Work stations once in each contest. No crossmode QSOs. Single op, single transmitter and multiop, single transmitter classes. Single ops may operate 16 hours max., and off-times must be at least 30 minutes each and clearly noted in the log and on the summary sheet. Multiops may use the entire period. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). Count 5 points per W/VE QSO, 10 points per DX QSO. Multiply by number of states (48 max.), VE provinces/territories (13 max.) and DX countries worked. Stations in the District of Columbia count as Maryland for multiplier purposes. Official entry forms are available from the sponsor. Mail entries by Feb. 12. 40-meter contest entries go to Dennis Younker, NE6I, 43261 Sixth St., E. Lancaster, CA 93535. 75-meter entries go to Jose Castillo, N4BAA, 1832 Highland Dr., Amelia Is., FL 32034.

9

**WIAW Qualifying Run**, 35-10 wpm, at 0300Z Jan. 10 (10 P.M. EST Jan. 9). See Dec. 8 listing for more details.

14-15

**ARRL January VHF Sweepstakes**, this issue, page 96.

**Hunting Lions in the Air Contest**, sponsored by Lions Clubs International, from 1200Z Jan. 14 until 1200Z Jan. 15. Open to all radio amateurs worldwide 80-10 meters (excluding WARC bands), phone and cw. Phone and cw count separately. Categories: single op; radio clubs and societies and multiop, single transmitter. Exchange signal report and serial number. Lion, Lioness and Leo club members will also send their club

name. Work stations once per band and mode. QSOs with stations on the same continent count 1 point; QSOs with stations on other continents count 3 points. Bonus points: 10 points for QSOs with Lion, Lioness or Leo club members from different countries; 5 points for members in the same country. 20 points for QSOs with Rio de Janeiro Arpoador Lions Club members. No multiplier. Mail logs by Feb. 5 to Rio de Janeiro Arpoador Lions Club Contest Committee, Rua Sao Francisco Xavier no. 246, Apt. 407, 22550 Rio de Janeiro, RJ, Brazil.

**HA DX Contest**, sponsored by the Hungarian Radioamateur Society, from 2200Z Jan. 14 until 2200Z Jan. 15. 80-10 (excluding WARC bands), cw only. Work stations once per band. Exchange signal report and serial number. HA stations will also send a two-letter code corresponding to their location (county). Possible codes: BA BE BP BN BO CS FE GY HA HE KO NO PE SA SO SZ TO VA VE ZA. Count 6 points per HA QSO, 3 points per QSO with non-HA stations on other continents. Multiply by sum of HA counties worked per band. Mail entries within 30 days to Radio Amateur League of Budapest, P.O. Box 2, Budapest H-1553, Hungary.

**160-Meter World SSB Championship**, sponsored by 73, from 0000Z Jan. 14 until 2400Z Jan. 15. Work stations once only. Entry classes: single op, single transmitter; multiop, single transmitter. Single ops may operate 32 hours max.; multiops may use entire 48-hour period. Exchange signal report and QTH (state, province or territory for W/VE stations; DX country name for others, including KH6 and KL7). Count 5 points per W/VE QSO, 10 points per DX QSO. Multiply by number of states (48 max.), VE provinces/territories (13 max.) and DX countries worked. Stations in the District of Columbia count as Maryland for multiplier purposes. All W/VE entrants are expected to observe the DX window from 1.825-1.830 MHz. Official entry forms are available from the sponsor. Mail logs by Feb. 19 to Harry Arsenault, K1PLR, 603 Powell Ave., Erie, PA 16505.

21-22

**ARRL QSO Party**, phone, this issue, page 100.

**A5 Magazine WAS SSTV Contest**

**Michigan QRP Club CW Contest**

**North Dakota QSO Party**

**Texas QSO Party**

24

**WIAW Qualifying Run**

28-29

**Classic Radio Exchange**

**CQ Magazine 160-Meter Contest**, cw

**Michigan YL QSO Party**

**REF French Contest**, cw

28-Feb. 6

**ARRL Novice Roundup**

## ARRL QSO Party Rules

Attention ARRL members and appointees! Start 1984 off right by participating in the operating activity just for you — the January ARRL QSO Party. Official entry forms are available from ARRL Hq. for an s.a.s.e. Everyone sending in a log will receive a copy of the results, and everyone making more than 200 QSOs will be listed in *QST*. Deadline for receipt of the logs is Feb. 8, so mail early.

### ARRL QSO Party Facts and Figures

Cw	Phone
Starts: 1800Z Jan. 7	Starts 1800Z Jan. 21
Ends: 0600Z Jan. 8	Ends: 0600Z Jan. 22

Eligibles: Member, Life Member, Charter Life

Member, President, Vice President, Past President, Past Vice President, Honorary Vice President, Director, Past Director, Director Emeritus, Vice Director, Assistant Director, Counsel, Canadian Counsel, Treasurer, Secretary, Advisory Committees, Technical Advisor, Intruder Watch, QSL Manager, NTS Official, Section Manager, Section Communications Manager, Asst. SCM, SEC, STM, ACC, BM, OO/RFI Coordinator, PIO, SGL, PGL, TC, DEC, EC, NM, OBS, OES, OO, ORS, PIA, Hq. Staff.

Rules: Exchange "status" (MBR, ORS, SM, etc.) and ARRL section. Overseas members may participate and should send dx for their section. You may work stations once per band. Operate a maximum of 10 hours; off-times must be at least 30 minutes each and must be marked clearly in the log. Log times must be

in UTC, not local time. Number new sections as worked. Phone and cw contests are separate. Include dupe sheets with entries of 200 QSOs or more total. Entries must be mailed in time to reach ARRL Hq. by February 8, 1984.

Scoring: Final score equals number of QSOs times number of different ARRL sections plus VES/VYI worked (max. 74). "dx" does not count as a multiplier.

Suggested Frequencies: Phone — 1.865 3.870-3.910 7.200-7.245 14.265-14.295 21.340-21.360 28.600-28.630; cw — up from 1.815 3.535 3.715 7.035 7.115 14.035 21.035 21.115 28.035 28.115. Try 10 on the hour from 1800-2100 UTC and 160 at 0430 and 0530 UTC. Check the Novice bands frequently. Don't forget 6 and 2 meters.



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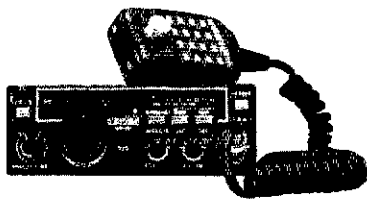
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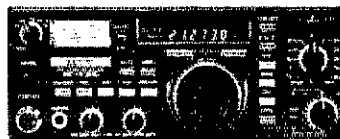
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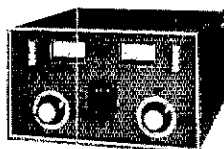
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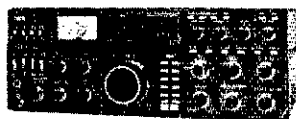
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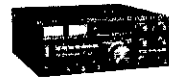


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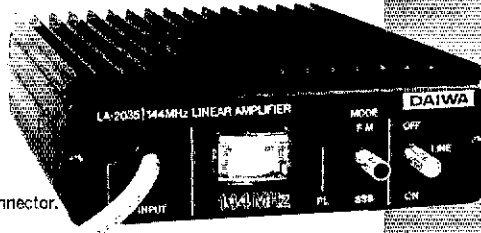
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  - Weight: 500 grams
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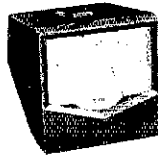
## DK-200/DK-210 Electronic Keyers

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W9URQ KA9FAM. Appts: ECs-N9CQD, Porter Co.; K89QR,  
Wayne Co.; OBSS-W9LJZ K9WVE, OOs-K9BA K99AY. NM  
(ITN) W9QYY. NM (VHF) W9PMT. NM (IWN) KA9ERC. NM  
(Lake Co.) N9DYC. Silent Keys W9MQ Fort Wayne, K9GAB  
Vincennes, KA9BZL Kokomo. The Indiana Radio Club  
Council has elected new officers for the next two years:  
W9K9RF, v.p.; W9BZC, secy.; W9UJU, pres.;  
W9SEW N9CUM, board member. Chairman of the Martins-  
ville Hamfest in an open letter dated September 29 an-  
nounced that the Martinsville Hamfest will be held at the  
Indiana State Fair Grounds Pavilion Building on Sunday  
March 11. Congrats to ACARTS with KV9B, pres.; N9AXI,  
v.p.; W9BPXT, EC for Allen Co. KA9ERC has been named  
new net manager of the Indiana Weather Net (IWN).  
W9UJU announced that she is sending bulletins on Mon,  
Wed, Fri & Sun at 1400Z on 3656. Her new VIC 20 works  
just great, hi. K9TUS and K9JDF had a 7-minute segment  
on local TV channel 15 (CBS) about the public service  
aspects of Amateur Radio. I am pleased to see the great  
surge of RF activities in Indiana. Traffic: W9UJU 80, K18J  
83, W9URQ 7, W9UJU 54, W9UJEM 89,  
WA9QCF 80, W9E1 77, N9AEI 62, W9XD 59, W9H11 58,  
K9WVJ 46, W9UMH 41, K9B9H 35, K9D 31, W9LJZ 27,  
W9UJU 22, KC9TA 22, W9I0H 20, K9U0P 20, W9PMT 20,  
AB9A 19, W9JZV 18, W9B0Z 17, W9DWD 16, KA9LUA  
16, N9CGS 12, W9BAWI 10, W9QCV 10, W9D9ET 10,  
W9D9AT 9, W9PRD 9, W9AOK 8, K9N 8, W9ZGC 8,  
W9RTH 5, W99AJ 3, W9U9S 3, W9BDP 2, KW9C 2, KW9D  
2, K9SBW 2, W9UJF 2.

WISCONSIN: SM, Roy A. Pederson, K9FHI — SEC:  
W9DAK. STM: K9UTQ. BWN 3984 1100Z QNI 1318, QTC  
1455 W9DND. BEN 3985 1700Z QNI 859. QTC 204  
W9ESM. V9BN 3985 2200Z QNI 990, QTC 267 K9ANV.  
W9SN 3845 2300Z QNI (July 21), (Aug. 194), (Sept. 89)  
QTC (July 82), (Aug. 48), (Sept. 54) KC9C1. W9N3 32300Z  
QNI 143, QTC 18 KA9HPC. WIN-E 3662 0000Z QNI 321,  
QTC 173 W9YCV. WIN-L 3662 0300Z QNI 241, QTC 134  
K9LGU. XPO 3925 1731Z QNI 200, QTC 11 WA9YVC.  
NW7N 34/94 2330Z QNI 442, QTC 53 N9BDL. Gr. Bay  
.72.12 Thurs. 0145Z QNI 28, QTC O W9B9NK. WCWTN  
.31/91 2300Z QNI 474, QTC 33 N9AUG. W9CBE has WPX  
and DXCC 150. W9BQC has Extra. Sorry to report the  
following Silent Key: W9CUA W99FUM W9CHG.  
KA9KUG has General. Those who attended the WNA had  
a good time, despite the showers. Where were you?? Mark  
calendars for next Sept. for this event: K9Y is now  
N9B. For the time in coming, if at all, please get  
someone to take the position. State officials are looking  
more and more to ham radio for help with communica-  
tions. BPL to KA9CPA. KA9GYD placed first in Wiscon-  
sin section SMURF party on 6 meters. Thanks much to  
the following stations for checking into D9RN, 9RN &  
CAND: KA9CPA W99FRI W9IEM KC9KQ WA9WY8  
N9AUG N9BYK W9CBE W9CXY K9GDF W99ICH W9LSR  
KA9OBP. Traffic: KA9CPA 2211, W9CXY 307, W9YCV 240,  
K9GDF 226, W9CBE 208, W99YV 195, WA9WY8 149,  
K9FHI 128, W99FRI 109, KC9CJ 101, W9LDO 93, KA9OBP  
93, W9IEM 92, W9DND 80, AG9G 78, K9AKG 76, KA9BH  
75, KC9KQ 68, W9UJL 68, W99ICH 55, W9ESM 52, W9B9O  
56, N9AUG 51, W9DND 50, WA9HPC 49, KA9HPC 48,  
K9UTQ 48, W9D9KT 47, KA9IKR 47, K9SAO 45, N9BDL 45,  
K9ANV 41, KB9NG 39, K9BMX 38, W9FDY 34, K9GB 33,  
N9CRO 30, KA9AFB 27, WA9YVC 27, W99JW 26,  
W9BRGE 26, N9DCF 25, W9B9NK 25, N9BGE 24,  
WA9DXW 24, N9CGS 23, KA9NOT 23, W99PKL 22, K9VSO  
22, W9YT 22, K9HDF 21, W9IHW 21, K9BBD 17, K9NP 17,  
K99FM 16, KA9BHK 10, K9VU 7, W9UJU 4. (Aug.) N9BGE  
29.

## DAKOTA DIVISION

MINNESOTA: SM, Helen Hayes, W9BHOX — SEC:  
KA9AP. STM: KD9CI. Hello Again! First of all, from the  
Overlooked. Forget or Didn't Know About. On Aug.  
7th, the first annual Millie Lacs Lake Rptr Corn Feed was  
held at the W98SYO rptr site. Fifty one quests registered  
and a great time was had by all. The corn was excellent!  
(So was the beer, hi!) On Aug. 6th, the Robbinsdale ARC  
provided emergency assistance and 2-meter communica-  
tions for the Mississippi River Canoe Classic, a 27-mile  
canoe race. Stations participating were N9BSN KC9BZ  
K9C8 N9GRN N9CSS N9EYV KY9H K9JA K9JE KA9LD  
K9OLG KA9OWL W9SBO and W98NP. Our section was  
hit several times by severe weather during the summer,  
some areas more than once (ask KC9B). On the evening  
of July 30th, KA9SN K9CGY KA9BW and W9LUP assisted  
at the Fargo office of the Nat'l W-Service in tracking a line  
of severe thunderstorms across western Minnesota that  
earlier had produced a tornado just north of Fargo.  
W9RRW received the information from these stations and  
passed it along to SKYWARRN. Sept. news: The Dakota Div.  
Convention was a success, sorry I could not be there.  
Among the highlights, a plaque was presented to W9JIE  
of the St. Paul RC for 50 yrs of continuous ARRL member-  
ship. The presentation was made by ARRL Pres. W4KFC.  
The St. Paul RC reports that its "Railroad Mobile" special  
events station was a huge success with 473 contacts  
made. There are four Special Service Clubs in Minnesota:  
The Paul Bunyan Wireless Assn. as well as the St. Paul,  
New Ulm and the Midrange ARCs. Congrats to K9TO and  
W9OZC who were reelected as Dakota Div. Director and  
Vice Director respectively by declaration, having ran unop-  
posed. To clear up any confusion concerning exams, if  
you plan to upgrade soon, call the FCC at the Federal Bldg  
in St. Paul to make an appointment. The number to call  
is 612-725-7810 during regular business hrs. Remember,  
exams are given by APPOINTMENT ONLY, so plan ahead  
and good luck! Net news: For reasons of health, W9DM  
has resigned as mgr of MSN/1. Our hats off to him for a  
job well done and his dedication to the CW net. W9EHI,  
who has been active in CW nets for quite some time, is  
the new MSN/1 mgr. We wish him well in his assignment.  
By the way, my apologies to the MSN/1 group, I noticed  
that the net report was not published in the Oct. issue of  
QST that was sent in late for July, so here it is: QNI 289,  
QTC 120, sess. 31. A new net is on the air at 3929 KHz every  
Thurs. eve, the Minnesota AFES Net or MNARESNT. All  
checkins are welcome, so let's hear from you. It is on im-  
mediately following the MNAMWXNT at about 7:30 P.M.  
Callsign changes: KA9ODJ new KD9K; KA9OJE now  
N9C8; KA9PBI now N9EYV. Finally, a reminder that the  
annual Handi Ham Winter Hamfest will be Sat., Dec. 3rd  
at the Eagles Club in Faribault. For more info, read the  
Hamfest Calendar in QST or listen to the 25-minute net  
Net Mgrs: MSN/1 W9EHI; MSN/2 KA9EY; MSN/3  
W9W9XU; MSN/4 MSN/5 K9OJU; MSN/6 N9AJX;  
MNAMWXNT W9B9AC; PICONET W9HZU.  
Net Freq. Time QNI QTC Sess.  
MSN/1 3685 6:30P 307 124 30

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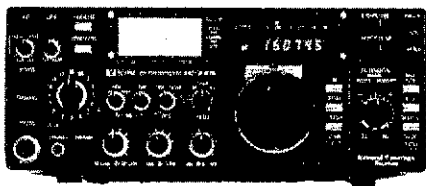
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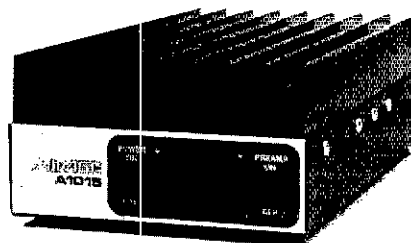
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AV-5	\$ 98	HG70HD	\$2339	KT34XA	\$449	TH3JRS	\$158	
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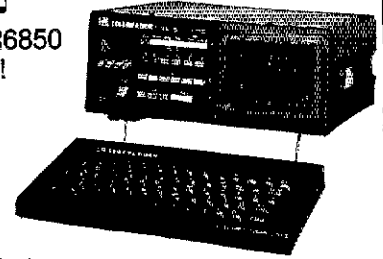
**A4**  
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 31 ft., 9.7 m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1 1/4 to 2 in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

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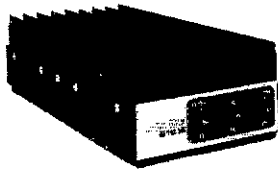


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B215	2M	Yes	2W	150W	22A	\$259
B108	2M	Yes	10W	80W	10A	\$159
B1016	2M	Yes	10W	160W	20A	\$249
B3016	2M	Yes	30W	160W	17A	\$199
C22	220	No	2W	20W	5A	\$ 79
C106	220	Yes	10W	60W	10A	\$179
C1012	220	Yes	10W	120W	20A	\$259
D24	440	No	2W	40W	8A	\$179
D1010N	440	No	10W	100W	20A	\$289

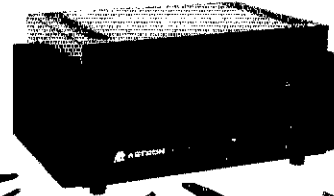
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RS12A	9	12	69
RS20A	16	20	109
RS20M	16	20	135
RS35A	25	35	149
RS35M	25	35	199
RS50A	37	50	229
RS50M	37	50	229



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### KDK FM2030



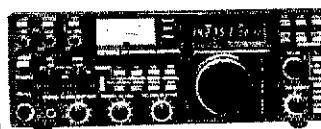
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ST-500B3 Ni-Cad Battery ..... 29

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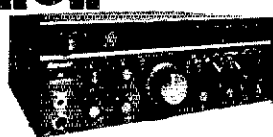
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HC-200 HF Ant Tuner w/Wattmeter ..... 89  
HC-2000 Deluxe 2KW HF Antenna Tuner ..... 299

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FREE . . . Ten-Tec Power Supply Model #260 (List Price \$189) with Purchase of Ten-Tec Corsair at \$1,169.

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All Other Ten-Tec Accessories In Stock. Please Call For Your Special Prices.



JANEL QSA5 PREAMP \$39!  
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PB-30 ..... \$25 PB144 ..... \$25  
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DAIWA CN-620B \$1111  
160/2 mtrs  
20/200/2000 wts



BENCHER PADDLE  
BY-1 Blackbase \$39  
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### MKJ MODEL 104 On Sale For Only \$33!

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484 2 MSG Mem Keyer ..... 89  
484B 12 MSG Keyer ..... 125  
494 Keyboard ..... 249  
496 Keyboard ..... 299  
525B RF Processor ..... 109  
624 Phone Patch ..... 59  
901 300W Tuner ..... 54  
940B Tuner w/Meter ..... 72  
941C Tuner w/Meter ..... 79  
949B Deluxe Tuner ..... 129  
989 Deluxe 2KW Tuner ..... 289

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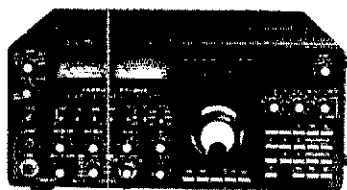
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Buy Now and Receive These Accessories Free:  
300Hz CW Filter, \$FREE    600Hz CW Filter, \$FREE  
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List Price \$3074. CALL FOR YOUR SPECIAL PRICE!  
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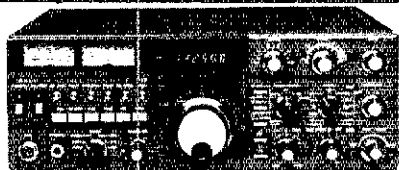


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- 10Hz Digital Readout
- CW/SSB/AM/FM/FSK
- RF Speech Processor
- IF Shift
- APF/Notch
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Computer Interface now in development—  
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### FT-102

**160-10MTR WITH WARC BANDS TRANSCEIVER**

- Digital Readout
- Variable Bandwidth
- CW/SSB/AM/FM Modes
- Noise Blanker
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- External VFO, Antenna Tuner Available
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  - 144-148 Mhz
  - 10 watts output on all bands
  - 430-450 Mhz
  - 21, 24.5 & 28 Mhz
  - option available soon
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Information



### VHF/UHF Multimode Portables

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**All Mode Digital Communications Receiver .15 to  
29.99Mhz—Receives SSB/AM/FM/CW, Built-in S  
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AC Supply and More!**

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FT-208R 2mtr HT . . . . . \$319  
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FT-708R 440Mhz HT . . . . . \$319  
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- LCD Display
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Accessories Available:  
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### 76PA \$1699



### ALPHA 78

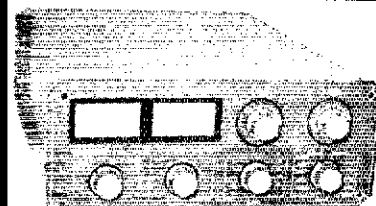


### ALPHA 374A

## 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!!**



## TOKYO HY-POWER HC-2000 Tuner

**\$339.95 List Price  
SALE \$289.00**

- Heavy Duty 2 KW Construction
- 160-10 Meter Operation (in-  
cluding WARC Bands)
- Calibrated Vernier Dial
- Built-in SWR and Watt Meter
- Built-in 12 Position  
Antenna/By-pass Switch
- Built-in Balun for Balanced  
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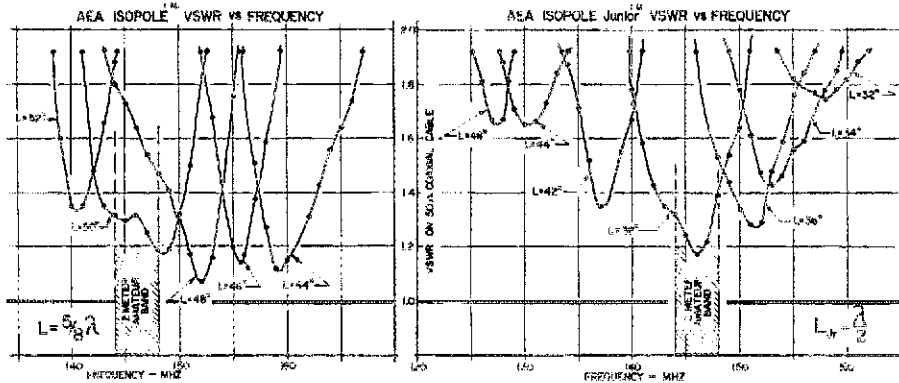
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# ISOPOLE™

## DO YOU? STUDY THE FACTS . . .

The IsoPole antenna is building a strong reputation for quality in design and superior performance. Innovative IsoPole conical sleeve decouplers (pat. pend.) offer many new design advantages.

All IsoPole antennas yield the **maximum gain attainable** for their respective lengths and a zero degree angle of radiation. Exceptional decoupling results in simple tuning and a significant reduction in TVI potential. Cones offer greater efficiency over obsolete radials which radiate in the horizontal plane and present an unsightly bird's roost with an inevitable "fallout zone" below. The IsoPoles have the broadest frequency coverage of any comparable VHF base station antenna. This means no loss of power output from one end of the band to the other when used with SWR protected solid state transceivers.



Outstanding mechanical design makes the IsoPole the only logical choice for a VHF base station antenna. A standard Amphenol 50 Ohm SO-239 connector is recessed within the base sleeve (fully weather protected). With the IsoPole, you will not experience aggravating deviation in SWR with changes in weather. The impedance matching network is weather sealed and designed for maximum legal power. All IsoPole antennas are D.C. grounded. The insulating material offers superb strength and dielectric properties, plus excellent long-term ultra-violet resistance. All mounting hardware is stainless steel. The decoupling cones and radiating elements are made of corrosion resistant aluminum alloys. The aerodynamic cones are the only appreciable wind load and are attached directly to the support (a standard TV mast which is **not supplied**).

IsoPole antennas have also become the new standard for repeater applications. They all offer low angle of radiation, low maintenance, easy installation, and low cost with gain comparable to units costing several times as much. Some repeater installations have even eliminated the expense of a duplexer by using two IsoPole antennas separated vertically by about twenty feet. This is possible because of the superior decoupling offered by the IsoPole antennas.

The IsoPole antenna is now available in a 440 MHz version which is fully assembled and tuned.

Our competitors have reacted to the IsoPole, maybe you should too! Order your IsoPole or IsoPole Jr. today from your favorite Amateur Radio Distributor.

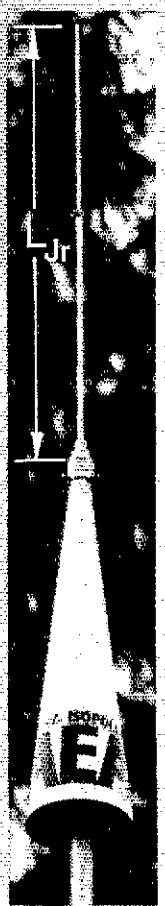
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ISOPOLE 220  
MAST NOT  
SUPPLIED

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**Breakthrough!**

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# Reliable Products with a Guarantee\*\*

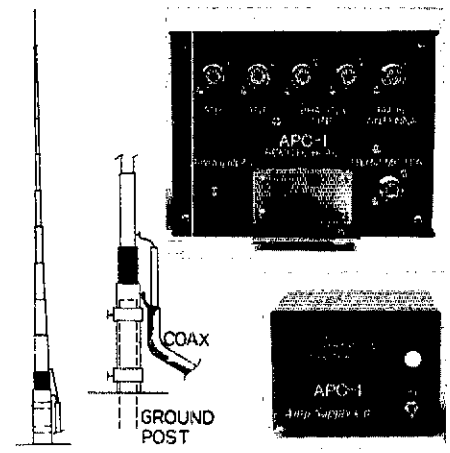
## More Than Parts from Amp Supply



**LA-1000A**

The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 700 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish. 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\***

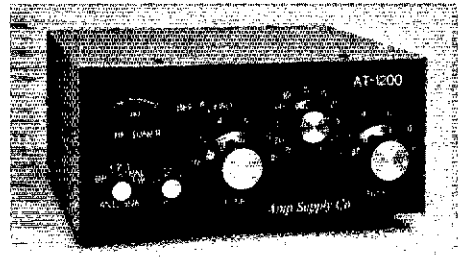


**AEX-1, APC-1**

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\***



**AT-1200**

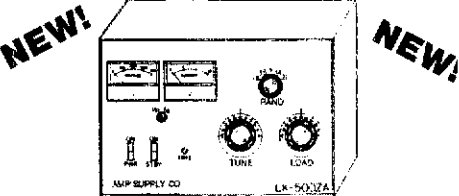
The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

**AT-1200 ..... \$169.50\***

**NVR Signal Injector Antenna**

The NVR antenna is an excellent all band 102 foot dipole. It comes completely assembled and will handle 2KW PEP. This antenna was originally developed in Great Britain and has enjoyed worldwide acceptance for years. It consists of 102 feet of copper antenna wire, 31 feet of 300 ohm transmission line, 70 feet of RG-8X coax, 2 end insulators, 1 center insulator 1 PL-259 and sleeve connector.

**NVR Antenna ..... \$50.00\***



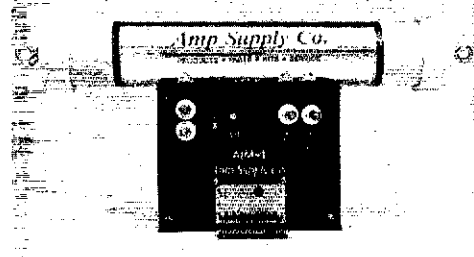
**LK500ZA 2KW AMPLIFIER**

The all new Amp Supply LK-500ZA 2 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 KW amplifier with a pair of 3-500Z tubes in the world that sells for under \$800.

**The Amp Supply LK-500Z!**

- 2 KW CW, SSB
- 1 KW SSTV, RTTY
- 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\***



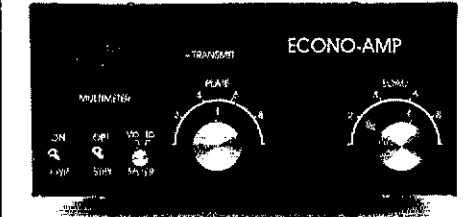
**AIM-1™**  
*Major Antenna break through!*

The AIM-1 is an antenna impedance matching network for random, long wire or loop antennas. It provides continuous coverage from 500 KHz - 30 MHz, is completely automatic, no knobs to turn or coils to tap. Installation is simple; hook on wire antenna, ground, coax cable to station and balancing module at opposite end of wire. The antenna is ready for transmission from 1.8 - 30 MHz at up to 3KW PEP.

- SWR max 2:1, 1.5:1 average
- wire lengths should be 1/2 wave on lowest frequency for maximum efficiency.
- inverted V, inverted L, rhombic, random wire or loop antennas
- weatherproof
- 2 year warranty

**AIM-1 ..... \$129.50\***

**with 130' antenna wire and insulators \$139.50\***  
**Stranded Ant. Wire .08 ft.**



**EA-160M**  
*160 meter 1200 watt Amplifier*

The 160 meter Econo-Amp will give you the edge on "Top Band" this season. With 100 watts of drive, the Econo-Amp will produce 1200 PEP input on SSB or 700 watts CW. This is a great little amp for "Top Band".

- 1200 watts PEP
- 117/234 VAC
- Tuned input
- Pi-net output
- 4 - 6MJ6 tubes
- Forced air cooled

**Special: EA-160M ..... \$289.50\***

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**\*\*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.

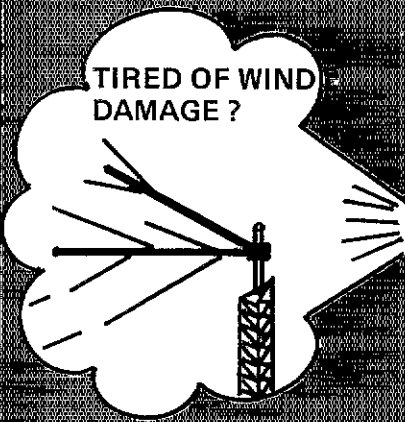
**Amp Supply Co.**  
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FACTORY  
DIRECT!!**

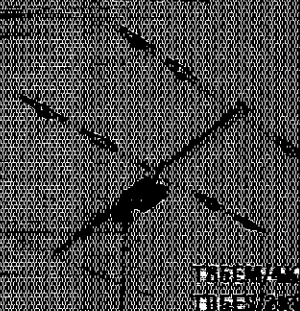
**STEP UP TO  
TELREX  
ANTENNAS  
ANTENNA SYSTEMS**

**WEST** in a Telrex antenna

Give a gift of a quality antenna system. The Telrex antenna is a quality designed quality product.



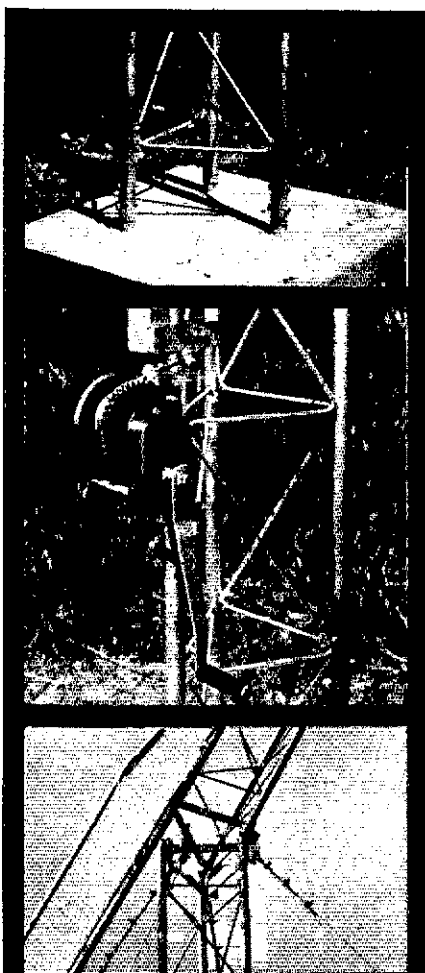
Antenna mast - Cores  
non-moisture



**Some of the WORLD'S finest.**

TB4 EC 10,15,20 Mtr.	\$205.00
TB5 ES 10,15,20 Mtr.	\$330.00
TB5 EM 10,15,20 Mtr.	\$445.00
TB6 EM 10,15,20 Mtr.	\$565.00
20 M326 3 elem. 20 Mtr.	\$325.00
20 M536 5 elem. 20 Mtr.	\$535.00
20 M646 6 elem. 20 Mtr.	\$945.00
15 M532 5 elem. 15 Mtr.	\$455.00
15 M845 8 elem. 15 Mtr.	\$925.00
10 M523 5 elem. 10 Mtr.	\$285.00
10 M636 6 elem. 10 Mtr.	\$625.00
2MVS814 2 Mtr. phased	\$201.00
A1312 RISX Rotator (50 sq. ft. rating)	\$970.00

For a list of the complete line of Telrex antennas, rotators, masts and accessories, call or write Telrex Antenna Systems, Inc., Peoria, Illinois 61656.



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MNN\* 3722 1730 Dy\*\* 206 52 53  
TASYL 3922 1900 M 13 3 3  
\*NTS nets. Times local. \*\*QMN late net, 2200; MNN late net, 2000; MACS Sn 1300. ARES net Sn, 3932, 1730. Traffic workshop Sn, 3953, 1800. ARRL Info Net Wed, 3953, 1745. 3932 is MI HF emer. freq. Silent Key, with deep regret, WDBOJ. New ORS: KB8GT W8QHB. New NM (QMN Slow Net) W8BSIW. Many thanks to W8QHB for his services as QMN Slow Net mgr during the past year. New club officers: Gaylord RA W8BPOL, pres.; KC4MX, v.p.; W83REH, treas./trustee; N8DHH, secy. Motor City RC-174, pres.; K8BKA, v.p.; K8BX, secy.; K8BNV, treas. W88IXZ has resigned from the EC post for Delta Co., but she will continue as DEC for the U.P. "Family comes first" and the line had to be drawn somewhere. This is a good thing for every family ham to keep in mind! Thanks for the good work as EC and for making the right decision on which job to keep. It is always saddening to hear of a long-standing tradition going the way of all good things. Thus it is for the UPYL net, formally disbanded last summer after 22 years of operation. Gee, no more blue hair ribbons for the QMs! The state ARRL leadership post of Public Information Officer has been filled. My thanks to Jack Egan, KC8K of Flat Rock for accepting the appointment. This was a tough one. There was a lot of interest shown in the job. I had to choose from among four serious and well qualified applicants. KC8K gets the nod on the basis of 20 years as an active ham, residence in the main population center of the state, and on enthusiasm and persistence! He is a super salesman and I know he will bring credit to the job. (Please note that these "jobs" to which I continually refer are unpaid, purely voluntary efforts, my own included. Indeed, were it not for the dedicated, freely given services of the volunteers there could be no ARRL as we know it.) EPL: AF8V Traffic: AF8V 645, K8CPS 431, W8CB 285, W88MD 216, W88HU 202, W88RT 151, W88DH 112, K8NCJ 812, K8NCR 30, K8GXV 78, W88VZF 73, W88MB 70, W88PD 64, K88GT 5, K8EQO 49, K8U 49, K8COWN 48, W88EB 45, W7L V4 44, W8IH 42, K8PQQ 35, W8YU 35, K8OCP 28, K8UPE 27, W8CUP 22, W8VIZ 22, K88Q 20, W88SIW 20, W88SYA 20, N8CNP 18, W8BYR 15, K8ZJU 15, K8TG 14, W88AGC 13, K88D 13, N8EO 13, W88CW 13, W88TTA 13, K88Q 11, K88JCL 10, W88EFK 6, W88OUO 7, N88BY 6, K88D 6, W888N 5, W88IT 4, W88YWA 3, K88L 2. (Aug.) N88BY 24, W88EFK 9, K8ZJU 2.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: K88MU.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	410	240	59	6:45/10 P.M.	3.577
BNR	349	100	30	6:00 P.M.	3.605
BSSN	367	296	59	9:45 A/7:15P	3.927
QNN	—	—	—	6:30 P.M.	3.708
OSN	233	142	30	6:10 P.M.	3.577
OSSBN	2109	803	90	10:30 A.M.	3.9725
				4:15 & 6:45 P.M.	
OSSN	123	52	28	6:45 A.M.	3.577
O6MN	350	13	30	9:00 P.M.	50.180

Congrats to W88CAE KC8KL and all the others who made this year's Great Lakes Division Convention such a success. The facilities were great and we had a tremendous banquet. Thanks to W88SYD. And thanks to the thousands of happy, contented ham conventioners for their support. Future affairs will be even greater. I guarantee. And how many Divisions can claim to have had both a Director's cabinet and section cabinet meeting in a floating WWII submarine's wardroom? I think we pulled off a first! What a great idea. K8US and K88MU! And speaking of the submarine (USC Cod), I hope the gang from NOARS will soon put together an article for QS7, documenting their summer's operation from the "Cod," complete with photos and examples of their certificates and QSL cards. September's newsletter from the Cuyahoga Falls ARC made me gulp with nostalgia when I read the paragraph describing their special event station at the 46th running of the All American Soap Box Derby. I can remember how years ago a trip to Akron's Derby Downs from the Northwest would have meant more to me than a personal invitation to visit the President in Washington. Never made either. Congrats to W8GRG W8EK W88MHO N8AUH and all the other local members of the Eye Bank Communicators for the success of their national meeting and convention in Canton recently. Without doubt, the Eye Bank is one of the most worthwhile programs we support, and all members have my deepest admiration and gratitude. Appts: Local EC — N8CZV, Allen Co.; K88MU, Delaware Co. Congrats to both! Local Nets QNI QTC Sess.

Local Nets	QNI	QTC	Sess.
ALERT	50	4	30
BRTN	240	162	30
COARES	101	8	3
Lorain Co.	59	20	13
LCNWO	368	116	35
MASER	131	7	7
Medina Co.	259	29	29
NEON	124	57	28
NCTW	34	95	22
RARA	62	2	4
TATN	131	81	30
TSRAC	923	85	37
WGCN	7	3	3

Traffic: K8NCV 712, K8OZ 379, K88MEB 268, K8JDI 245, W88DMF 242, K8YUV 224, W88MIO 217, N88DU 214, K88IC 200, AB8P 193, W88KKI 188, K8BJ 180, W88RIB 172, W88B 140, W88QZK 134, W88SKP 114, K88GJV 107, W8EK 90, K8IAF 87, N8EVC 81, W8WEG 80, N8CW 73, K88CGF 72, W88UBH 67, W88SSI 65, W88GMT 63, K8V8Q 61, W88RGP 61, W88KBW 60, K8TVG 49, K88ICB 48, W88IKC 40, W88ODV 37, W88OYK 37, W88HHZ 38, K8JE 35, W88AYH 30, W88HD 30, W88XM 29, W88KQJ 28, W88JGW 26, N8E8 24, W88BHL 21, K88GZJ 19, K8NJQ 16, N8AEH 15, W88TXV 17, W88UP 17, W88DYV 15, W88BRL 15, N88Q 15, W88SPC 15, K88GME 14, K88D 14, K88C 14, W88RGS 13, K88CY 10, W88HDZ 10, W88G 10, W88KWD 9, W88SIO 9, W88ZM 9, W88OL 8, W88WAV 8, N8CJS 7, K88GRH 7, W88EKI 6, W88JUP 6, W88NHV 6, W88JIK 5, N8AJU 4, K8EM 4, W88ZE 4, W88NTR 4, N8CGM 3, K88CMR 3, K88L 2, W88DYF 1. (Aug.) K88L 42, K88NM 27, W88HDZ 10, K88XT 8.

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EASTERN NEW YORK: SM, Paul S. Vydarany, WB2VUK — SEC: AK2E. STM: WA2SP. ACC & TC: N2BFG. BM: W82EAG. SGL: K88HQ. PIO (temp): N2DZJ.

Net	Time/Day	Freq.	NI
EPN	2300Z	3.902	AG2X
ESS	2300Z	3.590	W2WSS
NYS	0000/0300Z	3.677	N2APB
NYS/M	1500Z	3.677	W82EAG
NYPON	2200Z	3.913	W2AKOJ
NYSPTEN	2300Z	3.925	KA2Q



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loop switch, hand key input and dual tone mark/space RTTY DEMOD plus single tone CW detector. "SOFTWARE" in onboard ROM has: split screen, large type ahead transmit buffer, automatic keyword controlled receive data storage, WRU, SELCAL printer control and user programmable memories that can dump/store on disc and tape. Full speed RTTY, 60 to 132 wpm, CW to 150 wpm, 110/300 ASCII and optional 4 mode AMTOR operation covers all the bases. If you've been waiting for the right system at the right price, or you've been disappointed with previous operating programs, your time is now. At \$199, the complete AIR-1 is your answer for the VIC-20 and "64" (with 4 mode AMTOR, \$279). Join the silent revolution in RTTY/CW and get ON-THE-AIR! See it at your local dealer or give us a call at Microlog Corporation, 18713 Mooney Drive, Gaithersburg, Maryland 20879. TEL (301) 258 8400. TELEX 908153.

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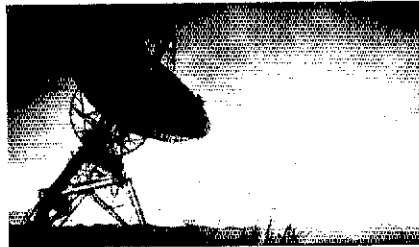
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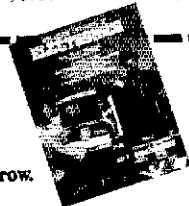
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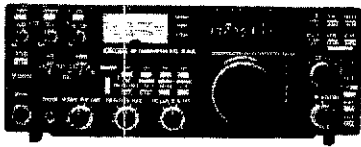
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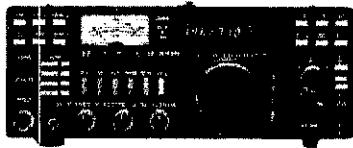
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IC-751



IC-745

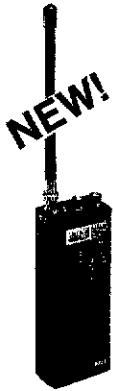


IC-271A



TS-430S

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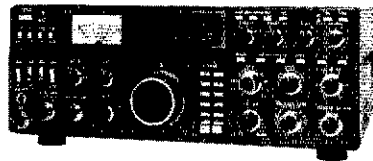
IC-02A



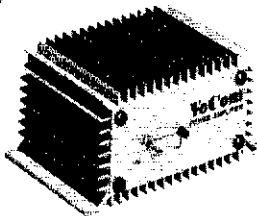
R-2000



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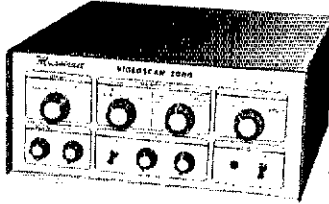
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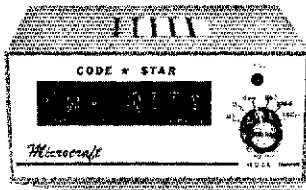
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The notch filter has both variable frequency and selectivity controls, and is very effective in removing heterodynes and SSB splatter. Notch depth is 50 dB. For peaking, there is a variable bandpass filter with both frequency and selectivity controls. Highly useful on CW, the controls can be adjusted to emphasize voice on SSB signals. This filter can be switched in or out, independently of the other filters. By the way, there is also a fixed 5 pole hi-pass filter with 300 Hz cutoff. All three tuneable filters cover 300 Hz to 3kHz.

Insert the MSB-1 between your phone jack and phones or speaker. Delivers 2 watts of clean, crisp audio. Requires 12 VDC @ 300 mA. 115 VAC adapter available @ \$8.95.

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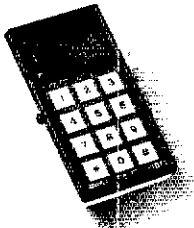
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NYS RATT 2330Z 3.825  
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 HVN 0030Z W-S 146.37/97 N2BWB  
 SDN 0230Z 147.66/08 K2ZVJ  
 SCRN 0100Z 147.735/135 KV2U  
 CLUBS: Albany ARA will have auction in Nov. Schenectady ARA new officers: AK2E, pres.; WB2VHD, v.p.; WB2MXJ, treas.; WB2VJC, secy.; AG2X N2AIG W2LIM WZPF, dirs. WECA had talk on Nat. Weather Service. NETS: AESN sess. 3, QNI 57, QTC 1; ATEN sess. 3, QNI 5; NYFON sess. 3, QNI 647, QTC 362; NYS sess. 6, QNI 540, QTC 601; NYS/M sess. 30, QNI 220, QTC 54; ESS sess. 20, QNI 361, QTC 58. W2C. Uster has report on group active on ring emerge, svcs mod. dilester, WB2AXF still active on nets. Even though ST59 was postponed, contact N2DZI for PR info. I cannot put your reports into the column if I do not get them. Please send reports by msg. Please help for holiday t/c load. PSHR: WB2MCO WB2EAG WB2VUK K2ZVI WB2OHR W2BIW KC2TF W2YJR K2ZM. Traffic: WB2EAG 243, WA2BPI 145, WB2MCO 237, WA2JQL 204, K2ZM 192, KC2TF 241, WB2VUK 129, W2BIW 128, K2ZVI 102, W2PKY 89, W2BZ 80, WA8MAZ 68, W2YJR 56, WB2QHR 31, N2AWI 12.  
 NEW YORK CITY - LONG ISLAND: SM, John H. Smale, K2IZ - SEC: WA2KKJ, STM: K2GCE, ACC: WB2IAP, OD/RF: NB2T, TC: W2JUP.  
 NLIPNW 3928 1900/2200 W2LWB  
 NLIPNW 3928 1815 KS2G  
 NCVHF 6.145/745 1930 M-F K2MT  
 SCVHF 4.775/37 2030 M-F WA2ARC  
 BAVHF 6.07/87 2000 M-F N2BDD  
 ESS 3590 1800 W2WSS  
 NYS 3677 1900/2200 N2APB  
 NYS/M 3877 1000 WB2EAG  
 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 Gartt will be the guest speaker at the banquet. K2M2 has resigned as EC. I want to thank him for the job he did. Radio Center has become the first club in the section to be appointed a Special Service Club. They also report a membership of 165. On behalf of myself, the XYL and the 4 kids, I want to wish everyone a Merry Christmas and a very Happy New Year. If anyone is interested in getting out the Quarterly Net Bulletin (QNB), please contact K82G who has to step down as editor. If anyone has any ideas for getting a traffic net going with computers using VHF and running at about 3000 bps, please contact me. Officers for Suffolk Co. ARC are: WB2PLT, pres.; WA2ARC, v.p.; AG2P, treas.; W2GZD, corr. secy.; WB2TYN, rec. secy. The following stations provided communications for the 3rd annual triathlon in the Harbor: RA2JMA KA2LAD W2GZD KA2NRA KA2GKC KA2PIY KA2LCC WA2UWF KA2MSB KA2HTV. WA2JWF did a FB job with the Suffolk Co. Heart Assn. Cyclethon. Grumman ARC and Sperry ARC had their fourth annual picnic, and were blessed with perfect weather. The Great South Bay ARC received a very nice letter from the United Jewish Ys of Long Island thanking them and the 80 hams that provided communications for the first Jewish Arts Festival. More information will be coming soon concerning the Special Olympics to be held next summer at Eisenhower Park. This will be a very large event and many operators will be needed. Traffic: K2GCE 96, W2BDD 74, K2MT 50, W2GZD 38, K82G 22.  
 NORTHERN NEW JERSEY: SM: Robert Neukomm, K2WVJ SEC: KB2UVE, M: W2XD, SM: N2BQP, ROC: W2CC, SGL: W2KE, PIO: WB2NOV, TC: AD71, ACC: K2J2U KY2S, NM: W2CC AG2R N2BEN KA2GSX WB2ANK WB2IQJ KY2D N2XJ W2PSU.  
 Net Mgr. Frig. Time Sess. QNI QSP  
 NJM N2XJ 3695 1000 Dy 30 129 38  
 NJN/E AG2R 3695 1900 Dy 30 269 121  
 NJSN WB2IQJ 3735 1830 Dy 30 75 60  
 NJN/L AG2R 3695 2200 Dy 30 244 101  
 NJPN W2CC 3950 1800 Dy 30 255 153  
 NJPN 0900 S'n 4  
 NJPN 0900 S'n 4  
 CBTTN KY2D 147.12 2000 Dy 29 289 64  
 TCETN KA2GSX 147.255 1930 Dy 25 113 18  
 NJRTTY W2PSU 147.51 Autostart  
 Stateline RC reports KB2WI discussed new Novice exams, the new OC program and traffic handling. Their August speaker was KW2U on the AMSAT program. Their other presentation was an excellent discussion on antennas by K2OZ WA2UGT and WB2UAC. KA2MRI is Stateline's new PIA. WB2ZA now a SK. Ramapo Mountain ARC in July had WA2DHF present a color slide presentation of the Pope's trip in Central and South America. W2WVC is in the hospital again, and we wish her a speedy recovery. KA2HNO retired as N2BEN after 2 years of excellent service. WB2ANK has assumed NM of NJVN. Metroplex reports their program for October was "Amateur Radio and Electronics for the Sightless Ham" by W2JIC. SCARC News reports 10 students signed up for Novice class. N2BIM is attempting to have the class visited by VK4AOK. WA2SUJ didn't say whether this was to be an "on-air" demo or an "eyeball." The club also has their other repeater on 147.93/33. W2LV is proud of having worked BY8AA and BY1PK. Nutley ARC reports starting a Novice class Oct. 1 in the meeting room of the library at 11 A.M. - contact KA2PCY 484-8428. The JSARS ka-Chunker reports KF2T's college address as PO Box 2829, River Stn., Rochester 14627. Congrats to N2BZT who was married Sep. 24. They also report K12L conducting a Novice class which began Oct. 4 and will run each Tuesday until Dec. 20. Assisting are KY2G W2DOR & KB2IB. TCRA News reports AD71 presented a talk on "AMTOR, an Error Reduction Teletypewriter Protocol for HF RTTY." W2AZL now a SK. Upgrades to Advanced KA2MCM (KC2ZJ) & KA2NQJ (KD2AG). They now have a new repeater on 449.975/444.975. BARA reports KV2U gave a demo on 2-meter computer RTTY. K2UFM has been appointed PIA, and recently underwent full bladder surgery. PS: AG2B W2JW K2B. WB2GHN KA2GSE KA2GSX W2XJ WSDTR KB2WI K2KB WB2ANK/T N2XJ W2RO. Traffic: N2XJ 307, KA2OIW 224, AG2R 213, W2RO 140, K2VX 111, WB2GHN 59, KB2WI 55, KA2GSX 54, W2XD 45, KD2BE 28, N2DZZ 24, WB2KLF 23, WB2ANK 21, W2CC 21, N2BEN 20, N2ELW 14, W2KB 11, W2UH 11, KC2YG 11, W2DOW 10, W5DTR 7.  
 MIDWEST DIVISION  
 IOWA: SM, Bob McCaffrey, K6CY - Sec: WA4WV. STM: K8BX, SGL: K8QJ, TC: K8DAS, ACC: WB6QAM, SM: K8IPI, PIO: K8BZP. Congrats to the Iowa Novice class presenter, "50 Years" affiliation card. K8ABTE and K8BER are now Extra Class. Watch for the new SE Iowa T and E net on the new wide are rpt on 146.33/83. All are welcome to check in. Lots of activities after the summer:

# Morse Keyers & Trainers by AEA

AEA produces the finest Morse keyers and trainers in the world. All AEA keyers operate with any standard keyer paddle and offer selectable monitor tone, selectable dot and dash ratios, full weighting and selectable dot and/or dash memory. In addition, all our keyers offer full, semi-automatic or straight key modes. The keyers and trainers are keypad controlled which significantly reduces the complexity of operation for all the features offered. Each keyer has separate + and - keyed outputs for keying any modern transmitter. All keyers and trainers operate from 12 VDC (or 117 VAC with optional model AC-1 wall adaptor) which makes them ideal for portable operation. AEA microcomputer-based products are all subjected to a full burn-in and test prior to shipment, as well as being designed for maximum R.F. immunity.

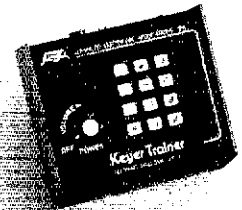
## NEW BT-1



The **BT-1 Basic Trainer** is a hand-held computerized unit which teaches the code one character at a time at 18 or 20 words per minute. The BT-1 contains a self-paced training program that allows serious students the possibility of learning Morse to 20 wpm in as little as one month! Each character represents a separate practice session in which the character is first introduced by itself, and then presented 50% of the time along with all previously learned characters. There are no tapes to memorize, wear out, or break. No programming skills are necessary; the BT-1 is very easy to use. The tone oscillator can also be keyed for sending practice. An earphone jack is provided for private listening. The BT-1 will go as high as 99 WPM in 1 WPM increments. A battery operated version, the BT-1P, is available with wall charger and internal NICAD batteries.

## NEW KT-3

The **KT-3 Keyer-Trainer** unit uses the teaching program used in the BT-1 trainer. In addition, the KT-3 features a full function Morse automatic keyer for keying any modern transceiver, or for sending practice. Speed range is 18-99 wpm for transmitting and 1-99 wpm for training.



## KT-2 Keyer Trainer



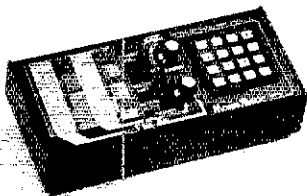
The **KT-2 Keyer-Trainer** is a computerized keyer with all the features shown above, plus a Morse proficiency trainer. It is designed to increase your existing code as quickly as possible. The unit can be set for beginning practice speed, ending practice speed, and duration of practice. The microcomputer does all the rest by gradually increasing the speed during the practice time selected. You can even select between fast code (Farnsworth) or slow code methods. The characters are sent in 5 letter groups, or random word lengths. Two levels of difficulty can be selected; common Morse characters or all English Morse characters. A 24,000 character answer book is provided for the 10 separate starting positions. There is also random practice mode for which no answers are available.

The **CK-2 Contester™ Keyer** is the lowest cost automatic keyer available featuring an automatic serial number generator for contesting. The CK-2 keyer features a large 500 character message memory that can be soft-partitioned into as many as 10 sections. An exclusive AEA edit mode makes it possible to correct mistakes made while entering messages or to insert words into previously established messages. Two different speeds can be set for fast recall in addition to a stepped variable speed control. The CK-2 features an automatic message repeat mode with variable delay-before-repeat for automatic CQ transmissions or TVI testing.

## CK-2 Contester™



## MM-2 MorseMatic™



The **MM-2 Morsematic Keyer** represents the most sophisticated paddle keyer ever designed and features two powerful microcomputers. The Morsematic incorporates virtually all the features (except the preset and stepped variable speeds) of both the CK-2 and KT-2 shown above. In addition, the MM-2 offers an exclusive automatic beacon mode which is invaluable for meteor scatter, moonbounce scheduling, or beacon operation.

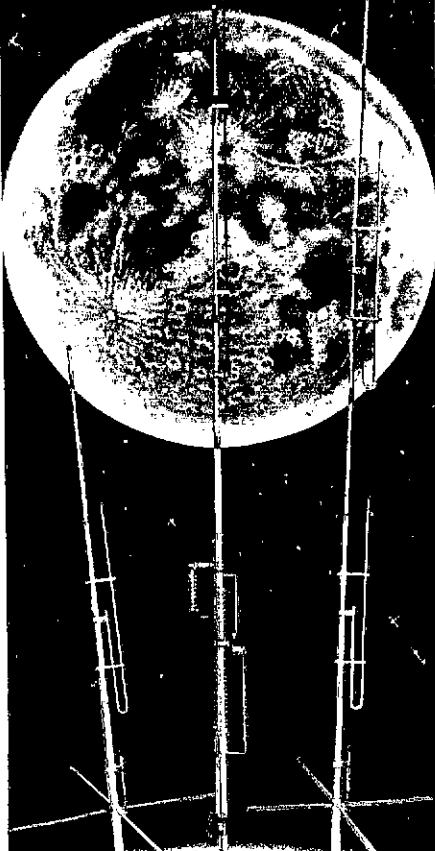
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Model 2MCV "Trombone"  
Model HF6V  
Model 2MCV-5 "Super Trombone"

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**Model 2MCV "Trombone"™ — omnidirectional collinear gain vertical for 2 meters having the same gain as "double-5/8 λ" types, but the patented "trombone" phasing section allows the radiator to remain unbroken by insulators for maximum strength in high winds. No coils "plumber's delight" construction and adjustable gamma match for complete D.C. grounding and lowest possible SWR. Height: 9.8 ft/2.98 meters.**

**Model 2MCV-5 "Super-Trombone"™ — Same advanced features as the basic 2MCV but a full wavelength taller with additional "Trombone"™ phasing section for additional gain. Height: 15.75 ft/4.8 meters.**

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NIARC had demo at MC "Cider Days" as well as participating with CD Riefler drill; CVARC provided assistance with "Farm Progress Show"; DSM helps with the Altoona Baloon Festival as well as Diabetes Bike-a-Thon. Ft. Madison did their thing with the "Radio Roadshow" and Dvnrp participated with the "Six Festival Special Event" and the "River Rat Run" and Old Threshers Reunion was visited by 115 hams from 7 states in Mt. Pleasant. Good rep again for DTENTEN. ICN looking healthy again, thanks for the help. Time to start thinking about "Iowa ARRL Amateur of the Year-1984." Let me hear from you. Wish everyone a Happy & peaceful Holiday Season and New Year!!!

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TLCN	3560	Dy	0030/0400	332	133	60
75MPhon	3970	M-S	1830/2330	1898	133	54
ICN	3713	TThs	0100	68	32	12
ITENB	3970	Sn	2230	7	11	4

Traffic: WA0AUX 258, W0DFB 178, W0SS 144, K0GP 120, W0FLS 104, N0CWW 99, K0ADF 51, K0BY 51, K0B1 51, W4JL 51, W0BAVW 43, K0BJQ 30, W0BWB 26, W0B0GVY 24, K09BGB 16, K0BSC 14, W0ZTF 8, W0B0HF 6.

KANSAS: SM, Robert M. Summers, K0BFX — SEC: W0KLL. STM: W0YH. SGL: N0BLD. TC: K0EZ. BM: K0UDD. Wichita hamfest attended by well over 300 persons. All meetings well attended and a good time was had by all. The following week the Concordia motorcycle shop burned to the ground, and those of us attending the get together, sponsored by the KN4C, spent an almost sleepless night. W0TQ really supplies quite an evening at those Concordia hamfests, hi. We are still looking for a Official Observer and RFI Coordinator as well as Public Information Officer. If you think you might be interested, get in touch with your SM. We would also like to coordinate the 2-meter station's working towards a coordinated effort to relay some of the traffic that gets bogged down sometimes on the low bands. Do we have a coordinator type out here hiding somewhere? Traffic net totals: QNI/QTC/mgr. K5BN 1172/155 K0BCUF; KPN 275/33/K0BCUF; KWN 891/592/W0ALBB; KMWN 536/456/W0ALBB; CSTN 1992/108/W0AOMB; QKS 258/96/W0BZEN; QKS-SS 50/19/W0MYM. Last but not least — The Oct-Dec issue of *Kansas Amateur Radio* (a CQGL publication) will be the last unless he can find someone wanting to continue. We will all miss the publication and most of all we miss W0CGL as an active Kansas ham. Traffic: W0BFR 250, W0BZEN 124, W0CYH 118, W0FDJ 79, K5BU 72, W0ALBB 67, W0BAM 48, K0BFX 39, W0CHJ 23, W0MYM 23, W0QMT 19, K0GSC 18, W0FB 16, W0K1 9, W0BBO 9, K0E3 3. (Aug.) W0B0WH 5.

MISSOURI: SM, Ben Smith, K0PCK — The Missouri Single Sideband picnic was held the third Sunday in September at Jefferson City. K7SY was reelected MO. Single Sideband Net Manager for the coming year. The Sideband Picnic will be held the second Sunday in September 1984 at Binder Lake in Jefferson City. Hamfest dates set for 1984 are: Columbia, May 5 and 6 at the Hilton Inn; The Columbia Hamfest Banquet, held Saturday evening May 5 at the Hilton; Indian Foothills ARC of Marshall, hamfest the third Sunday in May, K7SY and I appreciated the invitation to speak at the September meeting of the Northland AR Assn. of Kansas City. The Northland club has a lot of projects planned and we wish them luck. W0GL has received an OBS appointment. He sends the bulletins on CW on 6 meters for amateurs in the Kansas City area, to use for CW practice. Sounds like a good public service to the amateurs in the community. Perhaps that would be a good club project to help Novices and other amateurs working toward an upgrade. W0ENW was featured in a well written article about Amateur Radio in a local Sedalia newspaper. We want to wish everyone the best for the upcoming holiday season. Hope Santa brings all the new ham gear you want, and everyone works all the new countries, states and counties they never in 1984.

Net	Sess.	QNI	QTC	Mgr.
MON	60	394	143	K0SI
MOSSB	30	578	98	K7SY
MEOW	30	303	25	K0DSQ
HBN	22	418	73	K0DSQ
CMEN	4	53	3	K0PCK
PHD	6	97	25	W0AKUH
STARN	4	221	3	N0BKH
IFN	3	16	0	W0KNF
SARN	4	52	0	W0ENW
LRAN	25	359	18	N0ECM
LOARCN	5	114	0	W0B0W
LOARCN-CW	5	24	0	W0RTL

Traffic: K0SI 183, K7SY 129, A100 121, K0CBA 96, K0PCK 91, W0BMA 82, W0AVZX 39, K0DSQ 35, W0BUD 33, K2ONP 24, N0BLE 23, W0AKUH 17, W0B0P 14, W0BFLT 2.

NEBRASKA: SM, Reynolds Davis, K0GND — HAPPY HOLIDAYS! Hard to believe that the year is winding down, it has been a busy year for the section. Nebraska has 57 ARRL appointees who have been making things happen. We also have 15 active clubs, 11 VHF nets, 7 HF SSB nets, and 2 HF CW nets. There is a weekly HF-RTTY & SSB section bulletin. Special thanks to the team of N0AIF, K0BCEB, W0BEMR, K0GNV, W0B0JJ, K0CXY, & W0AWH. With their leadership and your support, we have made great progress in 1983. Congrats to W0AKGD on appt as Dakota Co. EC. Please note that all traffic must be reported in CD-210 format (orig. sent, received, delivered, total) AND must be formal written traffic in order to be included in the section count. Finally, to all Nebraska ARRL members who have helped in 1983: THANK YOU! Traffic: W0KK 106, K0DKM 105, W0B0TJ 73, W0AGCP 65, W0SGA 57, K0IXY 29, K0BCEB 28, W0ZNI 21, W0B0K 14, K0GND 13, K0B0WM 12, W0B0XY 9, W0B0WR 8, W0N1K 6, K0TUH 6, W0ATU 5, W0B0GM 3, W0WKP 3, W0YFR 3, W0B0BX 2, K0ODF 2.

### NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, K01KD — SEC: K1WGO. STM: K1EIC. OQ/RFI: K01ML. ACC: N1AZF. TC: W1HAD. PIO: K1INGL. SGL: K1AH. BM: K81F.

Net	Freq.	Local time	QTC	QNI	NM
CN	3640	1900/2000	195	300	K1EHR
CPN	3965	1800/1000 Sn	130	273	K01BH
NVTN	28/18	2130	39	278	W01ELA
WCN	78/18	2030	72	328	W01GXZ
RTN	13/73	2100	53	262	K1UQE

Season's Greetings to all from your Section Manager and staff. Upgrades: Extra/K0CXC; Adv/W0A1B; Certificate of Merit to K01HGH for his untiring contribution to N.E. Ct. ARES. New pres of SARAC-WA1GTP. Congrats to S.W. Ct. ARES W1FAL and group for their professional handling of the Millstone Reactor emergency drill. K1D11 NICVLC K01FW all have new beams up. W01AJC has moved to VT. Call changes: N1BLL/K01K; K01FGH/K01K; K01KCA/N1CVLC. Congrats to the Manchester RC on their 50 years of affiliation with the ARRL. W1CUT from HQ recently gave a talk to SARA on how QST is put together.

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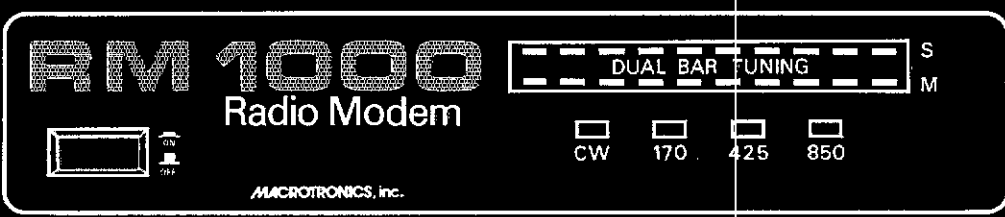
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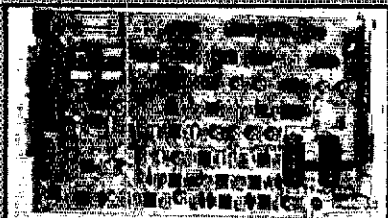
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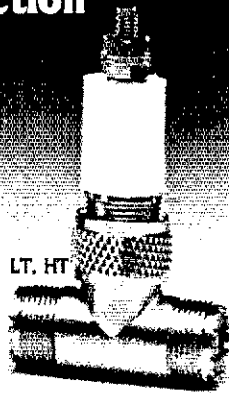
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The AREA machine 147.315 recently received permission from the Planning & Zoning Board to increase their tower height from 120 to 160 ft. level. Congrats to KA1DOC and YL on their new harmonic. BPL: WB1GZX. Want to know the latest happenings in Amateur Radio? DX bulletins? Propagational info? More? Tune in to W1AW for the up-to-date word. To assist in getting the word out why not become involved with our section's OBS program. If you are involved with RTTY, NTS or repeater operations why not accept the challenge of an OBS appointment. Contact K31F (ex-WB1DWE) for details. Han House Gang recently operated from the Bethlehem Fair and will be getting ready to put W1FHP on the air during the Christmas season. Note: All station appointments are valid for a period of two years, with renewals processed every January. Traffic: WB1GZX 539, WB9IH 144, W1EFW 142, K1UCJ 108, KA1BHT 101, KA1EGE 75, WB1ESJ 70, N1CLV 28, K3ZJJ 26, W1FAI 16, WA1WQG 16, W1QV 10, W1CUH 7, W1DPR 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	Mgr.	Freq.	Time (loc/Dy)	QNI	QTC
EMRI	WA1LPM	3.658	1900/2200/Dy	487	514
EMRIPN	KA1GBS	3.66	1730	288	326
EMN	N1BN	2363	2000/Dy	367	152
NEEPN	K1BZD	3.945	0830/5n	68	11
HHTN	KA1MI	04/64	2230/Dy	570	410
EMRIS	N1BHH	3.715	2030/Dy	170	99
C12MN	N1BYS	045/645	1930/Dy	165	45

All of the section-level appointments are now in place. They will be listed at the very beginning of this column each month as they are this month. Feel free to contact these stations for help in their areas of expertise: KA1GBS for traffic handling, W1IAY for emergency communications; K1AZE for club activities; WA4STO for Official Observer and bulletin information; KA1IU for technical matters; WA1IDA on public relations; and K1BCN regarding state government. These stations working as a team can make a most effective field operation in East Mass but only if you, the membership, take advantage of them. So feel free to contact them or me when you think we can be of help. K1UR gave a talk at the Billerica club on 10 GHz Gunnplexers. 1200 Radio Club got its share of the credit at the national convention in Houston regarding the Teleconference Radio Net. Wellesley club placed sixth nationwide in the June VHF Contest. Congrats to one of our Special Service Clubs. Norwood club has started a Novice class. N1BDA and W1YNL have been serving on the Connecticut Cable Study Committee. KA1101 has been experimenting with HF Packet Radio. Massachusetts club members enjoyed each other's company recently at a club picnic. KA1CFC gave a talk at the Framingham club on how to snag the rare DX with simple wire antennas and low power. Sturdy Mem Hospital ARC members KG1K KA1UE KB1KA KA1GQW and K1ZZJ worked on the antennas on the hospital in preparation for the contest season. Anyone interested in becoming a volunteer examiner under the volunteer examiner program should send their name along to ARRL Headquarters. Although the program is not in place yet it will help to have a large number of potential examiners ready and waiting when the time comes. Pilgrim Amateur Wire Club (K1101) will be commingling with HF Packet Radio. KA1KEP 527, N1BGW 371, N1AJJ 258, K1CB 206, KA1EXJ 205, N1BHH 194, KO10 162, KA1EPO 156, W1ICE 137, WA1TBY 137, WA1LPM 113, WB8TDA 71, WA1DXT 70, WA4STO 60, K1BA 59, KA1MI 48, KA1BBU 48, N1BYS 45, WA1FNM 45, KA1AMR 45, K1I1 44, KB1JM 32, WA1OZ 28, WB3FOC 23, K1BZD 23, K9HI 17, KA1KF 14, KA1EJ 12, K1OGF 12, KA1DJV 10, K1LCO 7, KA1R 6, W1ZHC 6. (Aug.) K1BA 107, KA1R 5.

**MAINE:** SM, Cliff Lavery, W1RWG — SEC: KL7JG/1, STM: AK1W, ACC: KB1JF, OO/RFI: W1KX, SGL: K1N1, PIO: KA1TJ, TC: KQ1L, BM: W1JTH. KA1AVU was appointed mgr of late session of PTN Oct. 1. We thank N1BJW for his work on PTN. KA1FHA, KA1FY, KA1EMK, KA1C N1BLZ, KA1BHF provided comms for Skowhegan Fair road race "Dollars for Scholars." August EARU provided comms for Maine Event Triathlon; Ellsworth AWA assisted Southwest Hbr Days Triathlon. Pub Info Off KA1TJ needs more PIAs from the clubs. PSHR: AK1W N1BJW W1KX KA1AVU KL7JG WA1YNZ KA1TJ W1RWG.

Net	Sess.	Checkins	Traffic	NM
PTN	52	417	195	AC1G/N1BJW
SGN	26	919	176	K1GUP
CMEN	3	195	15	W1WQ
AEN	4	45	1	W1YNZ
MPSN	3	44	1	W1JG

Traffic: AK1W 266, N1BLZ 136, WB1BYR 130, W1ISO 129, W1KX 123, KA1AVU 90, W1RWG 76, N1BJW 69, KL7JG 57, WB1GLH 49, KA1TJ 42, K1PV 27, WB1CBP 21, W1BMX 19, W1CTR 18, WA1YNZ 14, N1BME 10, KA1FTL 4, W4GKJ 4, KB1JF 4, W1OTQ 4, KA1ENL 1.

**NEW HAMPSHIRE:** SM, Robert C. Mitchell, W1NH — STM: W1TN, SEC: AK1E, Pearl Harbor survivor KA1HNU now on 2 meters. N1AIX WB1BRE & W1NH attended Director Sullivan's cabinet meeting in Worcester. K1OIQ reports the following in the Mt. Washington bike race: N1HR W1OKU N1CMD N1AHM KA1IIP KA1IXA KA4EZV. High checkins for NHN: N1NH KK1E. Join the Nashua gang for breakfast at Bud's Restaurant at 8 A.M. on Saturdays. First NH Teleprinter Net brought out W1FYR W1Y1 WB1GXN & W1TN. KA1UC back in NH from W1-Iand. Christmas and a Happy New Year to all. Traffic: KK1E 260, W1TN 198, K1IM 134, W1GUX 173, N1NH 129, N1CPX 100, AK1E 82, WB1CFP 81, K1YNH 78, K1POV 57, N1AKS 54, W1ALE 47, W1VTP 42, KA1BJ 36, W1UCJ 31, WA3BZM 26, W1MHX 20, WA1PEL 15, W1FYR 14, K1OIQ 11, KA1IIP 11, WA1YZN 11, K6UXO 10, KA1GOZ 8, KA1HP0 7, K1ACL 5, N1ALM 5, KA1HRH 2.

**RHODE ISLAND:** SM, Gordon F. Fox, W1YNE — SEC: KA1EHR, STM: W1E0F, TC: AB1D, NM: WA1OSL RIEM2MTN. New appts: K1DA, State Govt Liaison; N1BEE, Affiliated Club Coord.; WA1CSO WA1CRY, ORS. Endorsements: WA1OSL, NM RIEM2MTN. K1DS and N4MY operated Sep VHF contest on 8 thru 12/95 and had 246 QSO's and 53 mults. Both stations active on OSCAR 10. Hopewell Valley ARC and UPRC will license six new Novices: KA1KIL KA1KQD KA1KOR KA1KOS KA1KOT. Instructors were N1BEE and KB1G. OSARG provided comms for "Gaspee Day" parade and "Save the Bay." The "Buffalo" (.35) now has Austin antenna in service. Traffic: W1E0F 780, KA1KML 135, WA1CRY 80, WA1CSO 15, KA1EHR 12, N1RI 7.

**VERMONT:** SM, Reed Garfield, WB1ABQ — STM: N1ARI, BM: AE1T, SEC: W1RNA, SGL: W1KRV. Congrats to VT's first Affiliated Club Coord. KA1AKI. Lots of activity during the Yankee Vernon drill. Mtn Txn to K1K KA1s DK DXR ETQ W1s CTM RNA JLZ NHJ TN WA1s FWR LCH MAG



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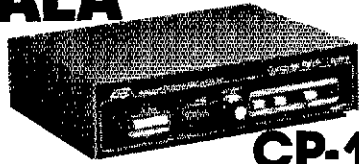
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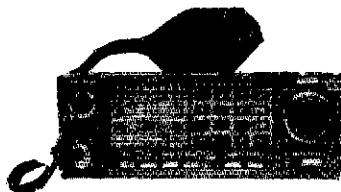
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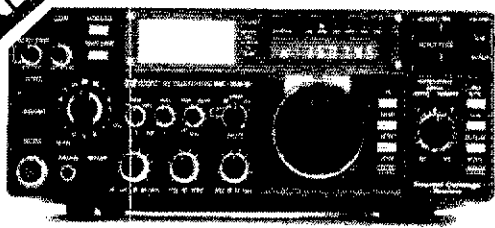
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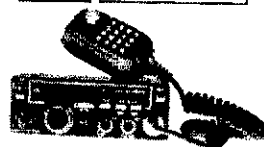


## IC-745

Your Price \$899



The IC-740 grows up!  
Now-with general coverage receiver, 16 memories, and scanning makes this one of the most versatile high performance rigs ever.  
Suggested Retail \$999

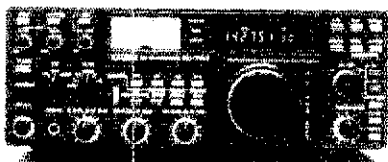


## IC-25H

You can be full-quieting with this 45 watt 2M mobile.

IC-25A 25 watt version available for **\$319.**

**NEW**



## IC-751

The best filter in the industry is standard with this state-of-the-art high performance rig.

**ONLY \$1229**

**NEW NEW**

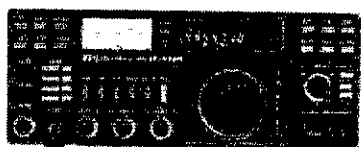
Ideal for satellite contacts!



## IC-271A

2 meter all mode, 25 watts, many new features.

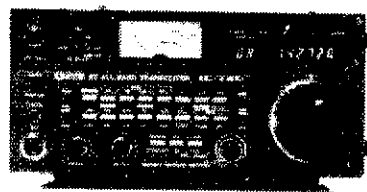
Suggested Retail \$699.00  
Call for Low, Low Price!



## IC-471A

All mode, 430-450 MHz coverage. Features not previously available.

Suggested Retail \$799.00  
Call for Low, Low Price!

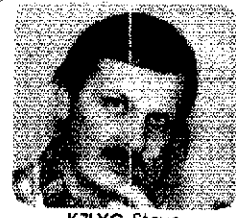


## IC-720A

A high performance ham transceiver NOW AT AN UNBELIEVABLE PRICE!  
This standard of the industry is also ideal for marine and portable use. Transmitter rated at 100% duty cycle for RTTY use.

Regular \$1349

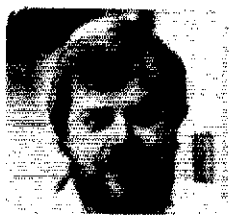
**CLOSEOUT SPECIAL!**  
**\$899**



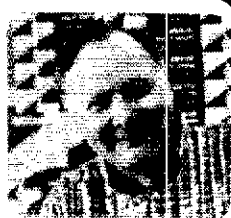
K7LXC Steve



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Wash. Residents: Add applicable sales tax. Call 800-562-6818  
International Orders: Telex 15-2391 C-Comm

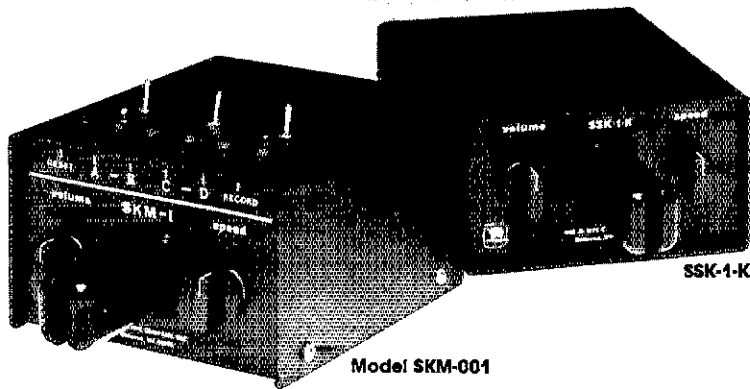
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Long, form-fitted paddles for tireless keying. Reliability of gold key contacts plus CMOS IC's.

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Positive or negative keying. 5 to 50 wpm speed and volume controls. Supplied with Nicad battery and A/C adapter.

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Serves as practice keyer. Switch allows "bug" or straight key operation.

## MEMORY KEYS SKM-001...

Record 4 messages up

to 256 bits each, 2—512 bit or 1—1024 bit message. Automatic playback return.

Repeat switch. Memory reset and LED status indicators.

## ALREADY HAVE A PADDLE...?

ESK-001 Keyer operates with average transistor battery. Remember Nye's TWO YEAR Warranty!

Available at leading dealers.



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PRETUNED - COMPLETELY ASSEMBLED - ONLY ONE NEAT SMALL ANTENNA FOR UP TO 7 BANDS! EXCELLENT FOR CONGESTED HOUSING AREAS - APARTMENTS - LIGHT - STRONG - ALMOST INVISIBLE!

FOR ALL MAKES & MODELS OF AMATEUR TRANSCEIVERS - TRANSMITTERS - GUARANTEED FOR 2000 WATTS SSB 1000 WATTS CW. INPUT FOR NOVICE AND ALL CLASS AMATEUR! IMPROVED DESIGN!

COMPLETE AS SHOWN with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge - molded, sealed, weatherproof, resonant traps 1"X8" - you just switch to band desired for excellent worldwide operation - transmitting and receiving! Low SWR over all bands - Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. THE ONLY ANTENNA YOU WILL EVER NEED FOR ALL DESIRED BANDS - WITH ANY TRANSCEIVER - NEW - EXCLUSIVE! NO BALUNS NEEDED!

80-40-20-15-10-6 meter - 2 trap --- 104 ft. with 90 ft. RG58U - connector - Model 998BUC ... \$99.95  
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YEH WB1GTO & hope I didn't miss any!!! I'm really pleased to see the increased interest in emergency & traffic operating. It's getting closer to time for antenna work. Tool #1 30-143-14, VSWR 30-50-12, VSWR 30-50-12, 30-532-50, GMIN 26-401-32, Carrier 26-635-30, RFD 4-74-8, VFN 4-85-4, CVFMM 4-64-4, RFD (Aug) 4-87-10, CVFMM (Aug) 4-27-2, Traffic: AE1T 156, N1COB 100, W1KRV 82, N1ARI 82, W1ABQ 59, W1OAK 31, K1IK 2.

**WESTERN MASSACHUSETTS:** SM. William J. Hall, W1JP — Good news and my heartfelt congrats to KA1T who has been elected WM/SM effective 1 Jan. 1984. His enthusiasm is infectious and he is currently NM of WMM and very active on NTS and ARES. WA1PCD informs me of yet another traffic net on KA1JMM/R 147.705/105 meeting M-F at 4 P.M. Name is WMTN/c3. It is linked to K1FFK/R6 to allow WB1HH to check in. In WMA we now have active nets for CW buffs (WMMN), tone nuts (WMMFN), ARES types (WMMEN), and 2M enthusiasts (CMATN, WMTN/c2, WMTN/c3). Words from AGC W1YL. The HCRA elected WA1ZKT "Ham of the Year." Field Day was a big success for the club, as was the VHF SS where they clinched top spot in the medium class club aggregate. K1JUV received a letter in Italian for her QST YL column which plasano W1KK translated. The Montachusett club elected WA1UCO proxy, and trustee of W1GZ/R is now K1JHC. The Provin Mt. club will again sponsor a computer net on 148.70 and will host the tri-club Christmas party this year. News from CMARC which continues its public service focus. The first job will be the M6 Bike-a-Thon in Worcester. W1DOY/5 organized communications during the floods in New Orleans this spring, and finally, WA1OY/3 a severely handicapped ham. News from a commendation from President Reagan. PSHR: WB1HH W1PUO K1JHC KA1T. Traffic: W1PUO 495, WB1HH 352, KA1T 256, W1UD 153, WA1WWW 92, W1KK 76, K1JHC 73, K1PUG 54, W1JP 52, N3DKC 34, WB1FSV 31, W1SWV 21, K1JUV 14, W1ZPB 12, WB1HKN 9, KA1EKQ 3, KA1E 2.

## NORTHWESTERN DIVISION

**ALASKA:** SM, Will Darsey, AL7AC — This is my last In-pot as Section Manager for Alaska. I wish to take this opportunity to thank each and every one of you for your support of both AL7C and myself during the past two years. With your support much was accomplished, but there are some areas that need improvement. Closer coordination/cooperation between clubs is the key to improving two of the more important programs, ARES and Public Service. Season's Greetings to those Alaskans (both cold ducks and snow birds) who will claim warmer nests this winter: KL7AG Arizona, KL7CJ Florida, KL7HAY Washington, KL7MD Philippines, KL7NW California, AL7O San Francisco, KL7P & KL7Q Iowa, AL7V Oregon, KL7YK Oregon. My sincere thanks and best wishes to all. Traffic: KL7VY 146, AL7FJ 48, AL7AC 18.

**IDAHO:** SM, Dennis Hall, KK7X — I am sad to report that on August 26 WB7WIA OO, OBS and dear friend of my family and an employee of my print shop passed away at the age of 26 from a rapidly developing brain tumor. Ed the Martin G. Ware Memorial Station was dedicated at the North Idaho fair by the Kootenai ARES, Coeur d'Alene. Now that I am running a press full time at my business I need your assistance more than ever. I need an assistant to aid in the paperwork involved as SM. Working up to 14 hours a day my time is more limited. Winter is around the corner. Are your antennas up and ready for the winter? Just get mine up at my new QTH at 74'. Hope you all did well in SS, and thank you to those who participated in October SET. 73 Dennis, KK7X.

Net	Sess.	QNI	QTC	Mgr.
FARM 3938	6 P.M. Dy			
1MN	3836 7-10 A.M. M-F	22	201	T16
Traffic: W7GHT 228, KA7GQP 78.				

**MONTANA:** SM, Les Belyea, N7AIK — Holiday greetings to all. K7TQM of Billings upgraded to Extra during a recent FCC visit. He is a blind operator and I believe this to be a Montana first. KD7Q WB7OYO and WB7OYP were operating hot air mobile in Albuquerque in October at the International Balloon Fiesta. Many thanks go to KL7LH K57R W7TGU and WB7TNH for being active on the Idaho - Montana Net. Members of the Lower Yellowstone ARC headed by WA7GVY have been busy putting up a new repeater on Richey Divide. Everything is homebrew. A repeater located near Sargis on 147.842 has the gap between the Billings and Butte. WA7GGG has moved from Missoula to Whitefish. N7BMR from Sidney has filed for DXCC. He said it cost him a fortune to send cards to ARRL insured, return request, etc. The Big Sky Net is back on the air for the winter season.

Net	Sess.	QNI	QTC	Mgr.
MTN	30	1109	137	KB7SE
BSN	12	143	0	WB7UTJ
1MN	22	201	116	K7RX/K7JV
Traffic: WB7TNH 95, KD7EG 86, KF7R 58, N7AIK 25.				

**OREGON:** SM, William Shrader, W7QMU — 6TM: V7VSE, SEC: N7CPA, PIO: K07YN, SGL: KA7KSK, ACC: WB7WTD, RFI: AK7T, OO: N7SC, Upgrades: KA7RCZ KA7QWJ (Novice), N7FNW KA7QEW KA7QOB (Tech), KA7QVH KA7QWJ (General), KA7KDU (Adv), K07M K07X K07Y W7LOJ K07Z (Extra), N7ACP is a new member in GCWA. WAT7IC WAT7CY and WB7QZI won the big prizes in the Hoodview Ham Fair. Congrats to all Salem ARC handed over 200 messages during the Oregon State Fair with over 25 club members participating at the booth. W7ALG and XYL were injured in a helicopter accident on Mt. St. Helens while touring the area. KA7MDM spotted a fire while on his way to the State Fair, reported it via the South Saddle repeater, and then helped put it out. North Coast RA has moved the Seaside repeater (145.45) to Sugarloaf Mt. It is completely solar powered. WB7SIC and N7EPE are going to Belize for GQWV DXpedition. Oregon section needs Official Observers. Contact G7C for information. K6DE will be banquet speaker for 80 Oregon State Conv. Section needs a Technical Coordinator. Someone must be interested in this type of contribution to Amateur Radio. Contact SM for info. OSN totals: 322 messages. Traffic: W7VSE 658, K07W 211, AL7W 202, W7ZB 171, KX7T 103, K17Y 55, KA7AID 45, W7LNE 41, N7BGGW 39, W7DAN 9, N7NZ 5, W7LT 1. (Aug.) K17Y 31.

**WASHINGTON:** SM, Joe Winter, WA7RWK — SEC: K7SH, STM: K7GX, ACC: K7RS, CT: KYU, SM: KD7G, PIO/SGL: W7CKZ, OO/RFI Coord.: KB7WC, BM WA7RWK is on vacation and section PIO W7CKZ is writing this month's column.

Net	Freq.	Time(Z)	QNI	QTC	Sess.
WSN	3590	0245/0545	653	266	60
WRTS	3570		262	233	30
NTN	3970	2000	184	50	30
NWSSBN	3045	0230	682	54	30
EWTN	146.84	0130/0530	100	70	55
PSTS	145.33	0130/0530	189	146	59

Governor Spellman proclaimed September 12-18 as Amateur Radio Week in Washington, but a foreign trad

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## MFJ-941D 300 WATT VERSA TUNER II

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**(\$4)** New styling! Brushed aluminum front. All metal cabinet.  
**(\$4)** 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-949B 300 WATT DELUXE VERSA TUNER II

**\$139<sup>95</sup>** MFJ's 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.

**\$329<sup>95</sup>** 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

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<sup>95</sup>**  
 (+\$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-962 1.5 KW VERSA TUNER III

Run up to 1.5 KW PEP **\$229<sup>95</sup>**  
 (+\$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

(200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for \$9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail. MFJ-981, \$239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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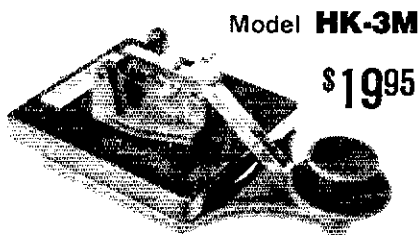
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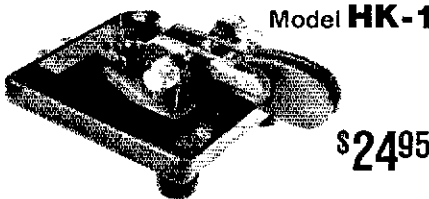


Model **HK-3M**

\$1995

- Deluxe straight key
- Heavy base. No need to attach to desk
- Navy type knob

CC-3P shielded cable & plug for HK-3M \$1.50



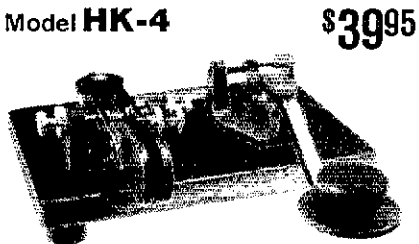
Model **HK-1**

\$2495

- Dual lever squeeze paddle
- For use with all electronic keyers

Model HK-2 Same as above less base \$15.95

CC-1P shielded cable & plug for HK-1 \$2.00  
Combo offer. HK-1/HK-5A & CC-1P \$69.95 Package

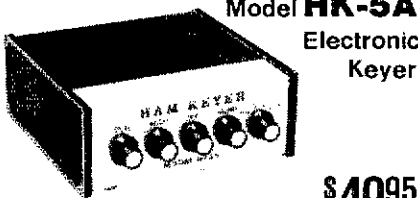


Model **HK-4**

\$3995

- Combination HK-1 & HK-3 on same base

CC-1/3P shielded cable & plug for HK-4 \$3.50



Model **HK-5A**

Electronic Keyer

\$4995

- Iambic circuit for squeeze keying
- Self completing dots & dashes
- Dot & dash memory
- Battery operated
- Uses Curtis 8044 keyer chip

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trip prevented his having pictures taken with Amateur Radio officials. The Washington State QSO Party was September 17 with K7RS handling the log and summary sheets. KATEOV, ARES EC for Lewis Co. is coordinating a RACES/ARES program for that area. Contact him and volunteer. The Mount Baker ARC will be getting a new generator for use in the many communication support projects that they participate in. Also, many MIBARC members are assisting the FCC and others in determining who the 2-meter "pirates" are operating from commercial fishing boats in the area. The Lower Columbia ARA recently held a 2-meter bunny hunt that was won by N7CFA and Emma. They were riding a single speed bicycle and took low points with only seven miles! The changeover from FCC field office test sites to local examiners will see the following: Scott and Joseph K9CH at ARRL if you can help in the Washington Section. Many Washington section amateurs attended the ARRL national convention in Houston. At the convention it was announced that the FCC would extend the Amateur Radio license term to ten years. The West Seattle ARC had an interesting September program that featured Tom Mahoney of the City of Seattle. He presented a discussion of the Spokane Street bridge project. The Quarter Century Wireless Association, Northwest Chapter, will have its Fall Dinner, Nov. 5, again at Lynnwood. The Yakima ARC held its W7AC fall kick off meeting Sept. 13. The Grays Harbor ARC meets the third Thursday of each month at 8:30 P.M. in the Montano Court house. The radio amateurs of Skagit Co. club members furnished communications for the Skagit Flats Marathon. Tom Sheakan, Skagit Co. Director of Emergency Services, is working with local Skagit Co. amateurs to develop a communications plan in case Mt. Baker causes earthquake activity. The Boeing Employees' ARS furnished communications the past two months for the Scot Highland Games, triathlons, Seafair Parades, Boeing Salmon Derby, equestrian events and a number of marathons. Bob Ummel, K87IL, Island Co. ARES EC, received a very nice "write-up" in the *South Whidbey Record* newspaper. He and a number of local amateurs participated in a mock hazardous material exercise coordinated by local amateurs and government officials. Traffic: W7DZX 587, WB7WOW 538, KD7ME 388, K7GXZ 368, K571 247, W7LG 171, KR7L 183, W7HNA 147, W7GB 105, N7ANE 86, WA7BDD 68, W7IEU 54, K7CTP 49, W7LUP 37, W7APS 34, KR7F 34, K7AJT 29, WA7JEB 24, KD7MW 14, KA7INX 6, K7OXL 6, W7AIB 2.

### PACIFIC DIVISION

NEVADA: SM, L. M. Norman, W7PBV — SEC; WB5VDV, STM: W7BS, Radio amateurs who have worked at Hoover Dam, send QSL card to SNARC, Inc., Box 945, Boulder City 89005 for 50th anniversary celebration information. WA7PZQ now KD7PD. New appointees: PIO WA7JUC, CES-K7ZOK, K7HRW DXing on 75 meters, W7PBV enjoyed dining in truck diner coordinated by local amateurs and government officials. Traffic: W7DZX 587, WB7WOW 538, KD7ME 388, K7GXZ 368, K571 247, W7LG 171, KR7L 183, W7HNA 147, W7GB 105, N7ANE 86, WA7BDD 68, W7IEU 54, K7CTP 49, W7LUP 37, W7APS 34, KR7F 34, K7AJT 29, WA7JEB 24, KD7MW 14, KA7INX 6, K7OXL 6, W7AIB 2.

PACIFIC: SM, Army Curtis, AH6P — Mele kalikimaka me ka hauoli makahiki hou. The list of volunteers continues to grow in the Pacific! KH6IJ is your new PIO. Joining him as PIAs are KH6AQ KH6BFZ KH6JUJ and AH6J. Mahalo, gentlemen. Now, what can the rest of you do for Amateur Radio? Please contact me to find out. KH6IJ would like outer island CW stations to meet him on a local evening net to pass traffic. This would be a good opportunity to learn traffic handling techniques. Please contact either KH6IJ, or myself for details. I hope Santa will be good to you and yours this year and that 1984 will be the best year yet. Mahalo to all for your support. Traffic: KH6B 196, KH6IJ 97, KH6S 53, KH6H 24.

SACRAMENTO VALLEY: SM, Ron Menat, N8AUB — STM: KY8Q, SEC: WA8ZUD. Thanks to all of you who have expressed your support in our efforts in the coming two years. Special thanks to Norm Wilson, N6JV, for having held down the SCM slot for so long. Congrats and thanks to Jack Littleton, KY6D, who will remain on as STM, and to Lyle Taylor, WA8ZUD, who is the new SEC. Thanks also to Tom Ollander, WB8WFG, for accepting a position of State Govt. Liaison (SGL). These gentlemen and a few others will make up the section cabinet. Please give them your input and support. If you have questions or concerns, do not hesitate to call them or me. A sincere welcome to the section to all of you League members in Amador Co. who have joined the SV section. Please include my name and address on your club's newsletter mailing. I look forward to hearing from all of you. Traffic: N8CVF 18, WB8SRQ 5, (Aug.) WA8WJZ 106, KY8Q 14, WA8ERZ 12, WB8SRQ 6, (July) WA8WJZ 91, N8CVF 28, N8CHU 18, WB8SRQ 10, WA8ERZ 6, WD8FEH 3, (June) WA8WJZ 88, KY8Q 16, WD8FEH 14, WA8ERZ 12, WB8SRQ 9, WA8ZUD 5.

SAN FRANCISCO: SM, Bob Smith, NA6T — SEC: N6BLN, STM: K8TP. It's election time within Pacific Division — DON'T FORGET TO VOTE. MARC will provide communications for Triathlon from Alcatraz to SF to Mill Valley to Stinson Beach. MARC is looking for Oil Timers. Who was licensed first in Marin Co.? Can you beat W8ZJ with 8-2-14? ACS Emergency Autodialer is up and working with the new ACC controller. Use it wisely? SCRA Fleamarket was a success. Look for 2nd annual next year. A few of the section worked BY1PK on 888 so far this month — hope alot more dol SKYWARN, ARES and FWRA nets are on FWRA repeaters now. Get out and support the ARES-ARES fund drive in the north bay area. TRYG0, WB8ERZ Sorry to hear that WB8F is a Silent Key in Eureka. HARC-FWRA won the club contest at the Pacific Division Convention — a new ACC controller for the FWRA Pptr System. Seven members made PSHR in September, the highest number ever in section. Traffic: W6RNL 257, W6NL 255, W8IPL 181, K6TWW 70, K6TP 43, WB8TE 27, NA6T 22, (Aug.) W6GGR 10, (July) W8IPL 27, W6GGR 28.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W8DPD — SEC: WA8YAB, STM: N8AWH, TC: WA8EXV. The Radio Clubs of W. Kern Co. had a successful Swapfest and picnic on Sept. 17. K8LU won a Foundation for Amateur Radio Scholarship. Congrats. W8ERE is a Silent Key, W8DPD is now secretary of Fresno ARC. If your club wants its future activities listed here before they occur, please let me know at least 2 months in advance of the event. WB6YIF is N6IUT, KE6QT is Extra. Be sure to check the expiration date of your license and make a timely renewal application. WA8YAB has an IC2AT. KA6SJB has W4000. N6SCH has a 1500. KA8RL is TRYG0. WB8ERZ has a 15330. The 1984 Fresno Hamfest (an ARRL hamfest) will be May 18-20 at the Tropicana Inn. Merry Christmas to all from your Section Manager. I hope Santa is good to

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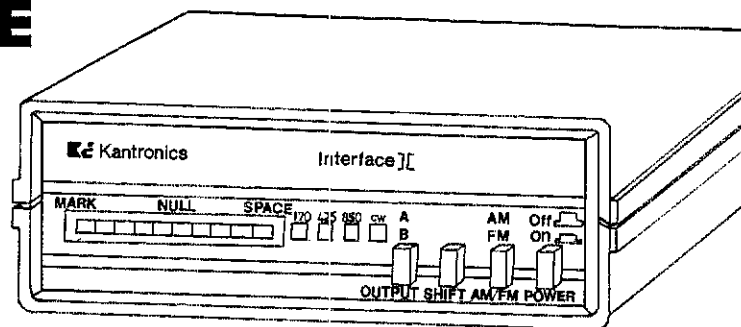
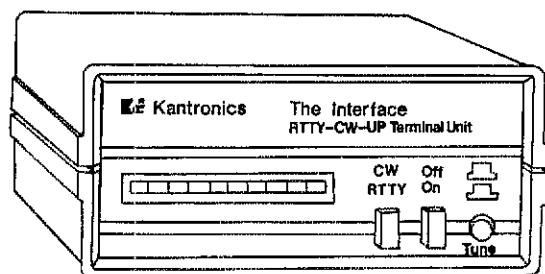
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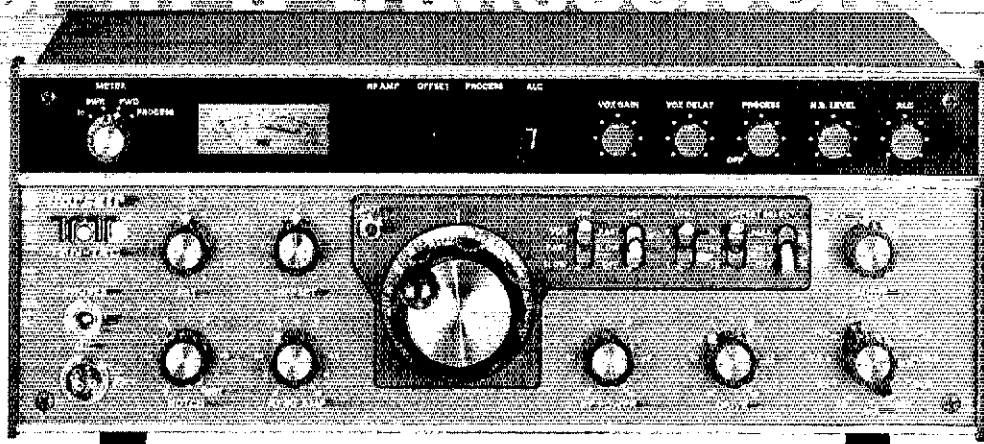
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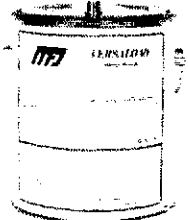
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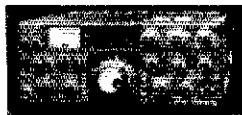
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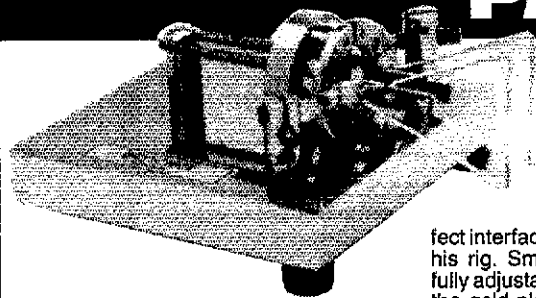
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everyone. Traffic: N6AWR 87, K6PMG 61, W6DPD 28, W8SX 21, WA6YAB 17, WA6JDB 6, K9YBM 5, W6FRS 1. SANTA CLARA VALLEY: SM, Ross Forbes, W86GFJ — ASM: K8ZV. SEC: KA8R. PIO: W88BPJ. ACC: W6MKM. This will be the last column to appear in QST with me as your Section Manager. Owing to increased business activities, I can no longer devote the time to the position. Rather than do as some would do and keep the title but not be available to the membership, I feel that it is in everyone's best interest if I step aside. This will allow the members of the section to have a person in the position who can devote full time to their needs. While I have notified HQ of my plans, they have as yet selected not to contact me, so I have no idea as to who the next SM will be. K8ZV was my suggestion on HQ, so with luck he will be doing the column from now on. Contact KA8R. I will also run for election as the office opens up for nominations next month. This will be announced in QST. While nobody came forward when I announced it months ago, here is another chance for those budding politicians. Good luck. KF6MD has a new beam up. KG6AE jumped right into Amateur Radio by taking the Advanced ticket; WELCOME! Many clubs have had W8XN as their speaker now that OSCAR 10 is going strong. W8KH and W86GFJ on OSCAR 10 regularly working DX! Very few SCV stations have been heard on that bird. Don't forget last year's winter. Right after Christmas, we had 3 weeks of dry weather, followed by LOTS of rain. Contact KA8R, or to see how you can help out. Amateur Radio is needed to help out. Traffic: W6PRI 140, W8KZJ 137, W6RFF 23, W86GFJ 5.

### ROANOKE DIVISION

VIRGINIA: SM, Phil Sager, WB4FDT — By the time that you read this the Christmas traffic season will be upon us. If you are a traffic handler or would be traffic handler then HELP. We will be running all four cycles of the NTS for the Christmas season so there are many more jobs — hopefully lighter jobs — to do. Meanwhile, back in early October when this is being written, the section has just come thru a rather busy time having just finished dealing with a weather emergency in the Tidewater area, a Surry trial and a section meeting at the Virginia Beach hamfest. We are heading into a weekend of four cycle nets for the national SET. WHEW! That doesn't seem to be enough to keep KA4IUM and K4JST busy, so they knocked a few holes in the walls of their home and are racing the rain and cold to patch things back together. Closing date for SM election petitions is December 9. Hurry. Two candidates, W3ATQ and K3RZR, declared at the Va. Beach Convention.

VTN	1 P.M.	7260
VSN	6 P.M.	3947
VSN	8:30 P.M.	3680
VN	7:10 P.M.	3680
VLN	10:15 P.M.	3947

Traffic: W4METK 423, WA4CCK 417, K4AET 382, AA4AT 351, K4KDJ 317, W3ATQ 315, WA4LJ 213, WD4OCW 218, N4GHI 207, KA3DTE 171, K4JST 164, WD4ALY 143, W3BBN 132, KR4V 119, WAUQ 118, W4JLS 105, KB4OG 102, WB4FLT 87, KA4IUM 79, WB2OMZ 60, NN4I 59, KB4PW 54, K4JM 52, KB4WT 51, K4VVK 40, NT4S 39, KA4JXZ 34, N4TE 34, KC4HN 31, KA4ZTB 31, K0JH 24, WB4UHC 22, N4FNT 19, WB4KIT 18, W4NFA 16, W4TZC 16, K4MLC 15, WB4DQZ 14, WB4FDT 14, NF4T 13, WB4PNY 11, K4DHB 10, W4LXB 10, W3BBQ 8, N4YE 8, N4NK 6, W4PVA 6, W4MAE 5, WB4ZNB 5, N4BJX 3, N3RC 3, WA4TVS 3, K14W 3, W4KX 2, N4LE 2, WB4RDV 2, W4DM 1

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: K8BG. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Rptr Coord.: WD4KHL. Swap meet held by Tri-County ARC at St. Albans on Sept. 9 was very nice affair. Prize was won by K8NLP. KB8DA and about 12 other hams are active on RITTY in Hunt. area. KA8SWA is new Novice net mgr and is looking for check-ins on 3730 at 6:15 each day. 17 RACES/ARES nets were held with 187 stations and 24 mgs.

Net	Freq	Time	QNI	QTC	Sess.	NM
WVW	3567	7:00	151	52	29	WBLYV
WVFN	3900	6:00	592	28	20	N8AJC
WVMD	7235	11:45	5	53	30	WBFPZ
Hillbilly	14290	1600Z	Sn	107	4	K8BYU
KFC2M	87147	8:30 M	85	3	4	W8BRHL
KARC2M	28/88	8:30 M	78	0	4	W8BAEW

Traffic: K28Q 165, K8QEW 51, K8TPF 40, WB4WJX 37, WBFPZ 36, WA8KQJ 29, KA8DJD 27, WB8ZA 26, K8KT 22, N8AJC 21, K8BG 16, KBJQ 8.

### ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, K0BJ — SEC: W8QFB. STM: WD8AIF. ACC: W8BDUV. TC: K0RP. PIO: WD8HNO. BM: W8MDT. QORF: N0CF (formerly WA1RF). He has been working very hard to increase the QO program. With the volunteer program of self-policing many qualified people will be needed. Drop N0CF a line and help. As usual our SET program was handled with enthusiasm and dedication. Recently, we had a visiting ham from India, interested in repeaters and emergency communications. Thanks to an ARES meeting in Colo Springs, the BARCES communication van and to ARA & RMFL repeater sites on Guy Hill, he will take home some useful info. Congrats to the Pikes Peak ARC, our first Special Service Club. Boulder was selected for participation in the Nat'l "Nite Set." Thanks to W8BQ for participation. K0CF reports that the Rocky Mtn. VHF/UHF conference held in Denver had a good turnout. The RMFL 34/94 has a new 8-bay antenna, and has extended coverage in all directions. This month's name droppers are W8DRLY N8BWE W8NRI W8SII. They set up a satellite station in Wyoming and made it possible for many operators to work that state. From the entire section crew, we wish each and everyone a very happy holiday season. 73, K0BJ. Nets: HNN QNI 1671, QTC 105, Inf. 382, time 1520, sess. 30; CWN QNI 137, QTC 159, time 805, sess. 27; CWXN QNI 2718, QTC 3254, time 2700, sess. 30. Traffic: N8BQP 2379, WA8HJZ 1827, KB4JAN 504, W8PPT 489, W8ACX 449, K0Z 322, W8QYI 204, KARC2M 151, W8KX 151, W8LE 81, K4DMR 83, N8BEM 75, W8BNHA 51, WD8AIT 32, W8NFW 18.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: K8SXD. STM: KV5U. NM: WA5UNO KB5LI W5VFO. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 193 mgs with 150 stations in. New Mexico Roadrunner Net (NMRN) meets daily on 3939 at 0100 UTC and handled 58 mgs with 929 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 97 mgs with 1044 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 10 mgs with 400 checkins. Caravan club 2-Mtr Net 68/06 handled 11 mgs with 111 checkins. SW NM & SE AZ hit hard by floods. Lots of emergency TFX. Good news letters from Eastern AZ ARS & Mesilla Valley RC. Lots of good PR on W5LFL and the space shut-

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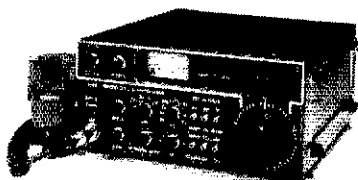
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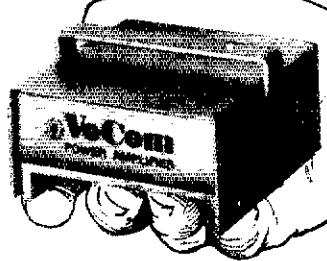
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the. Traffic: W6UH 263, ND5T 232, W5DAD 146, W5ENI 82, N5SJ 70.  
UTAH: SM, Ron Todd, K3FR — STM: W7COX. SEC: N47G. BM: W47MEL. OQRFI: KD7FL. ACC: K87XO. PIO: N7BHC. TC: K7RJ. Note N7BHC now PIO. He has done a great job with Utah PR for the STS-9 mission. Don't forget to feed relative info to both him and WA7MEL. K87XO getting wound up on clubs. Give him a call if you would like his help with affiliation, club activities, testing or would like a visit from us. Let's find an SGL. We could use an eye/ear on the laws affecting us. Contact W7COX if you would like to handle traffic. We could use some local outlets to lessen the burden on our telephone bills. Traffic: K7HLR 218, WA7KH 182, WA7KH 182, WA7KWB 100, WA7MEL 61, W7COX 16, K3FR 3, W7PBV 3, N7BQE 1.  
WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W6OQH. BM: KD7AN. OQRFI & TC: KC7QY. PIO & ACC: KC7QJ. New net of interest to computer users: "VIC-20 & C-64 USERS GROUP" meets every Sunday on 7260 kHz at approximately 1:15 P.M. with WB7QBC as net control. Very interesting and informative. Hope to hear you check in. Would like to welcome WB7NHR to the Official Observers Corps. Thanks for your volunteer efforts. Thanks to Sweetwater ARC for sharing their fine clubs newsletter with me. WB7NHR reports the Wyo. Cowboy Net held 22 sessions with 705 QNI & 9 QTC. WA6PFJ reports the Wyo Jackalope Net held 22 sessions with 284 QNI & 0 QTC. Season's Greetings & Best Wishes to All from Sandy and me. Traffic: WB7NHR 209, W7HLA 47, K7SLM 23.

### SOUTHEASTERN DIVISION

**ALABAMA:** SM, Hubert H. Wheeler, W4IBU — In this last section report I want to thank all those who have lent their support in providing for a better ARES throughout Alabama and to remind you that we still have a way to go. To those who have participated in the section and local nets also goes a big "THANK YOU!" To those who have participated in public service by providing communications to the local activities such as the fire, a big "THANK YOU!" To those ARRL members who have participated in guiding the ARRL by voting. Participating in the SET, etc. also get a "thank you." In spite of the fact that being a "ham" is to be a member of the greatest fraternity in the world, being a "ham" also carries with it a responsibility for providing a service to our communities. Being a member of ARRL carries with it a responsibility to provide input for the guidance of the League and to ensure that our privileges as "hams" are not endangered. Being a "ham" is something other than being apathetic and letting "George" do it. Get behind your new SM and lend your support. May God bless all of you. Vry 73. CAND represented in Alabama 100% by N4FQD and W4CKS. DRRS represented 98% by Alabama stations WB4IXA W4CKS KC4GS WA4JDH N4FQD W4WJF W4IBU and NW4X. Traffic: WA4JDH 597, W4CKS 80, WB4IXA 58, WA4XP 45, N4FQD 34, NW4X 30, K4AOZ 8, WD4DHI 7, W4WJF 6, WDGH 5.

**GEORGIA:** SM, Eddy Kosobucki, K4JNL — STM: K4VHC. SEC: WB4ABY. ACC: WA4ABY. BM: W4BIA. OQRFI: K4VHC. PIO: WA4PNY. SGL: W4BZT. TC: K4UDR. Major Georgia Section Nets (all times EST).

GCN	3995	0700 Dyl0800 Sn	W4HON
GTFON	7243	1200 Dy/1300 Sn	WB4NTW
GSN	3595	1900/2200 Dy	AA4TT
GSSBN	3976	1830 Dy	K45EH
GOWA	0302	0300 S	K4YH
ARRL INFO	3975	1830 W	K4JNL
ARES INFO	3975	1830 1st S	WB4ABY

Many tnx to W4WXA & WB4HXE for their time & dedication while serving the section as STM & SEC respectively. They ask that you cooperate with the new volunteers, STM K4VHC & SEC WB4ABY. The month of December is the heaviest in traffic months owing to the holidays & I again ask your cooperation so that we can make people happy. Remember that the PSHR rpts come to me & the traffic to the STM. As of this writing, we have two SSCs in the section. #1 was Augusta & #2 Central Georgia ARC. Wonder who will be #3. The 1st session of the ARRL Info Net was a success. Please listen on 3975 at 1830 WED. If you have any questions, gripes, etc., please let us know & we'll do our best to answer them & try to get something done. There have been many changes in our great hobby & many more to come. This is one way to keep posted. 1983-84 states of officers continue to come in. K45EH was reelected pres. of the GSSBA. Serving with him are: WD4NCP, v.p.; W4NKL (reelected), secy./treas.; K4DNH WD4BCO, directors. BGMRC in Newnan elected: W4IGE, pres.; WD4RAD, v.p.; W54N, secy./treas.; N4HIC, act.; N4DSG, fin.; AA4SL, rptr. mgr. GCN again chose W4HON as Net Mgr. & WA4ABY as Secy./treas. If it made contact with W5LFL in space please send me info on time, etc. Want to see how many in our Ga section that made the trip. Merry Christmas & a Happy New Year to all of you. Traffic: N9ECB 27, W4PIM 57, W4WXA 41, K4NM 27, WB4RUJ 26, WB4NTW 24, W4HON 20, W4BIA 19, K4BAI 17, K4AATM 15, K4VHC 15, AA4EI 2.

**NORTHERN FLORIDA:** SM, Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. ACC: N4ADI. PIO: W44PU. BM: W4GUJ. SGL: KC4N. New officers of Jax RANGE Assn. are NO4A, pres.: KB4B, v.p.; K4SWX, secy.; N4GBY, treas.; NF4L N4GIIH KE4OV, directors. Halifax Chapter GCWA new officers are: W1KZS, chmn.; N4BNY, v. chmn.; W2GDP, secy./treas.; W4MGO, membership secy. New upgrades are: N4DZT-Extra; W4LX-Adv.; WA4SY-Gen. Also K4ARDQ is now N4UP after private Extra exam and K44MGO is now N4JAF. Also congrats to K4ZED KE4KG and WA4AMST who made Extra and to KF4MX, Advanced & K44FCW, Tech. Freq. for RTTY in Central Fla is 145.6 MHz. Net meets daily at 0130Z on that freq. The North Florida ARS is the first ARRL Special Service Club (SSC) in our section. The State Government Liaison for our state is John Hills, KC4N. He will keep us abreast of legislation which could affect Amateur Radio. KE8O is a new PIA for Gulf Coast area. Clubs wishing to nominate a member as a PIA for their area should contact WA4PUP. NFPN moved back to 1830 (Eastern) and 1730 (Central). NFPN NM WF4Y reports three nets have been designated as local feeder nets for NFPN. They are PAEM (Pens.), SVTN and LSTN (Central Fla) WF4Y has published a new comprehensive packet of info for NCS. Included is a complete roster and guidelines for NCS operation. A first rate job! Gator Net now meets on 7266 kHz at 0830 Eastern Time. New FMSN 40-meter freq. is 7113 kHz. K44WNU hosted picnic for GARS club members and Novice class graduates. Nice activity! OARC planning for 1984 Orlando Hamcon. KC4CT is chairman. Jax and Melbourne hamfests well attended with nice traffic and section ARRL forums at each. WF4X earned another BPL for Sept. and is doing excellent job along with WD4RIQ and WD4IUI in

# NEW PRODUCTS

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Requires 12 to 13.8 VDC at 50 ma. for receive and 1 to 2 amps for transmit.

MFJ-2045, \$99.95. Like MFJ-2041 but for 430 to 440 MHz. 4 to 15 watts output for .1 to 3 watts input.

MFJ-2041, \$89.95. Portable Power Pack Batteries provides 120 minutes operation of MFJ-2040 or MFJ-2045 at 10 watts output. Has battery check meter. Has carrying case with belt loop and shoulder strap. 1 1/2 x 2 1/4 x 7 1/2 inches. Weighs 2 pounds.



### 2 Meter Handheld Wattmeter

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MFJ-840 lets you accurately check the output of your 2 meter handheld transceiver. 5 watts full scale. 50 ohm load. BNC connector. 2x2 1/4 x 1 1/2 inches. Black.

### 2 Meter Handheld SWR/Wattmeter

**MFJ-841**  
\$ **39 95**

MFJ-841. Connects in line with your 2 meter HT. Read SWR from 1:1 to 6:1 and forward power to 5 watts. Expanded scale. 50 ohm impedance. BNC connectors. 2x2 1/4 x 1 1/2 inches. Black.

### Cross Needle SWR/Wattmeter

**MFJ-815**  
\$ **59 95**

New MFJ-815 Cross Needle SWR/Wattmeter lets you monitor SWR, forward and reflected power at a single glance in 3 ranges (20/200/2000 watts forward and 2/20/200 watts reflected) and SWR from 1:1 to 6:1 on a 2 color scale. Works from 1.8 to 60 MHz. Accuracy is ±10% full scale. Mechanical zero adjustment, push button range selection. All aluminum, black w/ brushed front panel. 6 1/2 x 3 1/4 x 4 1/4. SO-239 connectors.

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If you have several coax feedlines and more than one rig, this MFJ-1700 gives instant selection of 1 of 6 antennas and 1 of 6 transceivers in any combination. Also plug in an antenna tuner, SWR/wattmeter, linear, etc., so that they are always in the circuit for any antenna/transceiver combination. Handles up to the full legal limit of 2 KW PEP for 50-75 ohm loads. SO-239 connectors. All aluminum, black with brushed aluminum front. 8x2x6.

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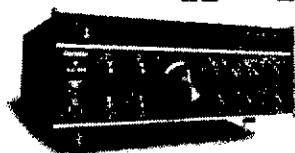
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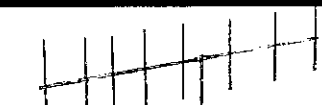
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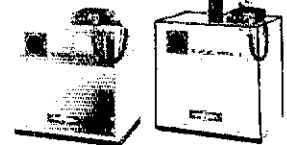
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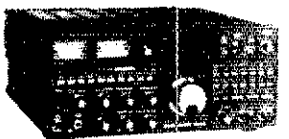


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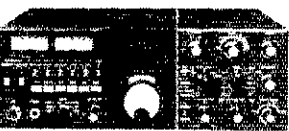


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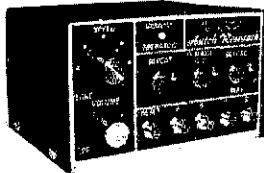
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**SOUTHERN FLORIDA:** SM, Richard D. Hill, WA4PFK — SEC: W4SS, STM: K4ZK, TC: K4IT, BM: WA4EIC, ACC: AA4WJ, PIC: W4WYR, SGL: KC4N. It was good to see so many of you at the Melbourne Hamfest in September. The meetings were interesting, productive and spirited. I especially enjoyed the Florida Phone Traffic Net luncheon and the Traffic Handlers breakfast. There have been a number of appointments this month. W4WYR is now the Public Information Officer, and thanks to N4UF and the Northern Florida Section for allowing us to appoint N4UF and the Tallahassee club, KC4N, in the SGL for both Florida sections. ND4E has been appointed Official Observer Station. N4IML is now an OBS covering the Key West area. WD4KBW is also a new OBS for the Hardee Co. area. OBS W4ESH will serve Collier Co. KA4ZPM and KE4VR are newly appointed ECs for South Brevard and Palm Beach Cos. respectively. Thanks to K4CGX for his EC work in Sarasota Co. He had had to resign owing to his work. W4SS is working to fill this vacancy. Congrats are in order for the Hollywood ARC, as they are the first club to be named a Special Service Club in Southern Florida. W4WYR K4IT and WA4PFK presented the program for the Fellowship ARC this month. After a presentation showing the new K4CAN in the SGL for the program, WB4GHU, manager of OFN, has revised the QFN Bulletin, and KF4YE will publish it. That's great news as it has been sorely missed. It's a major source of both CW traffic handling procedures and items of interest. KF4YE also handed out an update of the Florida Traffic Handlers listing at the Melbourne hamfest. He said he will have still another update for the Clearwater Convention in November. Many thanks! K4IT has written an article for possible use in Amateurradio regarding the presentation of an Amateur Radio station to the National Hurricane Center. W4LLA reports that he handled the presentation this month. The QFN report for W4DL, N4W4E, K4IEK, K4BNN, W4ESH, WD4KBW and N4IML received 90 bulletins and transmitted 187 for a total count of 256. FB, W4WYR said that at the Dade Co. ARPS Planning Committee meeting that the following committee chairmen were appointed: WN4L, Volunteer Examiner Coordinator; N4HRD, Volunteer Monitoring Coordinator; KA4RUP, Publicity En Espanol. Congrats to all. The number of SARs increased from 77 to 87 this month. I still would like to receive SARs from those of you who are active on the traffic nets but NOT sending them. Reporting helps the net, the section and Amateur Radio in general. There were 14 stations who reported qualifying for PSHR this month; there were 13 last month. I'm sure that you will see more activity in the next month. The ARPS listed for PSHR in "Public Service" of QST, 3 de WA4PFK, traffic: W3CUL 3141, W3VR 751, WA4PFK 265, WA4EIC 249, WD4CUL 226, K4SCL 206, K4ZK 201, KY4U 199, KA4AMC 195, WB4WYG 161, WB2NVJ 147, KA4GUS 139, W4NFK 116, K4IA 103, WB4AID 101, W4DL 92, WA4HXU 86, WB2ZY 84, WD4KBW 81, KE4O 79, W4YCL 78, W4PKP 59, KF4RL 56, W4ESH 55, K4JLL 50, KA4ASZ 49, W4LLA 49, NJ4O 47, KA4FZI 42, N4W4R 42, KB4KB 40, KF4JA 38, K5IH 33, KA4YHS 29, W4DVO 26, WB4GCK 26, K7LCA 24, KP4UE 24, AA4BN 23, KA4NFX 22, W3TLV 21, K4JL 19, W4ATWD 19, KA4RW 18, W4YT 15, KA4BAK 13, W4MGO 12, WB4B 12, W4JLR 12, N4AXN 11, N4ABS 11, W2BQIK 10, W4WYR 10, W4BARW 9, W4KAF 9, N4KB 9, W4NNW 9, W4OUJ 9, N4CMW 8, K4FQU 8, WB8SNT 8, KY8T 8, WA1VOB 8, KA4GDU 6, KD4VN 6, WD4MCC 5, WB4LPX 4, WD4PPA 4, KA4SIH 3, N4BXU 3, W4MPV 3, W4OAS 3, KA4EO 3, WR4J 1, KF4J 1, K4IRT 1. (Aug.) NC4H 104. (July) NC4H 87.

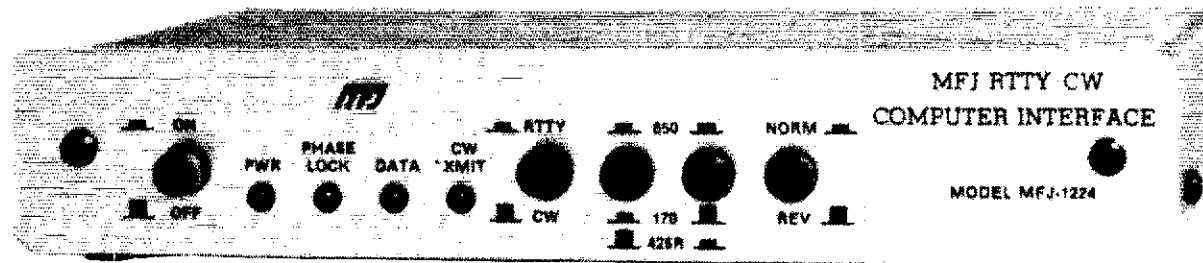
**WEST INDIES:** SM, Gregorio Nieves, KP4EW — West Indies Net Slow (WINS) daily 7:00 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 8:30 P.M. (2230 UTC) 145.35 MHz. The Puerto Rico ARC celebrated its annual convention on Sept. 25 at the Pichi's Convention Center in the town of Guayanilla, south of the island. Although the board of Directors could not be elected that day, the new directors will be announced in next month's report. Master games were celebrated in Puerto the last two weeks of Sept. with the valuable cooperation of amateurs providing communications for the Olympic torch run throughout the island and assisting in communications and traffic handling to participants via HF. This traffic was possible by the use of the communications van provided by the CD for the RACES and ARES programs and operated by SEC NP4CF, assisted by KP4ABG, in close cooperation with PRARC pres. KP4ABN, represented our amateur community in the games for those two weeks. Congrats to KP4FY (now NP42), KP4FX (now NP4X), KP4BZ and NP4P who led in the International DX Contest as reported in October QST. KP4DJ reports the following totals for WINS: QNS 454, QNI 125, QTC 40, 28 sessions. WP4BCV reports the following totals for WINC: QNS 469, QNI 368, QTC 87, 30 sessions. Traffic: KP4DJ 77.

## SOUTHWESTERN DIVISION

**ARIZONA:** SM, Erich J. Holzer, N7EH — STM: W7EP, NMs: W7KQE, WA7FDN. The only way to describe September is wow! The major activity for the section this past month and for the first week of October was emergency communications. Amateurs throughout the section have provided an invaluable service to their communities by assisting in providing communications in the wake of floods here in southern Arizona as well as in the Prescott area. The value of Amateur Radio to the community was clearly demonstrated by the many hams who volunteered many tireless hours at the microphones of their radios as the flood waters of the rivers and washes eroded their banks and destroyed homes and bridges. The value of the amateur mountain-top repeaters and remote base stations were proven during the past week. These stations especially the ZIA connections helped to provide a major comm. link from the state OC in Phoenix, Clifton, Saford and Mescal areas. I would like to extend my appreciation to all who helped during the emergency for a very professional job during the emergency. It is with sadness that I report that WB7ORP became a Silent Key recently. I am looking for a volunteer to head up the ARES organization in the Yuma and LaPaz Co. area. KB7FE has been appointed an ORS. W7KAX reports that the following participated in providing comm. for the "End of the Centennial Parade" held in conjunction with the annual

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This new MFJ-1224 RTTY/ASCII/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/CW station for sending and receiving.

It plugs between your rig and your VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, and most other personal computers.

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Uses Kantronics software for Apple, TRS-80C, Atari, TI-99 as well as VIC-20 and Commodore 64.

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A 2 LED tuning indicator system makes tuning fast, easy and positive. You can distinguish between RTTY/CW without even hearing it.

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The MFJ-1225 automatically copies all shifts (850, 425, 170 Hz shift and all others) and all speeds.

It plugs between your receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.

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An automatic noise limiter helps suppress static crashes for better copy, while a simple 2 LED tuning indicator system makes tuning fast, easy and positive.

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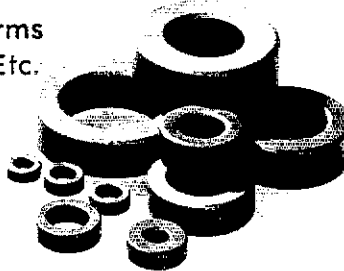
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Andy Divine days: N7BUC WB7RYQ W6TAZ W7KSF WB7YXC KA7JLV WB7RSV W7KAX. PSHR: KB7FE, ATEN: QNI 880, QTC 110. Cactus Net: QNI 655, QTC 84. Traffic: KB7FE 173, K6LL 99, KO7V 37, WA7KQE 25, K7RDH 20, N7CQY 17, W7KXE 14, KA7HEV 11, N7EH 5, K7POF 5, K7NMQ 4, WA7NXL 3. (Aug.) W7AMM 74, W7EP 45, KE7W 6.

LOS ANGELES: SM, Stan Brokl, N2YQ — SEC: N6UK, STM: W6INH, ACC: N6DH. ARES activities have been high in Los Angeles City. N6ZH reports that LA City will be supplying a new 45W all mode 2-meter transceiver for the WAFRC tower deep underground. Additionally, a 2-meter thru 440 MHz antenna with hard line feeder. The emergency operations center in LA City will be on the air and open 24 hours a day during the Olympics. Contact N6ZH is you would like to operate. The Antelope Valley ARC will be supporting STS-9 with a special event station operating from Edwards AFB. A commemorative QSL will be available. The call will be K6OX; QSL via Box 1221, Lancaster 93534. I visited and gave talks at the following clubs this past month: Crescenta Valley ARC, JPL ARC, Antelope Valley ARC, SCATS in West Covina. I will be at TRW Swap meet the last Saturday of the month. Still needed in the LA Section are: QRP/1 Coord. Director. Please volunteer this is your League, help! Band conditions seem to be improving. We have had a long spell of poor conditions and activity seems to slow down. N6DZQ is off air for a while so that he can get his transmitter repaired. He'll be back on soon. AD7G helping out during poor band condx. N6GZP has been very active on SCN/V with RTTY net and continues to increase her traffic count. The Lenore Traffic: K6UYK 608, W6INH 228, K6YBV 220, WA6OCM 131, AD6A 77, AD7G 51, N6GZP 38, W6NKE 32, K6CL 25, WA6LVO 15, W6DFWZ 8.

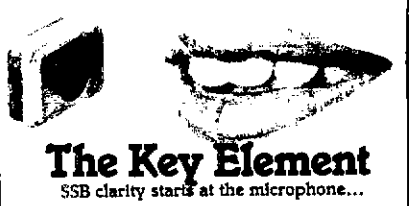
ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ, STM: WA6QCA, ACC: KA6NLY, BM: W6DXL, COIRFI Coord: N6PE, N6SW, SGL: N6HI, TC: AA6DD, DCL: (by counties): WB6JIB (Orange), W6JKN (Riverside), K6GGS (San Bernardino), WB6Y2 (Inyo), N6M, A16E (CIV); WA6QCA (FM), KA6HJK (RTTY), W6CPB (SSB), WA6WZO (ASCII). Congrats to Barstow ARC on being declared a Special Service Club (SSB) — first in Calif. and the SW Division. W6WPP, after many years of outstanding service as EC for the Lake Elsinore Valley, has stepped down. KE6FT will take on the EC position — San Bernardino Co. RACES Dist. # 8, N6ZN and N6IIE of the Citrus Belt ARC (C-Bar-C) are beginning new classes to be held at the Red Cross building in Redlands. Beach Cities Wireless Society (San Clemente) maintains repeater W6PJM/R (16,925-8) with PL 110.5 kHz; while the repeater for the Orange Co. ARES/RACES, 3945 (Riverside Co. ARES/RACES). For more information in Orange Co. on blood bank contact K6LJA or Red Cross EC W6RE. Bishop ARC reports repeater on Silver Peak 146.94 (-6) trustee change from W6TD to K6BDI, and repeater in Chalfant Valley trustee change from KE6OZ to W6CPY. PSHR: WB6QBZ A16E WA6QCA KA6HJK/T, Traffic: A16E 177, N6GIW 151, KA6HJK 138, WA6QCA 128, WB6QBZ 89, N6GOT 42, K6DD 38, W6RE 35, K6GGS 32, K6ZCE 28, W6CPB 22, W6PNS 18, W6TKV 5, WA6WZN 2, WA6WZO 1.

SAN DIEGO: SM, Arthur R. Smith, W6INI — STM: N6GW, SEC: W6INI, PIC: WA6CUP, ACC: WA6COE, TC: N6NR, BM: WA6HJJ. Clubs interested in applying for Special Service Club status should contact: Al Ciolek, California ARES/RAES, 8401 Camino Pl, La Mesa, 92041 (464-1744). See Dec 1982 QST, page 62. North County Tlc Net met 29 times, handled 97 msgs. K6HAP active with TCC skeds, RN6D, SCN. WA6LIK manages ARES SCW Net on Sun at 0930, 3770 kHz. KM6I is a regular on SCN 1 & 2, RN6D, PAND. New ARES members: KM6A, N6GVD, KA7GWO, N6IAG, N6IXN, N6JHU, KA6YIB. Certificates of Appreciation were presented to long-standing Red Flag Patrol participants by Capt. Van Meter of the Calif Dept of Forestry at an awards banquet in October. Honored were N6ARD, WA6BCC, WD6CS, WA6EDG, W6INI, WA6LVL, W6LJJ, WB6TQH, K6UJ, K6BYB. The Peckham ARC program in California features WA6HCP involvement with the Flying Samaritans. Upgraded: W66AYD to Advanced. Affiliated clubs, remember that you can retain \$2 for every new ARRL member and renewal that you process. Traffic: KT6A 631, K6HAP 282, KM6I 203, W6HUJ 120, N6AT 67, N6GW 26, WA6LIK 19.

SANTA BARBARA: SM, Robert N. Dyruff, W8POU — Commencing January 1, new Section Manager will be Ernest Kapphahn, WB6HJW, SBAR north county and Chairman 1984 S.W. Div. Convention in Santa Maria. I've been privileged to serve two terms during which the Section has grown significantly in its public service work through hard work of two District Emergency Coordinators, 12 ECs, over 200 ARES members, 7 Official Bulletin Stations, an Official Observer and Affiliated Club Coordinator and much good work with many local, state, federal and private agencies. My personal thanks and gratitude to you all as my work continues with agencies across the state. Largest ever quake disaster drill held by SBAR county-cities, hospitals, schools, Red Cross with large outpouring of communications support by 70 ARES mbrs on a workday! ECs WB6MSG of SLO and K66I of Thousand Oaks assisted along with K6QIF in SACTO and N6UU in L.A. and W1UUG/WB6SVJ, xmitting computer data. ECs KA6Q/WB6UNH aided by N6AJA/W66ESU/W66ELE/W6FL coordinated multi-agency comms. K66BF reports on Ventura City's successful neighborhood watch program using CB/Amateur Radio. KA6BPH reports over 40 students enrolled in PARC classes, mostly boat owners. WB6HWK hosted Ventura Co. ARES ECs and incoming Section Mgr. Hope you'll now address your news and info to WB6HJW, 1404 Grand Ave., Arroyo Grande 33420. I've enjoyed working with you. Happy holidays and best wishes for a prosperous SBAR Section in 1984!

### WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: N15V, SEC: W5GPO, STM: W5VMP, PIC: N5FDL, OO/RFI: W5JBP, TC: W5HIR, BM: W5QXK, SGL: W5UXP. K5UPN reports that the new Northeast Tlc and Emer. Net (Sun. and Wed. @ 2000L on 30.300) had a QNI of 83 QTC 26 in 8 ssn. In Sept. The Garland ARC set up a display at the Jaycee Jubilee. Handouts, HF, VHF,



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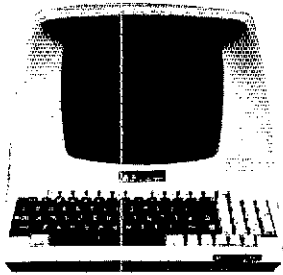
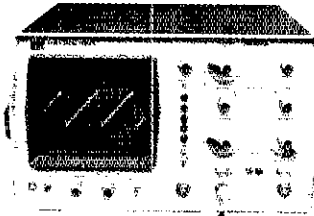
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Hazeltine H1510 80 col., U/L, reverse video, RS-232-C, protected fields	1,355	795
Hazeltine H1520 80 col., U/L, reverse video, RS-232-C, protected fields, printer port	1,675	950
Lear Siegler ADM-3A 80 col., upper case only	595	395
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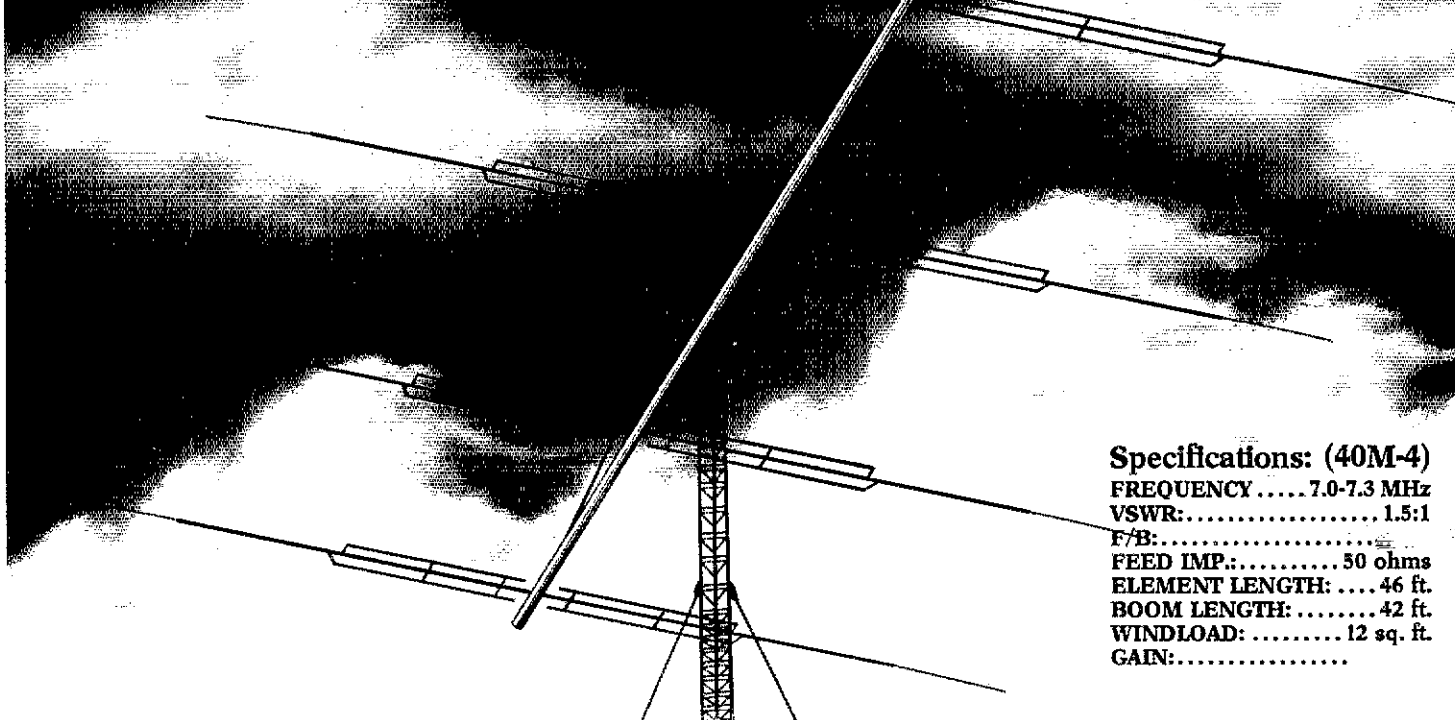
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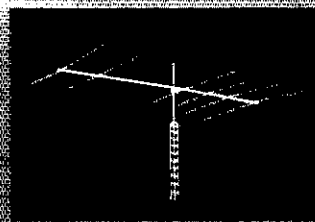
**Specifications: (40M-4)**  
 FREQUENCY ..... 7.0-7.3 MHz  
 VSWR:..... 1.5:1  
 F/B:.....  
 FEED IMP:..... 50 ohms  
 ELEMENT LENGTH: .... 46 ft.  
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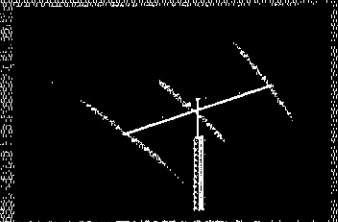
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 GAIN:.....

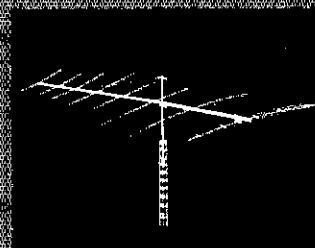


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 GAIN:.....

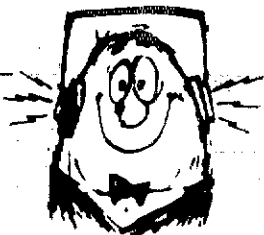


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 BOOM LENGTH: ..... 42 ft.  
 WINDLOAD: ..... 12 sq. ft.  
 GAIN:.....



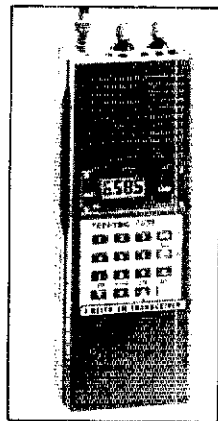
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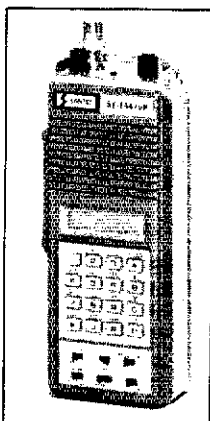


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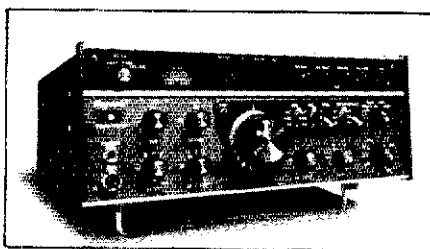
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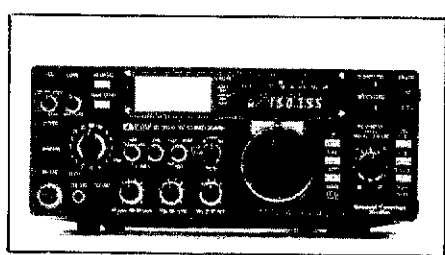
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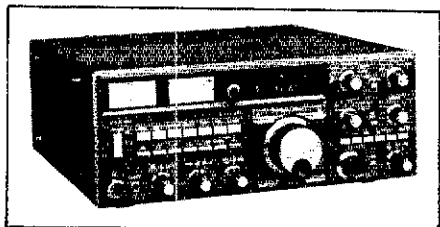
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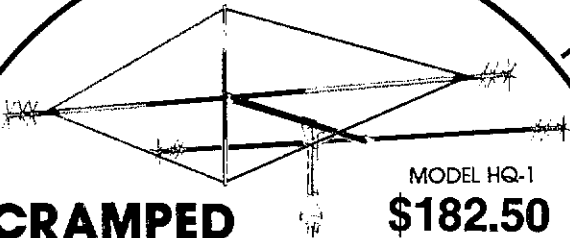
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and video displays, a QRP transceiver and a free message service were provided. The messages were originated at the booth, transmitted via 2-mtr RTTY to an operations center for QSP on HF and VHF nets. A net was maintained on the club repeater to get long distance tel. numbers so that all messages originated had complete info. This is exactly the concept I hope will be used in future disasters in our section. This was a great club effort, with more participation and good PR for Amateur Radio! N15V and I hit the hamfest trail to Wichita Falls, and the nat'l @ Houston this month. Vx was better than ever, and Houston was tremendous! We rounded out the year @ the Texoma Hamaram for a great time; lots of changes for the better this year! The traffic nets need your help for holiday tic. rush. Please send me your stn activity reports, so all our fine work will show up in the state. PSHR: AJ5F N15V KC5NN KA5AZK N5BT N5EZM N5FDL N5DKW KD5FR. Traffic: W5TI 246, KA5AZK 162, N5BT 158, WBSORH 150, KD5FR 91, W9OYL 56, KC5NN 51, N5DKW 42, WBSOXE 39, WBSOIC 34, K5SOR 28, KB5UL 24, AJ5F 23, N15V 22, K5PC 19, W5CUE 18, N5FDL 15, WBSBKL 14, W1AEL 12, N5EZM 5, WBSYUC 5, W5YK 4.

**SOUTHERN TEXAS:** SM, Arthur R. Ross, W5KR — ASM/TTM: N5TC. SEC: WA5RVT. BPL: WBSYDD N5DFO. Brenham ARC reports K5EDY working RTTY DX; K5LTS making progress on his travel trailer; KA5QON upgraded to General and is now working on 20 wpm tapes. Matagorda Co. ARC reports K5ASD celebrated 50th wedding anniversary. Houston ARC reports N5ZI and N5FLS, wife and husband, upgraded to Extra. Congrats to all San Antonio RG reports EC WA5RNV appeared on TV Channel 5 with a pre-recorded interview Aug. 16 and 17 as Hurricane Alicia neared landfall. EC W6GUR and Rio Grande Valley amateurs provided communication for Confederate Air Force AIRSHO 83 in Harlingen. ORS K5RVF reports Jefferson Co. hams did same for CAF air show in Beaumont. CAND mgr W5KLV reports DRN5 represented 100% in TX; STX stns N5EFG N5AMH KD5KQ WBSYDD N5DFO K6OWK W5KLV. DRN5 mgr WBSYDD reports STX represented 100% by N5DFO WBS5PA WBS5OU W5KLV N5AMH W5CTZ N5EFG N5BO K5RJM W5TFB KD5CB WBSYDD. ORS W5KLV reports broadcasting 13 bulletins, 29 satellite bulletins, 4 propagation forecasts, 4 DX bits, 3 CRRL bits in 104 readings on 7 nets. WHEWI Traffic: WBSYDD 528, N5DFO 525, W5KLV 468, W5CTZ 307, N5TC 177, W5TFB 64, WBS5PA 53, WD5GKH 31, W5KR 30, WBS5OU 18, W5BGE 17, K5HZR 16, KK8L 9, WBS5FJ 4, K5RVF 2. (Aug.) WD5GKH 30.

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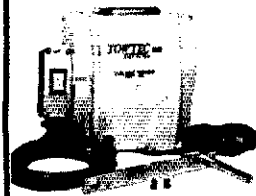
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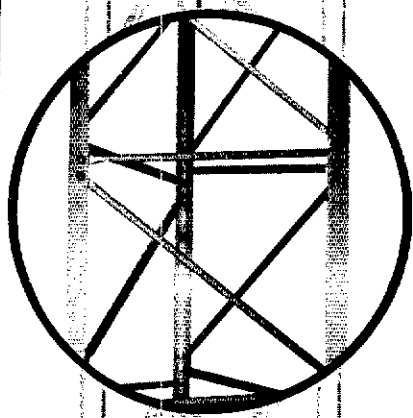
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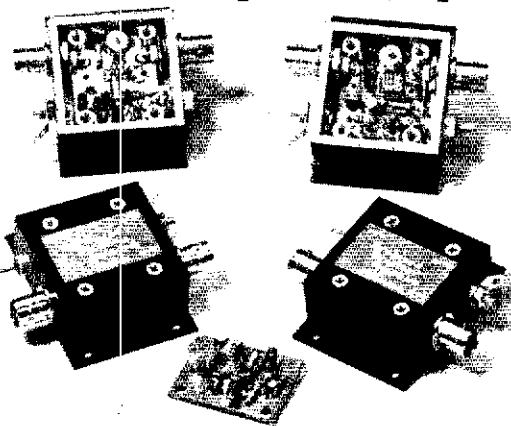
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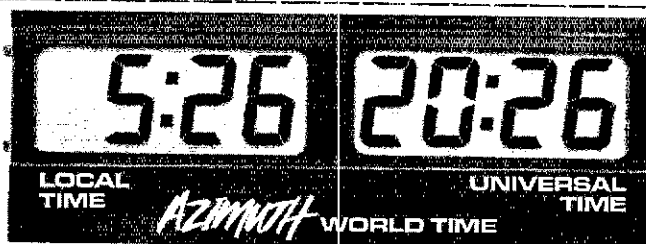
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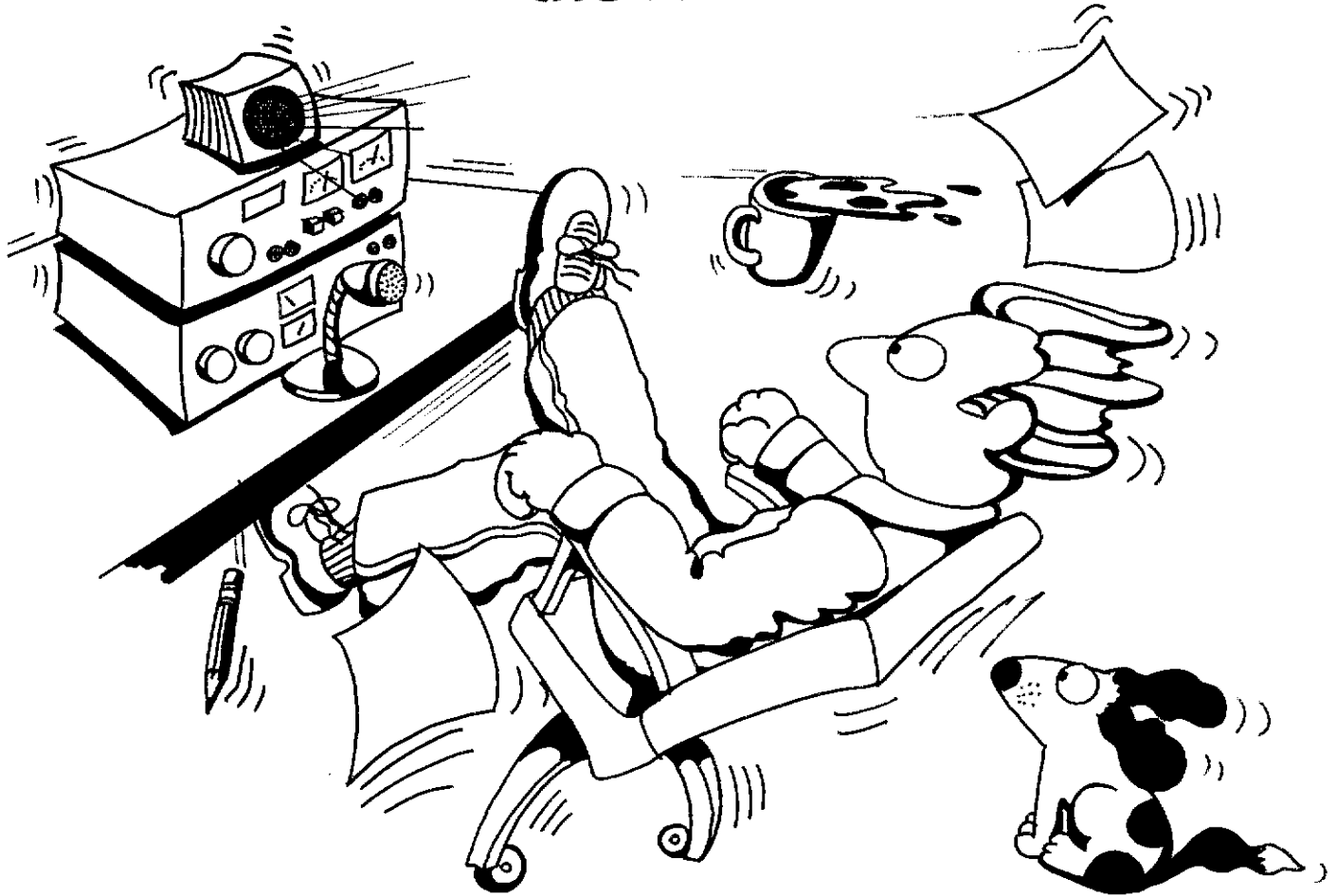
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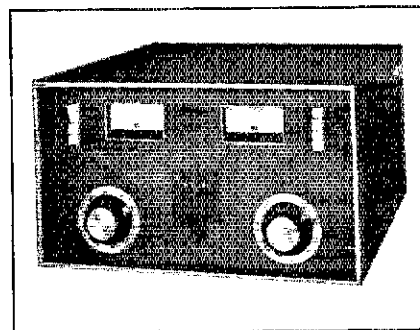
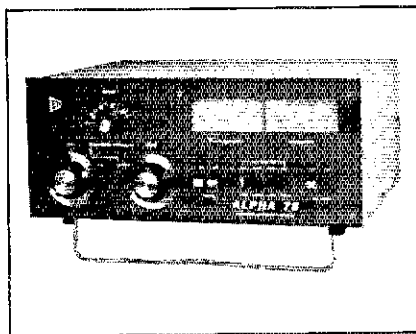
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SAROC Annual Prestige Convention hosted by Southern Nevada ARC, Inc., at Hacienda Resort Hotel, Las Vegas, January 12-13-14-15, 1984. SAROC room rate \$35.50 per night, single or double occupancy, call 1-800-634-8713. Included with Advance Registration \$17 per person, Technical Sessions and Exhibits (on Friday and Saturday), coupon for cocktail party for adults only (on Friday) hosted by Ham Radio Magazine, Awards and Ladies Program (on Saturday), one each Breakfast or Brunch (on Saturday and Sunday), one Free Swap Table (on Friday and Saturday) for non-commercial guest. QSL with check to SAROC, POB 945, Boulder City, NV 89005-0945.

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THE OAK PARK ARC presents its annual Swap, N Shop on Sunday, Jan. 8 from 8:00 A.M. to 3:00 P.M. at Oak Park High School, Oak Park, Michigan. Activities include seminars on Packet Radio, Oscar 10. F.C.C. Novice exams will be given at 11:00 A.M. Plenty of awards, refreshments and free parking. Talk-in on 52. For further information send S.A.S.E. to: Oak Park ARC Swap and Shop, 14300 Oak Park Blvd., Oak Park, MI 48237. Admission is \$5.00.

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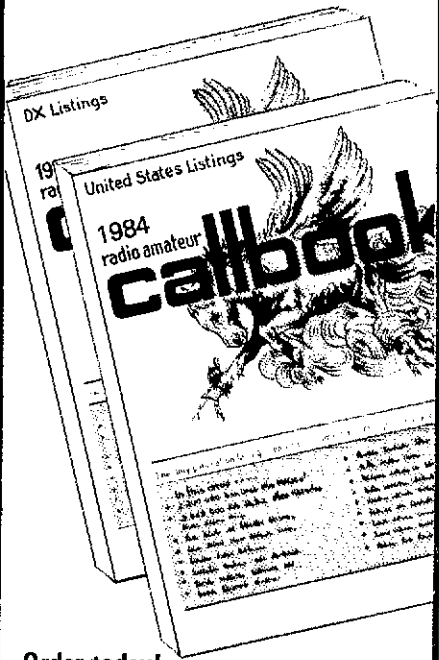
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# AEA Brings You The RTTY Breakthrough

**NEW MBATEXT™ \$109.95 List / \$89.95\* VIC-20 MBATEXT or C-64 MBATEXT**

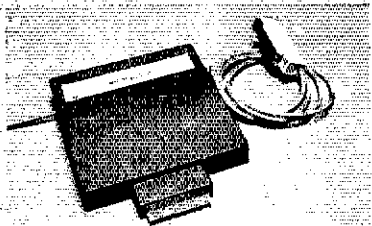


**MBATEXT™** is the most advanced MBA (Morse, Baudot, ASCII) software plug-in cartridge available for the VIC-20 or Commodore 64 computer. Compare our outstanding features and price to the competition.

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## NEW MICROPATCH™



**MICROPATCH™** IS A NEW LOW-COST, HIGH-PERFORMANCE Morse, Baudot and ASCII SOFTWARE/HARDWARE computer interface package. The MICROPATCH™ model MP-20 or MP-64 incorporates the complete MBATEXT software ROM (described above) for either the VIC-20 or Commodore 64 computers. 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, low-performance phase-locked loop detector!!! • SWITCH SELECTED 170 Hz or WIDE SHIFT on receive • 800 Hz multi-stage active CW FILTER • AUTOMATIC PTT • RTTY ANTI-SPACE • demodulator circuitry powered by external 12VDC (not supplied) to AVOID OVERLOADING HOST COMPUTER and for maximum EMI ISOLATION • EXAR 2206 SINE GENERATOR for AFSK output • SHIELDED TRANSCIVER AFSK/PTT INTERFACE CABLE PROVIDED • PLUS or MINUS CW KEYED OUTPUT • FSK keyed output.

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**\$149.95 List \$129.95\* MP-20 or MP-64**

## COMPUTER PATCH™



**COMPUTER PATCH™** is the name of our most advanced computer interface equipment for Morse, Baudot, ASCII, or AMTOR operation. The CP-1 will allow you to patch most of the popular personal computers to your transceiver when used with the appropriate AEASOFT™ TU software such as AEA MBATEXT, AMTOR TEXT™, or the MBATEXT RESIDENT ON THE MICROPATCH units. AEA also offers a full feature software package for the Apple II, II plus and IIE; TRS-80 Models I, III and IV; and the IBM-PC. The CP-1 will also work with certain other computers using commonly available software packages.

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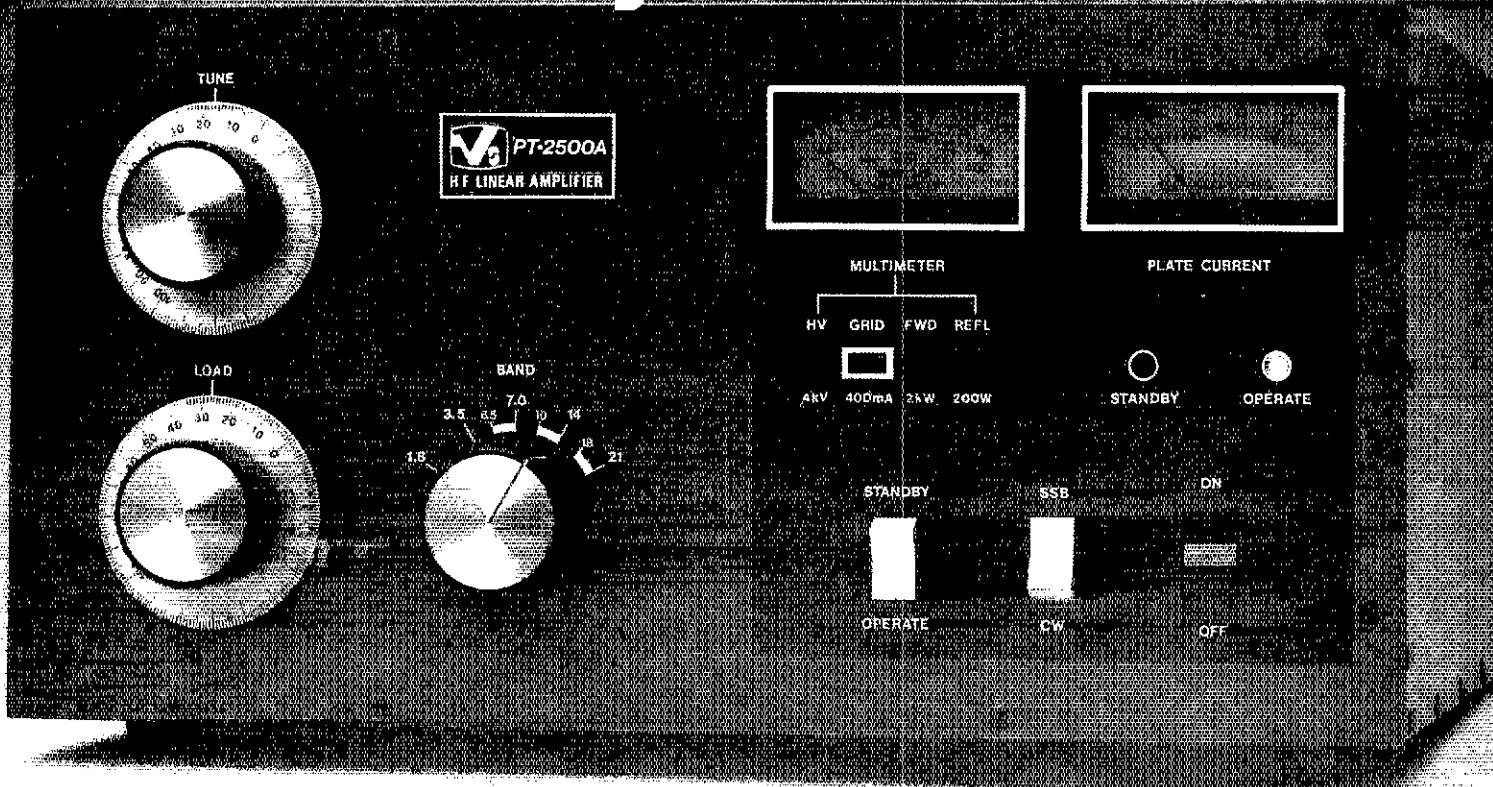
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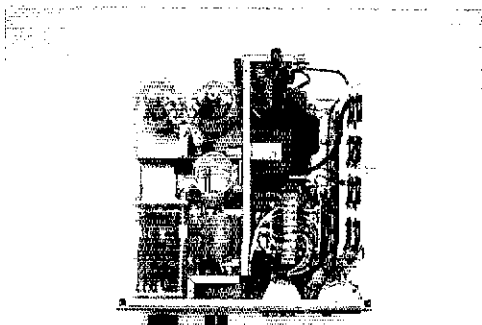
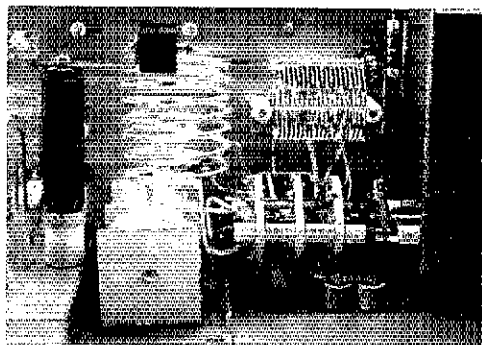
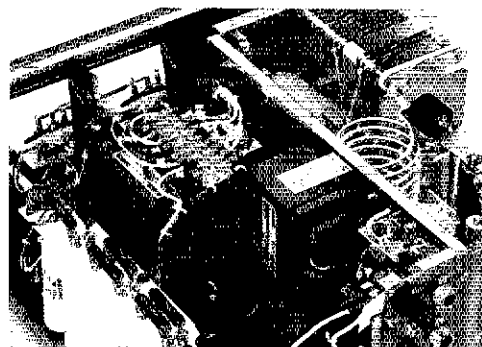
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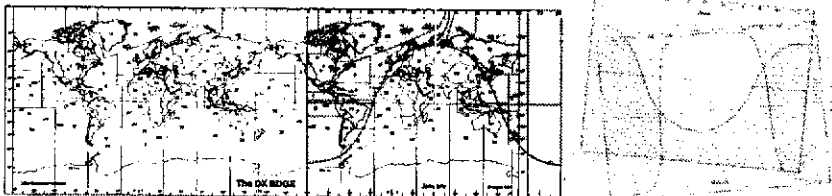
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208 CW filter	19 m				
405 Linear	129 m				
570 Century/21 Xcvr	239 m				
574 Century/21 digital	289 w				
276 Calibrator	19 m				
525 Argosy Xcvr	349 mw/v				
525/CW filter Argosy	379 f				
225 Pwver supply	89 mt				
544 Xcvr	349 f				
580 Delta Xcvr	429 mwv				
580/NB/250 Hz filter	489 m				

(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

<b>HEWLETT-PACKARD</b>	
606A .05-65MHz sig gen	895
608E 10-480MHz sig gen	1895
8640B .5-1024MHz sig gen	5895
w/options 002/003	
<b>SINGER-GERTSCH</b>	
FM-10CS w/RFM-10A, FIM-3 & ODM-1	4995
OAM-1 AM module for FM-10C 395	

**NEW EIMAC**



**3-500Z's \$99<sup>95</sup> each**

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Purchase a KENWOOD TS-830S at a SPECIAL SALE PRICE and receive either a SP-230 speaker w/audio filters or YK-88C CW filter - FREE!

Purchase a KENWOOD TR-2500 2m or TR-3500 440 MHz HT at the Low AES SALE PRICE and receive the optional PB-25H HD battery - FREE!

**TM-201A 25w, 2m FM Transceiver Special Low Price! - CALL!**

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		






**ANNOUNCING:** The latest, most complete and accurate listing of Hallicrafters ham gear, accessories, related equipment - ever compiled. List consists of model name, date, price and description. And, is all new! \$3 plus large SASE (40¢ stamps) to: Chuck Dachs - The Hallicrafters Collector - 4500 Russell, Austin, TX 78745.

**WANTED:** McIntosh tube audio equipment, accessories, literature, etc. for benafide personal collection. Information, appraisals given 100% reply. Marcus Frisch WA9IXP, P.O. Box 385, Elm Grove, WI 53122 414-475-6356.

**WANTED:** Microphones used in radio/TV broadcasting prior to 1960 for archive. Write: James Steele, N.A.B., Box 39190, Washington, DC 20016.

**FAST, ACCURATE, readable, nonsensational** — The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send \$19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 06111.

**WANTED:** Pre-1950 TV sets and old TV Guide magazines. W3CRH, Box 90-Q, Rockville, MD 20850. 301-654-1876.

**KEYER KITS, \$15.** SASE for information MSC, 1304 Toney Drive, Huntsville, AL 35802.

**EIMAC-3-500Z's.** New-very limited quantity! \$85 each, cash, COD, MO. Add \$3.50 per tube for shipping and handling. I pay cash or trade for all types of transmitting or special purpose tubes - Mike Forman, 3740 Randolph, Oakland, CA 94602 415-530-8840.

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**IBM-PC RTTY and ASCII S.A.S.E.** to E. Alline, NE5S, 773 Rosa, Metairie, LA 70005.

**1984 CALLBOOKS, \$17** either, \$32 both, any 4 or more, \$15 each. Postpaid, Calif. 6% tax. Century Printing, 6059 Essex, Riverside, CA 92504. 714-687-5910.

**APPLE Computer Net** every Sunday 1700 GMT on 14.329 MHz. For information on running RTTY/CW with Apple Computer send two stamps, WB7TRQ Jim Hassler 2203 Park Avenue O.V., Cheyenne, WY 82007.

**APPLE COMPUTER owners** announcing "The Logger". A very sophisticated, full-featured disk-based log book for ham radio operators. "The Logger" manages over 1900 log entries per standard DOS 3.3 diskette with sixteen separate functions including personalized QSL cards for less than 2 cents each! Unlocked program diskette and User's Guide \$35. ppd. U.S. large SASE for more information. Bob Jackson, Dept. QST, Box 57304, Webster, TX 77598.

**RTTY FDM Demodulators.** FDM RTTY exists on satellites, FM SCA broadcast subcarriers (e.g. CNS) and HF radio. Four solid state synthesized models, NSA surplus, new-used \$50 to \$350. Call/write for brochure. Electrovalve Industrial Inc., Box 376-Q, Morris Plains, NJ 07950. 201-267-1117.

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**AMRAD (Amateur Radio Research and Development Corporation)** is a nonprofit organization of experimenters in packet radio, spread spectrum and digital communications. Monthly newsletter. Mail \$15 to AMRAD, 5829 Parakeet Drive, Burke, VA 22015. Add \$2 for Canada, Mexico; \$8 overseas air, \$2.30 surface.

**TRS-80 Model III/IV Radio Amateur Software.** Super-Log & Super-Duper \$19.95; Compu-Log \$16.95; Antenna Anatomy \$14.95; Custom Beam Headings \$19.95; Code Trainer II \$16.95; General, Advanced or Extra Theory (specify) \$19.95 each; more, Add \$3 S/H. Specify Model, Tape or Disk? MICRO-80, 2665 Busby Quarter, Oak Harbor, WA 98277.

**CALLBOOKS 1984 editions, Flying Horse, since 1920.** Deliv starts Dec. 1. Postpaid all USA ZIPs. US \$19, DX \$18, both \$34. 6 or more any mix \$16.50 ea. Ron Williams W9JVF/ZB2CS, Avatar Magnetics Co., 1147 N. Emerson, Indianapolis, IN 46219.

**WANTED:** Aluminum tower sections. K4XS, 813-842-7315.

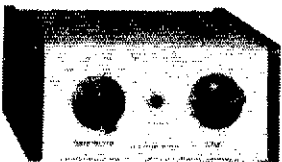
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**COLLINS CLASSICS: 75A4 and KWS1, \$375** each, \$700 pair. Pick-up only. K1FLJ, 203-438-5944.

**MADISON-REPAIR:** Collins KWSU, S-Line; Rockwell KW3M30; Drake, Kenwood, Yaesu, Icom, older U.S.; guaranteed. Used: 75A4/KWS1, 75S1/3251 parts - call! Prices on request. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268.

# WARNING!

## DON'T BUY THIS AUDIO FILTER



XZ-2 Audio CW Filter

... or any other until you've read our Audio Filter Fact Sheet. Audio filters, unfortunately, lend themselves to some pretty spectacular claims, like "infinitely variable" or "20 Hz bandwidth." Fine, but is this what you really need? Probably not. What about "Q" and ringing? They can be serious limitations in any filter. And, counting knobs on the front panel is no guarantee of virtue either.

A well designed audio filter can be a real asset in a station, one that literally makes the difference between solid copy and pure garbage, in even the finest receivers. There are several excellent filters on the market. Ours is one of them.

Some of the filters are not all that they seem to be. We think that our fact sheet can help you decide for yourself. Drop us a note, or your QSL. We'll rush the Audio Filter Fact Sheet right out to you.

If you decide not to heed this warning: \$69.95 at your dealer. In U.S.A. add \$2.00 handling.

**BENCHER, INC.**

333 W. Lake St., Chicago, IL 60606

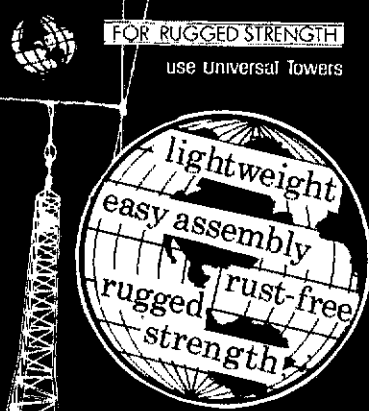
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For superior performance at lower cost, use top-rated 8-pole Fox Tango crystal filters to fill the optional spots in your rig. For example, our 1800 Hz FT2808 equivalent of the YK88SN has 60/6dB shape factor of 1.7 compared with 2.0, a price of \$55 vs \$63, and squarer shoulders at the top with steeper skirts all the way down to more than -80dB!

For more pleasant audio use our 2100Hz for SSB and/or our 6000Hz for AM. For CW, our 400Hz unit is better than the YK88C, while our 250Hz is sharper than the YK88CN.

**BIGGER IS BETTER!**

Fox Tango filters are better because of their discrete crystal (not monolithic) construction. This makes them slightly larger than YK filters so they are patched into the circuit with short lengths of coax. Installation is easy—no drilling or circuit changes. Order with confidence.

**COMPLETE FILTER KITS — \$60 EACH**

AM—FT2811 (6000Hz Bandwidth)

SSB—FT2808 (1800Hz); FT2809 (2100Hz)

CW—FT2801 (250Hz); FT2802 (400Hz)

Kits include all needed cables, parts, detailed instructions. Specify the type(s) desired:

Shipping \$3 per order, (\$5 air). FL Sales Tax 5%.

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1984 Editions—Flying Horse—Since 1920 Postpaid all US ZIPs. Delivery starts Dec. 1 US \$19, DX \$18 Both \$34

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Ron Williams W9JVF / ZB2CS

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# FM-2030

25 Watt 2 Meter FM

**NOW \$299**  
Suggested Retail

Win the Cost/Benefit Contest with its 6-in-1 Features.

- 1 DIAL** — Selects the desired frequency at the twist of the knob when the concentric ring switch is in the DIAL position. Easy and fast 2-speed dialing with audible beep at the end of band.
- 2 M-CH** — Selects and displays the memory channel numbers as the knob is turned. An audible beep is made at channels 1 and 10 for safer mobile operation.
- 3 M-FR** — Selects the memory channels but displays the frequency contained in each channel instead of the channel number. Same safety beep at channels 1 and 10.
- 4 CALL** — A flick of the concentric switch ring selects the eleventh memory channel which is used for your favorite frequency for calling or listening.
- 5 WRITE** — By pushing the dial in, the frequency selected is programmed into the appropriate memory location.
- 6 RIT** — 1 kHz steps for RIT. Clears up the distortion caused by the transmitting station's off frequency condition.



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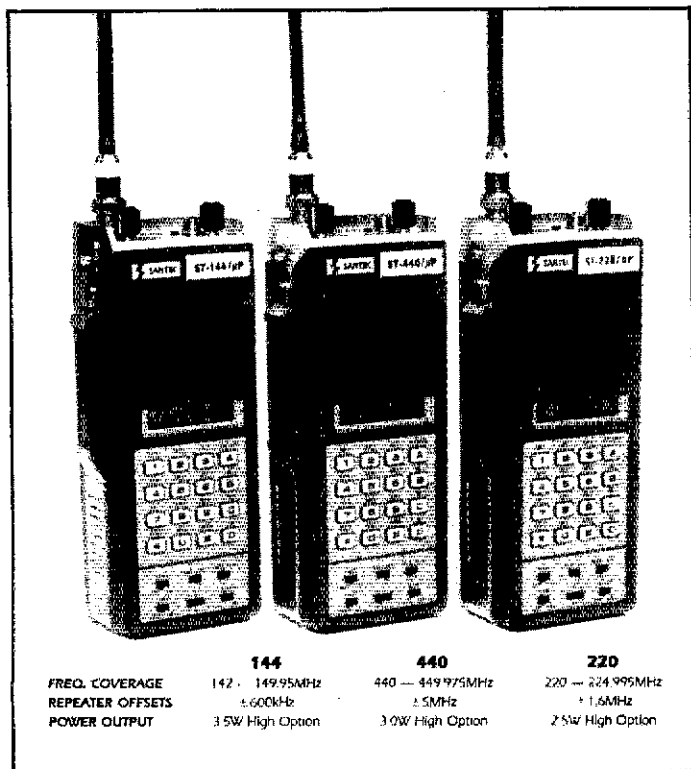
- Remote Stepping From Microphone
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The Santec ST series of handheld transceivers is now complete! With the introduction of the new **ST-220/μP** which covers 220.000 — 224.995 MHz in 5 kHz steps, Santec brings its unparalleled technology and quality to a third complete band. Now you can get it right on three bands with Santec.

All of the little Santec ST radios are identical in form and features, varying only in power output and individual band characteristics. All share: 10 memories with stored offsets; priority memory scan; 24 hr. format clock; three output power levels; wide band operation; low "quiet time" standby drain; three modes of bandscan; and a full two year extended service plan. Now there are three great handhelds which get it right the Santec way!

	144	440	220
FREQ. COVERAGE	142 - 149.95MHz	440 - 449.975MHz	220 - 224.995MHz
REPEATER OFFSETS	±600kHz	±5MHz	±1.6MHz
POWER OUTPUT	3.5W High Option	3.0W High Option	2.5W High Option

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# \$99.00 UHF Transceiver

**HL-20U UHF AMPLIFIER** — This is another super compact from THL, and it's beautiful, with the controls on the brushed metal face panel to make operations as easy as touch and go.

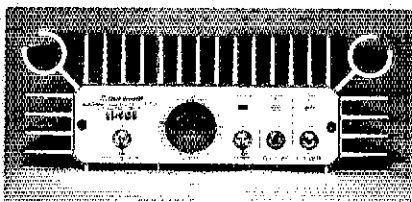
The ultra-compact HL-20U is a basic amplifier for all UHF handheld radios, and it can accept input levels from 200mW to 3W, to provide a big 20W output signal. Fixed attenuator design allows for full output from as low as 200mW drive.

Your UHF handheld operations have never experienced anything like this surprising little amplifier. \$119.95 Suggested Retail

## TOKYO HY-POWER LABS, INC.

For catalog, send OSI card to  
**Department G**  
2000 Avenue G, Suite 800, Plano, Texas 75074

All stated prices and specifications subject to change without notice or obligation.



**HL-90U UHF AMPLIFIER** — Our new 80W output big-power UHF amp, with GAS-FET preamp and drive requirements as low as 10W, is designed for the 70cm amateur band.

It features stable and powerful amplification along with excellent linearity, which is especially effective on SSB. With its built-in receiver preamp, the HL-90U enables you to enjoy more comfortable DX QSO's. Accurate output power can be read with the built-in precision directional coupler, and power can be reduced by one half by the power level switch.

The HL-90U works FM, SSB, and CW, it provides a remote control terminal, and it comes to you for \$389.95 Suggested Retail.

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## Yes, It's True!

Now there is a truly unsophisticated 3 channel crystal controlled radio to get everyone on UHF NOW. This radio is so affordable everyone should have at least two.

The low cost MICRO-7 (Model HT-7) comes with one channel of two crystals, a transmit and a receive already installed, the four drycells (AA size) needed to power the unit, an antenna and 200 mW of transmitting power.

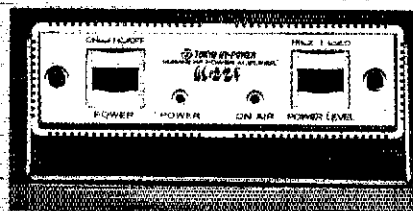
A rather wide variety of accessories are available to boost your enjoyment and convenience such as: Speaker/mic (HSM7) (24.95) compatible with other audio systems like Kenwood and ICOM units, Subtone generator (HTE7) (19.95) set for 103.5 by a crystal, the VOX module (HVX7) (19.95) use with the boom-mic headset (HBM7) pictured below (39.95) and a rechargeable NI-Cd battery and charger (39.95). For more output use the HL-20U THL amplifier (114.95) for up to 20 watts output.

The HT has been around for a long time but not like this. The MICRO-7 makes it time you got yourself a UHF radio and joined the evolution . . . upward.



## THL Highpower Amplifiers Couplers, Transceivers

Distributed by: **Encomm, Inc.**  
2000 Avenue G, Suite 800  
Plano, Texas 75074



**HL-32V VHF AMPLIFIER** — The first of our super compact amplifiers for use with handheld radios. For VHF operations, this unit produces up to 25W output with drive from your 0.5W to 3W handheld. Low insertion loss on receive and selectable power level design provide low VSWR to the transceiver.

Excellent for mobile use in snugly fitted smaller cars, this little beauty can be stowed under the seat, out of sight and out of mind.

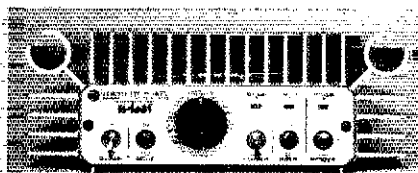
The HL-32V operates linear mode for SSB or FM (switch selected), and the best news of all: the price is only \$89.95 Suggested Retail

Meets or exceeds FCC specifications.

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**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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# 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.

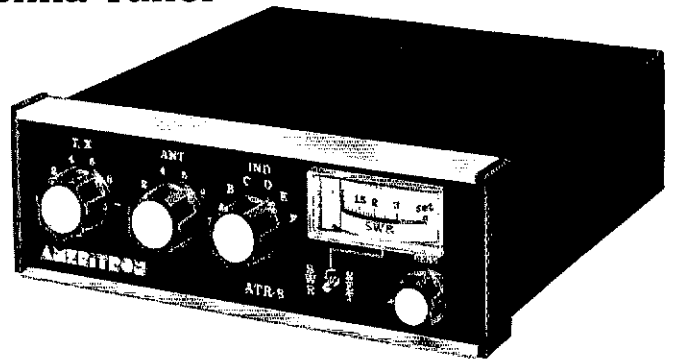
## ATR-8 Antenna Tuner

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

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Simply, THE BEST

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Low Noise - High Dynamic Range front-end boards with: Low loss relay, RF Amp, DBM, 6 pole Xtal filter, and IF amplifier for:

ICOM IC251 & IC211 . . . . .	131.95
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GLBA144e Mast-Mounted GaAsFET preamp, 1kw PEP Max, includes lin. amplifier sequencer, Interfaces to all rigs! . . . . .	249.95
MIRAGE D1010N 100w 432 Amp w/N's . . . . .	275.00
Call for our low Quots on KLM & MIRAGE	
F9FT 1296 23al Yagi . . . . .	47.35
F9FT 1296 Quad Array + PD + Frame . . . . .	361.00
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F9FT 144 17al Yagi "NEW" . . . . .	CALL!
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1296 GaAsFET Preamp NF < 1.9db	
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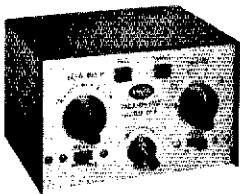
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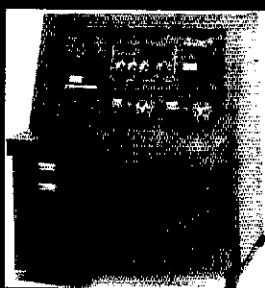
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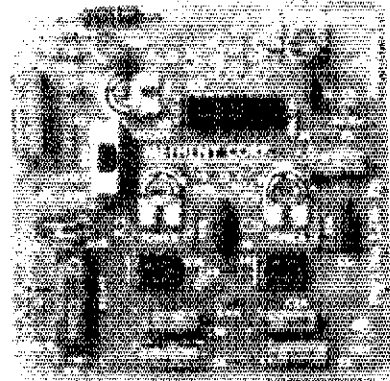
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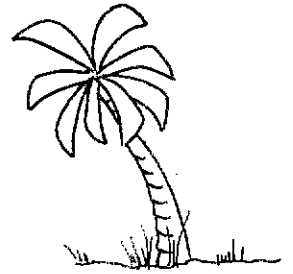
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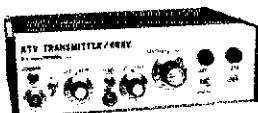


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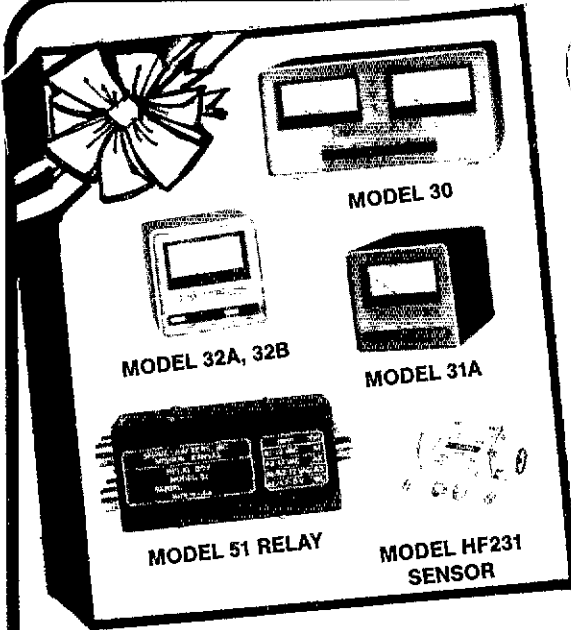
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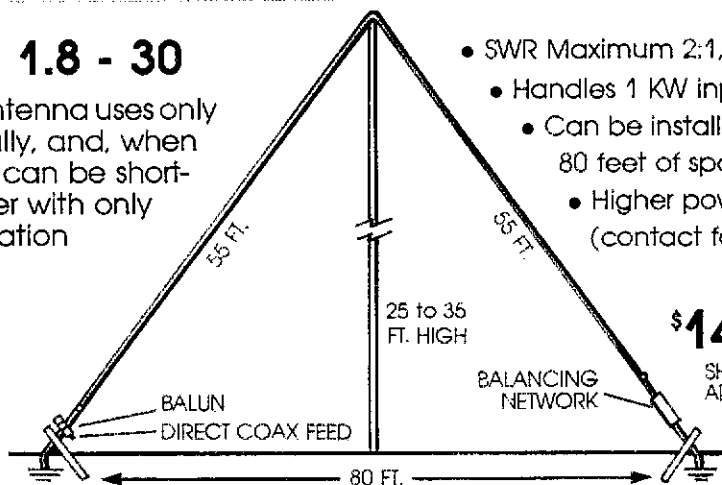
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 \*FL-53A 250 Hz CW filter (2nd IF)..... 96.50 89<sup>95</sup>  
 \*FL-44A SSB filter (2nd IF)..... 159.00 144<sup>95</sup>  
 SM-5 Electret desk microphone..... 39.00  
 HM-10 Mobile scan microphone..... 39.50  
 MB-12 Mobile mount..... 19.50

- \*Options also for IC-745 listed below  
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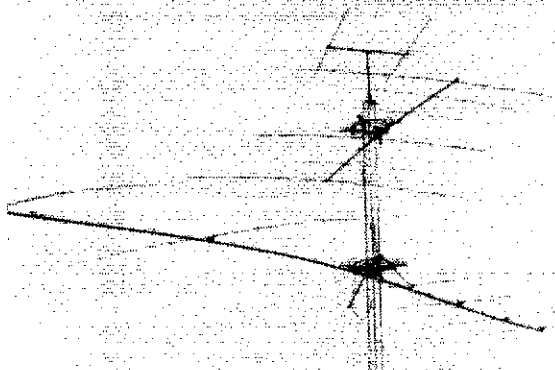
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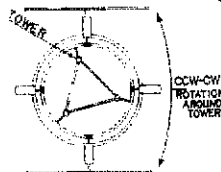
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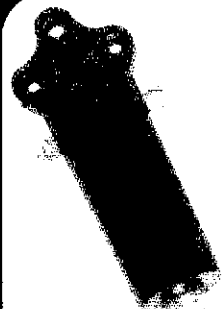
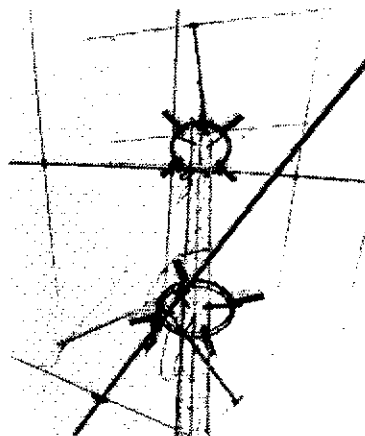
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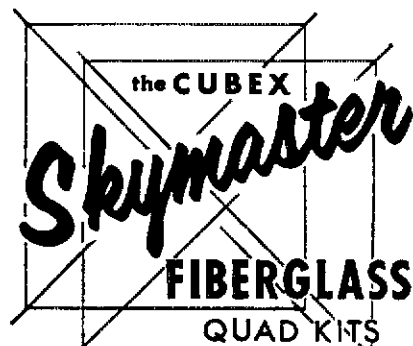
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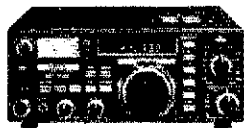
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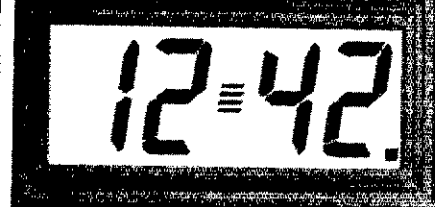
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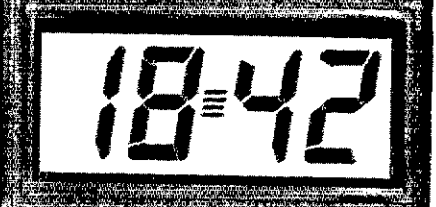
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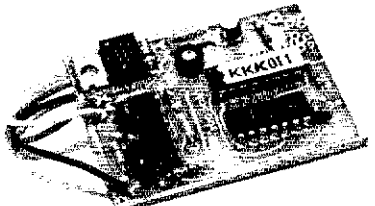
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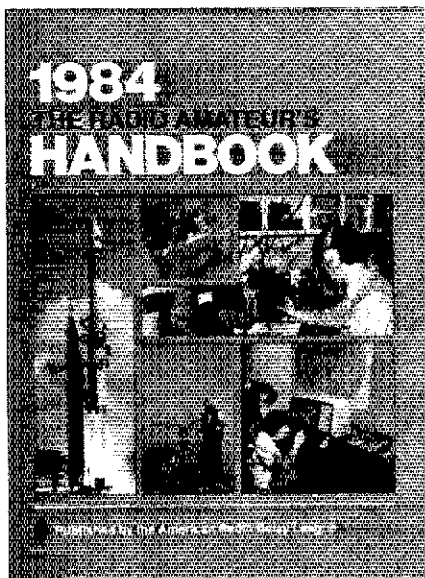
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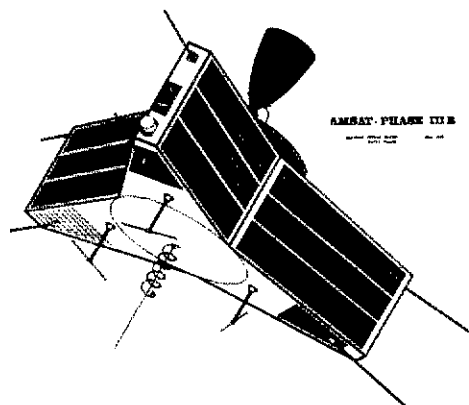
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WANTED: Swan VFO-160. Accurately state condition, appearance, minimum price. KB0TG, Box 2012, Olathe, KS 66061-2012.

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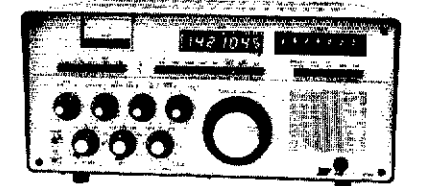
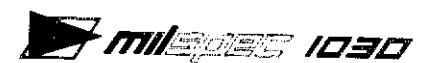
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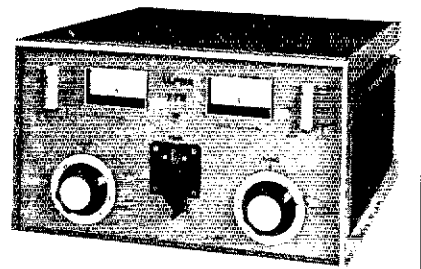
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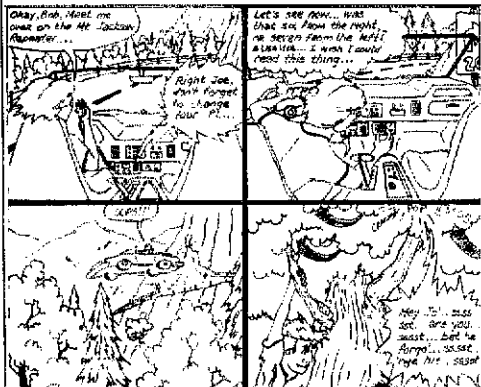
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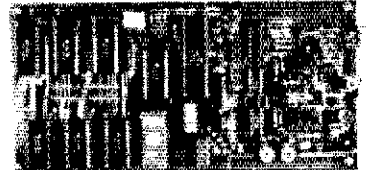


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YAESU FT-901-DM in mint condition. Will ship. \$650. W7BYG 509-682-2440. Box 1503, Chelan, WA 98816.

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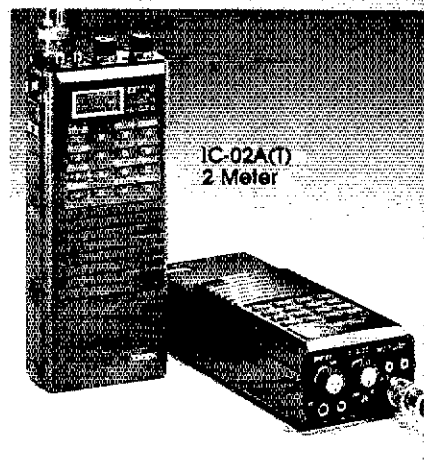
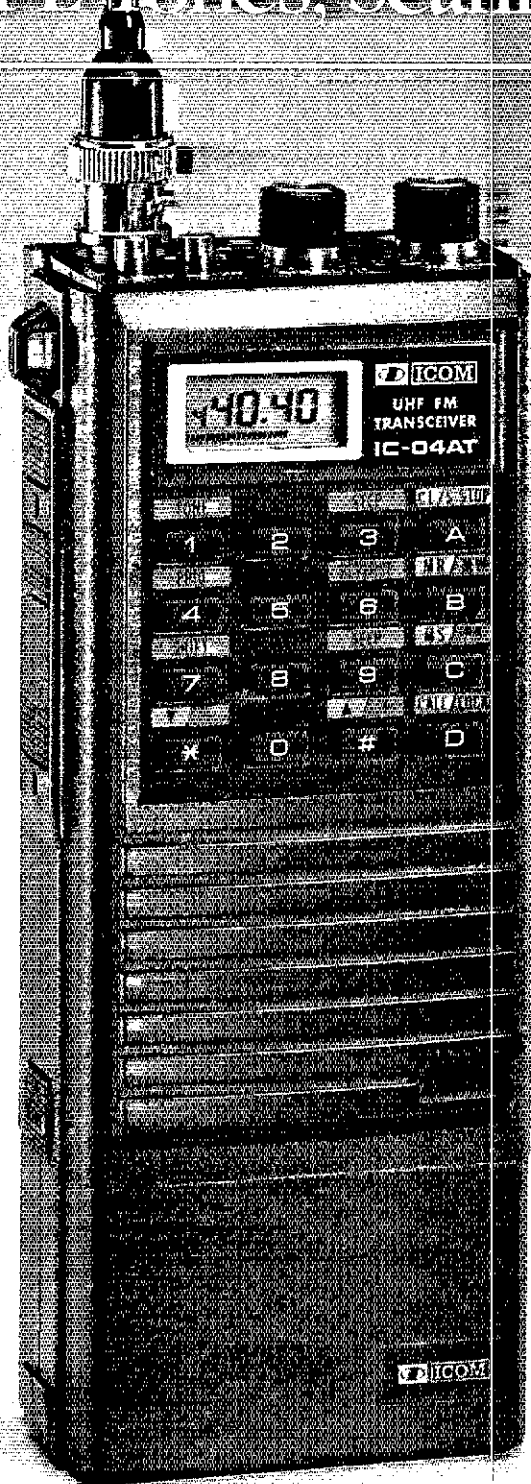
# ICOM IC-04AT

## 440MHz, PL Tones, Scanning, Plus...

ICOM is proud to announce the latest in 440MHz handheld transceiver technology. The IC-04AT represents the best in a multifunction, multifeature handheld for 440 - 450 MHz.

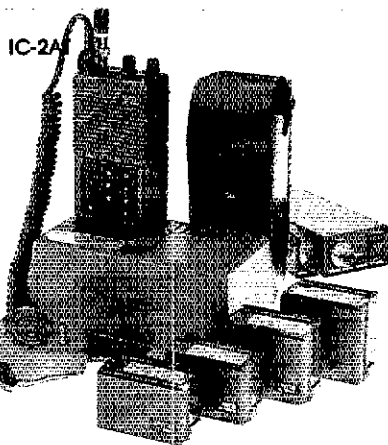
**Features. Features. Features.** The IC-04A and IC-04AT cover from 440 - 449.995 MHz. Frequency entry, as well as control functions for the handheld, are controlled by the 16-button pad on the face of the radio. Included as a standard feature are 32 PL tones which are controlled by the 16-button pad on the front panel. Also included are priority scanning (both of memories and programmable band scan) and DTMF (04AT only). Ten memories with internal lithium battery backup give the ultimate in flexibility for channelizing operation of this sophisticated handheld for easy access to most used channels. Thus, the IC-04A(T) may be used to individually bring up any frequency between 440 and 449.995MHz with 5kHz spacing, or favorite frequencies may be stored in the memory and recalled at the touch of a button. The IC-04A(T) has all the features you could want in a handheld.

and IC-2A(T), plus new accessories such as long-life and high-power battery packs and a boom headset. Multiple battery packs allow the widest flexibility in charging: either from a wall charger, cigarette lighter plug, stand-up desk charger, or through the top of the radio. Twelve volts applied through the top of the radio not only provides operation of the radio at high power, but provides charging of the battery packs at the same time - a feature not commonly found in handheld units.



**Built to Last.** The IC-04A(T) comes with a sealed case, providing resistance to moisture, dust, and other elements detrimental to the operation of the radio. An aluminum back provides a massive heatsink for the power module allowing the IC-04A(T) to run at a standard 3 or 5 watts (optional battery required). A battery lock is provided to ensure the battery will remain secure, and the unit will continue to operate even if mishandled. A custom LCD readout with S-meter is unique to the ham industry.

Expanding on our line of available accessories, the IC-04A and IC-04AT become the most versatile handhelds in their class. See the IC-04A(T) at your nearest ICOM dealer.



**Compatible Accessories.** The IC-04A(T) has the same styling, control features and functions of the IC-02A(T). The IC-04A(T) utilizes the existing accessory line available for the IC-2A

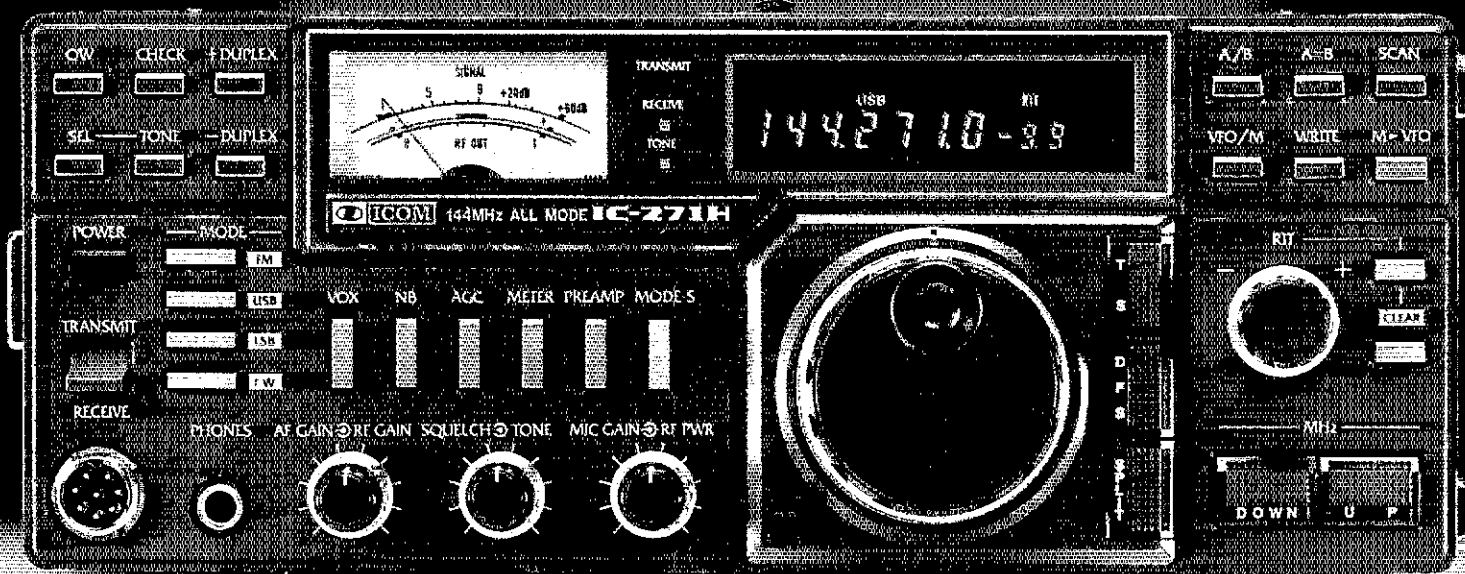


# ICOM

## The World System

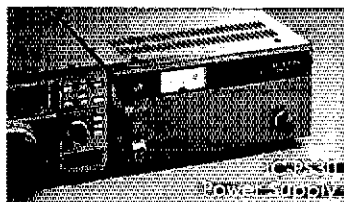
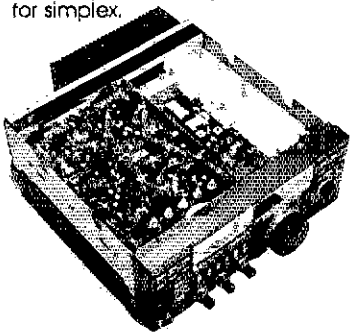
# IC-271H

## Now a 100 Watt, 2 Meter Base!



For the ultimate in two-meter communications, ICOM presents the IC-271H transceiver with a high dynamic range receiver and a 100 watt transmitter. Operating from the IC-PS30, IC-PS15, or the internal IC-PS35 (optional), the IC-271H brings all the advanced functions of the latest CPU controlled radios to your shack.

**100 Watts.** Now a two-meter base station with 100 watts of internal power! The IC-271H provides all the power required for operation from remote places to repeaters, or for simplex.



### Subaudible Tones.

Included as a standard feature are 32 built-in subaudible tones which are easily selected by rotating the main tuning knob. PL tones may be stored into memory.

### 32 Full-Function Memories.

Each tunable memory holds frequency, offset, offset direction, mode and subaudible tone. Each parameter is selected by rotating the main tuning knob in conjunction with the switches on the front panel.

### PLL Locked at 10Hz.

An extremely low-noise, professional receiver and a good signal-to-noise ratio PLL allows the IC-271H's synthesizer to lock to 10Hz providing receiver performance unparalleled by any other VHF receiver.

**Fluorescent Display.** ICOM's high-visibility, multicolor display gives easy-to-read display of all information necessary for logging a contact. Frequency, mode, duplex, offset direction, RT frequency, memory channel and PL tone can be displayed.

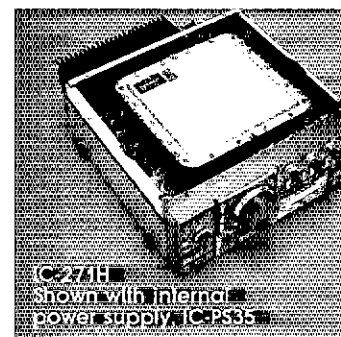
**Scanning.** The IC-271H can scan memories and programmed sections of the band or modes. Mode-S scan can be used to scan only memories with a particular mode or lock out frequencies continuously busy so the receiver will not stop at that memory channel while scanning.

### Other Standard Features.

To facilitate the operation of the IC-271H, ICOM has incorporated a duplex check switch, all-mode squelch, receive audio tone control, S-meter, center meter, seven-year lithium battery memory backup, accessory connector and microphone.

**Optional Features.** IC-271H options are: switchable preamplifier, CTCSS encoder/decoder (encoder is standard), computer interface and voice synthesizer.

**Size.** Only 11½ inches wide by 4¾ inches high, the IC-271H is styled to look good and engineered for ease of operation.



**The IC-271A.** The IC-271A with 25 watt output is available and has the same features as the IC-271H, plus an optional IC-PS25 internal power supply to make it a compact, go-anywhere two-meter base station. See the IC-271A(H) and other fine ICOM equipment at your ICOM dealer today.

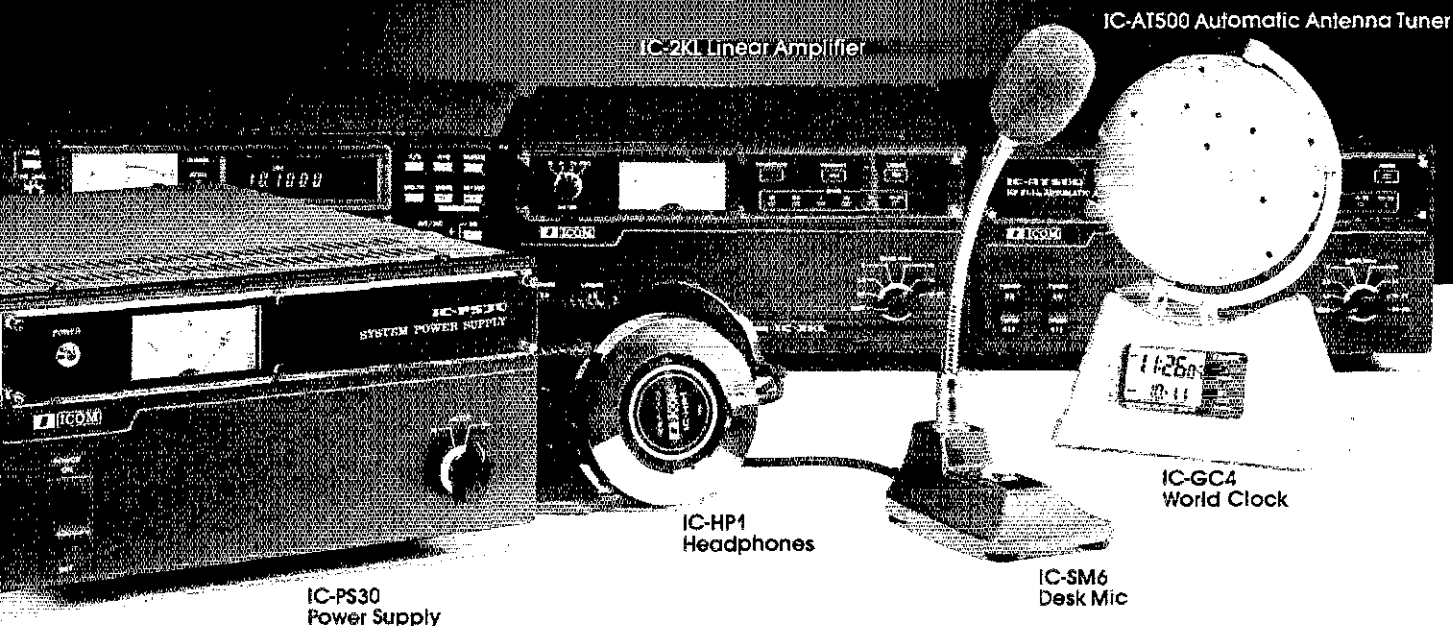


# ICOM

## The World System

# ICOM Accessories

## All you need to build your World System



Create your ideal HF system with ICOM's transceivers and complete line of interchangeable components. When you acquire a new ICOM HF transceiver, there is no need for new accessories. ICOM's standard accessories...the IC-PS30 power supply, IC-2KL solid state linear amplifier, and the IC-AT500 or AT100 automatic antenna tuners are compatible with any ICOM exciter you own.

### Transceivers.

Choose either the new IC-751, IC-745 or IC-730 to drive your ICOM HF system.

Other transceivers such as the IC-701, IC-720A and IC-740 are also compatible and have ICOM's distinct base station styling.

### IC-PS30.

The IC-PS30 is ICOM's power supply system designed for powering up to four pieces of ICOM equipment at the same time. Full current and voltage metering is provided. 25 amp capacity. 117 VAC or 220 VAC operation.

### IC-2KL

The ultimate solid state linear amplifier, the IC-2KL provides a full 500 watts of power on 160 through 15

meters. Working from its own IC-2KLPS power supply, the IC-2KL uses 40 VDC on the final transistors for excellent IMD. Automatic bandswitch is operable when used with an ICOM exciter. Broad-banded, the IC-2KL requires no tune-up. Finals are fully protected through a unique three-way APC circuit.

### IC-AT500/AT100.

The 500 watt IC-AT500 or 100 watt IC-AT100 are automatic antenna tuners. When used with an ICOM exciter, they provide automatic bandswitching and automatic antenna matching. Four antenna ports are included, and the

correct antenna is automatically selected for the band in use. A preset tune position is supplied for each band to allow coarse tuning for receiving without transmitting first.

### Others.

ICOM's extensive product line includes accessories for every need: IC-PS15 power supply, IC-MT100 manual antenna tuner, IC-PP1 phone patch, IC-HP1 headphones (shown), IC-SM6 desk mic (shown), IC-GC4 world clock (shown), mobile mounting brackets, plus much more.

See ICOM equipment at your local ham store.



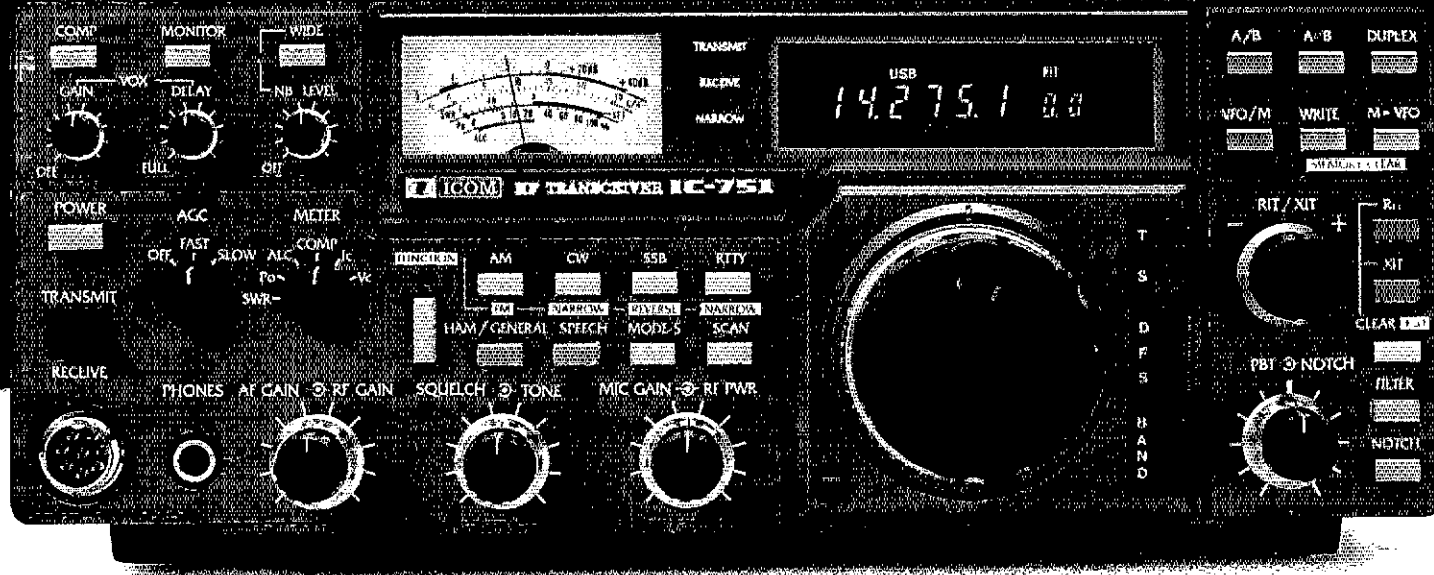
# ICOM

## The World System

# ICOM IC-751

## The New Standard of Comparison

**NEW**  
Competition  
Grade  
Transceiver!



ICOM is proud to announce the most advanced amateur transceiver in communications history. Based on ICOM's proven high technology and wide dynamic range HF receiver designs, the IC-751 is a competition grade ham receiver, a 100KHz to 30 MHz continuous tuning general coverage receiver, and a full featured all mode solid state ham band transmitter, that covers all the new WARC bands. And with the optional internal AC power supply, it becomes one compact, portable/field day package.

**Receiver.** Utilizing an ICOM developed J-FET DBM, the IC-751 has a 105dB dynamic range. The 70.4515MHz first IF virtually eliminates spurious responses, and a high gain 9.0115MHz second IF, with ICOM's PBT system, gives the ultimate in selectivity. A deep IF notch filter, adjustable AGC and noise blanker (can be adjusted to

eliminate the woodpecker), audio tone control, plus RIT with separate readout provides easy-to-adjust, clear reception even in the presence of strong QRM or high noise levels. A low noise receiver preamp provides exceptional reception sensitivity as required.

**Transmitter.** The transmitter features high reliability 2SC2904 transistors in a low IMD (-38dB @ 100W), full 100% duty cycle (internal cooling fan standard), 12 volt DC design. Quiet relay selection of transmitter LPF's, transmit audio tone control, monitor circuit (to monitor your own CW or SSB signal), XIT, and a high performance speech processor enhance the IC-751 transmitter's operation. For the CW operator, semi break-in or full QSK is provided for smooth, fast break-in keying.

**Dual VFO.** Dual VFO's controlled by a large tuning knob provide easy access to

split frequencies used in DX operation. Normal tuning rate is in 10Hz increments and increasing the speed of rotation of the main tuning knob shifts the tuning to 50Hz increments automatically. Pushing the tuning speed button gives 1KHz tuning. Digital outputs are available for computer control of the transceiver frequency and functions, and for a synthesized voice frequency readout.

**32 Memories.** Thirty two tunable memories are provided to store mode, VFO, and frequency, and the CPU is backed by an internal lithium memory backup battery to maintain the memories for up to seven years. Scanning of frequencies, memories and bands are possible from the unit, or from the HM12 scanning microphone. In the Mode S mode, only those memories with a particular mode are scanned; others are bypassed. Data may be transferred between VFO's,

from VFO to memories, or from memories to VFO.

**Standard Features.** All of the above features plus FM unit, high shape factor FL44A, 455 Kh SSB filter, full function metering, SSB and FM squelch, convenient large controls, a large selection of plug-in filters, and a new high visibility multi-color fluorescent display that shows frequency in white, and other functions in white or red, make the IC-751 your best choice for a superior grade HF base transceiver.

**Options.** External frequency controller, external PS15 power supply, voice synthesizer, computer interface, internal power supply, high stability reference crystal (less than  $\pm 10$ Hz after 1 hour), HM12 hand mic, desk mic, filter options:

SSB: FL70  
CWN: FL52A, FL53A,  
FL32, FL63  
AM: FL33



# ICOM

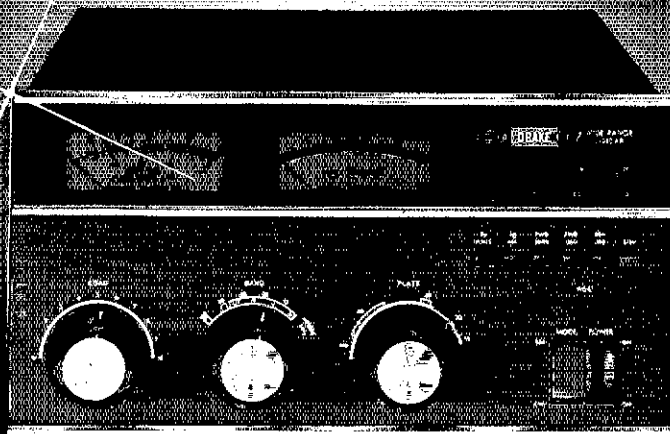
## The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-2776

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

754111

# 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.

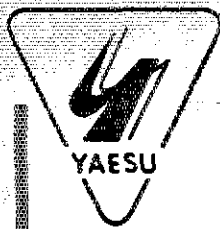
**R.L. DRAKE COMPANY**



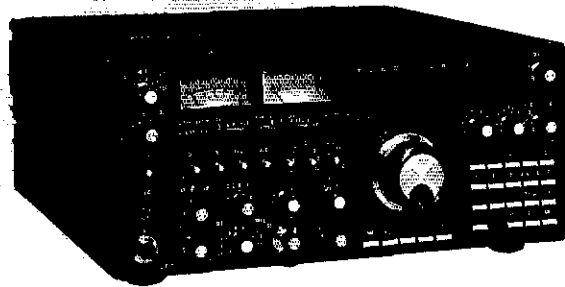
**DRAKE**

For more information write or call:

840 Birchard St., Farmington, Ohio 45342, USA  
Phone: (513) 866-2221  
Telex: 288-017



# HF FAMILIES



## FT-101

THE TOP OF THE LINE HF ALL MODE GENERAL COVERAGE TRANSCEIVER WITH COMMERCIAL-GRADE CONSTRUCTION, COMPETITION-GRADE DESIGN WITH UNEQUALLED RECEIVER FILTER PERFORMANCE.

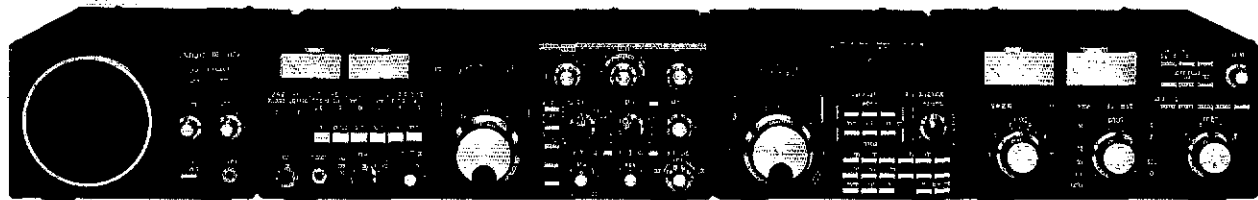
TX: 100W 1.8-29.99 MHz  
RX: 150 kHz-29.99 MHz



## FT-980 CAT

NEW HF ALL MODE TRANSCEIVER WITH GENERAL COVERAGE RECEIVER, 8-BIT MICROPROCESSOR CONTROL, AND INTRODUCING YAESU'S NEW COMPUTER-AIDED TRANSCEIVER SYSTEM FOR COMPLETE EXTERNAL COMPUTER CONTROL.

TX: 100W 9 bands  
RX: 150 kHz-29.99 MHz



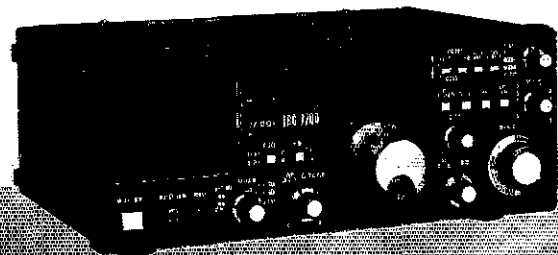
## FT-102 LINE

Designed for wide dynamic range and clean transmitter output—to give you that extra competitive edge. Three 6146B's give power to spare, while the ultra-modern features give you total operating flexibility and control.



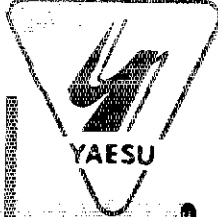
Simple, reliable and thrifty, the all solid-state rig that gives you everything you need for no-frills mobile HF, or base station with the optional FP-700 Power Supply. 100W; 9 bands, SSB and CW, w/FM optional

Specifications subject to change without notice or obligation.

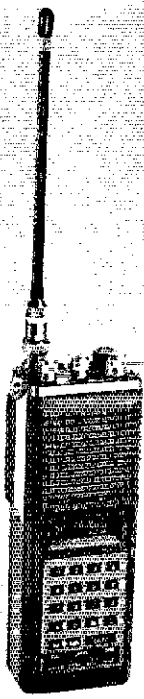


All mode synthesized general coverage receiver—perfect for serious shortwave listening. Options include 12-channel Memory Unit, VHF Converters, Antenna Tuner and an Active Antenna.





# V/UHF FAMILIES



## FT-208R/708R

Feature-packed FM Handhelds that have proven their superior performance. Microprocessor control assures convenient operation while incorporating every worthwhile feature the serious operator needs.

FT-208R 2.5W/1W RF:  
143.5-148.5 MHz

FT-708R 1W/200mW RF:  
440-450 MHz

10 memories w/lithium backup  
Full scanning features



## FT-230R/730R

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  
FT-730R 10W RF: 440-450 MHz



## FT-290R/690R/790R

All mode portables with full microprocessor control and all of the features needed for serious SSB, CW and FM field operation when powered by eight optional "C" cells. Options also available for mobile and base operation.

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



## FT-480R/680R/780R

All mode base/mobiles with power and performance in all SSB, CW and FM applications. Optional matching FP-80A AC Power Supply makes the perfect base station.

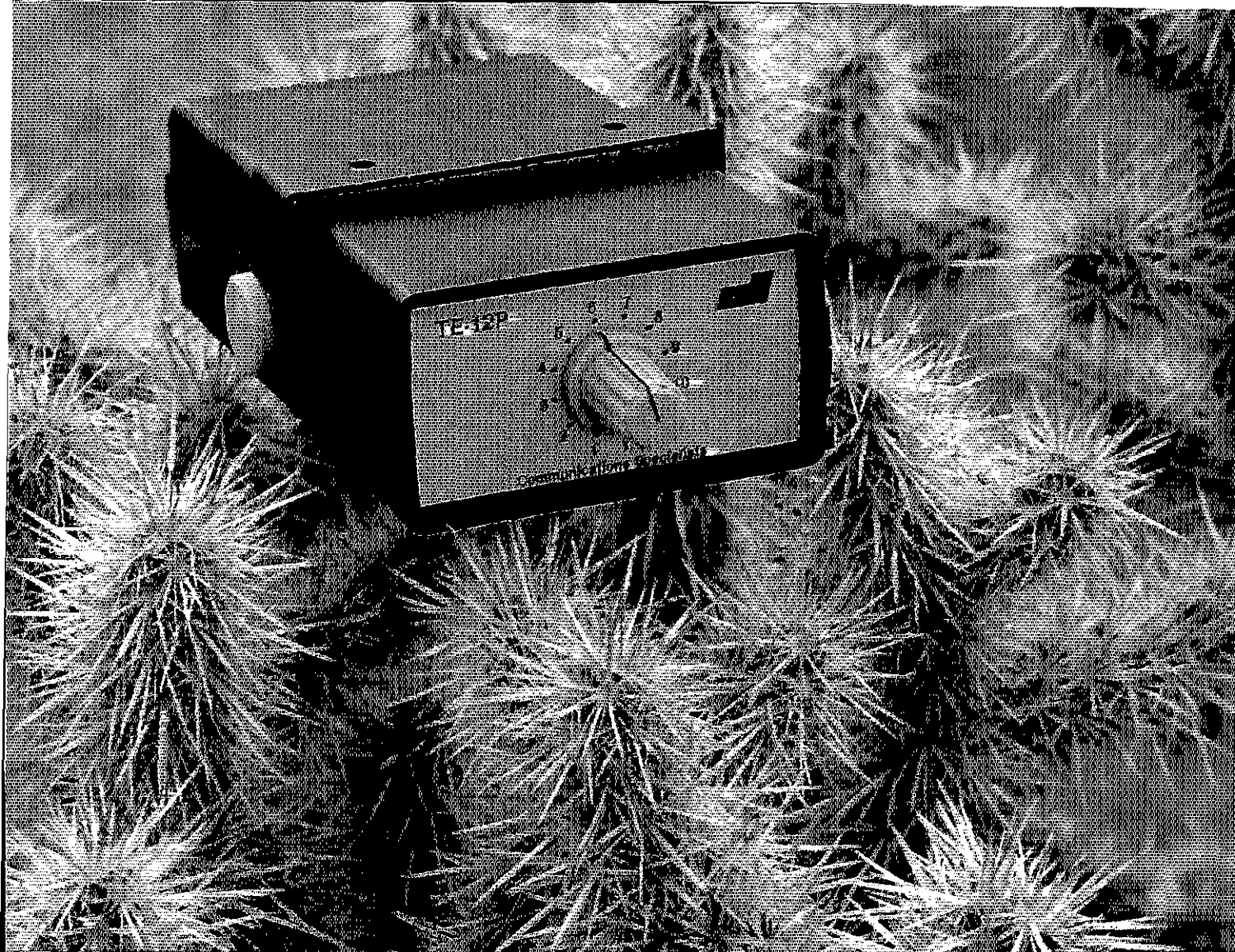
FT-680R 10W RF: 50-54 MHz

FT-480R 10W RF: 143.5-148.5 MHz

FT-780R 10W RF: 430-440 MHz

# YAESU

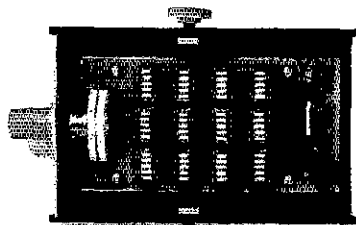
YAESU ELECTRONICS CORP., 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007  
YAESU Cincinnati Service Center, 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100



## Stuck with a problem?

Our TE-12P Encoder might be just the solution to pull you out of a sticky situation. Need a different CTCSS tone for each channel in a multi-channel Public Safety System? How about customer access to multiple repeater sites on the same channel? Or use it to generate any of the twelve tones for EMS use. Also, it can be used to access Amateur repeaters or just as a piece of versatile test equipment. Any of the CTCSS tones may be accessed with the TE-12PA, any of the audible frequencies with the TE-12PB. Just set a dip switch, no test equipment is required. As usual, we're a stickler for 1day delivery with a full 1 year warranty.

- Output level flat to within 1.5db over entire range selected.
- Immune to RF.
- Powered by 6-30vdc, unregulated at 8 ma.
- Low impedance, low distortion, adjustable sinewave output, 5v peak-to-peak.
- Instant start-up.



### TE-12PA

67.0 XZ	85.4 YA	103.5 1A	127.3 3A	156.7 5A	192.8 7A
71.9 XA	88.5 YB	107.2 1B	131.8 3B	162.2 5B	203.5 M1
74.4 WA	91.5 ZZ	110.9 2A	136.5 4Z	167.9 6Z	
77.0 XB	94.8 ZA	114.8 2A	141.3 4A	173.8 6A	
79.7 SP	97.4 ZB	118.8 2B	146.2 4B	179.9 6B	
82.5 YZ	100.0 1Z	123.0 3Z	151.4 5Z	186.2 7Z	

- Frequency accuracy,  $\pm 1$  Hz maximum  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Frequencies to 250 Hz available on special order.
- Continuous tone

### TE-12PB

TEST-TONES:	TOUCH-TONES:	BURST-TONES:
600	697 1209	1600 1850 2150 2400
1000	770 1338	1850 1900 2200 2450
1500	852 1477	1700 1950 2250 2500
2175	941 1633	1750 2000 2300 2550
2805		1800 2100 2350

- Frequency accuracy,  $\pm 1$  Hz maximum  $-40^{\circ}\text{C}$  to  $+85^{\circ}\text{C}$
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

**\$89.95**

**COMMUNICATIONS SPECIALISTS**

426 West Taft Avenue, Orange, California 92667  
(800) 854-0547/California: (714) 998-3021

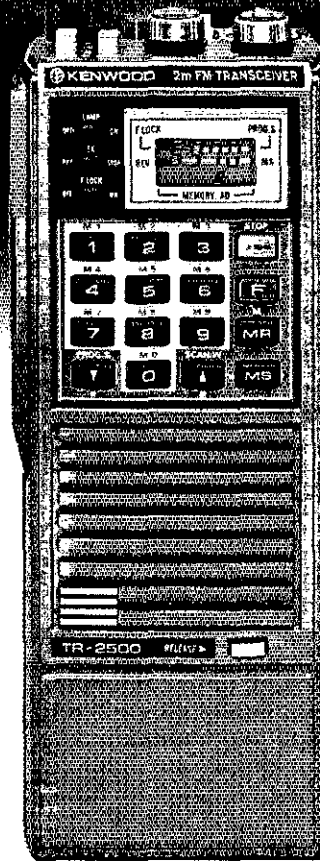


# TR-2500

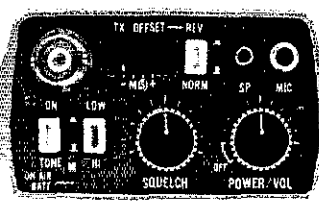
The TR-2500 is a compact 2-meter FM handheld transceiver with every conceivable operating feature.

### 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.



### CONVENIENT TOP CONTROLS



- while charging.
- Battery status indicator.
- Complete with flexible antenna, 400 mA 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 mA 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,  $\pm 5$  kHz to  $\pm 9.995$  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  $\lambda$  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  $\pm 600$  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.



# KENWOOD

TRIO-KENWOOD COMMUNICATIONS  
1111 West Walnut, Compton, California 90220



## TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

### TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.

- Wide receiver dynamic range. Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display. (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

### Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455CN (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob.

**NEW**



## TS-530SP

"Cents-ational"...notch, IF shift, digital display, narrow-wide filter switch

The TS-530SP SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

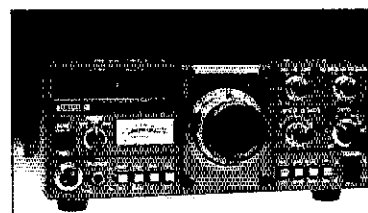
### TS-530SP FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.

- Audio notch filter, tunable, for minimum QRM.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

### Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.



## TS-130SE

Compact, solid-state HF, 80-10 m, incl. WARC.

- 200 W PEP, 160 W DC.
- Digital display.
- IF shift, narrow/wide filter, switch. (Filters opt.)
- Speech processor, VOX.
- RF attenuator, noise blanker.
- CW semi break-in w/sidetone.
- Final amp, protection circuit.
- Size: 3-3/4 H x 9-1/2 W x 11-9/16 D.

### Optional accessories:

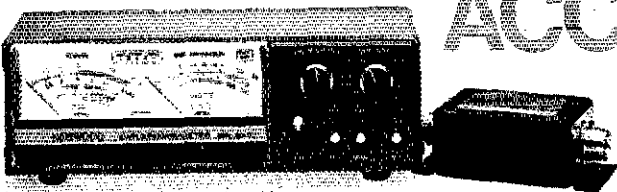
- PS-30, KPS-21 Power supplies.
- SP-120 External speaker.
- VFO-120 remote VFO.
- AT-130 antenna tuner.
- YK-88C (500Hz), YK-88CN (270Hz) CW filters.
- YK-88SN (1.8 kHz) SSB filter.
- MB-100 mobile mtg. bracket.

# KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

# ACCESSORIES

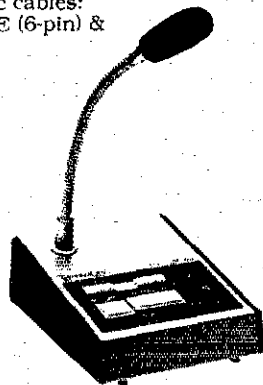
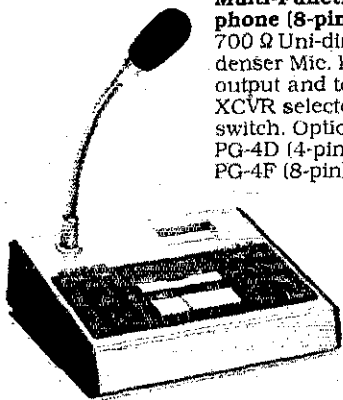


## SW-2000

**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).

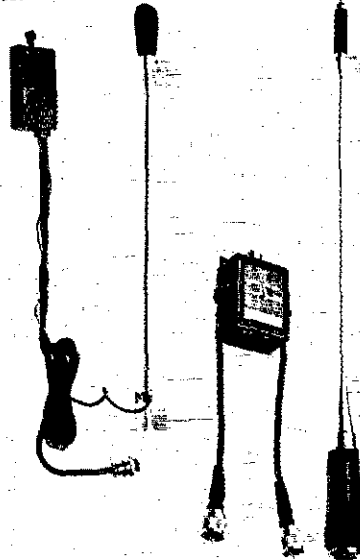
## MC-85

**Multi-Function Desk Top Microphone (8-pin)**  
700  $\Omega$  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).



## MC-55 (8P/6P)

**Mobile Microphone (8-pin or 6-pin)**  
700  $\Omega$  Electret Condenser Mic. with flexible boom, and separate STAND-BY box built-in UP/DOWN switch and 5 minute Time-Out-Timer.



## 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  $\Omega$
- **MC-60N4** Deluxe desk top microphone (pre-amp. not included). (4-pin) 50 k/500  $\Omega$
- **MC-50** Desk top microphone, 50 k/500  $\Omega$  (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  $\Omega$  (4-pin)
- **MC-30S** Noise-cancelling hand microphone, 500  $\Omega$  (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 FLUG 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  $\lambda$  Telescoping antenna with BNC connector
- **RA-5** 2-m 1/4  $\lambda$  /70-cm 5/8  $\lambda$  Telescoping dual-band antenna with BNC connector

### Other accessories:

- **RD-20** Dummy load, 50  $\Omega$ , DC-500 MHz, 50 W intermittent
- **SP-40** Compact external mobile speaker
- **AL-2** Lightning & static protector, 50  $\Omega$  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.

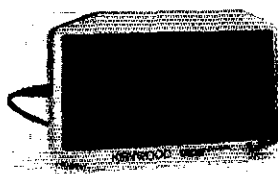
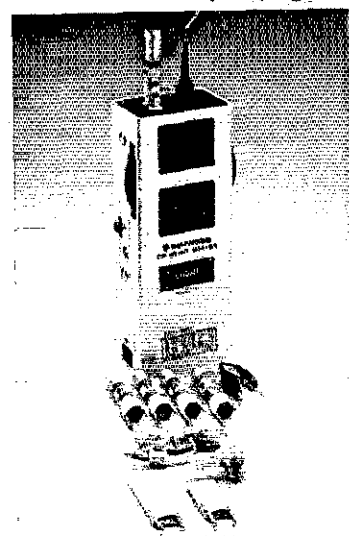


## MC-80

**Desk Top UP/DOWN Microphone (8-pin)**  
700  $\Omega$  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).

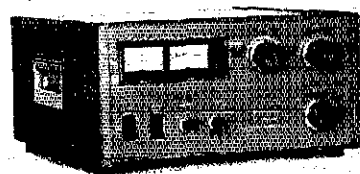
## HS-7

**Micro Headphones (16  $\Omega$ )**  
Ultra light weight and portable ear-fitting headphones supplied with two audio adaptor plugs.



## SP-50

**High Quality External Mobile Speaker**



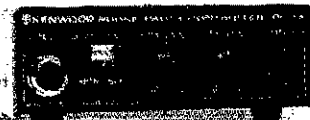
## TL-922A

**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.

## MA-4000

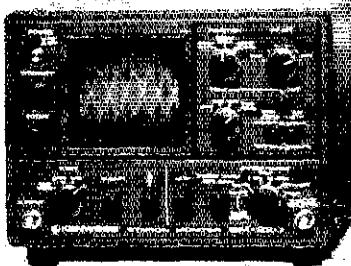
**2-m/70-cm Dual Band Mobile Antenna**

5/8  $\lambda$  for 2-m and stacked 5/8  $\lambda$  for 70-cm. Duplexer is supplied.



## PC-1A

**Phone Patch (FCC Part 68 registered)**



## SM-220

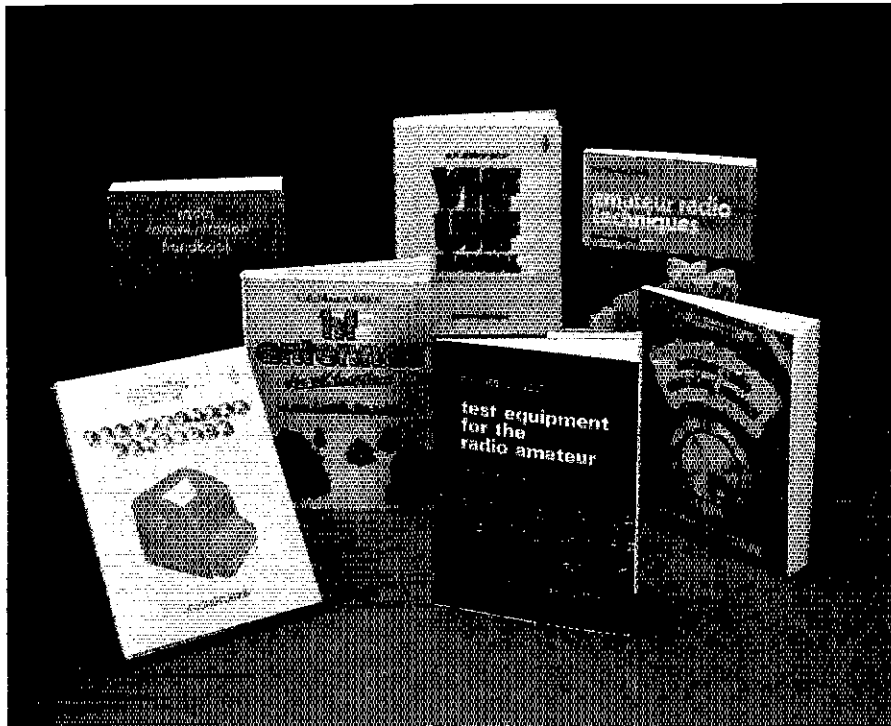
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**VHF-UHF MANUAL** by G. R. Jessop, G6JP. You will find the new fourth edition of *VHF-UHF Manual* jam-packed with practical theory and construction projects for the region above 30 MHz to 24 GHz. The microwave chapter has been expanded to 83 pages; and includes information on: converters, cavity amplifiers, Gunn diodes, waveguides, directional couplers, and antennas. Receivers and Transmitters for these bands are covered in 181 pages. The balance of this 512-page book contains chapters on propagation, tuned circuits, space communications, filters, test equipment, antennas, and a handy data section. (Since this is a British publication, there is little coverage of the 6-meter band, but many of the 4-meter band projects can be adapted by the experienced amateur for use on 6-meters.) Copyright 1983. Hardbound **\$17.50**.

**AMATEUR RADIO OPERATING MANUAL** by R. J. Eckersley, G4FTJ. Get the British side of operating. Besides such chapters as Setting up a station, and Mobile, Portable and Repeater Operation, the reader will find information in the Appendices most useful. There are continental and regional maps which show the prefixes assigned to each area and listing of countries showing ITU callsign allocations, callsign systems for each country, notes on foreign amateur operation, addresses of licensing administrations and the names and addresses of National Amateur Radio Societies. 189 pages. Copyright 1979, 2nd Edition. Softbound **\$10.00**.

**HF ANTENNAS FOR ALL LOCATIONS** by L. A. Moxon, G6XN. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and its Environment; Single-element Antennas; Horizontal Beams; Vertical Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna; Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound **\$12.00**

**TELEPRINTER HANDBOOK** with mechanical teleprinters available at inexpensive prices these days, this book shows how you can set up a RTTY station and keep the equipment running. Besides covering British made **RSGB publications are available from:**

machines, the *Teletypewriter Handbook* also covers maintenance, repair and operation of Teletype Model 15, 19, 28, 32, 33, and 43 units. Also covers reperforators, power supplies, demodulators, polar relays, keying methods, filters, and test equipment. 353 pages. Copyright 1983, 2nd Edition, Hardcover **\$21.00**.

**RADIO COMMUNICATION HANDBOOK** 5th Edition. You probably have the ARRL *Radio Amateur's Handbook* in your library. Now you can have a second source of authoritative radio frequency and electronics information at your fingertips. Contains 23 chapters (778 pages); Principles, Electronic Tubes and Valves, Semiconductors, HF Receivers, VHF and UHF Receivers, HF Transmitters, VHF and UHF Transmitters, Keying and Break-in, Modulation Systems, and RTTY, Propagation, HF Aerials, VHF and UHF Aerials, Mobile and Portable Equipment, Noise, Power Supplies, Interference, Measurements, Operating Techniques and Station Layout, Amateur Satellite Communication, Image Communication, the RSGB and the Radio Amateur, and General Data. Now in one paperback volume. Copyright 1982, **\$22.00**

**AMATEUR RADIO TECHNIQUES** by Pat Hawker, G3VA. Contains 800 diagrams and 364 pages of circuit ideas and devices which the author has gathered during 22 years of writing the *Technical Topics* columns in *Radio Communication*. It is not a text or handbook, but an idea book — RSGB's version of ARRL's *Hints and Kinks*, but on a larger and more in-depth scale. Copyright 1980, 7th Edition. Soft cover **\$12.50**.

**TEST EQUIPMENT FOR THE RADIO AMATEUR** by H. L. Gibson, G2BUP. A great addition to the library of the Radio Amateur who builds his own equipment. Beside measuring techniques, you will find a wealth of test equipment you can build yourself. Construction projects range from simple dummy loads and attenuators to a 150 MHz digital frequency counter and timer. You will find simple signal sources for 1296 and 2304 MHz and 10 GHz. Chapter titles and number of pages devoted to each: Current and Measurement — 23, Frequency Measurement — 23, Wavemeters — 19, RF Power Measurement — 9, Aerial and Transmission Line Measurements — 9, Noise Measurements — 8, Components, Valves and Semiconductors — 12, Signal Sources and Attenuators — 12, Oscilloscopes and Modulation Monitors — 8, Power Supplies — 3, and Reference Data — 8. Copyright 1978, 2nd edition. Hardbound **\$11.00**.

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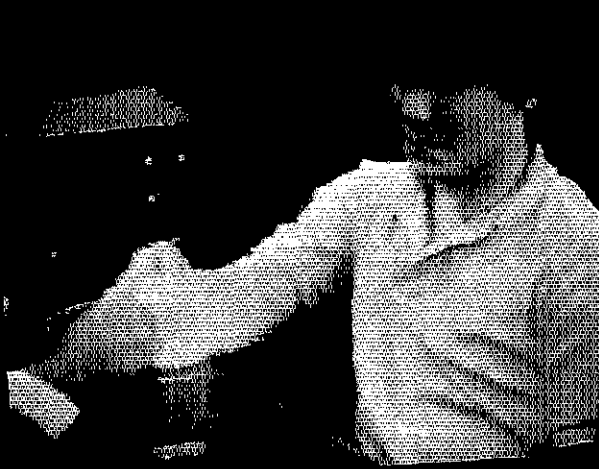
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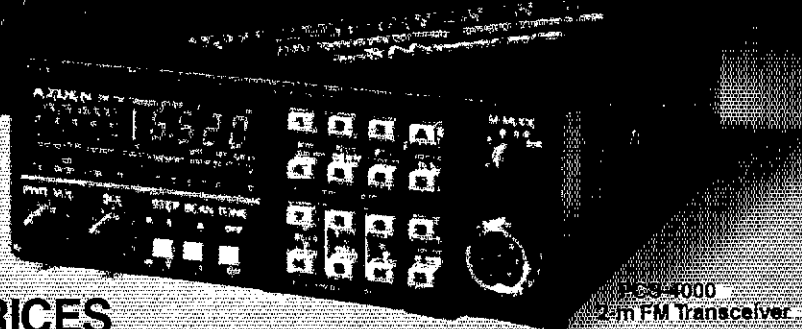
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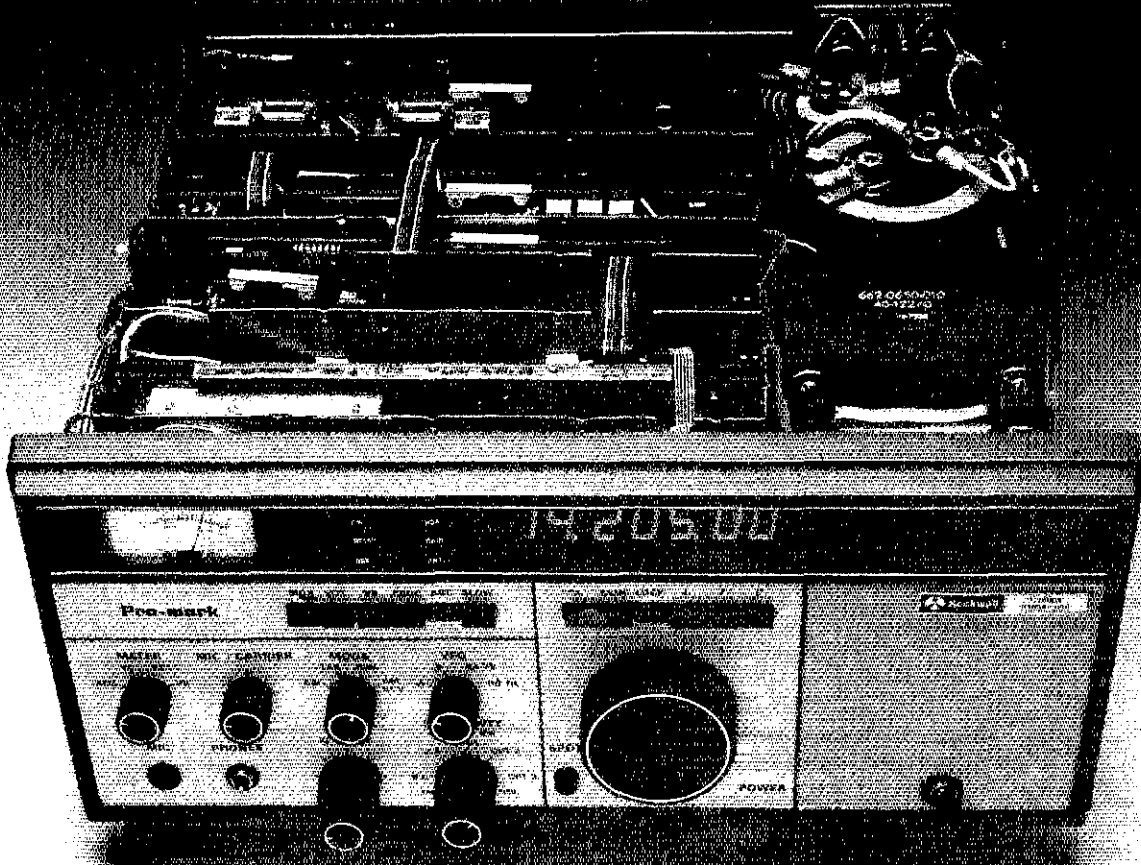
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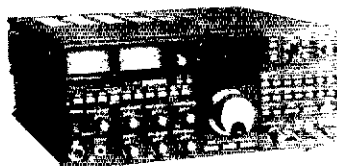
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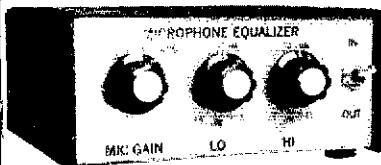
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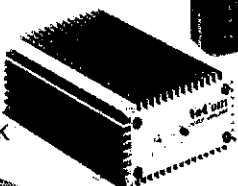
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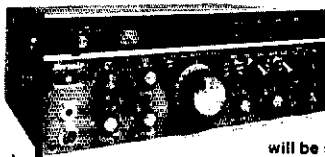
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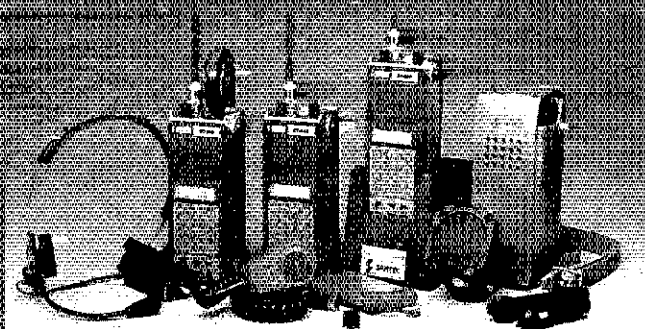


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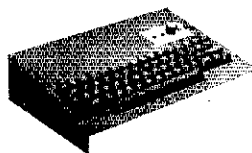


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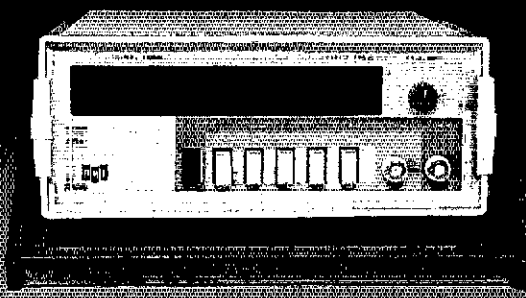
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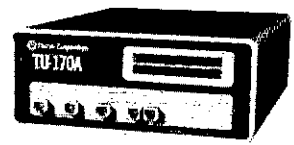
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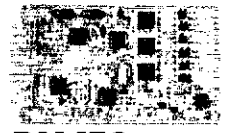
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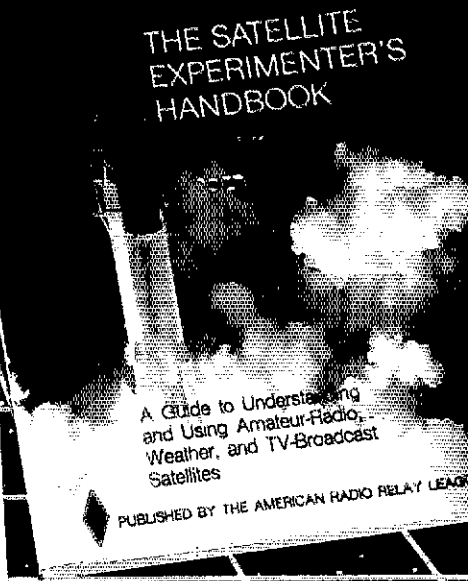
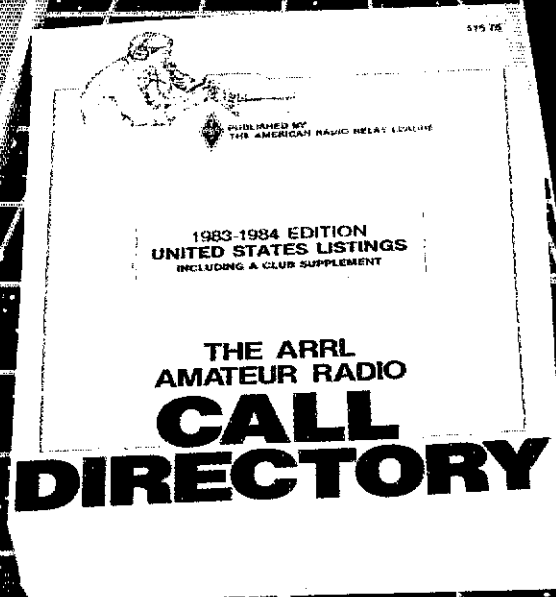
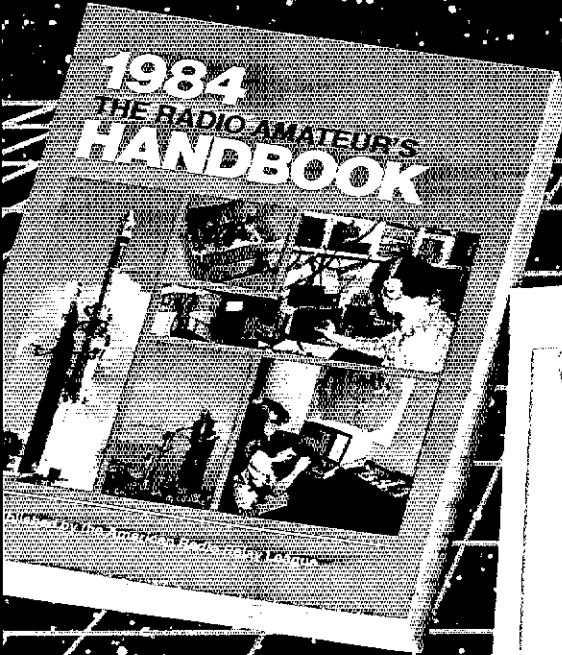
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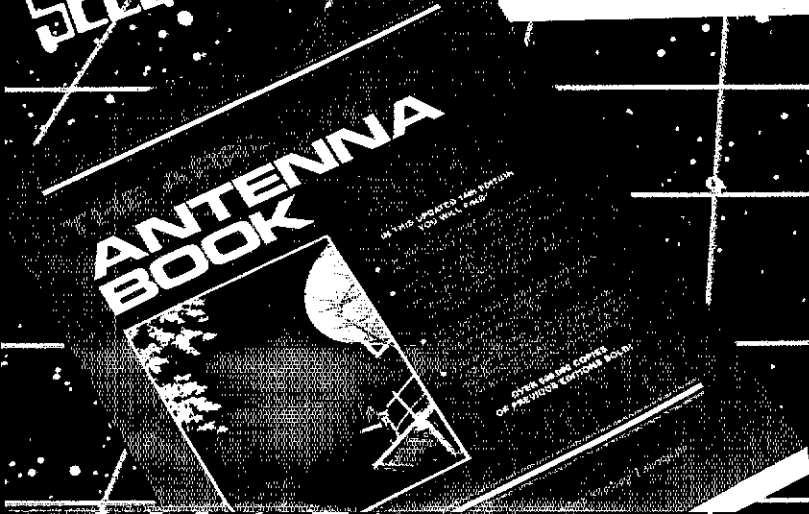
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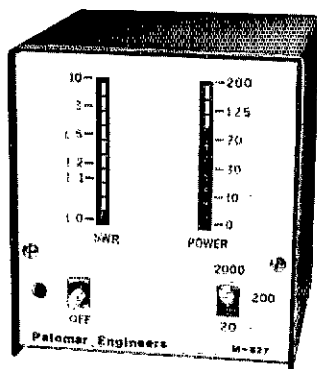
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15-3CD... \$119 15-4CD... \$129  
20-3CD... \$199 20-4CD... \$279  
40-2CD \$289 D40... \$149

### UHF/UHF BEAMS

A60-5... \$ 79 6178... \$199  
214B... \$ 79 3218... \$ 95  
220B... \$ 95 424B... \$ 79

### OSCAR/TWIST ANTENNAS

A144-10T... \$ 52 A144-20T... \$ 75  
A147-20T... \$ 63 4161B... \$ 59  
A147MB... \$ 29 PS4... \$ 69

### VHF/UHF FM ANTENNAS

A147-4... \$ 29 A147-11... \$ 49  
214FB... \$ 79 228FB... \$219  
A449-6... \$ 29 ARX29... \$ 39

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TH5MK2S Broad Band 5-el Triband Beam... \$319  
TH7DXS 7-el Triband Beam... \$379  
TH3JRS 3-el Triband Beam... \$159  
TH2MK3S 2-el Triband Beam... \$139  
HY-QUAD 2-el Triband Quad... \$279  
402BAS 2-el 40-mtr Beam... \$199  
205BAS 5-el 20-mtr Beam... \$299  
155BAS 5-el 15-mtr Beam... \$179  
105BAS 5-el 10-mtr Beam... \$119  
204BAS 4-el 20-mtr Beam... \$229  
203BAS 3-el 20-mtr Beam... \$139  
153BAS 3-el 15-mtr Beam... \$79  
103BAS 3-el 10-mtr Beam... \$59  
DB1015BAS 3-el 10/15 mtr Beam... \$159  
64BS 4-el 6-mtr Beam... \$55  
66BS 6-el 6-mtr Beam... \$109  
18HTS 80-10 mtr Hy-Tower Vertical... \$339  
LC-160 160-mtr Coll Kit for 18HTS... \$39  
214 14-el 2-mtr Beam... \$35  
2BDD 80/40 mtr Trap Dipole... \$49  
5BDD 80-10 mtr Trap Dipole... \$99  
BN86 80-10 mtr KW Balun W/Coax Seal... \$19

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### ALPHA DELTA COMMUNICATIONS

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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

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KT34A 4-el Broad Band Triband Beam... \$309  
KT34XA 6-el Broad Band Triband Beam... \$469  
3-8-180-mtr Rotatable Dipole... \$429  
7-2-140-mtr Rotatable Dipole... \$159  
7-2-2-40-40-mtr Beam... \$289  
7-2-3-3-el 40-mtr Beam... \$439  
7-2-4A-4-el 40-mtr Beam... \$599  
6el-20mtr Big Stick Monoband Beam... \$599  
6el-15mtr Big Stick Monoband Beam... \$389  
6el-10mtr Big Stick Monoband Beam... \$229  
10-30-7LP Log Periodic Broad Band Beam... \$599  
144-148-131BA 13-el 2-mtr Beam... \$79  
143-150-14C 14-el 2-mtr Satellite Antenna... \$79  
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	FK4544	44 ft	34.8 sq ft	\$1159
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6" Diam - 4 ft Long Earth Screw Anchor... \$12.95  
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502 Guy Insulator (1/4" Cable)... \$1.95  
5/8" Diam - 8 ft Copper Clad Ground Rod... \$11

### PHILLYSTRAN GUY CABLE

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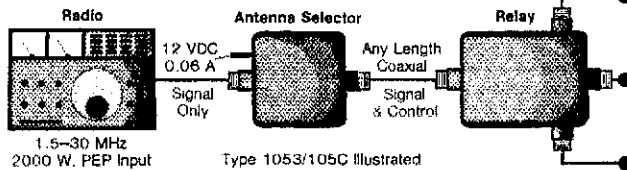
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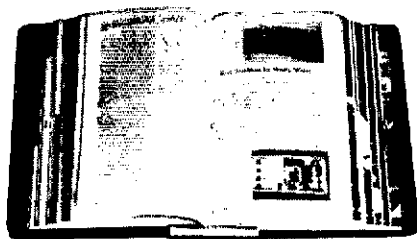
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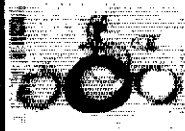
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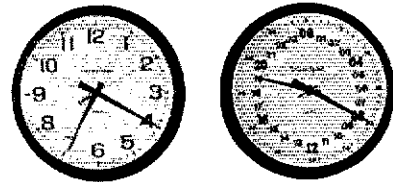
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 Apple® Interfacing (J. Titus, D. Larsen and C. Titus): 73, April  
 Armchair BASIC (A. and D. Fox): 54, May  
 BASIC Book, The (Helms): 54, May  
 Buyer's Guide to Radio and Electronics Parts (Hall): 70, Aug.  
 Computers and the Radio Amateur (Anderson): 16, Jan.  
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 Disassembled Handbook for TRS-80 (Richardson): 75, Jan.  
 DiskGuide™ Series (Osborne/McGraw-Hill): 13, Oct.  
 Emergency Communications: An Organizational and Operational Handbook: 34, Dec.  
 EMP Engineering and Design Principles (Bell Labs): 25, Feb.  
 Ferromagnetic Core Design & Applicable Handbook (DeMaw): 48, March  
 Guide to RTTY Frequencies (Ferrell): 70, Aug.  
 Hearst Business Communications IC Master (Howell, ed.): 14, Sept.  
 Introduction to Microcomputers, An: Volume 0 — The Beginner's Book (Osborne and Bunnell): 73, April

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 Packet Radio (Rouleau): 75, Jan.  
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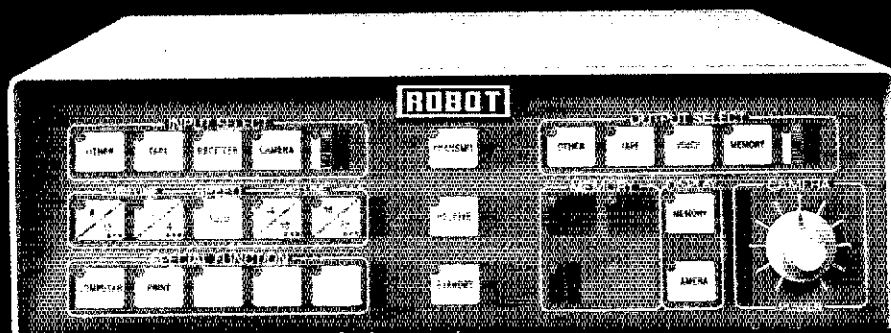
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# COLOR SSTV



## Introducing the Robot 450C and 1200C Single Frame Color SSTV Converters

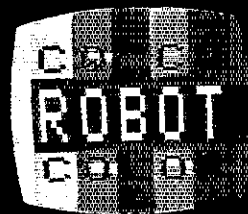
Robot's new color slow scan TV converters provide you with a whole new dimension of Amateur Radio activity. Now you can exchange color pictures of your latest DX QSL card, the best stamp in your collection, or even that terrific sunset scene you shot last summer.

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:



**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.**

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**World Leaders in Slow Scan TV, Phone Line TV and Image Processing Systems**

# YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

SATELLITES!!

SCATTER!!

M!!

EME!!



The New Yaesu FT-726R Tribander is the world's first multiband, multimode Amateur transceiver capable of full duplex operation. Whether you're interested in OSCAR, moonbounce, or terrestrial repeaters, you owe yourself a look at this one-of-a-kind technological wonder!

#### Multiband Capability

Factory equipped for 2 meter operation, the FT-726R is a three-band unit capable of operation on 10 meters, 6 meters, and/or two segments of the 70 cm band (430-440 or 440-450 MHz), using optional modules. The appropriate repeater shift is automatically programmed for each module. Other bands pending.

#### Advanced Microprocessor Control

Powered by an 8-bit Central Processing Unit, the ten-channel memory of the FT-726R stores both frequency and mode, with pushbutton transfer capability to either of two VFO registers. The synthesized VFO tunes in 20 Hz steps on SSB/CW, with selectable steps on FM. Scanning of the band or memories is provided.

#### Full Duplex Option

The optional SU-726 module provides a second, parallel IF strip, thereby allowing full duplex crossband satellite work. Either the transmit or receive frequency may be varied during transmission, for quick zero-beat on another station or for tracking Doppler shift.

#### High Performance Features

Borrowing heavily from Yaesu's HF transceiver experience, the FT-726R comes equipped with a speech processor, variable receiver bandwidth, IF shift, all-mode squelch, receiver audio tone control, and an IF noise blanker. When the optional XF-455MC CW filter is installed, CW Wide/Narrow selection is provided. Convenient rear panel connections allow quick interface to your station audio, linear amplifier, and control lines.

Leading the way into the space age of Ham communications, Yaesu's FT-726R is the first VHF/UHF base station built around modern-day requirements. If you're tired of piecing together converters, transmitter strips, and relays, ask your Authorized Yaesu Dealer for a demonstration of the exciting new FT-726R, the rig that will expand your DX horizons!

Price And Specifications Subject To  
Change Without Notice Or Obligation

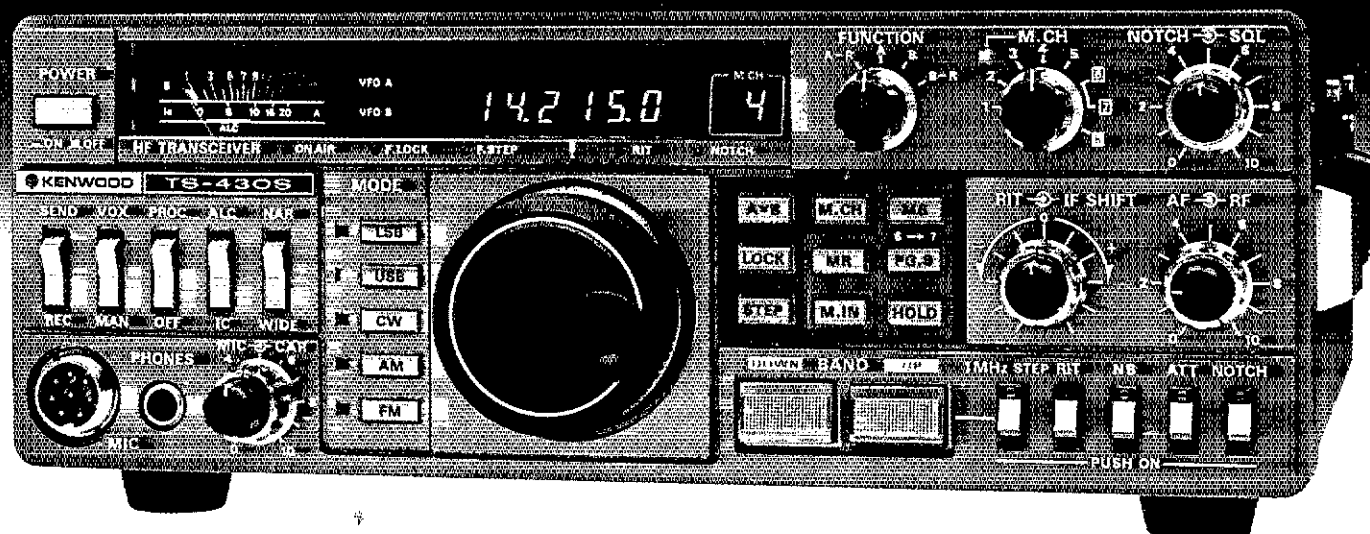
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# Digital DX-terity...



**General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch... COMPACT!**

## TS-430S

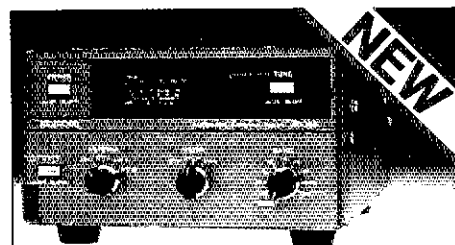
The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-30 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

### TS-430S FEATURES:

- **160-10 meter operation, with general coverage receiver**  
With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.
- **USB, LSB, CW, AM, with optional FM**  
Operates on USB, LSB, CW, and AM, with optional FM; internally installed. AGC time constant automatically selected by mode.
- **Compact, lightweight design**  
Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14.3 lbs. (6.5 kg.).
- **Superior receiver dynamic range**  
Use of 2SK125 junction-type FET's in the Dyna-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.
- **10-Hz step dual digital VFO's**  
10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross operation possible. Dial torque adjustable. STEP switch for tuning in 10-Hz or 100 Hz steps. A-B switch quickly shifts "B" VFO

to the same frequency and mode as "A" VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.

- **Eight memories store frequency, mode, and band data**  
Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.
- **Lithium battery memory back-up**  
Estimated five-year life.
- **Memory scan**  
Scans memories in which data is stored.
- **Programmable automatic band scan**  
Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.
- **IF shift circuit for minimum QRM.**  
IF passband may be moved to place interfering signals outside the passband, for best interference rejection.
- **Tuneable notch filter built-in**  
Deep, sharp, tuneable, audio notch filter.
- **Narrow-wide filter selection**  
NAR-WIDE switch for IF filter selection on SSB and CW when optional filters are installed. (2.4 kHz IF filter built-in.)
- **Speech processor built-in**  
Improves intelligibility, increases average "talk power".
- **Fluorescent tube digital display**  
Indicates frequency to 100 Hz (10 Hz modifiable).
- **All solid-state technology**  
Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit line protection. Operates on 12 VDC, or 120/220-240 VAC with optional PS-430 AC power supply.
- **All-mode squelch circuit, built-in**
- **Noise blanker, built-in**
- **RF attenuator (20 dB)**
- **Vox circuit, plus semi break-in with side-tone**



### Optional AT-250 Automatic Antenna Tuner

Designed to match the TS-430S in size, color, and appearance. Functionally compatible with any HF transceiver of 200 watts PEP or lower. (Requires manual bandswitching.)

- Covers 160-10 meter incl. WARC
- ABC Automatic Band Changing System (when used with TS-430S)
- SWR/Power meter
- 4 antenna terminals
- Built-in AC Power Supply.

### Other optional accessories:

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- FM-430 FM unit.
- YK-88C (1500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-55 (8P) mobile microphone.
- MC-60A deluxe desk microphone.
- MC-80 UP/DOWN desk microphone.
- MC-85 multi-function desk microphone.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

# KENWOOD

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