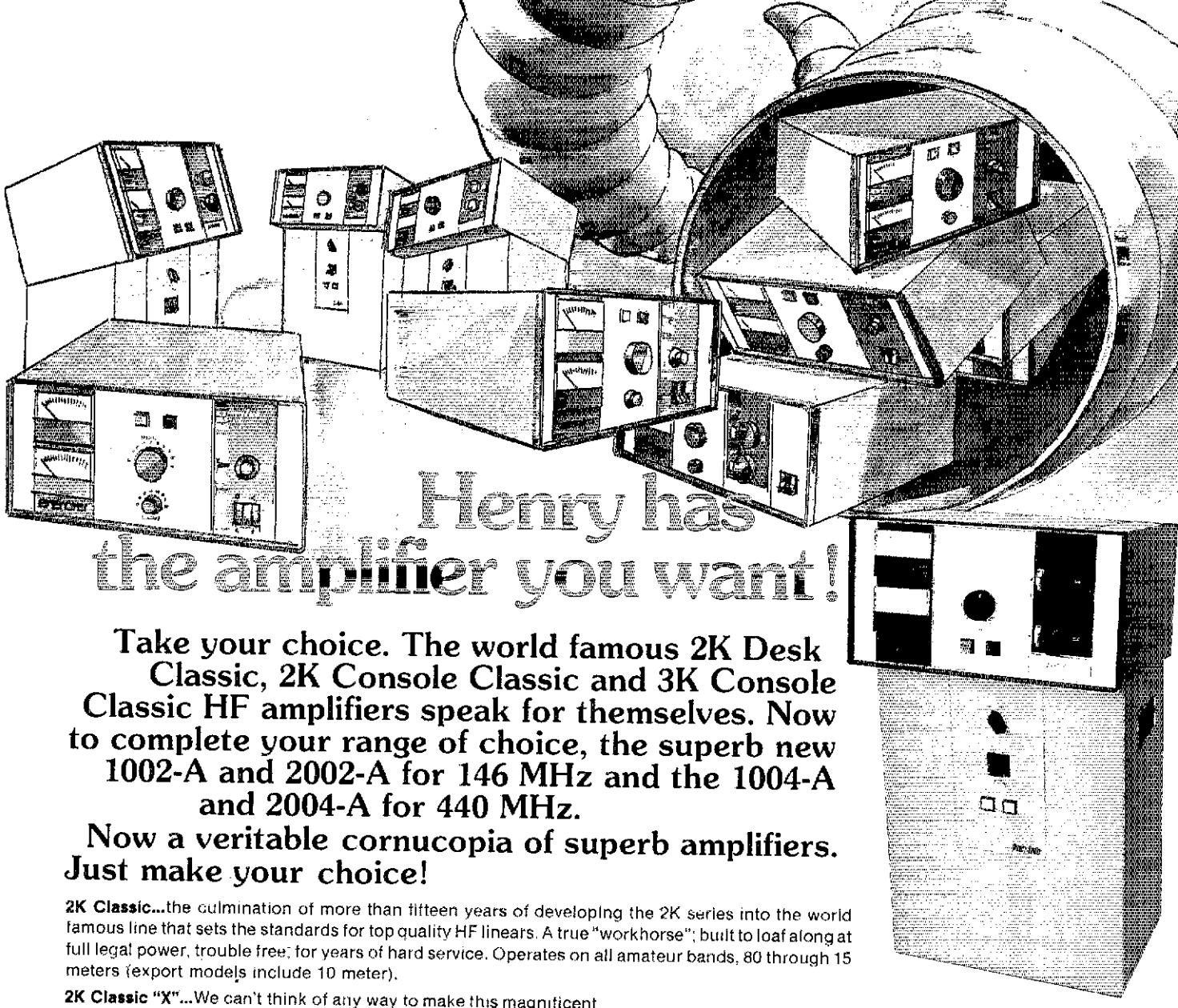
QST

March 1984 $2.75

devoted entirely to Amateur Radio

Getting ready for Volunteer Examining

Page 48



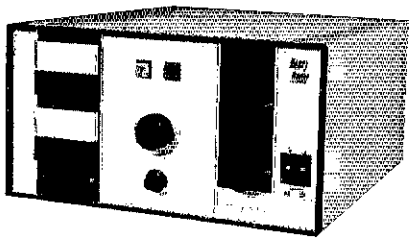
Henry has the amplifier you want!

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

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

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

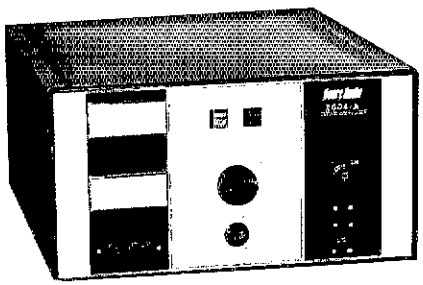
2K Classic "X"... We can't think of any way to make this magnificent 2000 watt amplifier better. Rugged...durable...the last amplifier you may ever need to buy.



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

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

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



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

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

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

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

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

Henry Radio

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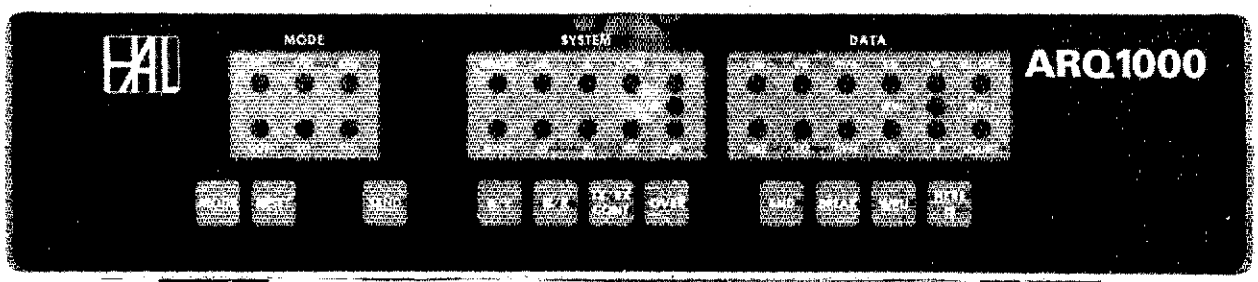
AMTOR RTTY

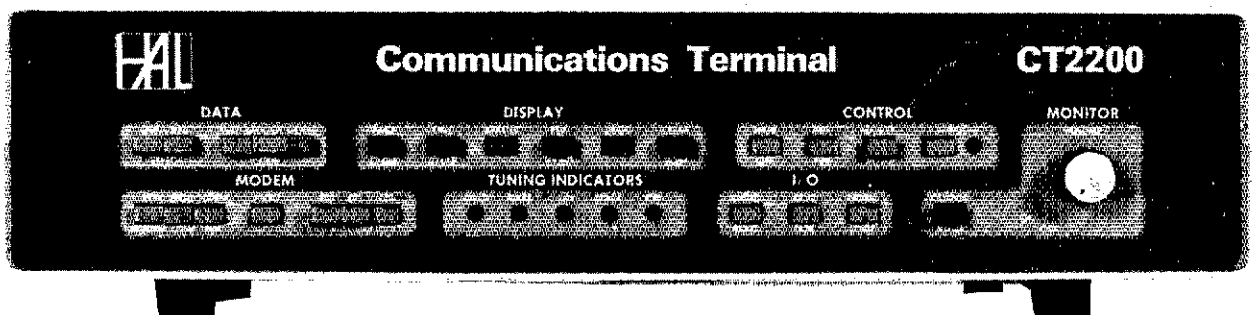


HAL is proud to announce the ARQ1000 code converter. This terminal not only supports the AMTOR amateur codes, but meets ALL of the commercial requirements of CCIR Recommendation 476-2. The ARQ1000 can be used with present and previous generation HAL RTTY products. In fact, any Baudot or ASCII full duplex terminal at data rates from 45 to 300 baud may be used with the ARQ1000. Some of the outstanding features of the ARQ1000 are:

- Send/receive error-free ARQ, FEC, and SEL-FEC modes
- Automatic listen mode for ARQ, FEC, and SEL-FEC
- Meets commercial requirements of CCIR 476-2
- By-pass mode for normal RTTY without changing cables
- Programmable ARQ access code, SEL-CAL code and WRU
- Programmable codes stored in non-volatile EEPROM
- Keyboard control of normal send/receive functions
- 30 Front panel indicators and 11 control switches
- Interfacing for loop, RS232, or TTL I/O
- "Handshaking" control for printer and keyboard or tape
- Self-contained with 120/240V, 50/60 Hz power supply
- Cabinet matches style and size of CT2200 and CT2100
- Table or rack mounting
- Built-in DM170 modem option available
- Encryption option available for commercial users
- 8½" × 17" × 10½"

The ARQ1000 is commercial-quality equipment that will give you the outstanding performance you expect from a HAL product. Write for full details and specifications of the ARQ1000.

BY POPULAR REQUEST



By popular request—the new CT2200. Our slogan is "When Our Customers Talk, We Listen"—and we have been listening. The CT2200 includes these often requested features:

- New AMTOR connections for use with ARQ1000
- Keyboard programming of all 8 "brag-tape" messages
- Programmable selective call code
- Expanded HERE IS storage for a total of 88 characters
- Non-volatile storage of HERE IS, "brag-tape," and SEL-CAL code
- 3⅝" × 17" × 10½"

All of the proven CT2100 features are retained. Some of these features are:
• Tuning scope outputs (a MUST for AMTOR) • Built-in demodulator for high tones, low tones, "103", or "202" modem tones • 36 or 72 character display lines • 2 pages of 72 character lines or 4 pages of 36 character lines • Split screen or full screen display • Baudot or ASCII, 45 to 1200 baud • Full or half duplex • Morse code send/receive at 5 to 99 wpm • Send/receive loop connection • Automatic transmit/receive control (KOS) • Audio, RS232C, or Loop I/O • On-screen tuning and status indicators • Clearly labeled front panel switches, not obscure keyboard key combinations • Separate convenient lap-size keyboard • Internal 120/240, 50/60 Hz power supply • Attractive shielded metal cabinet

In addition, an update kit is available so that all CT2100 owners can update their CT2100's to include CT2200 features. The kit even includes a new CT2200 front panel! Rather than making a proven product obsolete, HAL put even more behind the buttons. Pick up a CT2200 at your favorite HAL dealer and join the RTTY fun. Write for our full RTTY catalog.

HAL COMMUNICATIONS CORP.
Box 365
Urbana, IL 61801 (217) 367-7373

ICOM IC-R71A

The Best Just Got Better

IC-GC4
World Clock

ICOM introduces the IC-R71A 100KHz to 30MHz superior-grade general coverage receiver with innovative features including keyboard frequency entry and wireless remote control (optional).

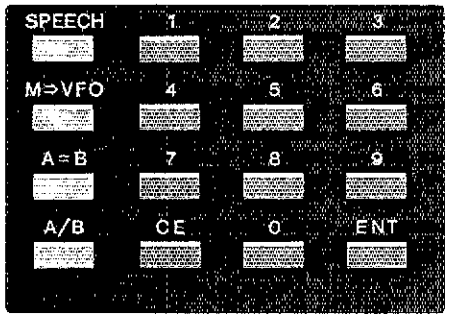
This easy-to-use and versatile receiver is ideal for anyone wanting to listen in to worldwide communications. Demanding no previous shortwave receiver experience, the IC-R71A will accommodate an SWL (shortwave listener), Ham (amateur radio operator), maritime operator or commercial operator.

With 32 programmable memory channels, SSB/AM/RTTY/CW/FM (optional), dual VFO's, scanning, selectable AGC and noise blanker, the IC-R71A's versatility is unmatched by any other commercial grade unit in its price range.

Superior Receiver Performance. Utilizing ICOM's DFM (Direct Feed Mixer), the IC-R71A is virtually immune to interference from strong adjacent signals, and has a 100dB dynamic range.

IC-RC11
Infrared
Remote

Passband tuning, a deep IF notch filter, adjustable AGC (Automatic Gain Control) and noise blanker provide easy-to-adjust clear reception, even in the presence of strong interference or high noise levels. A preamplifier allows improved reception of weak signals.



Keyboard Entry. ICOM introduces a unique feature to shortwave receivers... direct keyboard entry for simplified operation. Precise frequencies can be selected by pushing the digit keys in sequence of frequency. The frequency will be automatically entered without changing the main tuning control. Memory channels may be called up by pressing the VFO/M (memory) switch, then keying in the memory channel number from 1 to 32.

VFO's/Memories. A quartz-locked rock solid synthesized tuning system provides superb stability. Three tuning rates are provided: 10Hz / 50Hz / 1KHz.

32 Tunable Memories. Thirty-two tunable memories, more than any other general coverage receiver on the market, offer instant recall of your favorite frequency. Each memory stores frequency, VFO and operating mode, and is backed by an internal lithium memory backup battery to maintain the memories for up to five years.

Options. FM, synthesized voice frequency readout (activated by SPEECH button), RC11 wireless remote controller, CK1 DC adapter for 12 volt operation, MB12 mobile mounting bracket, two CW filters FL32 — 500Hz, and FL63 — 250Hz, and high-grade 455KHz crystal filter FL44A.

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)620-2780**

March 1984 *Volume LXVIII Number 3*

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CONTENTS

OUR COVER

Those red and green pins on the U.S. map represent nearly 4000 prospective Volunteer Examiners (those registered through mid-January). VE Program Clerk-Supervisor Lori McBride adds another pin to Texas. See page 48 for an update on the program.

TECHNICAL

BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

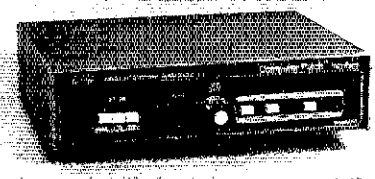
Try an AEA Breakthrough

ADVANCED ELECTRONIC APPLICATIONS, INC. was the first company to introduce a single chip microcomputer-based product (the AD-1 Auto Dialer) to the consumer market back in 1977. Since that time, AEA has developed a reputation for engineering design excellence (in both hardware and software), high manufacturing quality, outstanding customer service and prices that are competitive with products providing much less value. If you have never owned an AEA product, ask others who have and you will find a real pride in ownership resulting from years of reliable and enjoyable service.

MICROPATCH™ Low-Cost/High-Performance Interface with Software

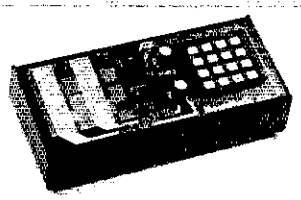
The **MICROPATCH™** computer interface is our latest example of engineering excellence bringing you superb value at a low, low price. The MICROPATCH is a COMPLETE RTTY/CW/ASCII PLUG-IN HARDWARE/SOFTWARE PACKAGE for either the Commodore 64 (model MP-64) or VIC-20 computer (model MP-20). The MICROPATCH includes MBATEXT™ software which is currently the most extensive and most user-friendly communications software available for the VIC-20 or C-64 computers. The hardware outperforms any competitive unit we have tested under $200, but is easily up-gradeable to the CP-1 Computer Patch™ without sacrificing $90 worth of software. You can also use it with any other computer by making use of the MICROPATCH hardware and procuring new software. The MICROPATCH is extremely easy to integrate into your station by simply wiring a mating microphone connector onto a cable pre-wired to the MICROPATCH and by providing audio to the 3.5 mm jack on the MICROPATCH from your receiver external speaker jack. The MICROPATCH comes complete with keyboard overlay prompting aid and operator's manual. Operates from 12VDC (power supply not included). For more information, see your dealer or use the coupon below.

COMPUTER PATCH™ Deluxe Interface



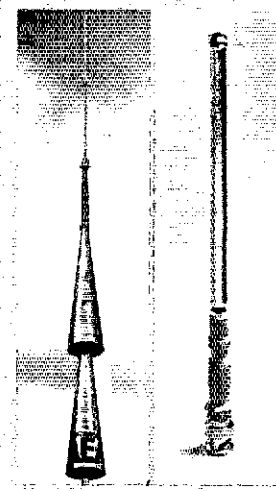
The **COMPUTER PATCH™** interface has earned a solid reputation for outstanding performance at a very reasonable cost. The COMPUTER PATCH features dual-channel Mark and Space filtering with a sophisticated Automatic Threshold Correction (ATC) circuit that allows for good copy even when either one of the tones is totally obliterated. The COMPUTER PATCH has become the new standard of excellence for computer interfaces. 117VAC wall adapter supply is included. AEA now has software available for most popular computers, including AMTORTEXT™ for the C-64 when used with the CP-1 or MICROPATCH.

MORSEMATIC™ Advanced Keyer/Trainer



AEA has developed the most sophisticated line of automatic microcomputerized Morse keyers and trainers in the world. AEA keyers and trainers are the standard against which all others have been judged and have fallen short. Two of our trainers (Model BT-1 and KT-3) are designed for people who have never learned the Morse Code. The BT-1 and KT-3 utilize our basic training program which actually teaches the code at 18 or 20 WPM character speed and allows you to go to 99 WPM. The proficiency training programs in the MM-2 and KT-2 are designed for the person who already knows the Morse Code, but wants to upgrade in the shortest time possible. All AEA keyers operate from 12VDC (power supply not included).

ANTENNAS



The **ISOPOLE™** patented antenna has caused more excitement in innovative VHF antenna design than any antenna in recent history. Initially called a "gimmick" antenna by our competitors, all the laughter has long since subsided as the ISOPOLE has proven to be a high performer, rugged yet sleek appearing, and easiest of all to assemble, with little chance for installation or tuning errors.

In the same vein, the AEA **Hot Rod™** antenna is shorter, lighter and less bulky than competitive 5/8 wave two meter handheld whips. Equally important, the Hot Rod does not have an out-of-phase current at the base that distorts the pattern as in the case of the 5/8 wave competitors. This means actual on-the-horizon gain for the Hot Rod relative to the 5/8 wave. In spite of the fact that a tuning network to match an end fed half-wave is far more difficult to achieve than for a 5/8 wave, the Hot Rod is priced to compete.

Since our beginning in 1977 with one unique and innovative product, our product line has grown to over 30 catalog items. For your free catalog describing all our fine products in detail, please fill out and return the attached coupon or better yet, see your dealer.

Please Send:
☐ Catalog ☐ Dealer List ☐ Price List ☐ Other

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AEA Brings you the Breakthrough!

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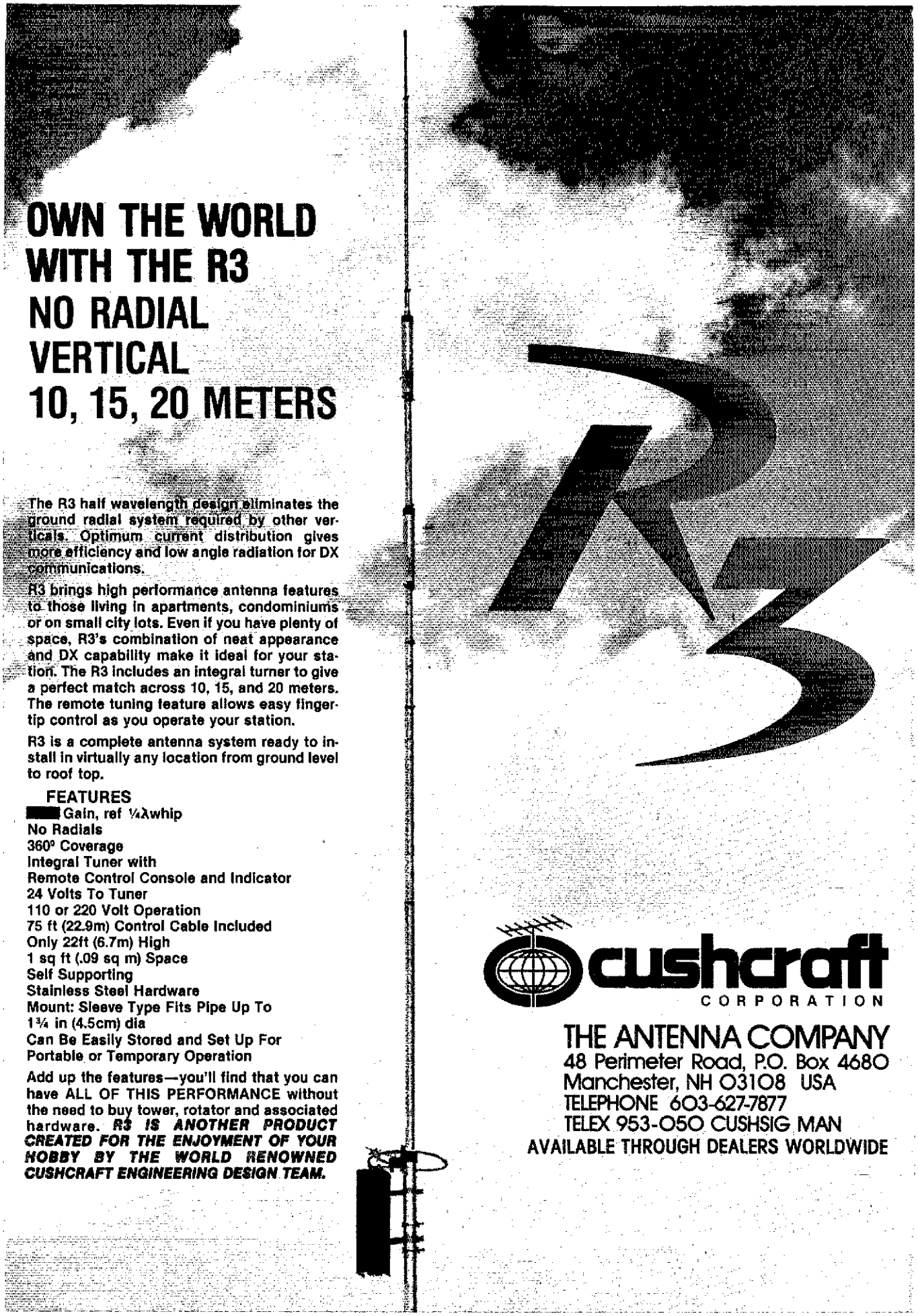
12/07/83



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

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

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

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

FEATURES

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

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

cushcraft
CORPORATION

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48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108 USA
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TELEX 953-050 CUSHSIG MAN
AVAILABLE THROUGH DEALERS WORLDWIDE

Digital DX-terity...

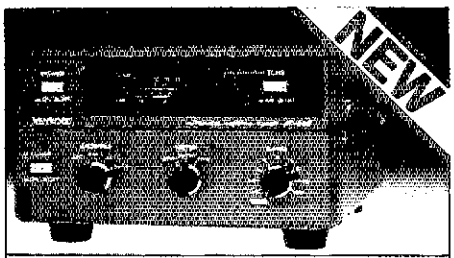
General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

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 interferring 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 final 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 (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand 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

pacesetter in amateur radio

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

Optional FC-10 frequency controller
May be easily connected to the TM-201A or TM-401A. Convenient control keys for frequency UP/DOWN, MHz shift, VFO A/B, and MR (memory recall or change memory channel). A green, easy-to-read, back-lighted LCD display indicates transmit/receive frequencies, memory channel number, ALERT, and SCAN (with blinking MHz decimal). Size: 4.4 (112)W x 1.4 (35)H x 0.9 (22)D, inch(mm). Weight: 3.5 oz. (100 g).

TM-201A/TM-401A

Ultra-compact and lightweight, priority, memory and band scan, 25 watts/TM-201A & 12 watts/TM-401A.

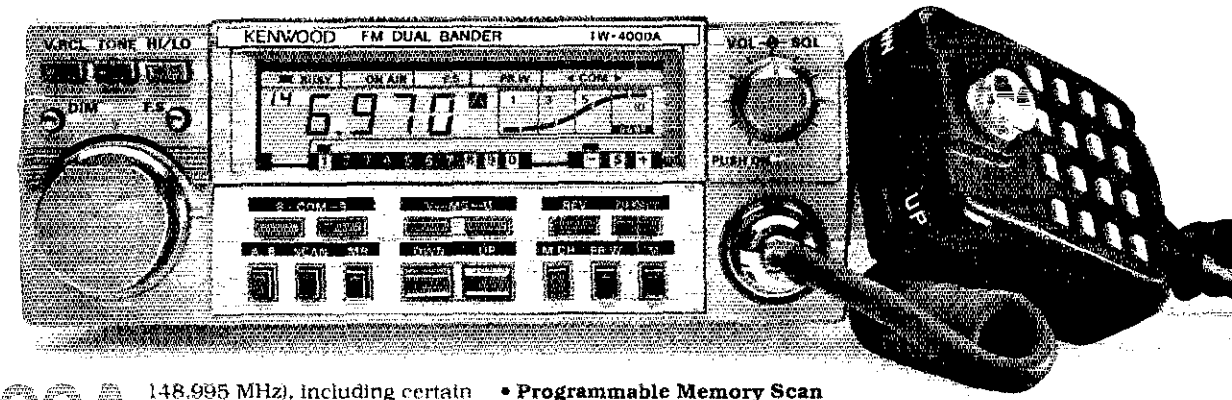
The KENWOOD TM-201A 2- meter and TM-401A 70-cm FM mobile transceivers are the smallest and lightest units available, allowing maximum flexibility in automotive installation.

TM-201A/TM-401A FEATURES:

- **Ultra compact and lightweight** Measures 5.6 (141)W x 1.6 (39.5)H x 7.2 (183)D, inch(mm), weighs 2.8 lbs., (1.25 kg.).
- **25-watt output, with HI/LO power switch** Produces a powerful 25 watts RF output from a surprisingly compact design (TM-201A).
- **Dual digital VFO's built-in**
- **5 memories plus "COM" channel, with lithium battery back-up (est. 5 yr. life)**
- **Memory scan/programmable band scan**
- **Priority alert scan**
- **Highly visible yellow LED frequency display**
- **High performance receive/transmit** GaAs FET RF amplifier for high sensitivity with wide dynamic range. Transmit modulation characteristics selected for best sound and minimum distortion.
- **External high quality speaker supplied** (No internal speaker)
- **16-key autopatch UP/DOWN microphone**
- **Repeater offset switch (±600-kHz/TM-201A; ±5 MHz/TM-401A; and simplex) and reverse switch**
- **Audible "BEEPER" confirms operation**
- **Easy-to-install mobile mount**

TM-201A/TM-401A accessories:

- **TU-3** programmable two-frequency CTCSS encoder
- **KPS-7A** fixed station power supply



TW-4000A

FM "Dual-Bander"... 2-m & 70-cm in single compact package, LCD, 25 W, optional voice synthesizer.

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**
- **25 Watts RF Power on 2-m/70-cm.**
- **Opt. "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**
- **Programmable Memory Scan**
- **Band Scan in Selected 1-MHz Segments**
- **Priority Watch Function**
- **Common Channel Scan**
- **Dual Digital VFO's**
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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

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

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

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

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

All membership inquiries and general correspondence should be addressed to the administrative headquarters at 225 Main Street, Newington, CT 06111 USA. Telephone: 203-666-1541, Telex: 643958 AMRAD NEWI.

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Amateur Radio Is Flying High!

The untimely death of ARRL President Vic Clark, W4KFC, last November cast a pall over what was otherwise a very bright period for Amateur Radio. Last summer's successful launch of OSCAR 10 ushered in a new era of amateur satellite communications; unprecedented national publicity resulting from the Grenada evacuation and W5LFL's operation from space gave radio amateurs a more favorable and higher-profile public image than we had enjoyed in many years; and FCC's dropping of its no-code license proposal proved that Washington *does* listen to us. To be sure, there were problems and challenges to be faced; but as 1983 drew to a close, radio amateurs had ample justification for feeling good about their avocation and themselves.

None of this happened by accident. It was the result of a lot of hard work by a lot of people. And the vehicle for much of that effort was the American Radio Relay League.

Our hopes for a successful satellite launch aside, the first indication that 1983 would be a very special year came with the realization that getting Amateur Radio aboard NASA's Space Shuttle was not just a fantasy. Dozens of amateurs and supporters in NASA, ARRL, AMSAT, Motorola and elsewhere were destined to become the team that made the first live Amateur Radio operation from space a reality. But that was just a part of the job; it was equally important that we take maximum advantage of this unparalleled opportunity for public exposure of Amateur Radio. Enter Roy Neal, K6DUE, and his team of video magicians. They conjured up a first-class videotape, *Amateur Radio's Newest Frontier,* on a schedule whose tightness was exceeded only by that of the budget. Armed with this and about a ton of Press Kits provided by ARRL Headquarters, our far-flung band of publicity guerillas set out, determined to get Amateur Radio's Shuttle involvement into the pages and onto the screens of their local media.

Before the *Columbia* even got off the ground, though, we found ourselves the targets of an unexpected media blitz when Amateur Radio became the only source of information as to what was happening on Grenada in the early hours of the October evacuation operation. Neighbors, and especially those with relatives and friends on the island, found themselves looking at our backyard antennas with new appreciation and respect. Not since the launch of Sputnik 1 in 1957, when hams were among the few equipped to hear the first man-made signals from space, had we served as the ears of the nation to such an extent and with so little warning.

With all this favorable publicity, one might reasonably expect to find an increasing number of people wanting to become radio amateurs — and already there are some signs that this is happening. For the past 90 days, sales of *Tune in the World,* the League's Novice licensing package for beginners, have run 40% ahead of the same period a year ago. Instructors across the country are reporting that their licensing classes are filling up. An encouraging trend in ARRL membership is developing, as well; after a period of decline following the last dues increase in 1981, membership increased during 1983 at a faster rate than did the number of FCC licensees. With no dues increase planned for 1984, this trend should continue.

But let's not kid ourselves; our quest to ensure a healthy and vibrant future for the Amateur Radio Service has just begun. We must turn public awareness of Amateur Radio into a desire to participate. In turn, we must translate this desire into a willingness to meet the licensing requirements, and to overcome the obstacles which discourage many new hams from ever getting on the air. Finally, we must complete the process by providing convenient opportunities for upgrading through the Volunteer Examiner Program. Each of these steps requires dedicated volunteers at the local level, willing to exchange a few hours of their time for the satisfaction of knowing they are helping Amateur Radio in their communities.

For willing volunteers, there is lots of assistance available. For example, we now have the post-flight version of *Amateur Radio's Newest Frontier* ready for distribution. The new program is 28 minutes in length, and draws heavily upon tape shot during the STS-9 mission by some 40 television stations throughout the country. It's even better than the pre-flight version! The tape is available on a free-loan basis for public showing and/or duplication, or you or your club may purchase a copy: See League Lines for details.

Yes, 1983 was quite a year for Amateur Radio. What shall we do for an encore? — *David Sumner, K1ZZ*

League Lines...

Roy Neal, K6DUE, and crew have completed editing the final version of "Amateur Radio's Newest Frontier," which is now available for distribution. This 28-minute edition features footage from W5LFL's historic operation as well as that of earthside stations attempting to contact him. Production work was completed at CBS Television City Sunday, January 15. Roy Neal is the Executive Producer, Alan Kaul, W6RCL, is the Producer, Frosty Oden, N6ENV, is the Editor and Bill Pasternak, WA6ITF, is the Field Producer and Technical Supervisor. If you would like to borrow a copy, write to the ARRL film library and specify whether you need VHS or U-matic along with the date needed. If you want to purchase a copy, the price for VHS is $25, and U-matic, $35. Both prices are "postpaid in the U.S." (foreign delivery extra). The Radio Society of Great Britain will be making PAL versions available in both VHS and Beta formats. Contact the RSGB (Alma House, Cranborne Rd., Potters Bar, Herts. EN6 3JW, England) for PAL version information.

"Spaceweek '84: America Leading The Way" is the theme for the fifth annual Spaceweek, to be held July 16-24. Coincidentally, the ARRL National Convention will be held July 20-22 in New York City featuring Astronaut Dr. Owen Garriott, W5LFL. If you or your organization were active in the STS-9/Ham Radio project, now is the time to start thinking of ways to gain local PR exposure during Spaceweek. If you would like to get in touch with people in your area who are working on Spaceweek '84, contact Spaceweek National Headquarters, P.O. Box 58172, Houston, TX 77258.

Owen Garriott, W5LFL, has approved the STS-9 QSL card design and has returned the material to ARRL Hq. The League is responsible for the printing of the cards. When they return from the printer, Hq. will send the appropriate card (2-way or SWL) and promotional enclosures to each of the people who reported contact or reception. Approximately 10,000 envelopes are ready for "stuffing." The Poughkeepsie (NY) ARC, Newington (CT) Amateur Radio League and Murphy's Marauders (CT) have volunteered to help with the final processing. Garriott will individually sign the QSLs going to those lucky enough to make it into his logs; his signature will be printed on the SWL cards.

Seventy-seven entries in the Special Service Club logo contest have been forwarded to the Membership Affairs Committee. The Committee will make a preliminary selection of the five or so best entries that will be submitted to the Board for final selection at its March meeting.

ARRL has filed two petitions regarding the 160-meter band. One requests that the power restrictions in 1900-2000 kHz be lifted because of the cessation of LORAN-A operations. The other requests that the Commission amend Section 97.61(a) of the rules to permit F1 emissions over the entire 160-meter band. Details in April Happenings.

Would you like a full-time job answering technical inquiries for the ARRL Technical Information Service? This is an entry-level position for a person with at least one year of electronics schooling or equivalent and Amateur Radio experience. Contact Paul Rinaldo, W4RI, at ARRL Hq.

Hq. is looking for someone with a background in writing and/or education who has volunteer public service experience. This newly created Assistant Communications Manager will be responsible for developing public service educational material including an emergency communications training course. Please contact John Lindholm, W1XX, at ARRL Hq.

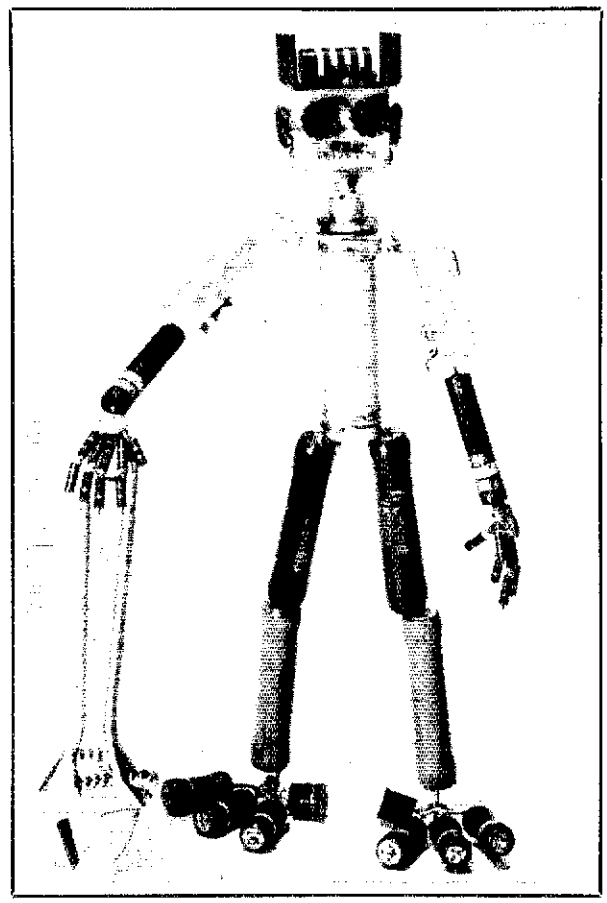
Responding to a Board request, the Management and Finance Committee has determined it is feasible to shift from two-year to four-year terms for ARRL Directors and Vice Directors. However, the Board has not yet decided whether it is a good idea to make the change. Have any thoughts? Let your Director know before the March 26 Board Meeting in Hartford. Names and addresses can be found on page 8.

FCC says employer-employee and employee-employee relationships are not necessarily prohibited under the Novice testing procedure. They also say that "in-law" relationships are considered to be "family" relationships, and thus prohibited for testing purposes (Section 97.319(a)(ii)). Details in next month's Happenings.

Don't miss your chance to be a Charter Contributor to the Goldwater Scholarship fund. See page 58.

• *First Steps In Radio*

Understanding Resistors



Part 3: Without resistors we would be unable to build electrical circuits. What part do they play in a circuit? How are they rated? What do the color bands mean?

By Doug DeMaw,* W1FB

What is a resistor? Well, it is an electronic component that functions precisely as the name implies — it *resists* alternating or direct current. Resistors come in many sizes, shapes, power ratings and tolerances. Some have the value (resistance is specified in ohms) stamped on the case, while others have a group of color bands that help us to learn the resistance value. Let's learn more about resistors.

The Nature of Resistors

We can think of the resistor as an imperfect conductor. On the other hand, a perfect conductor would have *no resistance* at all. Therefore, if we had a test instrument that could accurately read ac or dc resistance to a finite value (zero ohms, in this case), the instrument would indicate zero ohms when the test set was arranged to read the resistance from one end of the conductor to the other (see Fig. 1). Perfect or nearly perfect conductors are necessary in many electronic circuits, but we also need to have poor conductors — namely resistors — in many parts of our radio circuits. This is where the resistor does its job.

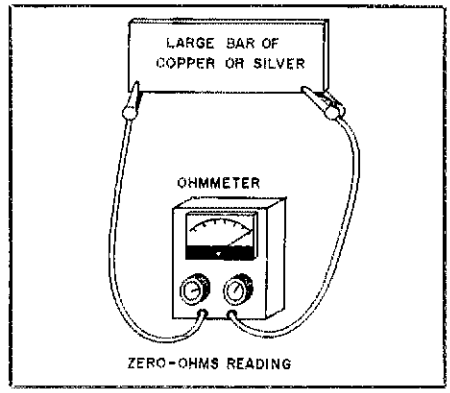


Fig. 1 — A perfect conductor would show a zero resistance. A large bar of highly conductive metal might represent a perfect conductor.

In electronics work we usually measure the resistance of a material with an instrument known as an *ohmmeter*. Many hams and experimenters own a VOM (volt-ohmmeter) that is used for this purpose. A VOM also measures ac and dc voltage, and may include a function for measuring dc. Inexpensive VOMs can be obtained from Radio Shack, Heathkit and similar outlets that sell components for experimenters. You should acquire a VOM for use in learning radio theory (lab experiments) and for design and repair work after you become experienced in Amateur Radio.

Power Classification

The greater the current that flows through a resistor the higher the power (wattage) rating must be. Resistors are available with ratings from as low as 1/8 watt to hundreds of watts. If the power rating of a resistor is too low for a particular circuit, it will get hot and burn out, sometimes quickly and other times gradually, depending on how much lower the rating is than the circuit application requires. When power is dissipated (as within a resistor) there will be heat. This is demonstrated clearly by an electric heater or toaster. The heating element in such appliances is a gigantic power resistor made from nichrome wire. This wire has a resistance that causes power to be dissipated as current passes through the wire. The wire glows from a red color to an almost yellowish color in some instances.

We could not tolerate having our radio-circuit resistors get that hot, so they are designed to operate cool or slightly warm to the touch. Choosing the correct power rating is, therefore, essential (more on this

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Table 1
Resistor Color Codes†

Band Color	Number (First Two Bands)	Zeros (Last Band)
Black	0	—
Brown	1	0
Red	2	00
Orange	3	000
Yellow	4	0,000
Green	5	00,000
Blue	6	000,000
Purple	7	0,000,000
Gray	8	00,000,000
White	9	000,000,000

†Used on small carbon-composition units

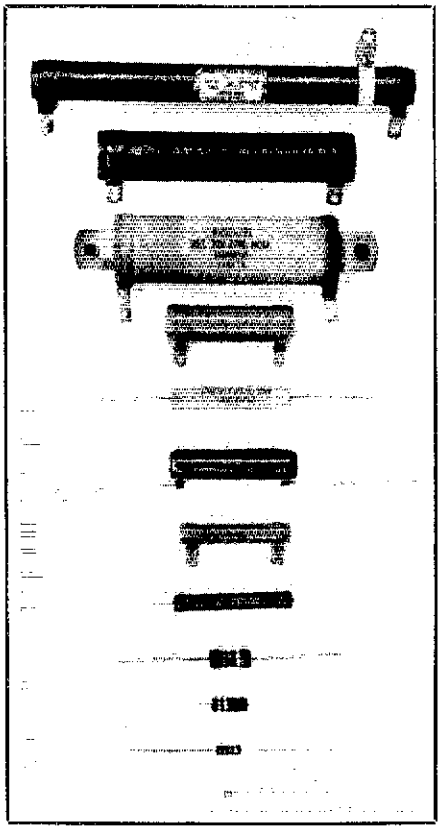


Fig. 2 — Photograph of various types of common resistors. The high-wattage types start at the top and the low-power resistors are at the bottom.

later). Fig. 2 shows a number of resistors of various wattage ratings. Low-power radio circuits (such as pocket-size transistor radios) use very tiny resistors ¼-watt sizes) because very little current flows in those circuits. On the other hand, we may find huge power resistors in large items of equipment, such as power supplies, that deliver large currents.

How to Read a Resistor Color Code

If we are to work with resistors we must learn how to determine their values from the color bands that are printed on them. Table 1 lists the colors found on resistors and shows what each color band represents numerically. You will want to memorize these numerical designators to be able to recognize and select them easily later on. There is usually a fourth color band on small carbon-composition resistors. It indicates the tolerance of the resistor in ohms — the percentage the actual resistance can vary, plus or minus.

Fig. 3 shows some examples of resistors with color bands, and provides the ohmic value of each. Remember that the term "k" means *thousand* and "M" stands for *million*. Thus, a 2.2-kΩ (kilohm — the omega symbol stands for ohms) resistor has 2200 ohms of resistance. Similarly, if the resistor is a 2.2-M (megohm) unit, the resistance is 2,200,000 ohms. Resistors are available with ratings from a fraction of an ohm to millions of ohms, but they come in *standard values* only. That is, resistors are not available for every possible ohmic round-number value.

Table 2 lists the standard values of primary interest to amateurs. If we need a special resistance value that falls between the standard value we can purchase, we must use a combination of resistors in parallel or series to obtain the needed value. More on that later. Alternatively, we may use a variable resistor (one for which the value can be changed by mechanical adjustment over a specified ohmic range). A volume control on a radio is an example of a variable resistor (also known as a potentiometer or "pot").

Physical Forms

Various formats are used in the manufacture of resistors. Some have wire leads (pigtails) that come out of the ends of the resistor bodies. Others have a tab at each end to which we may solder our circuit connections. The variety with tabs are

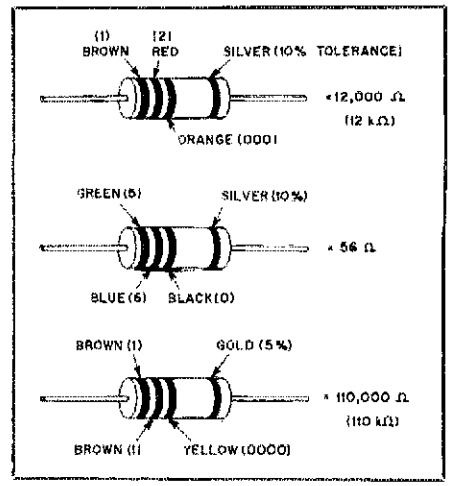


Fig. 3 — Three color-code examples to illustrate how to determine the value of a resistor that is banded.

called "power resistors" and are quite large. Some integrated circuits (ICs) contain microscopic arrays of resistors. Connection to those resistors is by means of the pins on the IC body.

There are many kinds of variable resistors. Some have sliders that make contact with the wire from which the resistor is made. As the slider is moved from one end of the resistor to the other, the effective resistance is changed. Panel-mounted variable resistors are used as volume and tone controls, as well as for a host of other functions, such as adjustment controls on TV sets. Other circuits contain variable resistors that must be adjusted by means of a screwdriver. These are called "trimmer resistors" or "Trimpots,"® which are generally set for a specific resistance just

Table 2
Standard Resistance Values

Resistors with ±10% tolerance are available only in values shown in bold type. Resistors with ±5% tolerance are available in all values shown.

Ohms									
1.0	3.6	**12**	43	**150**	510	**1800**	6200	**22000**	75000
1.1	**3.9**	13	**47**	160	**560**	2000	**6800**	24000	**82000**
1.2	4.3	**15**	51	**180**	620	**2200**	7500	**27000**	91000
1.3	**4.7**	16	**56**	200	**680**	2400	**8200**	30000	**100000**
1.5	5.1	**18**	62	**220**	750	**2700**	9100	**33000**	110000
1.6	**5.6**	20	**68**	240	**820**	3000	**10000**	36000	**120000**
1.8	6.2	**22**	75	**270**	910	**3300**	11000	**39000**	130000
2.0	**6.8**	24	**82**	300	**1000**	3600	**12000**	43000	**150000**
2.2	7.5	**27**	91	**330**	1100	**3900**	13000	**47000**	160000
2.4	**8.2**	30	**100**	360	**1200**	4300	**15000**	51000	**180000**
2.7	9.1	**33**	110	**390**	1300	**4700**	16000	**56000**	200000
3.0	**10.0**	36	**120**	430	**1500**	5100	**18000**	62000	**220000**
3.3	11.0	**39**	130	**470**	1600	**5600**	20000	**68000**	

Megohms				
0.24	0.62	1.6	4.3	11.0
0.27	**0.68**	**1.8**	**4.7**	**12.0**
0.30	0.75	2.0	5.1	13.0
0.33	**0.82**	**2.2**	**5.6**	**15.0**
0.36	0.91	2.4	6.2	16.0
0.39	**1.0**	**2.7**	**6.8**	**18.0**
0.43	1.1	3.0	7.5	20.0
0.47	**1.2**	**3.3**	**8.2**	**22.0**
0.51	1.3	3.6	9.1	
0.56	**1.5**	**3.9**	**10.0**	

once, then left in that position. Fig. 4 shows a number of variable resistors.

Putting the Resistor to Work

Let's imagine that we built a small transistorized audio amplifier designed to increase the output from a microphone. We would need some resistors to perform electrical tasks within the circuit. The diagram in Fig. 5 illustrates our use of resistors. The illustration at drawing A is a refresher of sorts on how to read a diagram (see Part 2). It shows the physical aspects of our little microphone amplifier. Examine the schematic diagram at B of Fig. 5. Note that at the top end of R4 we have a lower voltage than is found at the battery terminals. That is because R4 is a resistor, and when the transistor (Q1) draws current through R4 it will cause what is known as a *voltage drop*. The higher the current flow, or the greater the resistance of R4, the greater the voltage drop across the resistor.

This can be used to advantage in many circuits where the battery or power-supply voltage is too high for a particular transistor, tube or IC. The proper value of resistor is used to ensure that the transistor is protected from excessive voltage or current. Too much voltage (and the increased current) can cause the transistor to overheat and be destroyed, or the excessive voltage might puncture the inner elements of the transistor and destroy it.

In order for us to select a correct value of resistance for R4, we need to know the amount of current in that branch of our circuit. That exercise is beyond the purpose of this discussion, but we mention it now for tutorial purposes. Once we know the current value in such a circuit (we'll assume it is 1 mA in Fig. 5), we can choose a resistor value to provide the desired operating voltage. We will use Ohm's Law, which shows the relationship between resistance, voltage and current in simple algebra:

$$R = \frac{E}{I} \text{ ohms} \qquad \text{(Eq. 1)}$$

where E is the desired voltage drop, and I is the circuit current in amperes (note that 1 mA equals 0.001 A). Hence, if we have a 9-V battery and desire 4.7 volts at the collector of Q1 (Fig. 5B), our resistor must drop 4.3 volts. Its resistance will be determined by

$$R = \frac{4.3 \text{ V}}{0.001 \text{ A}} = 4300 \text{ ohms} \qquad \text{(Eq. 2)}$$

If we subtract 4.3 (the voltage drop across R4) from 9 volts, we have 4.7 volts at the collector.

R4 serves still another purpose in our circuit. Since it resists the passage or flow of dc and ac, it will hold back our amplified voice signal (composed of ac energy) and prevent it from being lost into ground via the battery. Instead, the audio energy is directed to the output jack (J1) through capacitor C3. If R4 were too low in resistance we would lose a large part of the audio signal before it reached J1.

R1 and R2 are used at the input of our Fig. 5 circuit for the purpose of establishing a small operating voltage (approximately 0.9 V) at the base of Q1. Those resistors also isolate the signal from our microphone so it is routed to Q1 rather than to ground via BT1.

Our circuit needs a small voltage at the emitter of Q1, so we are using R3 to develop what is called *self bias* (emitter bias). The 0.001-A current of the transistor also flows to ground through R3. This creates a

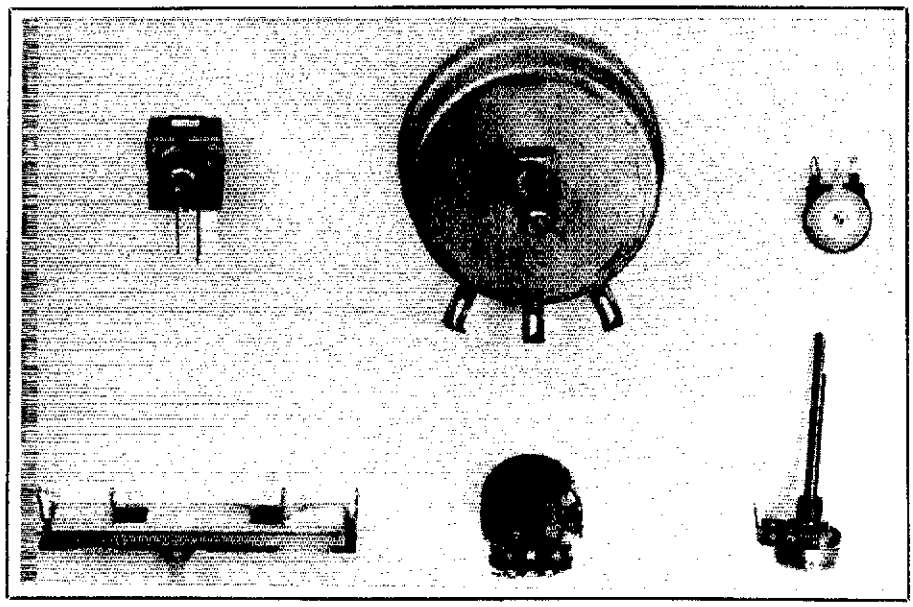


Fig. 4 — Photograph of assorted variable resistors. Some can be adjusted by means of a knob, while others require a screwdriver to change the effective resistance value.

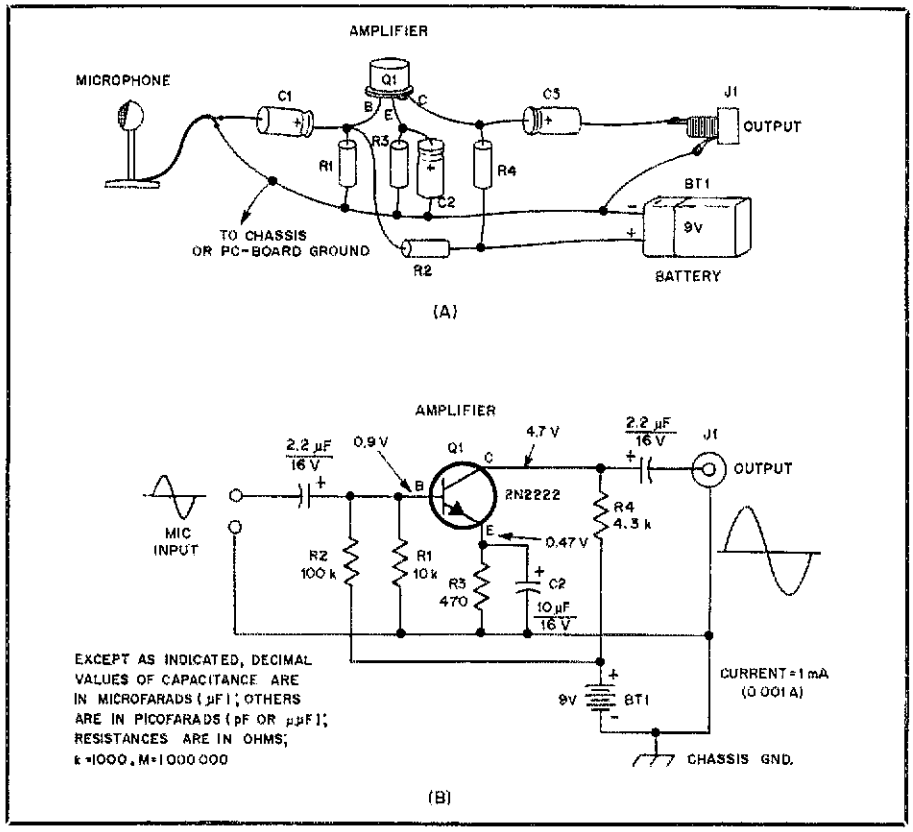


Fig. 5 — Pictorial (A) and schematic (B) examples of a simple one-stage audio amplifier. This set of examples is presented for text-discussion purposes.

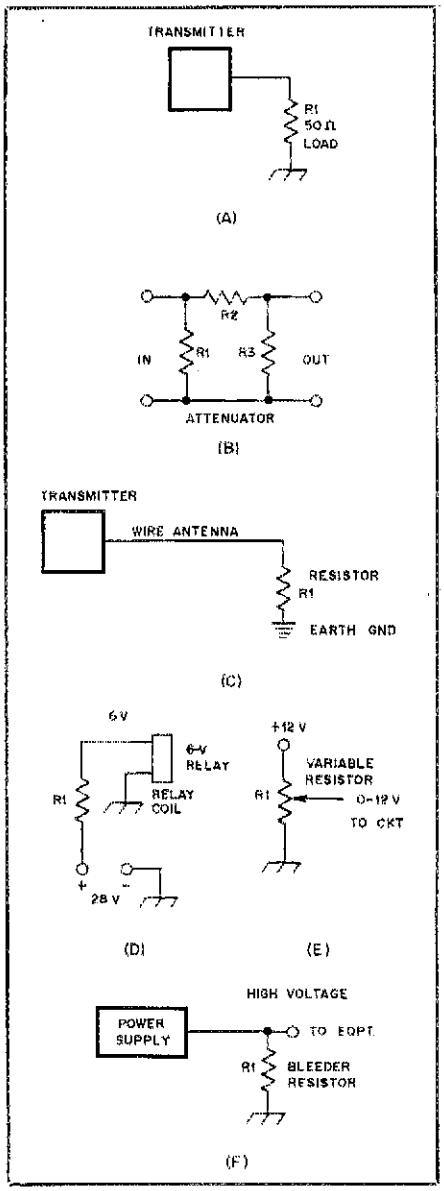


Fig. 6 — Various applications for resistors (see text).

voltage drop across the resistor, which in this case is 0.47 V. This can be calculated from another form of Ohm's Law:

$$E = IR$$
$$= 0.001\ A \times 470\ \Omega = 0.47\ V \quad \text{(Eq. 3)}$$

where I is in amperes (A) and R is in ohms.

If you have a voltmeter available I suggest you obtain the parts for the circuit in Fig. 5 and tack it together for experimental use. Try various resistance values at R4 to see how the collector voltage at Q1 changes. Of course, as the resistance is made greater, the current drawn by Q1 will fall. But, once you measure the voltage drop across R4 you will be able to calculate the current of Q1. Since Ohm's Law is the basis of electrical work, and may appear on license exams, you should practice your calculations now. You can learn what the current flow is from still another version of Ohm's Law:

$$I = \frac{E}{R} \text{ amperes} \quad \text{(Eq. 4)}$$

where E is the drop across the resistor in volts and R is the resistor value in ohms. Furthermore, if you build the test circuit neatly on a printed-circuit or "perf" board, you can try it with your microphone by placing it between your mike and the input of an audio hi-fi amplifier.

I believe strongly in "learning by doing." I hope you will get involved with the simple lab experiments suggested in this series. They will bolster your "book larnin."

Some Other Uses for Resistors

The applications for resistors are so numerous, and at times detailed, that we could fill an entire book discussing them all. But for the sake of brevity let's examine a few examples of where we might apply resistors in routine amateur work.

Fig. 6A shows a transmitter to which we have connected a 50-ohm resistor (R1). This is called a *dummy load* or *dummy antenna*. If R1 is the same resistance as the transmitter output (usually 50 ohms), and if it can safely handle the transmitter output power, we may use R1 in place of an antenna during transmitter tests. We thereby prevent our signal from going out over the air and possibly interfering with another amateur.

Fig. 6B shows three resistors used in an *attenuator* circuit. Attenuators can be designed to reduce the power by almost any amount we desire. The example shows a circuit that will reduce the input power to a desired output power level. The amount of power reduction (attenuation) depends on the resistance values selected for resistors R1, R2 and R3. In other words, if we had a low-power transmitter we wanted to use to drive a high-power amplifier, but the small transmitter put out too much power, we could use an attenuator. It would be placed between the transmitter and amplifier. In our example, because the attenuator in Fig. 6B cuts power in half, we would get 30 watts into the amplifier if the transmitter put out 60 watts.

Resistors are sometimes used in antenna systems, as shown in Fig. 6C. R1 can be used to make the antenna present a particular resistance to the transmitter and receiver. An antenna of this type is called a *terminated antenna*, because the resistor is used at the far end (termination).

Sometimes we hams buy surplus relays for our projects. They may have the wrong voltage rating for the power supply we have on hand. Fig. 6D shows how we might lower the relay operating voltage if it requires a lower potential than that of our power supply. To find the value of R1 we can measure the resistance of the relay coil with an ohmmeter, then apply Ohm's Law in accordance with the voltage drop needed.

Earlier in this article we talked about variable resistors. An example of one is given in Fig. 6E. The resistor has a movable contact that can be varied for any voltage from 0 to 12.

Finally, in Fig. 6F we see a resistor being used as a *bleeder*. Power supplies that provide dangerous voltage potentials (hundreds or thousands of volts) are equipped with bleeder resistors. Your ham license exam may have a question about this. The resistor permits the power-supply voltage to trickle or bleed off slowly (seconds) when the supply is turned off. This protects the operator against an accidental shock (which could be lethal) from the charge stored in the filter capacitors. R1 has a sufficiently high resistance to prevent it from taxing the power supply (drawing excessive current) during normal operation.

The Wattage Rating of Resistors

Each resistor we use must be chosen in accordance with the power that will be dissipated within it. If it isn't, we can burn up a resistor rather quickly! Resistors come with various wattage ratings, and for most low-current, low-voltage operations (such as in transistor radios) we will use ¼- or ½-watt units. The wattage rating of a resistor signifies the *maximum* safe power it will dissipate without changing value or burning out. As a safety margin it is wise to use the next higher rating than the circuit demands. In other words, if ½ watt of power was dissipated in a resistor, a ½-watt unit and would be warm to the touch and you'd want to use a 1-watt unit.

We can learn the power consumption in a circuit branch if we know any two of the voltage, current or resistance values.

$$P = E \times I$$
$$= I^2R$$
$$= \frac{E^2}{R} \quad \text{(Eq. 5)}$$

where P = power in watts, E is in volts, I is current in amperes and R is in ohms. Thus, if the branch of our circuit that contains a resistor has a current flow of 50 mA (0.05 A) and the resistor is 470 ohms, the power dissipated in the resistor will be 1.175 watts, from

$$P = I^2R = 0.05^2 \times 470\ \Omega = 1.175\ W \quad \text{(Eq. 6)}$$

This tells us that a 2-watt resistor should be installed in that part of the circuit.

Resistor Combinations

At the start of our discussion I mentioned combining resistors in series or parallel to obtain special values of resistance. How might we do this and know the resultant value of resistance? Simply by doing a bit of basic math with a calculator or slide rule, or by longhand.

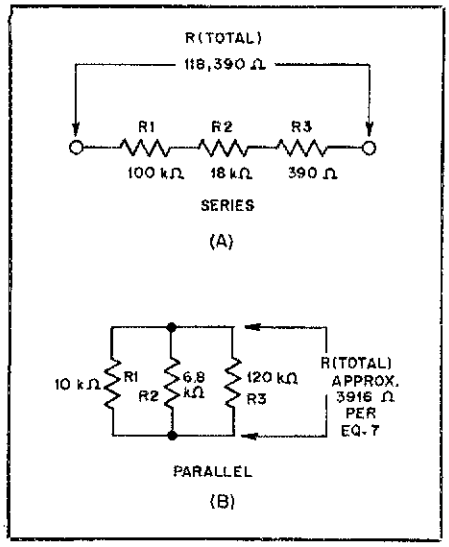


Fig. 7 — Resistors in series result in the combined ohmic value of the string (A). When resistors are wired in parallel (B) we must use Eq. 7 to learn the resultant total resistance.

Glossary

bias — a voltage, normally on the input lead of an active device (tube or transistor), to make the active device operate in a desired region. Bias sets the resting voltage when no signal is present.

parallel — a way of connecting two or more components together in a side-by-side manner. The current is divided between the two or more branches formed. For example, the following two resistors are connected in parallel:

relay — a switch that can be remotely controlled by an electrical signal. The control signal goes to a coil that magnetically pulls an armature, which in turn causes the switch to move from its normal position.

series — a way of connecting two or more components together in a string so the same current goes through each. For example, these two resistors are connected in series:

When we connect resistors in series (Fig. 7A) we merely add the values of the individual resistors. But, when we place the resistors in parallel we must use Eq. 7.

$$R(total) = \frac{1}{\frac{1}{R1} + \frac{1}{R2} + \frac{1}{R3} \cdots} \text{ ohms (Eq. 7)}$$

Fig. 7B shows a combination of series resistors and the net value of resistance, as determined from Eq. 7. When resistors are used in this manner they occupy considerably more room in the circuit than if a single unit were employed. But, using series or parallel combinations is often necessary to obtain a critical value of fixed resistance.

Final Comments

I hope you now have a basic understanding of what resistors are and why they are necessary. Next month we will discuss capacitors in the same fashion. Meanwhile, let me encourage you to obtain some small hand tools, a soldering iron, a VOM and some rosin-core solder. This will enable you to do experiments as we progress through this learning series.

I should say in closing that special resistance values can often be obtained from *precision resistors* that can be purchased on special order. They are costly and are thus not apt to be a product you will ever want to buy! Also, close-tolerance resistors (1%) are available at increased cost from most large parts distributors. For most practical applications, precise values are unnecessary — both to the circuit and to your pocketbook. QST

New Products

MOTOROLA MC14442 CMOS ANALOG-TO-DIGITAL CONVERTER

☐ A new CMOS 8-bit analog-to-digital converter (A/D) is now available from Motorola. The MC14442 is a 28-pin, CMOS, parallel-bus-compatible successive-approximation A/D converter with additional digital input capability. This low-power, microprocessor-compatible converter operates from a single 5-V supply and provides interface to the CPU data bus used by all M68XX-family parts.

The 8-bit conversion is done in 32 machine cycles and allows up to 11 analog inputs and up to 6 digital inputs. Resolution is 8 bits with a relative accuracy of ± ½ LSB across voltage and from −40 to 85° C. No external trimming required. All the necessary logic for software configuration, channel selection, conversion control and bus interfacing is included.

The MC14442 has a 32-microsecond conversion time at f_E = 1.0 MHz. The MC14442 A/D has TTL-compatible inputs with a 5-V (±10%) supply and is fully programmable.

These units are available now with pricing in quantities of 100 and up being $14.23 (plastic package) and $18.41 (ceramic package). Contact your local Motorola sales office or distributor for further information. — *Paul K. Pagel, N1FB*

Strays

MORE ON THE NAVY KNOB

☐ In January 1984 *QST* there is a Stray on the Navy knob ("The Navy Knob — From Whence It Came," p. 25). The article did not state why the black button was placed underneath the knob, however.

When these keys were used for radio, they were dangerous because they were hot with both RF and the power source that was being used. If an operator wasn't careful while handling the key, he could get burned. By adding the black button, the operator could avoid the burns. — *Everett Power, K6JY, Oakland, California*

WHAT A COMBINATION!

☐ Let me offer an amateur's solution for a universal problem: remembering lock combinations. On the back of the lock, paint or engrave prefixes for countries in the CQ zone corresponding to the lock combination. For example, a lock with a combination of 14-25-38 would get G-JA-ZS. I defy any non-DXing cryptographer to figure that one out! — *Jim Stahl, K8MR, Cleveland Heights, Ohio*

GOING TO BE STATIONED IN OKINAWA?

☐ U.S. military personnel who are going to be stationed in Okinawa can write to the Radio Society of Okinawa for licensing information and help in setting up. The club's address is P.O. Box 217, Torii Station, APO SF 96331.

QST congratulates...

☐ Kenneth M. Miller, K6IR, of Rockville, Maryland, on being elected to the Radio Club of America Board of Directors.

The Perfect 10: A Power Supply for FM Portables

Does your FM transceiver "eat" batteries faster than you can charge them? The solution is simple — I'll even tell you how to find the parts!

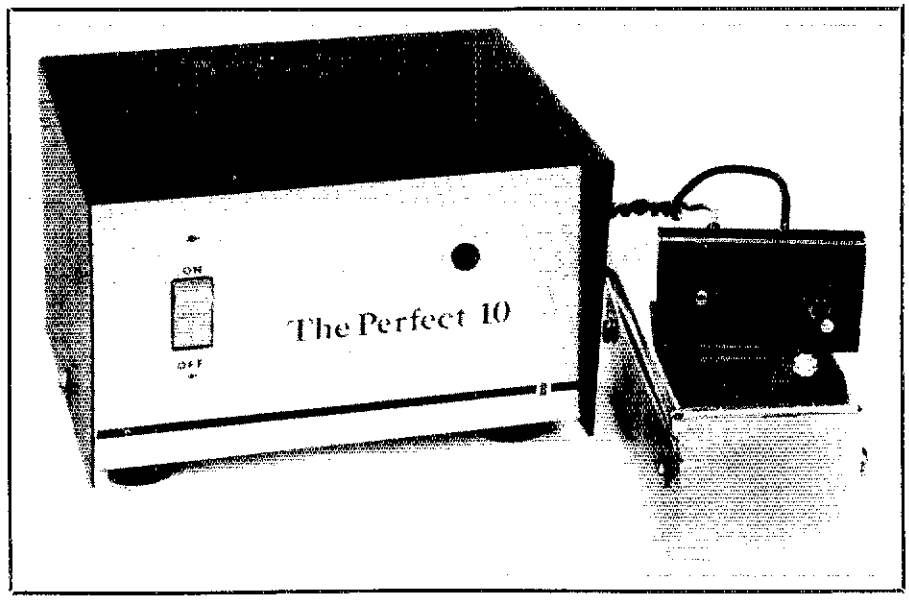
By Peter O'Dell,* KB1N

"Sorry, Pete, I think you're having transmitter trouble. You dropped completely out of the repeater after only a few words."

"Okay, Lee. Batteries shot! W1SE from KB1N..."

A frustrating problem confronting users of 2-meter FM portable transceivers is the frequent need for recharging the batteries. When I started in 2-meter FM operation (long ago), I had a portable unit with a 12-V dc internal battery pack. The rig had a jack for an external 12-V dc power source. I could operate the radio in the car or at home, regardless of the condition of the internal batteries.

Portable equipment became smaller, including the battery pack. An easy way to make the battery pack smaller is to eliminate one or more cells. Now a typical portable rig operates from a battery pack containing eight cells (nominal 9.6-V potential). Applying 12 V to these circuits is risky. What can we do?



Two versions of the Perfect 10. The mobile unit bracket with on/off switch attaches to a convenient spot on the dashboard, while the box housing the regulator mounts out of sight.

Characteristics of an Ideal Mate

Recently, I've noticed several circuits that could be used as battery eliminators for 9.6-V equipment. All have drawbacks, however. The circuit should have a minimum number of components, but still incorporate all possible safety devices. The device should be immune to effects of RF.

The simplest circuit I have seen was contained in a device that a manufacturer sent to ARRL Hq. for advertising acceptance. It consisted of a high-wattage power resistor in series with the positive lead (his application for advertising was refused)!

Others have used 5-V, three-terminal regulator chips to obtain the nominal 9.6-V output. In these circuits the manufacturer lifts the reference point of the regulator above ground by inserting a diode, transistor or resistor between the common terminal and ground. When wired in this manner, some fixed-value regulator chips may self-destruct if the output is shorted to ground. If this happens, the full input voltage appears at the output terminal of the regulator chip. Less serious problems include poor voltage regulation and ineffective internal thermal shutdown circuits.

A more sophisticated approach has been to use a variable-voltage regulator chip. The output voltage can be adjusted by means of external components. The internal protective circuit remains operable. The drawback I object to is the extra components required (as compared with a fixed-value voltage regulator) and the need to adjust the output voltage. Rendering unto Murphy his dues, this is more components that *can* fail, and anything that can

*ARRL Public Information Officer

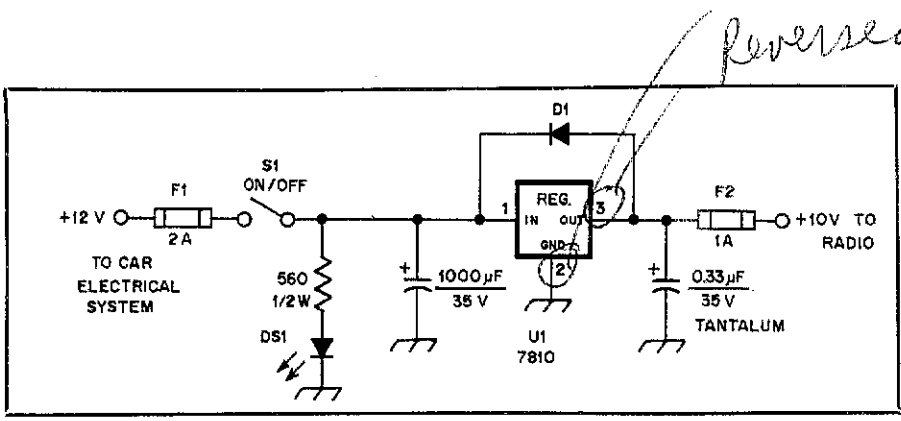


Fig. 1 — Schematic diagram of the regulator circuit. The resistor is a carbon-composition type. Capacitance is in microfarads. The input capacitor is electrolytic. Parts numbers in parentheses are from Radio Shack.

D1 — Silicon power diode, 1N4001 or equiv.
DS1 — Green LED (276-022).
F1, F2 — Fast-acting fuse, 1 A (270-1273).
S1 — Spst toggle (275-602).
U1 — 10-V, 1-A, three-terminal regulator, Texas Instruments 7810 or equiv. (available from Active Electronic Sales Corp., Box 1035, Framingham, MA 01701, tel. 617-366-0500).

be adjusted can also be *misadjusted*.

What is the ideal circuit? In my opinion, it is built around a 10-V *fixed-value* regulator chip. Such chips do exist, but they are difficult to locate.

The Regulator Circuit

Fig. 1 shows a circuit for use with the 12-V electrical system of an automobile (or any other 12-V dc source capable of supplying about 500 mA). Both the input and the output are fused for added safety. The mounting tab of U1 (internally connected to pin 2) is bolted to the metal cabinet that houses the circuit. Heat-sink compound is applied between the tab and the cabinet to aid heat transfer. The metal of the cabinet should be more than adequate as a heat sink because the input voltage is only 2 to 4 volts above the output voltage.

D1 provides protection for the regulator chip in the event that the output terminal potential of U1 rises above that at the input terminal. Without D1, the regulator can be destroyed. That condition can occur easily. For instance, I use a miniature phone plug and jack to connect the battery eliminator to a Tempo S5. As the plug is inserted into the jack, the tip momentarily makes contact with the positive potential of the internal battery. The capacitor on the input of U1 charges (assuming S1 is open). DS1 lights, then slowly extinguishes as the capacitor discharges. U1 may survive the small reverse current, but why take chances?

The two capacitors should be mounted as close to the regulator IC as possible. Some manufacturers recommend lead lengths no greater than ¼ inch (6.35 mm). I mounted U1, D1 and the capacitors in a small aluminum box. I attached a mounting tab to the box that permits it to be secured under the dash, out of sight. F1 and F2 are housed in in-line fuse holders. S1 and DS1 are mounted on a small homemade bracket that is attached to the dash.

In bright sunlight I have trouble determining whether or not a red LED is lit. I painted the bracket flat black and used a green LED for DS1. This has proved superior to any red LED indicator I have used. Of course, the LED is not necessary, but it does remind me to turn S1 off. (I ran the car battery down once when I inadvertently left the supply plug tip resting against a bolt on the floor of the car. It only took a couple of days!)

A Base-Station Supply

Fig. 2 shows a version of the circuit that operates directly from 117-V ac. The regulator circuit is identical to that of Fig. 1. DS2 is located on the output and provides a quick visual check of the output status. The fuse holders are the panel-mounted variety instead of the in-line type. All the components are mounted inside a small aluminum box. Again, the cabinet serves as the heat sink for the regulator chip.

Initially, I used a 1000-µF capacitor for the input of the regulator. No problems were encountered when I used the supply with the Tempo S5 on low power (about 2.5 W) transmit. When I switched to high power (about 5 W), listeners reported a slight hum on the signal. I replaced the 1000-µF capacitor with a 5000-µF unit. This eliminated the hum on high-power transmit. The value of the capacitor is not critical. If you experience hum, the rule of thumb is to add additional capacitance until the hum disappears.

Making Connections

Fig. 3 shows the method I used to connect the battery eliminator to the S5. J1 is a miniature plastic-enclosed, closed-circuit phone jack (Radio Shack 274-296 or similar). P1 is a matching plug. As a phone plug is inserted into a jack, the tip will cause a short, initially, between the elements of the jack. This results in a momentary short from the positive terminal of the battery to ground, which will not damage the battery pack (as long as the short is momentary). The event may cause a fuse in series with the battery to blow. If your radio incorporates a fuse in series with the battery pack, you should consider a different plug-and-jack system.

Finding a place to mount the jack in a small radio can be a chore. I found a spot on the side of the S5 opposite the PTT switch. It is about 2 inches down from the top or the rear portion of the plastic case. Carefully measure the openings and distances before drilling the mounting hole. Use liberal amounts of heat-shrink tubing to cover bare wires or terminals.

This method should work for most portables on the market — those that do not have slide-on battery packs. For rigs with the slide-on packs, the easiest approach is to obtain an empty pack and construct the circuit inside it.

Two ferrite beads are added to the power leads near the circuit board in Fig. 3. These minimize the possibility of RF getting back into the portable-rig circuit through the battery eliminator. If the eliminator is constructed in a slide-on pack, the beads should be placed on the output wires that are soldered to the terminal inside the pack.

Before applying power, double check all

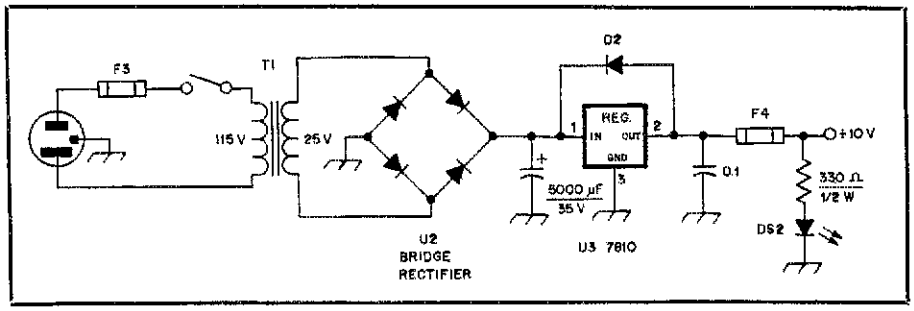
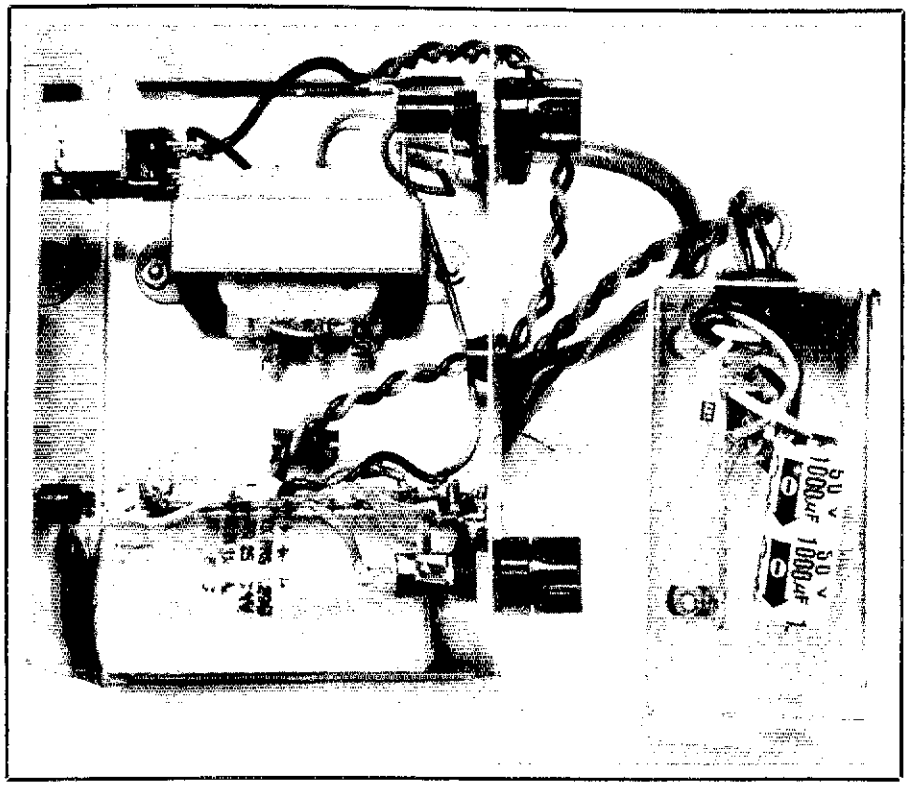


Fig. 2 — Schematic diagram of the base-station version of the battery eliminator. Components used in the regulator circuit are identical with those in Fig. 1. Consult the Fig. 1 parts list for component values.

T1 — Filament transformer; primary: 117-V ac, 60 Hz; secondary: 12.6-V ac, 1.2 A (273-1505).
U2 — Bridge rectifier, 4 A, 100 PIV (276-1171).



Internal view of the regulated supplies. Construction is straightforward; layout is not critical.

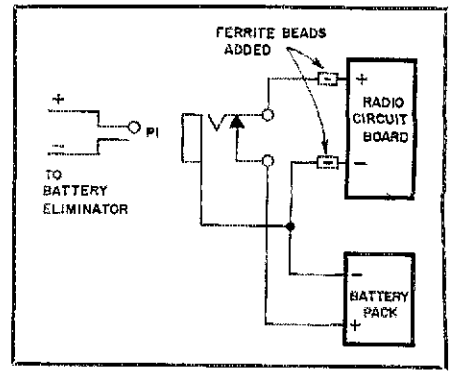


Fig. 3 — Block diagram of the connections between the battery pack, radio circuit board and battery eliminator for the Tempo S5 and similar portable units.

wiring. With the radio on/off switch in the OFF position, apply power to the eliminator circuit and check the voltage at the power input of the radio. If everything is all right, proceed with final assembly. There is nothing to adjust. Just use and enjoy.

Perplexing Parts Predicament

The most time-consuming aspect of this project was locating the 10-V regulator chips. (See the parts list for the name and address of the distributor.) Members of the ARRL technical staff are constantly writing manufacturers and distributors asking for catalogs and literature. We share the fruits of our search with each other. This makes the task more manageable. You can follow the same procedure with the members of your club. Take your parts catalogs and flyers with you to the next meeting. Ask other members to bring their catalogs. You'll be surprised at how much information you have at your disposal.

The suppliers cater to the market. The market can be divided roughly into the industrial and hobbyist segments. Club members who are involved in electronics professionally will probably be familiar with the local industrial suppliers and be able to supply catalogs and ordering information. The easiest way to locate information on the hobbyist suppliers is to look in the advertising sections of the hobby-type electronics magazines. These can be found on almost any newsstand. Most of these periodicals have reader information cards inside. The reader circles the appropriate numbers for selected advertisers and returns the card to the magazine publisher. The publisher contacts the advertisers, who then mail the literature to the reader. The trade-off is that it may take a couple of months to receive the literature. If you want information quickly, contact the manufacturer or distributor directly.

Once you locate a supplier for the parts you need, the next step is placing an order. Suppose you need a "gidget" that sells for 98¢. Most industrial suppliers have minimum orders of $25. Many of the hobby-item suppliers have minimum orders that range from $5 to $15 or more. If the only part you need is the gidget, then it becomes an expensive item.

Frequently, Hq. staffers place group orders. Several people may build the same project and need exactly the same parts. Or they may be working on several projects at the same time. The result is the same: It is easy to meet the minimum order without someone ordering things that are not needed.

Club members can follow the same plan: Once you share catalogs at meetings, a group order is possible. This is practical if the club has a group project. It can be an official club function or an expedient adjunct. One person can be placed in charge of procurement, or the job can rotate. The structure is not that important. One bit of advice: My experience suggests that these things work smoother when everything is on a cash-up-front basis.

When you look at catalogs with a group order in mind, you will notice an advantage to buying en masse: Most distributors offer a discount for quantity purchases. Although there are a few who raise the shipping costs in a linear fashion as the amount of the order goes up, many distributors absorb the shipping and handling costs on the larger orders. A little comparison shopping for parts and terms should benefit the members of the club. Many Radio Shack stores offer a discount for quantity purchases. Check at a local store for details.

Have you dropped out of the repeater recently because your batteries died during a transmission? Have you heard it happen to someone else? Why not eliminate the problem now? You and other club members will find it easy to locate parts and construct projects. Who knows what you'll build next. QST

Next Month in QST

What do *QST* readers have to look forward to in the April issue? Quite a bit. Among the variety of technical articles on tap for next month is one describing an innovative cubical-quad OSCAR 10 antenna, and one devised expressly for beginners — an overview of capacitors. Also, look for a construction article on a 19-W in/700-W out 2-meter amplifier that uses the new 3CX800A7 tube.

Also, you'll find an antidote to thorny cable-TV-interference problems, and a look at the universal RS-232-C — the connector that allows you to hook a computer to your rig.

Switched-Capacitor Filters — An Emerging Technology for Amateur Radio Use

Digital electronics has invaded Amateur Radio and the pages of *QST* over the past few months. Now you can replace those discrete-component audio filters in your equipment with a few ICs, and move into this new age.

By Richard R. Schellenbach,* W1JF and Frank Noble,** W3MT

The switched-capacitor filter (SCF) is a sophisticated modern device employing digital techniques to provide filtering similar to that accomplished by the older analog filters composed of capacitors, inductors and resistors. Amateurs are quite knowledgeable in the use of analog filters, be they passive types consisting of inductive and capacitive elements that exhibit insertion loss characteristics, or more modern active types that provide gain as well as miniaturization through the use of IC op amps and precision resistive and capacitive components.

Most amateurs are not yet familiar with SCF technology. We begin this article with a discussion of SCF basics, so more individuals may participate in the application of this new technology. This basic exposure to SCFs, and a later article demonstrating the hardware application of selected devices, should stimulate great interest in Amateur Radio use of modern digital signal processing.

Recent manufacturing innovations in the semiconductor industry have resulted in the development of SCFs that are superior filters in a variety of configurations. Low-pass, high-pass, band-pass and notch filters are all possible, using only a few basic components such as switching capacitors and op amps employed as integrators. Quite recently, SCF technology moved out of the research laboratory and into full-scale commercial production, when improved wafer-masking techniques utilizing CMOS and NMOS technology were perfected. Before that, SCFs were just a laboratory curiosity that had astonishing potential, but which were difficult to produce economically in the quantities required by the telecommunications industry.

The major stimulus for the rapid development of SCFs was brought about by ever-increasing demands from the telecommunications industry for more compact and highly stable filtering circuits. They needed filters that could be mass produced easily, and offered low cost, high efficiency and reliability. The Bell Telephone Co. and the University of California, Berkeley, laboratories were instrumental in SCF technology development.

Millions of switched-capacitor filters are used by the telecommunications industry. This is because of the rapid change to digital switching and transmission networks for telephone communications, designed to increase service capacity. They are found in high-quality tone receiver/decoders used with modern push-button telephones and private, automatic-branch-exchange (PABX) designs using pulse-code-modulation (PCM) techniques for voice switching and transmission over cable or satellites.

The upper-frequency response of typical SCFs is approximately 250 kHz because of switching-speed limitations and component tolerances allowed by the wafer-fabrication process. Therefore, SCFs can be used for audio-frequency filtering suitable for Amateur Radio communication purposes.

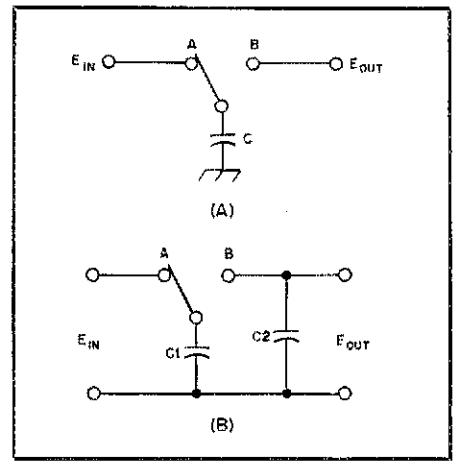


Fig. 1 — The basic idea of a switched capacitor is shown at A. An elementary scheme for a switched-capacitor filter is illustrated at B.

Theory of Operation

In general, filters are designed to select a desired portion of the frequency spectrum and, thus to reject the unwanted portions. The filtering action can be defined as low-pass, high-pass, band-pass or combinations of these to suit particular requirements. Active filters using op amps in various circuit combinations, along with precision resistors and capacitors, provide a miniaturized version of the older passive-type filters using physically large capacitors and inductors. Switched-capacitor filters, on the other hand, while still retaining the op amp, utilize only capacitors and switches as critical elements.

It is important to note that the basic difference between SCFs and their analog counterparts is the monolithic processing of the capacitors and the elimination of resistors. The absolute values of these capacitors are not important; the ratio is.

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This is completely in contrast to conventional filter designs, in which the the absolute capacitance and resistance are quite critical. The process of fabricating accurately controlled capacitance ratios is crucial for the success of these filters. They are manufactured on a silicon chip, and there is no further trimming of values, as is required for precision resistors and capacitors used in conventional analog-type filters.

The basic properties of matched capacitance ratios and the frequency of the switching operation in SCFs are illustrated by Fig. 1. In Fig. 1A, where the switch alternates between point A and point B, it is obvious that the voltage impressed on capacitor C will change from E_{in} to E_{out}. The resulting charge on the capacitor will change, as determined by

$$\Delta Q = C (E_{in} - E_{out}) \qquad \text{(Eq. 1)}$$

where ΔQ is the change in charge on the capacitor and C is the capacitance.

If the switch changes repeatedly between points A and B, an amount of charge will be transferred from position A to position B at each complete cycle of the alternating switch. A net current will flow from node A to node B. This current flow is the time rate of charge transfer, and is therefore equal to the product of the charge transfer at each switching cycle and the frequency of the switch cycling, f_c:

$$I = \Delta Q f_c = C(E_{in} - E_{out})f_c \qquad \text{(Eq. 2)}$$

When both E_{in} and E_{out} are constant, so is the resulting current flow. The analysis remains accurate for varying values, as long as the variation in voltage during one cycle of switch closure is negligible, or, in other words, $f_s << f_c$, where f_s is the signal frequency (E_{in} and E_{out}). A thorough analysis indicates that there is a definite dependence on f_s when this relationship is not true. SCFs are limited to an upper frequency of 250 kHz because the cyclic speed of the charge transfer cannot keep up with a faster rate of signal changes.

Going one step further in the basic explanation of how SCFs work, we may show how the circuit of Fig. 1B is equivalent to a simple RC type integrator (shown in Fig. 2). The network of Fig. 2 is a simple low-pass filter that depends upon the values of R and C to provide attenuation beginning at dc and going to some higher-frequency cutoff point established by the RC product. In Fig. 1B the operation of the elementary SCF has the following transfer function:

$$G(j\omega) = \frac{1}{1 + j\omega RC2} = \frac{1}{1 + j\omega C2/C1\, f_c} \qquad \text{(Eq. 3)}$$

This equation holds true as long as ω is much less than $2\pi f_c$. The time constant,

$$\frac{C2}{C1\, f_c}$$

is dependent only on the capacitance ratio and the clock frequency. The externally controlled clock frequency provides a continuously variable filter cutoff frequency.

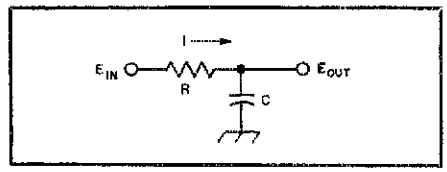


Fig. 2 — Diagram of an RC type integrator.

Op amps are used as integrators with the switched capacitors, to produce an SCF. These basic circuit elements are used in various arrangements to produce different filtering characteristics such as low-pass, high-pass, notch and band-pass filters. External control of the frequency response is accomplished by a change in clock frequency. All of the other relative parameters are fixed by the integrated-circuit-substrate design during manufacture. Thus, incorporating SCFs into Amateur Radio communications equipment is a relatively simple process. Typically, SCFs have the following characteristics:

- All types of filters are possible;
- gain/shape factor varies less than 0.1%;
- temperature stability better than 20 ppm/°C;
- Q factors up to 50 (single chip);
- dynamic range typically 80 dB;
- external clock (frequency) control; and
- low power drain and dissipation.

The same basic mechanism of series switching as shown in Fig. 1A also has utility as a digitally controlled delay line when a number of such switch and capacitor elements are cascaded together to form signal delays based on clock repetition rate and capacitance values.

Digital circuitry, such as is used in SCFs, has opened up new horizons in signal processing. Digital filters don't drift with temperature, can yield incredible Q values, provide up to 250 dB/octave roll-off, and exhibit an impressive dynamic range if enough sample bits are utilized. As a matter of fact, signals may be analyzed in the digital realm and counted exactly, instead of measured and approximated. Complete systems incorporating computers or microprocessors on chips can perform pattern analyses on incoming data, often in real time.

If certain priority information, such as the frequency content of a desired signal, is known, and it is a relatively narrow frequency band compared to noise or interference, a digital filter can detect it and select the desired data. This is possible even when the desired signal is buried within the noise or interference. The intent of this article is not to delve into details of complicated signal processors, but to point out the maximum possibilities that the future holds for weak- and noisy-signal detection using digital filters and analytical signal processing. Off-the-shelf ICs that consist of a variety of architectures, such as fast Fourier transform (FFT) and finite impulse response (FIR) signal processing systems, are available from several manufacturers.[1]

As the capabilities of digital components continue to grow while their costs plummet, prospective users are finding that digital processing is becoming more attractive than analog circuitry for many applications. In the area of filtering, digital filters are replacing their analog counterparts because of the inherent stability and low power consumption characteristics of digital methods. Most important, digital filters have almost no limit on the possible low signal-to-noise-ratio detection capability.

Monolithic Realizations

Having illustrated the basic capacitor-switching scheme and the charge-transfer mechanism between capacitor pairs as being equivalent to a simple RC integrator, we will now discuss the dynamic operation of simple digital filters and how they are implemented. Fig. 3 shows how the input capacitors are connected by using a pair of solid-state switches.

[1]FFT uses an efficient algorithm based on the work of J. W. Cooley and J. W. Tukey. It is implemented into practical hardware by using many complex multiplications and additions on a data array. FIR filters are nonrecursive filters that are usually configured with many feed-forward terms, and they require large data memories.

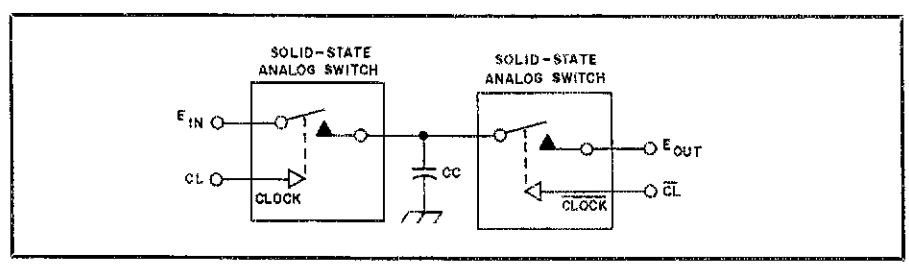


Fig. 3 — Solid-state switches provide a practical means to implement the switched-capacitor idea.

The two switches are alternately turned on and off by the CL and $\overline{CL}$ clock signals. While the $\overline{CL}$ gate signal is held off, gate signal CL turns on the input switch, charging up the capacitor CC to the signal voltage E_{in}.

Next, gate signal CL is turned off and gate signal $\overline{CL}$ turns on, transferring part of the charge stored in CC to the output. This alternating switching action is the basic mechanism for processing an analog signal. A series of input voltage samples are taken under control of the clock signal. It should be noted that these CMOS switches have an "on" resistance of less than 1 kΩ, and an off resistance measured in billions of ohms. In analog signal processing, the capacitance of the switches and the on and off impedances play an important role.

The sampling rate is extremely important. That rate, illustrated by the cyclic period of CL and $\overline{CL}$ in Fig. 3, is defined as the frequency at which the analog input-signal amplitude is gated into an integrator. It must be fast enough to prevent what is termed "aliasing" or "fold-over." Aliasing is a distortion component that is created when frequencies present in the sampled signal exceed half the sampling (Nyquist) rate. The Nyquist sampling theorem states that if a limited-bandwidth signal is sampled at regular intervals and at a rate equal to or greater than twice the highest frequency of interest, the sample contains all the information of the original signal. In Amateur Radio communications, the frequency of interest ranges from 300 to 3000 Hz, so a sampling rate of at least 6 kHz would provide dc to 3000-Hz reproduction at the output without aliasing distortion.

To further prevent aliasing problems in signal filtering, it is often useful to provide a filter, normally low-pass, which limits the bandwidth of the input analog signal, including possible extraneous noise, before sampling. Other techniques, such as notch filtering or high-pass filtering at some troublesome frequency, may be worthwhile to reduce overloading problems with sensitive amplifiers. Many commercially available SCF devices include noncommitted operational amplifiers just for the purpose of using them as auxiliary anti-aliasing or notch filters.

Basic SCFs

Although the basic examples shown in this section are realizable filters, they are low-order configurations, to allow simple analysis and ease in discussion. These low-order filters may be cascaded to realize highly selective, higher-order filters. Commercially available SCFs have various filter combinations with 5- to 10-pole filters on a single chip. These can be built into a highly efficient and superior filtering element for a system.

Combinations may also be cascaded in a chip system to provide band-pass and notch-filter characteristics. IC digital filters are not usually manufactured in a universal configuration, but are assembled for specific filtering applications demanded by the telecommunications industry. This is primarily the result of user demands and should not suggest that a more universal SCF cannot be developed.

The investment costs in producing particular chip configurations are quite large;

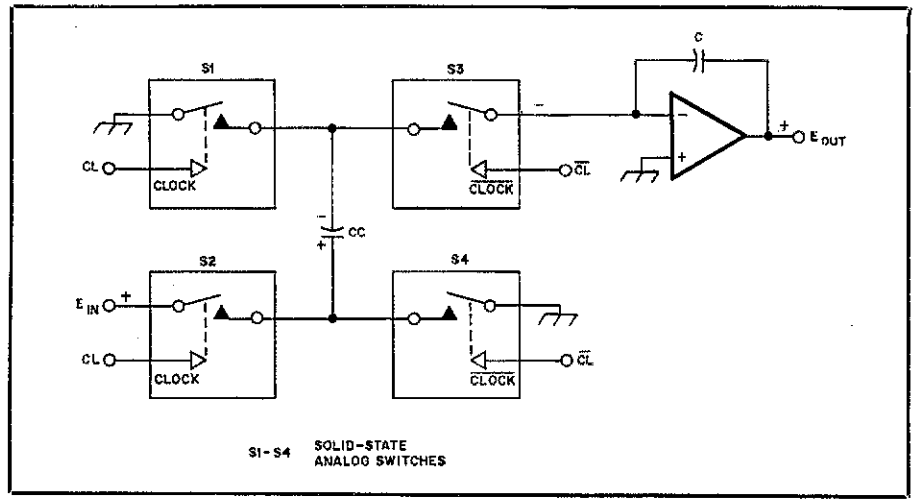


Fig. 4 — Schematic diagram of a noninverting SCF input stage. The polarity markings are to indicate the signal polarity at a specific instant in time.

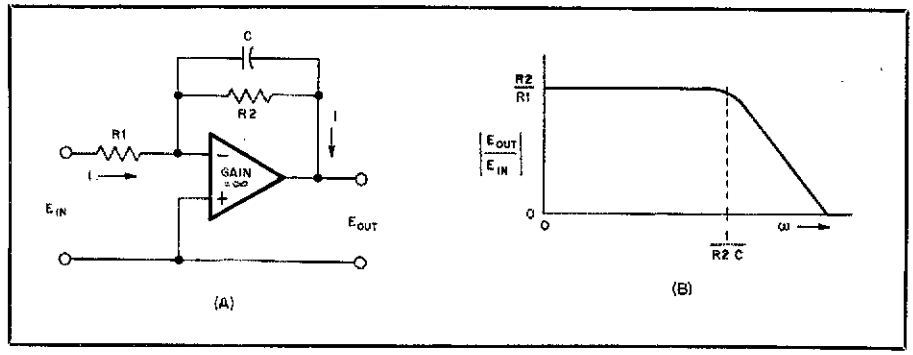


Fig. 5 — Diagram of an intrinsic integrator used as a low-pass filter is shown at A. The frequency response of this filter is shown at B.

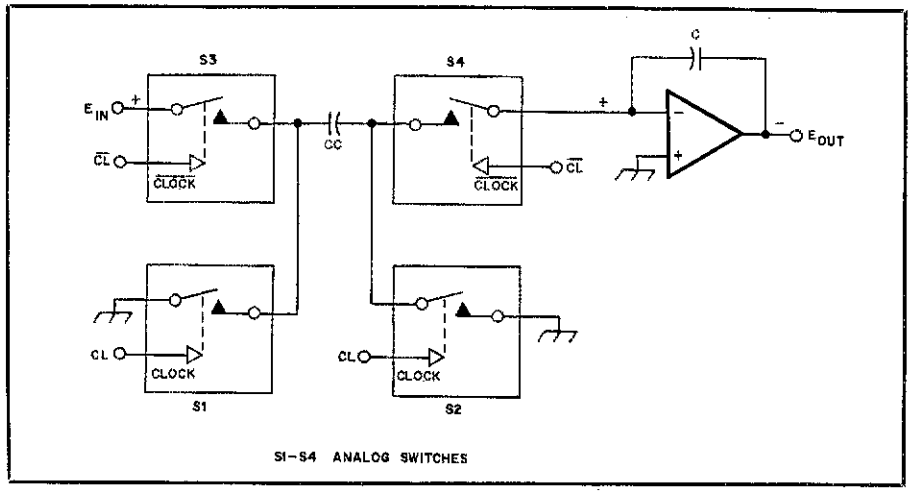


Fig. 6 — An example of an inverting SCF input stage. The polarity markings indicate the signal polarity at a specific instant in time.

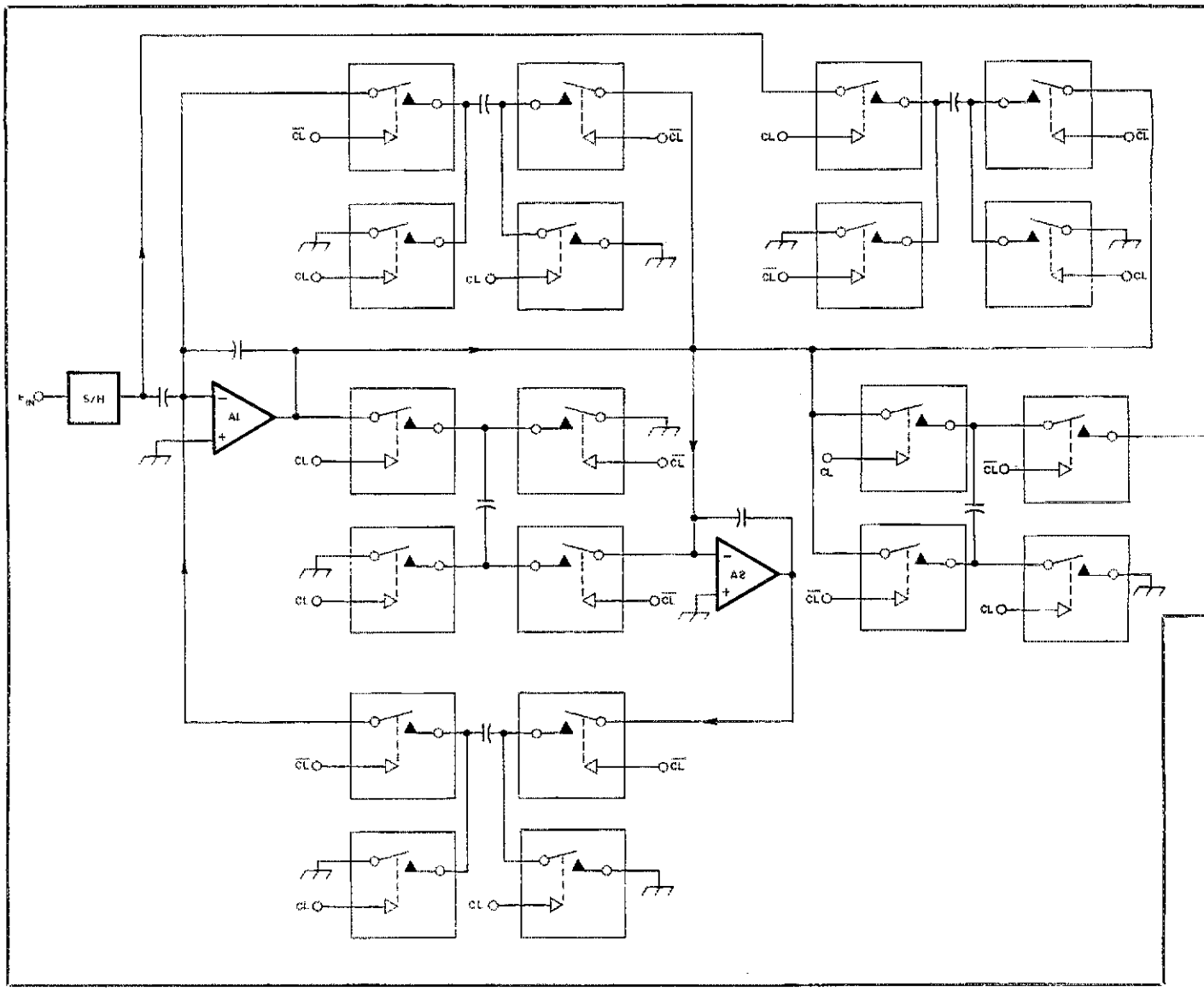


Fig. 7 — An example of an SCF implementation of a third-order elliptic low-pass filter. Amplifiers A1 and A2 form a closed-loop notch filter. A3 is configured as a conventional low-pass filter.

therefore, the market has to indicate sufficient demand to warrant costly development by the semiconductor industry. It is for this economic reason that the current types of SCFs were developed to meet the extremely high quantity demanded by the telecommunications industry. If a little ingenuity is used, amateurs can use these telecommunications-type SCFs. The possibilities are almost unlimited for our communication applications. If amateur interest grows sufficiently for the the use of SCFs, maybe a semiconductor manufacturer will take notice and begin development of more universal filter configurations geared to our specific applications.

As illustrated previously, the basic building block of an SCF is the switched-capacitor version of an integrator. There are two possible input configurations in using the other major element, the op amp. The input configuration to the op amp from the switching element may be inverting or noninverting, depending on the filter type.

Fig. 4 illustrates a noninverting integrator stage used in an SCF. Note in this example that the first phase of the clock, CL, closes both S1 and S2 while holding S3 and S4 open. The input signal at this instant is thus impressed upon the capacitor CC as a finite charge of value $E_{in}CC$. The next clock phase, $\overline{CL}$, now opens S1 and S2 while at the same time switching "on" S3 and S4, thus transferring the charge impressed upon CC into the inverting input of the op amp. When this occurs, the charge on CC is transferred to the larger value capacitor C in the integrator. In this way the increment of the output voltage is

$$E_{in}\,\frac{CC}{C}$$

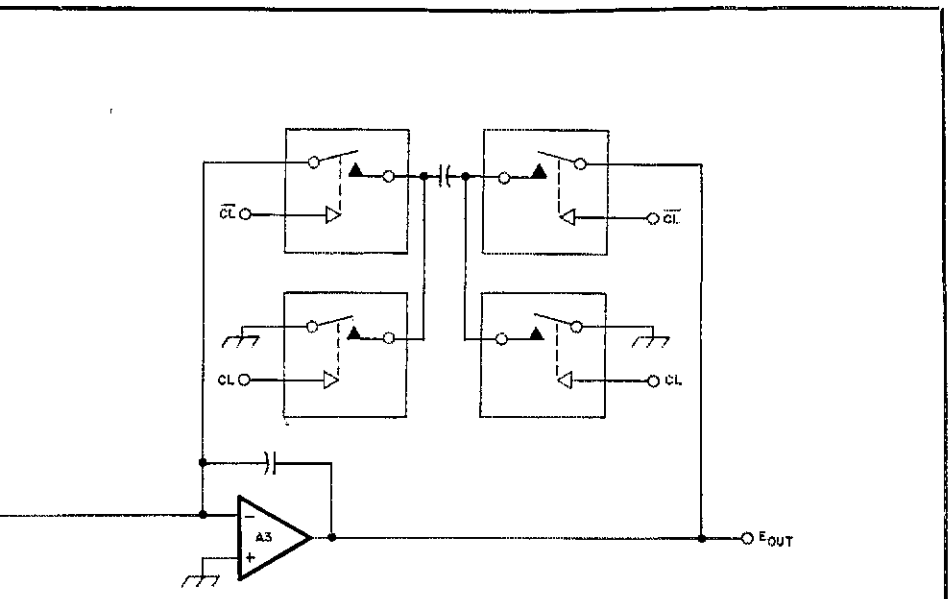
This charge is held until the next sample is transferred.

The resulting transfer function of the circuit shown in Fig. 4 may be defined as

$$+\,e = \frac{1}{RC}\int E_{in}\,dt \qquad \text{(Eq. 4)}$$

where $R = \dfrac{1}{f_c CC}$

is the equivalent resistance of the switched capacitor, C is the capacitance and E_{in} is the input signal voltage, neglecting any



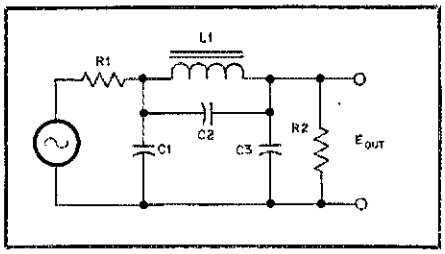


Fig. 8 — An analog implementation of a third-order elliptic low-pass filter. Compare this circuit with Fig. 7.

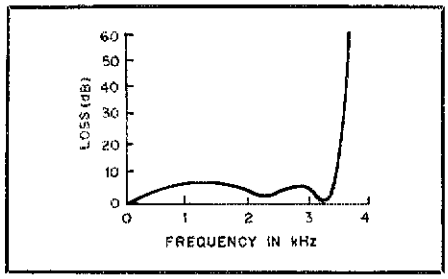


Fig. 9 — A frequency-response plot of a third-order elliptic low-pass filter.

other parasitic losses or capacitor leakages.

It should be mentioned, however, that an intrinsic resistance appears across capacitor C in all of the op amps. Sometimes these circuits are called "leaky integrators," but their function results in improving the low-pass filter characteristics.

This phenomenon is explained in more detail in Fig. 5. An op-amp integrator circuit combines the equivalent series resistor, R1, and the shunt resistor, R2, across capacitance C, producing the frequency plot indicated at B. To produce a low-pass filter, it is necessary to include the resistive shunt across the capacitor C. The gain of this circuit is described by

$$\left|\frac{E_{out}}{E_{in}}\right| = \frac{R2}{R1\sqrt{1 + (\omega R2C)^2}} \quad \text{(Eq. 5)}$$

The frequency response is plotted in Fig. 5B. The gain at frequencies well above cutoff is

$$\frac{1}{\omega R1C}$$

Although appearing somewhat similar to the noninverting circuit of Fig. 4, the inverting configuration is shown in Fig. 6. Notice that capacitor CC is placed in series with the signal input line, and is switched either in line or to ground by the two clock signals.

In this illustration, the clock pulse (CL) closes both S1 and S2, thus discharging any residual charge on CC. The next clock period ($\overline{CL}$) now opens S1 and S2 while closing both S3 and S4, causing the input signal E_{in} to be fed through capacitor CC in series with the op amp. Capacitor C will receive the charge increment E_{in} CC. Its voltage will change by the amount

$$E_{in}\frac{CC}{C}$$

as before, but with reversed polarity.

Combining and Cascading Basic Elements

Now that the basic elements of an SCF have been defined, refinements of these circuits will be accomplished with examples of how they may be combined in an IC system to provide different filtering functions.

The basic switching mechanisms and amplifier configurations shown in Figs. 4 and 6 will be repeated a number of times and in various combinations in the examples of simple SCFs that follow.

In some of the filter examples to be presented, it is assumed that the input sample-and-hold (S/H) circuits, which are actually integrators (see Figs. 4 or 6) consisting of the clocked input switches and the input capacitor CC are used. Therefore, the signal following the S/H will already be presented as a sampled-and-held value initiated by CL and $\overline{CL}$ clock signals.

Low-Pass Filters

The first example of an SCF is a third-order elliptic low-pass filter, used primarily because of its ability to produce a sharp cutoff. Where the attenuation characteristics between passband and stop band are optimized, many commercial SCF devices incorporate fifth- to tenth-order elliptic filters, resulting in extremely sharp cutoff characteristics. These are often referred to as "brick-wall" filters because of the resulting sharpness.

Fig. 7 is descriptive of a third-order elliptic low-pass filter that combines the input S/H circuit with other capacitor-switching and op-amp elements in a feedback manner, as indicated by the directional arrows in the diagram. An analog equivalent of this SCF is shown by Fig. 8.

The passive version would consist of bulky components that require a relatively high degree of precision to meet cutoff characteristics equal to those produced by the SCF shown in Fig. 7. To illustrate a typical elliptic low-pass filter characteristic for a third-order filter, Fig. 9 shows a plot of frequency versus loss in decibels.

High-Pass Filters

The second example to be presented is an SCF configured as a high-pass filter. The third-order filter depicted in Fig. 10 consists of the same basic elements as that shown by Fig. 7; however, the circuit configuration and the feedback terms are different.

Notch Filter

The third SCF example, shown at Fig. 11, is a notch filter configured as a second-order type for simplicity. Again the basic SCF elements are used, but the feedback terms around the filter are different to produce the frequency response shown in Fig. 12.

Commercially available SCFs, with notch filter capability, provide more than 60-dB attenuation at the selected audio frequency. These are sixth-order rejection filters, built on a single chip — a very difficult task indeed when using analog techniques.

Second Installment

The second installment of this article will

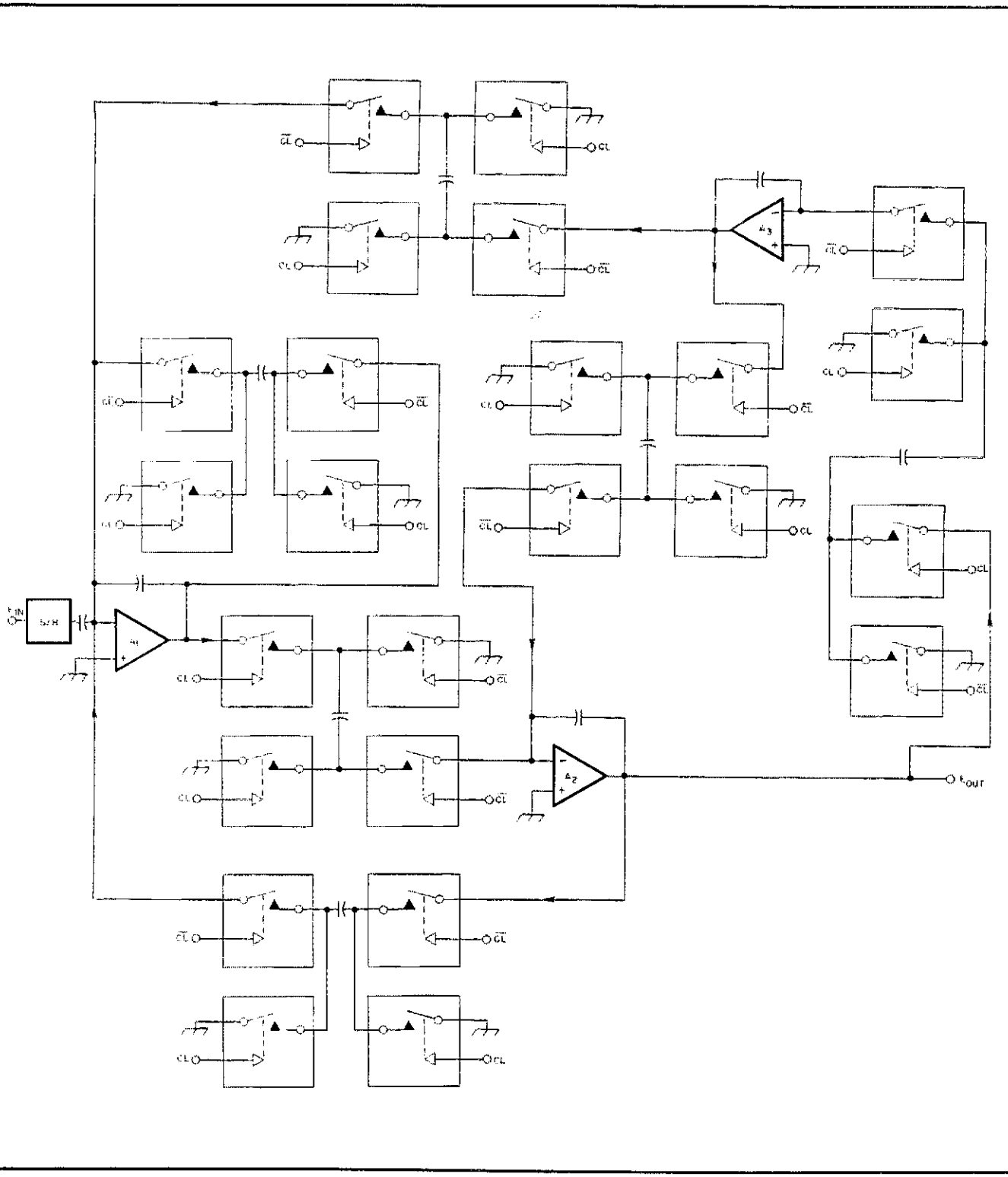


Fig. 10 — An SCF implementation of a third-order elliptic high-pass filter. Amplifiers A1 and A2 form a closed-loop notch filter. A3 provides inverse feedback for the filter.

present available ICs using SCF technology that appear to be useful in Amateur Radio applications. Various manufacturers' products will be represented, along with sufficient data to allow the reader to use these devices in his or her own application.

The second installment will also show the practical implementation for various digital filtering and signal processing operations using SCFs. These devices have been breadboarded into Amateur Radio equipment as either an economical add-on to existing equipment or as a complete detection and selectable filter scheme incorporated into modern solid-state transceiver designs.

References

AMI-Telecommunications Design Manual. American Microsystems, Inc., 3800 Homestead Rd., Santa Clara, CA 95051.

Bellamy, J. C., *Digital Telephony.* New York: John Wiley & Sons, Inc., 1982.

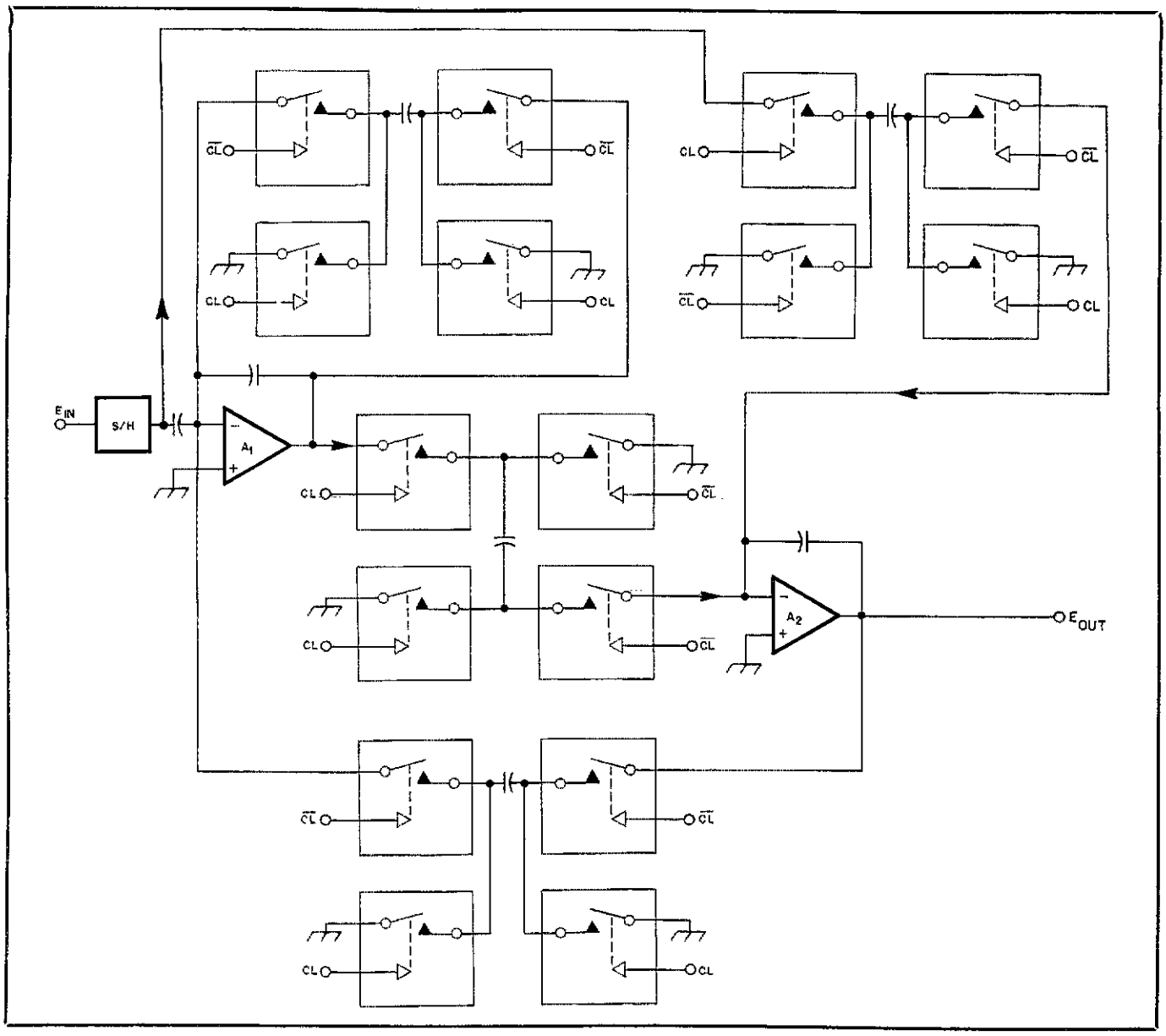


Fig. 11 — An example of an SCF implementation of a second-order notch filter.

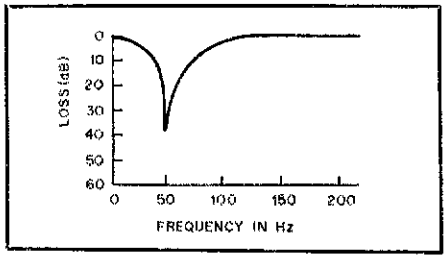


Fig. 12 — A frequency-response plot of a second-order notch filter set for 50 Hz.

Motorola Semiconductor Products, Inc., 3501 Ed Bluestein Blvd., Austin, TX 78721. Data Sheet DS9833 — (MC14414-2).

Schellenbach, R. R., "Versatile Switched Capacitor Filter with Automatic Level Control." Technical Correspondence, *QST*, Nov. 1982.

Strays

I would like to get in touch with...

☐ anyone with modifications for a Yaesu FT-501. Siegfried Bernhoff, VE3JDA, 15 Sandwell Crescent, Kanata, ON K2K 1V2.

☐ anyone with a schematic diagram for a Spectronic Digital Frequency Display, Model DD1C. Herb Baynon, K2QOV, 11 Hargrove Dr., Stony Brook, NY 11790.

☐ anyone with information on modifying the Drake TR7 or TR7A. Marvin Moss, W4UXJ, Box 28601, Atlanta, GA 30358.

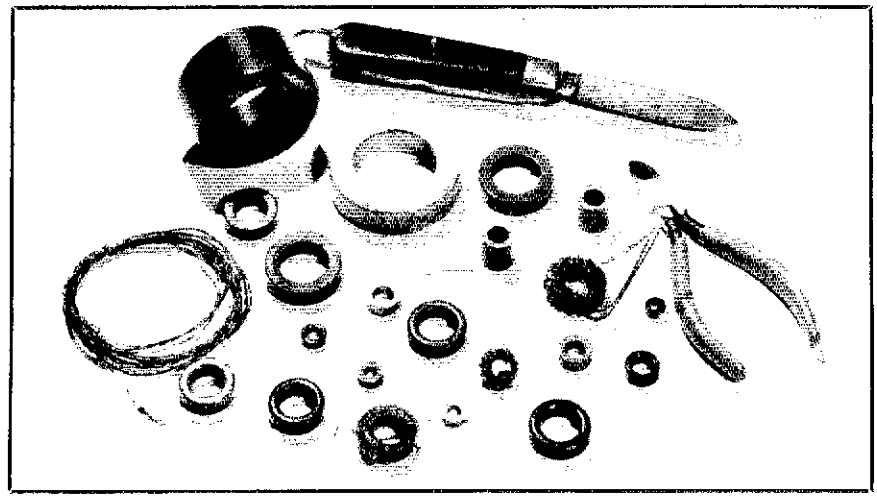
☐ anyone who has devised a successful method of keeping birds from perching on a Yagi antenna. Bill Mullin, AA4M/6, 3042 Larkin Pl., San Diego, CA 92123.

☐ anyone with information on interfacing a Wang 2200 disk-drive computer with Amateur Radio. Bill Foley, WB2TOU, 13 Sandt La., Long Valley, NJ 07853.

BEGINNER'S BENCH

Learning to Work With Toroids

Nearly all RF circuits today contain toroidal inductors, transformers or ferrite beads. Understanding the nature of toroids is essential to using them correctly.



By Doug DeMaw,* W1FB

"Odd looking things, those toroids, aren't they?" I've heard that statement during "show and tell" at club meetings. I've also heard the comment, "I never use toroids because I don't understand them." If you are avoiding the use of toroid cores and beads because you aren't familiar with the basic steps, I hope this article will provide the incentive to adopt these devices in your quest for better circuit performance and added convenience.

The word *toroid* is used simply to define the geometry of the doughnut-shaped magnetic core material. If we were to wind an air-wound coil into a circular, doughnut-like form, it would still be a toroidal inductor. Why then would we want to bother using a core in the first place? The answer is to the point: The core material (powdered-iron or ferrite) increases the effective inductance of a toroidal coil over that value which would exist if no core were used.

What does this mean in a practical situation? Well, fewer coil turns are needed when the toroid core is used. This leads to a smaller assembly and reduced losses from the resistance of the coil wire. The decreased resistance can provide a higher quality factor (Q) for a given coil. This is aided when we use a toroid core by virtue of larger-diameter wire being usable for compact inductors, as opposed to many turns of wire being required for an air-wound coil of equivalent inductance. This is demonstrated in Fig. 1.

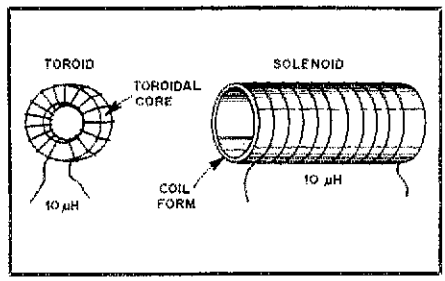


Fig. 1 — Graphical comparison between the size of a toroidal inductor versus a large solenoidal-wound cylindrical coil. Both have the same inductance.

Another important advantage of toroid-coil use is that the inductor or transformer we have wound on the core is pretty much self-shielding. This means that unwanted stray coupling (inductive) between toroidal components is virtually nonexistent. Non-toroidal coils or transformers often exhibit interreactive properties, which can cause circuit instability (self-oscillations) or detuning effects. That is why we find shield cans over so many tuned circuits. Others may have shield partitions between the various coils or transformers to minimize stray coupling. So, the toroid has some useful and appealing properties. Agree? Alright, let's learn more about them.

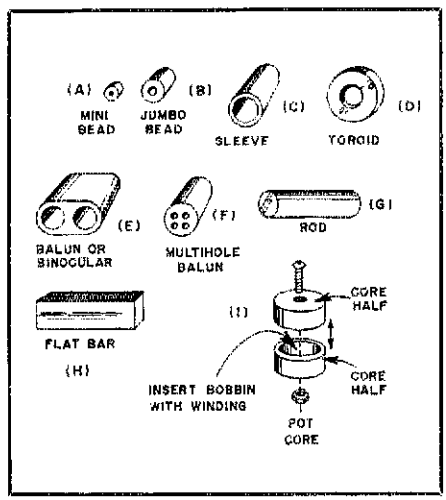


Fig. 2 — Various shapes for magnetic-core devices (see text).

The Shapes of Various Magnetic Cores

Ferrite and powdered-iron cores come in a vast assortment of sizes and physical forms. We will not discuss all of them here. Rather, we will consider the most common shapes found in amateur work. Fig. 2 illustrates a host of core types we might employ in circuits we design or duplicate. Miniature and jumbo ferrite beads are shown at A and B of Fig. 2. We can see that they are essentially the same as a toroid core, except that the form factor is greater and the center hole is smaller than with most toroid cores. Next comes the ferrite sleeve (C). It is a cylinder with a relatively thin wall. Sleeves are useful for increasing the inductance of RF chokes that can be slipped within them. They also can be used

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over coaxial feed line to serve as decoupling devices. The standard toroid form is shown at D of Fig. 2.

The balun or "binocular" core at illustration E is most often used in the design of broadband RF transformers. It also can be used for RFI suppression by winding the ac line cord or hi-fi speaker leads through it. Various sizes are available. At drawing F of Fig. 2, we see a similar device that may have two or more small holes through it. These smaller balun types of cores can also be used as foundations for low-power broadband transformers, or we might use them for RF decoupling of voltage-supply lines in our equipment.

A ferrite rod (G) and ferrite bar (H) are shown in Fig. 2. The disadvantage of this style of core is that it does not exhibit the self-shielding property of the toroid core. These cores are used mainly as foundations for loop antennas and high-power RF chokes for grounded-grid RF power amplifiers.

Finally, we have a pot-core unit at illustration I of Fig. 2. The coil or transformer windings are wound on an insulating bobbin, which is contained within the core halves. A screw and nut hold the core halves or cups tightly together. Shielding is provided by the two shells because the coil is inside the assembly. Pot cores are used primarily for high-Q audio inductors or transformers, but they are also satisfactory for a number of RF applications in high-frequency work. We have discussed the collection of core shapes mainly to acquaint you with the variety of materials that are available. Our purpose in this article is to deal specifically with the use of beads and toroids, and we will touch lightly on the application of balun cores.

A Closer Look at Toroids

Toroid cores are available from an almost microscopic size to a very large format — as great as 6 inches in diameter.[1] In our ham radio work we will be more concerned with the use of cores that range from 0.25 to approximately 3 inches in diameter. Ferrite and powdered-iron cores find frequent application in circuits we may build. Although they look the same to the naked eye, there is a substantial difference in their properties and the types of circuits in which they are used. Generally speaking, powdered-iron cores are the best suited to RF circuitry when high-Q, narrow-band tuned circuits are developed. We may purchase iron cores that work well from the audio spectrum up through the VHF region. We must select the proper core for the operating frequency. Ferrite cores, on the other hand, are used below, say, 10 MHz for narrow-band RF circuits, but they are suitable into the VHF region when they are wound as broadband transformers.

[1]Notes appear on page 29.

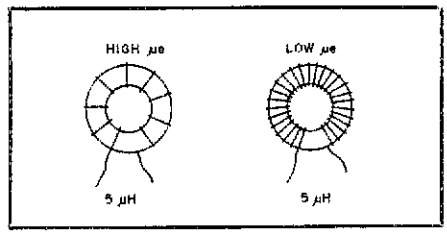


Fig. 3 — A high-permeability core requires fewer turns than does a low-permeability core to yield an equivalent inductance.

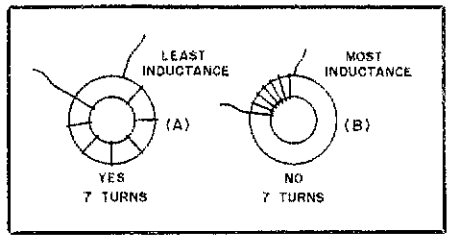


Fig. 4 — Best results are had when spreading the winding over 330 degrees of the core as shown at A. Bunching, as at B, is not recommended.

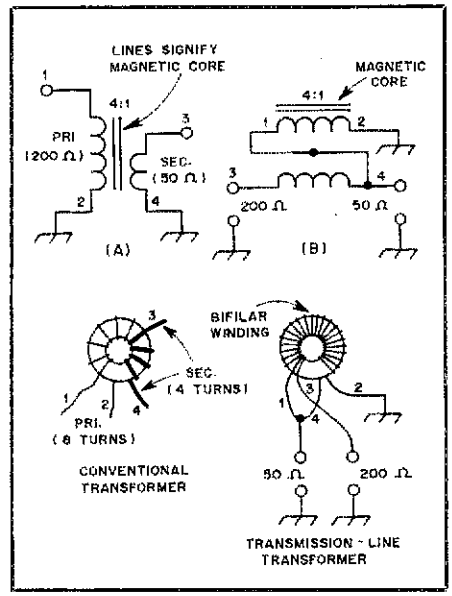


Fig. 5 — Examples of conventional and transmission-line broadband transformers. The circuit at A is suitable also for tuned transformers in narrow-band RF circuits.

Each core mix, or recipe, has a specific permeability factor. This is expressed as μ_i (initial permeability) or μ_e (effective permeability). The greater the permeability of a core, the higher the coil inductance for a given number of turns. The trade-off is found in the optimum operating frequency versus permeability. More specifically, the higher the permeability, the lower the operating frequency in terms of Q. For example, a core with a μ_e of 2000 is the most effective at VLF or audio when the tuned circuit must have high Q. A μ_e of 10 or less would, conversely, be a proper choice at 50 MHz. The manufacturers of magnetic cores can provide data sheets that list the various core types, their permeabilities, flux densities in gauss and the optimum operating frequency for the core material.

It is important that we know the core characteristics before using it in one of our circuits. The wrong core can spoil the performance or even render a circuit inoperative. For this reason, we must be cautious about buying unknown toroid cores at flea markets or surplus outlets. If the seller can't identify the core characteristics, brand or part number, it's best to avoid buying it. There are reliable suppliers from whom we can buy our cores by mail.[2] Data sheets can also be obtained from these vendors.

The effects of permeability are demonstrated pictorially in Fig. 3. Here we have two toroidal inductors of the same value (5 μH). The core with the high μ_e has very few turns, whereas the low-μ_e core requires many turns to obtain the same inductance. The smaller winding is preferable if the core can provide an acceptable Q at the operating frequency. The advantage is that it is much easier to add a smaller winding to a toroid core by hand. The more turns we need, the more tedious the task becomes — especially when light-gauge wire (i.e., no. 30) is used. Few hams have access to toroid-winding machines!

The recommended winding style is shown in Fig. 4 at A. Our coil should occupy most of the core area as shown, but with a small gap (about 30°) between the ends of the winding. The example at B is not recommended. However, we can make small adjustments in the coil inductance by spreading or compressing the coil turns. The more they are spread apart, the lower the inductance. This feature can be useful when we make final tweaking adjustments in a tuned circuit. A drop of glue can then be applied to hold the turns in position.

Toroidal Transformers

Broadband RF amplifiers usually contain some type of toroidal or balun transformer. We hear reference to *conventional* (Fig. 5A) or *transmission-line* (Fig. 5B) transformers. The so-called conventional transformer follows the design characteristics of power and audio transformers, with the secondary winding(s) laid over the primary winding as seen at A of Fig. 5. The secondary winding need not be bunched near one end of the main winding, as shown. Some designers spread the smaller winding over all of the core area. I prefer not to do that in the interest of minimizing unwanted capacitive coupling between the windings. The method shown at A of Fig. 5 helps to reduce capacitive coupling, which reduces the passage of harmonic currents from one

winding to the other in narrow-band circuits.

Transmission-line transformers are used principally as broadband coupling devices between unlike impedances. They can be wound for transformations of 1:1, 4:1 and 9:1. Two 4:1 transformers can be used in cascade (series) to yield a 16:1 transformation ratio. An in-depth treatment of this topic and many more that relate to magnetic cores from audio to VHF is provided in a book that is addressed to the subject.[3]

Although some engineers will argue that transmission-line transformers are more efficient than conventional ones, I have thus far been unable to measure the performance difference with ordinary lab instruments. The conventional transformer offers the advantage of providing almost any transformation ratio, but the transmission-line transformer holds us to specific integers. The latter type is wound with bifilar, trifilar or coaxial-cable windings, depending on the transformer application. *Bifilar* means that two wires are laid on the core in parallel at the same time. *Trifilar* windings contain three parallel conductors, etc. Some designers twist the wires together before laying them on the core. I use about eight twists per inch when I do that. One end of the parallel-winding wires is clamped in a vise and the other end is tightened in the chuck of a hand drill. Twisting the wires is an easy matter when this technique is used. The objective in using parallel or twisted conductors is to obtain a line (winding conductors) impedance of 25 ohms. The ARRL *Handbook* shows the hookups for a number of broadband transformers.

The most popular type of core for RF power amplifiers in the medium- and high-frequency spectrum is the balun type shown at Fig. 2E. A single turn is used for the low-impedance winding (wound through the two holes in the core). The secondary winding is also wound through the core holes. It contains sufficient turns to ensure the approximate impedance ratio needed. For high-frequency work, the core μ_e is usually between 800 and 950. Detailed design information concerning this type of transformer is given in the text of the book referenced in note 3. This is a conventional transformer when wound in the manner discussed earlier. Two rows of ferrite toroids can also be used when building this kind of transformer, but the balun core is more convenient and practical to work with.

Saturation and Power Ratings

Not only must we select a core that will provide the desired Q and μ_e, we need to be mindful of the power our core can handle safely. Excessive power for a given core can cause it to (1) heat up, (2) change permeability, (3) generate harmonics and (4) become fractured. A ferrite core that has been subjected to more power than it can tolerate will go through a change in permeability, and even when it cools off the permeability will not return to the original value. Powdered-iron cores do not respond in that manner, and will not suffer from permanent changes in μ_e under similar conditions.

For the most part, ferrite cores (for a specified size) can yield much higher values of μ_e than is possible with iron cores. But, the flux density (gauss) of a powdered-iron core of the same dimensions is much greater than that of the ferrite core. This means that powdered-iron cores are capable of handling more power per unit size than their ferrite counterparts.

Rather than burden you with the details of calculating the proper core cross section versus circuit power, I will refer you to Chapter 2 of the *Handbook,* where pertinent data and the equations are given. See note 3 for the same information in expanded form. The manufacturer's data sheets list the gauss ratings of the cores they produce. If you are in doubt concerning the power capability of the core you are using, feel it after the circuit has been in operation for a few minutes. If it is more than slightly warm to the touch (cool would be better), it may be underrated: A larger core will be necessary. Ferrite toroids are capable, however, of handling huge amounts of RF power. I own a medium μ_e toroid that was designed to serve as the core for a 20-kW balun transformer in a commercial broadcast station. Needless to say, it's a "whopper."

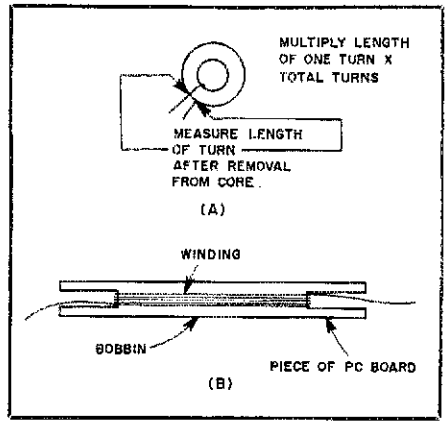


Fig. 6 — A single test turn on a toroid core will enable us to determine the total winding length versus the required number of turns. A homemade shuttle or bobbin (B) can be used to wind toroids that have a great many turns.

Winding and Checking Toroids

One annoyance that concerns us when handwinding toroids is knowing how much wire to start with for a particular number of coil turns. It is poor practice to guess at the length, for we may end up with too little wire after laboriously applying a large number of turns! Too much wire, on the other hand, makes for awkward winding of the core. An easy way to judge the wire lengths is to place a complete turn on the core, as in Fig. 6. A piece of string is handy for this step. Then, remove the turn and measure the length between the arrows of Fig. 6A. Multiply this length by the total number of turns needed. Add a few more inches for the leads at the ends of the winding.

Toroidal windings of a few turns can be placed on the core by hand while looping the wire through the core, again and again. But, when many turns are required it is often easier to build a small shuttle or bobbin (Fig. 6B) from PC-board stock, then wind the wire on it as shown. The shuttle is then passed through the core, repeatedly, until the winding is completed. This method works best with large cores.

Each toroid or other magnetic core has a factor known as the A_L. The supplier can provide the A_L for each of his or her cores. The A_L is based on the inductance provided by a single core turn. Once we know the A_L characteristic, it is a simple task to calculate the number of turns needed on a specific core to yield the required inductance. For example, let's suppose that we want to use a core with an A_L of 50, and the required inductance is 5 μH. We can calculate the number of turns from

$$\text{Turns} = 100\sqrt{L(\mu H)/A_L} \qquad \text{(Eq. 1)}$$

$$= 100\sqrt{5/50} = 31.6$$

Since it is not practical to place a fractional turn on a toroid core, we will settle for 31 or 32 turns. I favor the smaller number in such instances. This helps to compensate for stray circuit capacitance.

Cores with very high μ_e values (ferrites in particular) are assigned A_L factors that relate to millihenrys rather than microhenrys. Hence the following equation:

$$\text{Turns} = 1000\sqrt{L(mH)/A_L} \qquad \text{(Eq. 2)}$$

We can use Eq. 2 for these cores by converting microhenrys to millihenrys when low-inductance windings are needed. The equations are based on the premise that the winding will occupy nearly all of the core, as in Fig. 3.

If we want to check the inductance of a core layer that we have wound (just to be sure!), we can use a dip meter and an *ARRL L/C/F Calculator.* We must connect a known-value capacitor in parallel with the toroid winding (Fig. 7) to provide a resonant circuit. If we leave ample lead length at the connection point (Fig. 7A), we can insert the dipper probe to get a reading on the meter.

Remember that toroids are self-shielding. This means that we can't couple a dip meter to them directly. But, the loop area where

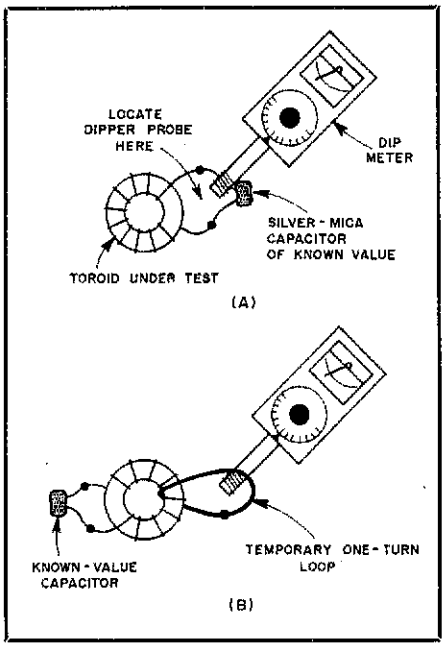


Fig. 7 — Methods for coupling a dip meter to a resonant toroidal circuit. If the capacitance and frequency are known, the inductance can be obtained by equation or from the *ARRL L/C/F Calculator.*

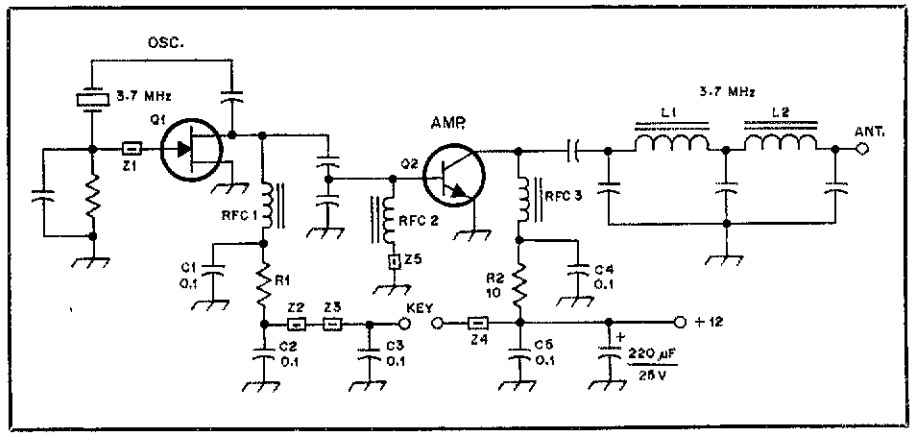


Fig. 8 — Typical circuit in which numerous beads and toroids might be used (see text).

the capacitor is connected causes a discontinuity, which permits coupling to the dipper. Alternatively, we may employ the method shown at Fig. 7B. Here, we have passed a wire loop through the toroid to provide a coupling link for the dipper. At the lower frequencies, we may need two or three turns to ensure adequate coupling to the dip-meter probe.

Other Uses for Beads and Toroids

We can examine the illustrative circuit in Fig. 8 to learn where and how some ferrite beads and toroids might be used in our amateur projects. The beads are designated as Z1, etc. The circuit conductor or wire is passed through the hole in the bead to form a small inductor. The higher the bead μ_e, the larger the inductance. We may wind several turns of light-gauge wire through the bead to obtain higher values of inductance. Small toroid cores may be used in a like manner where the beads are indicated in Fig. 8. We will recommend that high-μ_e beads be used for the applications shown (800 to 950 μ_e).

Z1 of Fig. 8 is used to damp VHF or UHF parasitic oscillations. It should be placed as close to the transistor body as possible if it is to be effective. The impedance it presents at VHF does not spoil the circuit performance in the HF range. Some designers use a low-value resistor (10 to 27 ohms) in place of Z1 to aid stability.

Z2, Z3 and Z4 are used in Fig. 8 to prevent RF energy from migrating between the stages via the supply line. R1 and C1 help to accomplish this also. C2, C3 and C5, in combination with Z2, Z3 and Z4, form what is called a decoupling network. R2 and C4 also function as decoupling devices.

Z5 has been added below RFC1 to degrade the Q of the choke. This helps to ensure stability at and near the transmitter operating frequency. For example, a choke that has measured a Q of 50 will indicate a Q of 10 or less when a single 950-μ_e bead is used in series with it. This does not prevent the RF choke from performing satisfactorily in the circuit, however. In some VHF or UHF RF amplifiers, we may use four or five ferrite beads in series to replace the RF choke. Such a practice is not suitable at HF or lower, since the beads will not offer sufficient impedance to function as an RF choke.

RFC1, 2 and 3 need not be solenoidal-wound commercial units. We may wind them on toroid cores or on ferrite beads and save a few cents in the process. The important thing is that they provide the required impedance for circuit operation.

L1 and L2 are used in a half-wave harmonic filter (Fig. 8). These coils may be wound on powdered-iron toroid cores. The circuit of Fig. 8 illustrates clearly how a number of magnetic-core devices might be used in an amateur circuit. Many more applications are possible.

In Summary

We have treated the practical aspects of toroids in this article. The math was left out intentionally, since many readers object to the use of equations. Unfortunately, very little can be learned about electronics without using math. Certainly, the design procedure can fail miserably if we are unwilling to use equations. For those of you who are interested in more than the superficial aspects of magnetic cores, the references we have mentioned should be helpful.

I recommend that you keep a stock of toroid cores and beads on hand if you do experiments and build station gear. The *QST* ads will give you the addresses of by-mail suppliers.

There can be no doubt that the toroid core is here to stay. It has become much more affordable than early-day slug-tuned forms, and it can be much easier to work with. Perhaps this is the time for you to start using magnetic cores in your work. Good luck, and have fun!

Notes

[1]mm = in × 25.4.

[2]See *QST* ads for Amidon Associates, Palomar Engineers and RadioKit.

[3]D. DeMaw, *Ferromagnetic Core Design & Applications Handbook*, no. 0-13-314088-1, Englewood Cliffs, NJ: Prentice-Hall, Inc.

Strays

VIC 20 PROGRAM LISTING AVAILABLE

☐ ARRL Hq. has received many requests for a larger copy of the VIC 20 computer program listing for "A Keyboard Keyer and Code-Practice System" (Jan. 1984 *QST*). If you would like a photocopy of the listing as we received it from the author, please send an s.a.s.e. to ARRL Technical Department, Jan. VIC 20 Program, 225 Main St., Newington, CT 06111.

AFCEA MARCH LUNCHEON

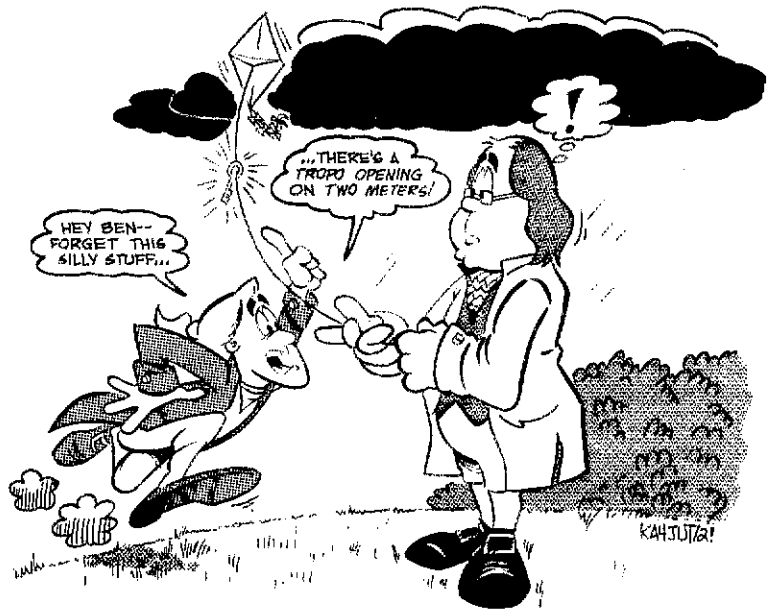
☐ Joint Chiefs of Staff Chairman Gen. John W. Vessey, Jr., U.S. Army, will be the featured speaker at the Armed Forces Communications and Electronics Assn. luncheon on March 2 at the Shoreham Hotel, Washington, DC. For more information and reservations, call Diane Sibley at 202-457-3060.

QST congratulates...

☐ Joseph M. Janiszewski, KB8GL, of Marysville, Michigan, on being selected Southeastern Michigan Gas Co. Employee of the Year.

VHF Propagation and Meteorology

Temperature, barometric pressure and humidity are the significant factors for VHF tropospheric propagation. How can we pinpoint the most productive times to work VHF DX?



By Richard Miller,* VE3CIE

How familiar are you with the refraction concept? Do you understand the relationship of refraction to propagation? If not, I'm sure you will find the subject fascinating. Let's discuss the principle in fairly broad terms.

Most of us are familiar with the refractive properties of light. As a ray of light travels from one material into another (e.g., from air into glass or from the air into water), the ray of light bends or otherwise changes direction. We can attribute this change of direction to the fact that light travels at different speeds in various mediums. The refractive index of the material is utilized to determine the amount of bending that will occur. Also, the greater the refractive-index difference, the greater the amount of bending that will take place.

Light is a form of electromagnetic energy. VHF radio signals are another form of this energy; they also undergo refraction or bending when moving from one region of a given refractive index to another. This concept is fundamental to the understanding of the propagation of VHF radio signals in the earth's atmosphere.

A Closer Look at Refraction

The refraction of light rays and the influence of the refractive index of the material are illustrated in Fig. 1. In this example, we can observe that the light ray is moving from a material that has a low refractive index, n_a, to a material with a higher index, n_w, which is water. The direction of travel is referred to the normal (perpendicular to the interface or boundary between the two materials).

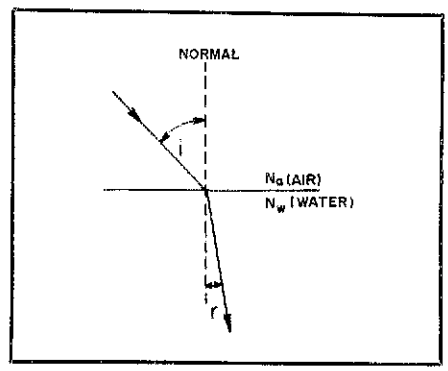


Fig. 1 — The refraction of light rays and the influence of the refractive index of the material (see text).

In Fig. 1, we find n_w to be greater than n_a, and the ray of light bends toward the normal. This is always the case when the light moves from a material with a low index to one that has a high index. If the situation is reversed, with the ray moving from the water to the air (n_w being greater than n_a), the ray bends away from the normal. These concepts can apply to VHF propagation in the atmosphere of our earth.

Radio Refractivity

The portion of the earth's atmosphere that influences VHF propagation related to refraction is the lowest layer. It is called the troposphere (referred to as the "tropo zone" by amateurs). This layer extends from the surface to a height of approximately 7 km (4.35 mi). However, the lowest kilometer (0.62 mi) appears to be of greatest importance to signals that leave the antenna at low angles of radiation. While the troposphere can be considered as only one material, air — the refractive index — depends on temperature, pressure and the amount of water vapor (humidity) contained in the air. The refractive index of a vacuum is 1.0, while the index for air in the tropo zone might range from 1.00010 to 1.00040. To avoid working with such awkward numbers, we can use a quantity called the *radio refractivity*.[1] The mathematical expression is $N = (n - 1) \times 10^6$. Thus, for $n = 1.00010$, $N = 100$; for $n = 1.00040$, $N = 400$. The relationship of the refractivity to temperature, pressure

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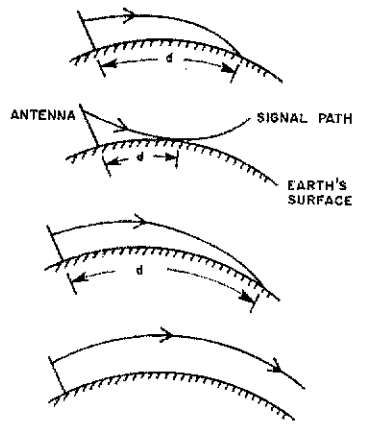
[1]Notes appear on page 33.

Table 1
Tropospheric Propagation Characteristics

Mode	Type of Propagation	Change in Refractivity with Height	Path of Signal
N	Normal refraction	0 to −79N/1000 m	
B	Sub refraction	More than 0N/1000 m	
R	Super refraction	−79N/1000 m to −156N/1000 m	
D	Ducting	less than −157N/1000 m	



Note: Negative N indicates values decrease with height.

and vapor is given by

$$N = \frac{77.6}{T}\left(p + 4810\frac{e}{T}\right) \qquad \text{(Eq. 1)}$$

with T = temperature in Kelvins (T°C + 273), atmospheric pressure (p) in millibars, and the partial pressure of the water vapor (e) in millibars. We will now examine the way in which the refractivity, N, affects the propagation of VHF signals.

Modes of VHF Tropo Propagation

There are four modes of VHF propagation in the troposphere. These modes and the manner in which they are influenced by changes in the refractivity are summarized next in Table 1.

Mode N is considered to be the normal propagation phenomenon in the troposphere. Refractivity N decreases with height above the earth by a rate of between 0 to −79N/1000 meters. In a well-mixed atmosphere that occurs under sunny skies at midday, the average change in refractivity with height is −39N/1000 m.

Mode B is substandard refraction, in that the distance to the VHF radio horizon is less than during normal refractive conditions. In this mode, refractivity increases with height.

Mode R can be regarded as super standard refraction because the distance to the VHF radio horizon is greater than under normal refractive conditions. In this mode, we find that refractivity N decreases at a rate between −79 and −156N/1000 m. Mode R, with the extended radio horizon, is of special interest to VHF DXers.

Mode D is the premier propagation mode for VHF DX. In this mode, the refractivity decreases at a rate less than −157N/1000 m. In effect, the VHF signals are trapped in a duct or waveguide. They will travel an infinite distance parallel to the surface of the earth, making DX contacts possible over thousands of kilometers.

Table 2
Refractivity by Mode

Mode	Surface Refractivity (N_s)	Decrease of Refractivity with Height
N	180	−20 N/1000 m
N	289	−39 N/1000 m
R	429	−80 N/1000 m
R	469	−100 N/1000 m
D	523	−157 N/1000 m

Table 3
Percent of Time VHF Propagation Mode Occurs

Season	Mode	Buffalo	Flint
Winter (J,F,M)	B	2	3
	N	92	92
	R	5.6	5
	S	2.4	0
Spring (A,M,J)	B	3	7
	N	77	61
	R	14	27
	D	6	5
Summer (J,A,S)	B	5	7
	N	75	61
	R	14	27
	D	6	5
Fall (O,N,D)	B	2	7
	N	89	84
	R	7	8.5
	D	2	0.5

To make the most effective use of these tropo modes, it is necessary to determine how and when they will occur. To learn the manner in which the refractivity, N, varies with height, it is necessary to utilize the expression

$$N = \frac{77.6}{T}\left(p + 4810\frac{e}{T}\right) \qquad \text{(Eq. 2)}$$

to calculate the refractivity at heights in the atmosphere for which the temperature (T), pressure (p) and vapor pressure (e) are known. Since this information is not readily available, the Central Radio Propagation Laboratory (CRPL) and the National Bureau of Standards (NBS) have defined a reference model (note 1) of the N structure of the troposphere for normal or average conditions in which the rate of decrease in N with height can be determined from values of the surface refractivity (N_s) calculated at the location of the transmitter. It has been learned that the decrease in refractivity with height becomes greater as the value of N_s increases. Hence, the distance to the radio horizon increases. The value of N_s is given in Table 2. Various modes for VHF propagation are listed.

At this point, we should recall that as N decreases more rapidly, the radio horizon is extended. Thus, the VHF DXer is interested in the high values of the surface refractivity, N_s.

Radio Refractivity Climatology

Let's consider here the changes in VHF propagation modes with the seasons and times of day (diurnal change). We will focus on the average radio climatology of the lower Great Lakes area, particularly southern Ontario, lower Michigan and eastern New York. There are two locations in the area (Flint, Michigan and Buffalo, New York) where observations are taken by means of balloon-launched radiosonde transmitters. Information is provided by telemetry to indicate the temperature, barometric pressure and humidity in the atmosphere. The transmitted data has been examined to determine the variation of radio refractivity and, hence, VHF propagation modes seasonally and diurnally.[2] The data is tabulated for Buffalo and Flint in Table 3. We can note that the spring and summer months are best for modes R and D, and, therefore, VHF DXing. The poorest conditions are found during the winter months.

We can now examine the month-by-month variation (note 2) of the mean surface refractivity, N_s, during the spring and summer at Toronto. Flint and Buffalo (Table 4 and Fig. 2). It is apparent that the mean monthly values of N_s are fairly constant among the three stations, and that the months of July and August, with the highest values, offer the best opportunities for VHF DX work.

Diurnal data was available (note 1) only for Washington, DC, and is presented in Fig. 3 for the months of May, August and November. It is clear that the highest values of N_o occur after sunset and before sunrise. In summary, on the average, the best conditions exist in the months of July and August — sunset to sunrise. It is worth our while to note the range of values for N_s for the months of July and August.

Refer again to Table 2. It lists representative values for the CRPL reference atmosphere for the rate of decrease of refractivity N with height and surface refractivity N_s. See Table 5, also. You will observe that the range of values for N_s in Table 5 does not seem to allow for propagation

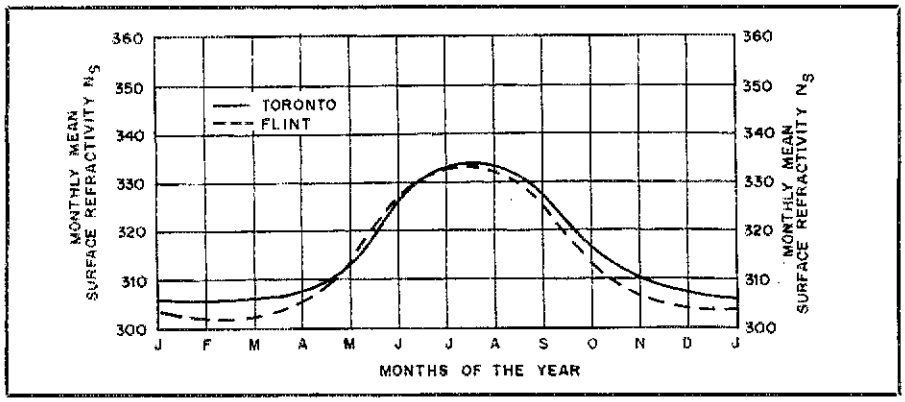


Fig. 2 — Monthly mean surface refractivity (N_s) for Toronto and Flint.

Table 4
Monthly Mean Surface Refractivity (N_s)

	April	*May*	*June*	*July*	*Aug.*	*Sept.*
Toronto	307	314	327	333	334	328
Buffalo	306	314	327	334	335	326
Flint	305	314	327	333	332	327

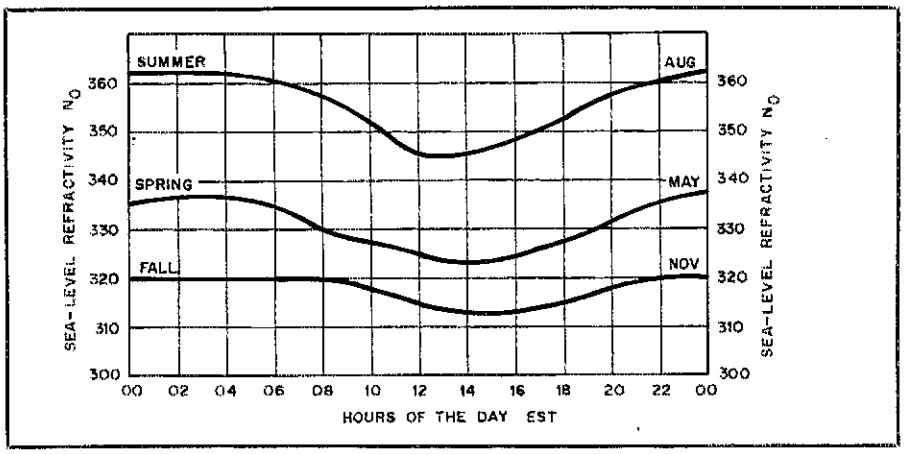


Fig. 3 — Diurnal variation in N_0 for Washington, DC.

Table 5
Mean Values of Surface Refractivity (N_s) and the Range for July and August

	Toronto		*Flint*		*Buffalo*	
	J	*A*	*J*	*A*	*J*	*A*
Mean	333	334	333	332	334	335
Range (95% Limits)	300-368	308-363	300-365	300-363	300-370	330-365

modes R or D. However, it should be recalled that these modes are for abnormal rather than statistically average conditions, which the CRPL values are meant to represent.

Atmospheric Ducts

An atmospheric duct traps the radio waves in the troposphere when the downward curvation of a nearly horizontal signal equals or exceeds the curvature of the earth's surface. Under such conditions, the signals are constrained to propagating within the duct: They may travel far beyond the earth's horizon before being returned to the surface. In order for a duct to form, the refractivity gradient within the duct must be less than -157 N/1000 m. These may be surface ducts when the required N decrease occurs at the surface or is elevated when it takes place at a particular altitude. The occurrence of ducting conditions (note 2) is illustrated in Figs. 4 and 5 for Flint and Buffalo. We can see that the months of June and July afford the highest incidence of ground-based

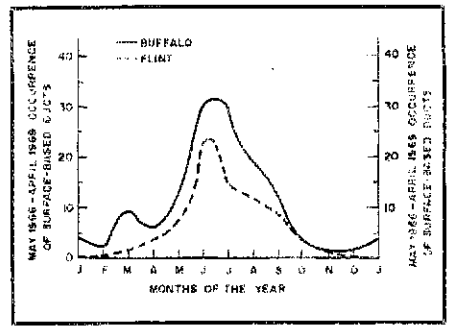


Fig. 4 — These curves show the occurrence of surface-based ducts for May 1966 to April 1969.

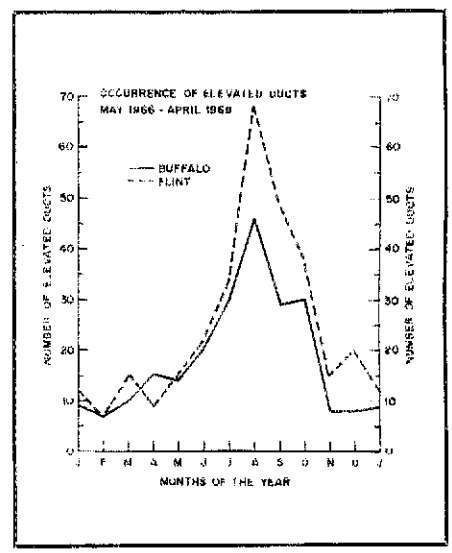


Fig. 5 — Occurrence of elevated ducts from May 1966 to April 1969.

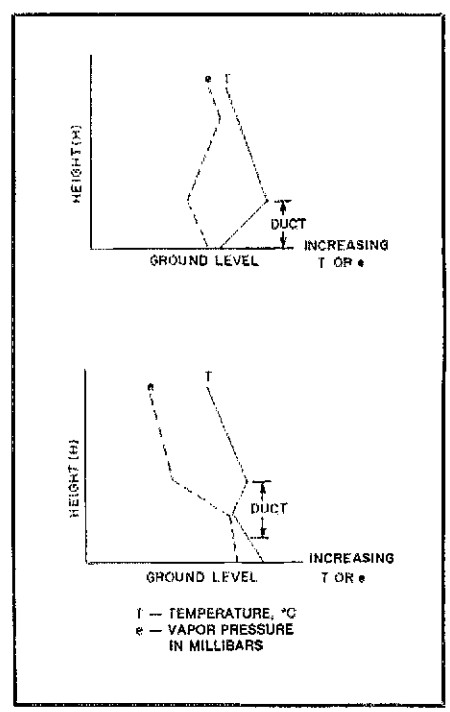


Fig. 6 — Distribution of vapor pressure and temperature for two kinds of ducts, referenced to height.

ducts. July, August and September provide the highest incidence of elevated ducts.

Requirement for Modes R and D

Mode R (super refraction) and Mode D (ducting) are the phemonena of most interest. These modes require that the refractivity, N, decrease with height. R is between −79 and −156 N/1000 m, and D is greater than −156 N/1000 m. The requirement for larger decreases in N between the surface and 1000 m is for the temperature to increase with height and vapor pressure to decrease with height (pressure — p — always decreases with height). As we noted earlier, there are two types of conditions for ducting: surface-based ducts and elevated ones. The distribution of temperature and vapor pressure with height for both types of ducts is seen in Fig. 6. There are generally two weather conditions that occur over inland areas to produce Mode R or Mode D situations — a nocturnal inversion layer and/or a subsidence layer.

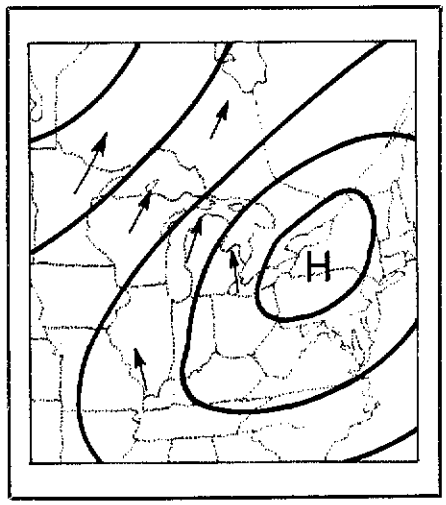


Fig. 7 — The area over the lower Great Lakes to the west of the high-pressure system will have a high probability of Mode R or D occurrence.

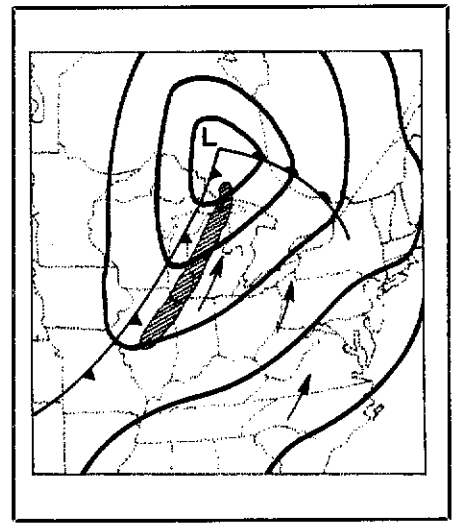


Fig. 8 — The shaded area ahead of the cold front will have a high probability of Mode R or D occurrence.

Nocturnal Inversion Layer

Under clear skies at night, the earth's surface cools rapidly by radiating the heat into space. As a result, the lowest levels near the ground cool rapidly and an inversion layer, in which the temperature increases with height, is formed. This layer can be associated with a decrease in water vapor with height. If the resulting decrease in N with height is sufficient, then super refraction or ducting will occur. Winds must be light to permit these to form and endure.

Subsidence Inversion

A subsidence inversion is formed when the air from high altitudes sinks toward the surface of the earth. The air is warmed by compression, caused by increased atmospheric pressure in the lower levels, which causes an inversion to form. This high-level air is usually quite dry. This results in a decrease in water vapor within the inversion layer, which leads to a decrease in N with height in the layer. This may be sufficient to form a super-refracting layer, or a duct. Figs. 7 and 8 illustrate the locations on a weather map, where Mode R or D conditions are most likely to take place. Familiarity with the concepts provided in this paper should be helpful in predicting your band openings.

Notes

[1]B. Bean and E. Dutton, "Radio Meteorology," *NBS Monograph 92*, 1966.

[2]B. Segal and R. E. Barrington, "The Radio Climatology of Canada," *Tropospheric Refractive Atlas for Canada*, Communications Research Centre, DOC, Report No. 1315-E, Ottawa, 1977.

Reference

Pocock, E. "The Weather That Brings VHF DX," *QST*, May 1983.

Richard Miller is presently head of the Meteorological Applications Unit at Ontario Hydro, the provincial power utility. Previously, he was staff meteorologist for an environmental consulting firm, and served as a duty forecaster for Environment Canada at Toronto International Airport. He became a licensed radio amateur in 1972, and has his BS in Physics from the University of Waterloo, Ontario.

Strays

CALL FOR *QST* TECHNICAL ARTICLES

☐ Many Field Day groups take advantage of the extra 100 points for making at least five contacts using some form of natural power to run the station. This alternate source of power can take the form of solar cells, wind or water power, or nonpetroleum fuels such as methane or grain alcohol. If these power sources can be used to make a few Field Day contacts, why not use them to power our stations every day? What an advantage this could be when you are called on to provide emergency communications!

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

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 February issue were:

- Hints on improving your RX Impedance Bridge, by H. R. Hyder, W7IV
- How to master the resistor color code with the "Commodore C64 Color-Code Program," by J. A. Biggs, K9MUJ
- The 1983 *QEX* article index

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

TWO AACS ALUMNI NETS ACTIVE

☐ Two nets for former members of the Army Airways Communications Service are presently in operation. The National AACS Alumni Net meets every Friday at 2200 UTC on 14,297 kHz (alternate 14,287 kHz) USB and at 2230 UTC on 21,397 kHz (alternate 21,387) USB. The Pacific net meets every Monday, Wednesday and Friday at 1800 UTC on 7218 kHz LSB. Newcomers welcome. — *Ronald Martin, W6ZF, Napa, California*

HF DF — A Technique for Volunteer Monitoring

Want to play hide and seek — *and win?* Let high-frequency direction finding help you locate intentional or unintentional interference.

By Gregory M. Bonaguide,* WA1VUG

Anyone licensed before World War 2 will tell you the same story: Few hams would risk emitting anything but a clean signal for fear of being nabbed by the local FCC radio inspector. Stories were traded wherever hams gathered of FCC raids on unsuspecting violators of the letter of the law. Stations were closed down, and operator licenses were confiscated.

These days, with far more stations and operators, the FCC just can't keep track of everyone. Add to this the recent cutbacks in their monitoring program, and you have a potential problem: how to deal with the few, but destructive, hams and others who interfere with legitimate amateur communication. It may be malicious, or it may be accidental, but either way it's a problem that must be dealt with.

Thanks to the passage of Public Law 97-259 in late 1982, it is now possible for Amateur Radio volunteer monitors to work closely with the FCC. One means of doing this is to become proficient in high-frequency direction finding (HF DF).

DF involves equipment and techniques for locating sources of radio-frequency (RF) radiation. Although this is hardly a new concept, DF finds many practical applications in today's RF-saturated world. It can be used to identify malicious interference, malfunctioning transmitters, and unintentional emitters such as computers, dimmer controls and receiver local oscillators.

This article will explore antennas and equipment used primarily for tracking down interference sources, and explore some propagation problems associated with DF. We'll also look at some DF techniques.

DF Equipment

Professional DF systems tend to be highly automated, which translates to *costly*. Fortunately, many hams already own one of the main ingredients of a portable DF system — a receiver (or transceiver) capable of portable or mobile operation from a 12-V battery. Many of these receivers have some form of noise blanker to reduce impulse noise. This can be particularly helpful to the DFer who might otherwise find it difficult to search for a null with electrically noisy cars whizzing by.

The built-in S meter is another handy DF gadget. It can discriminate between signal peaks and nulls as a directional antenna is rotated in a moderately strong RF field. The combination of an S meter and a skillful listener allows changes in signal level to be discerned over a wide range.

Most communications receivers have a few shortcomings for DF use, however. One problem — overloading — occurs when the receiver gets very close to the RF source. Such an intense signal will be detected in all antenna orientations, making peaks and nulls hard to sort out, and pinning the S meter.

*ARRL Laboratory Engineer

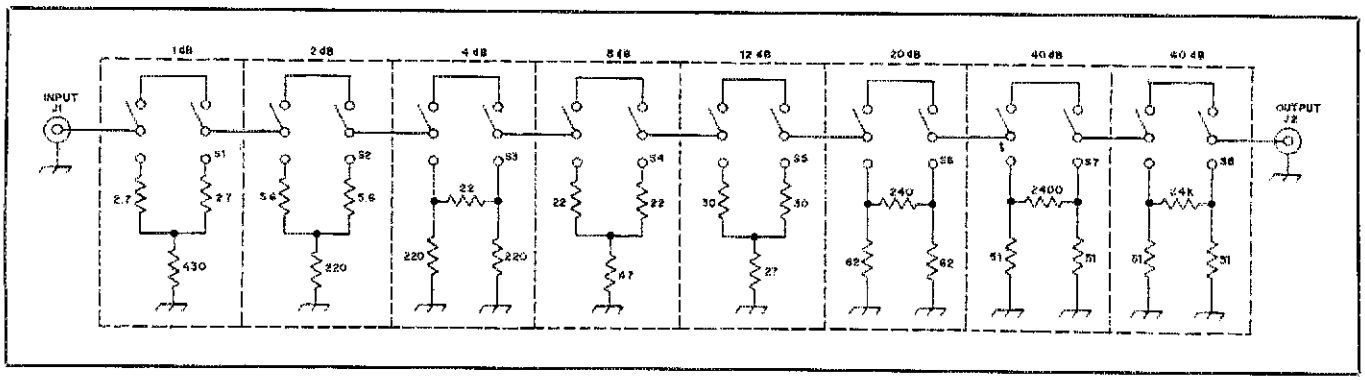


Fig. 1 — Schematic diagram of a 0-147 dB step attenuator, suitable for DF work. S1-S8 incl., are DPDT toggle switches.

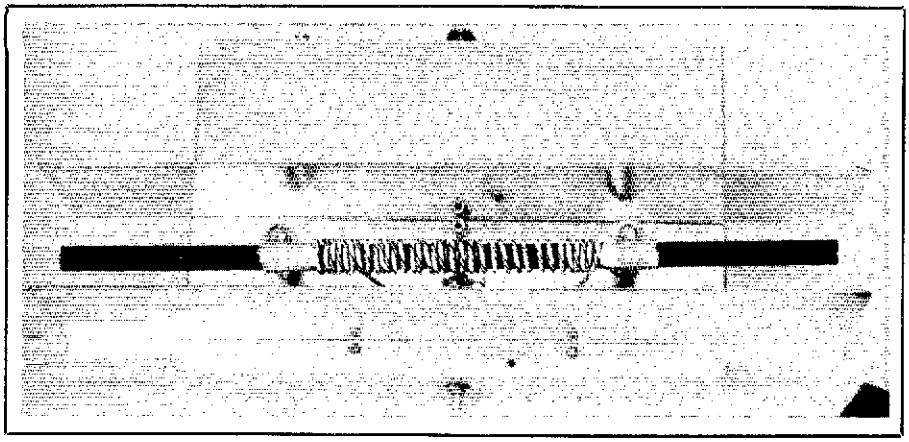


Fig. 2 — Loopstick antenna with electrostatic shielding.

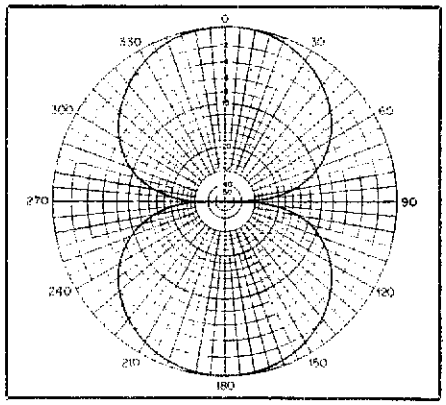


Fig. 3 — Directive pattern for a small loop antenna. The sharp nulls at 90° and 270° are used for direction finding.

If an RF-gain control is provided, it can be adjusted to make the signal-level variations distinguishable, but this will also render the S meter inoperative on many receivers. Improvement can be made by inserting a step attenuator, as shown in Fig. 1, to reduce the level of RF entering the receiver while still allowing the S meter to work.

Another related problem concerns shielding. A poorly shielded receiver (one with a plastic cabinet) or an improperly installed antenna feed line may allow unwanted RF to enter the receiver. This can seriously reduce the depth of antenna nulls, especially in high RF fields. If this is the case, you might need to put the receiver in an RF-tight enclosure with all interconnecting cables shielded carefully.

DF Antennas

The main requirement of a DF antenna is that it have a pattern exhibiting great differences between peaks and nulls. Unidirectional antennas, such as 2-or-more-element beams, can be used at the home QTH. This technique involves simply turning the beam until the receiver S meter indicates a peak. If the antenna rotator is calibrated to north when the indicator is at 0 degrees, any DF azimuth can be plotted on a map with a line running through the DF station location. This is known as a *line of bearing*, or LOB. Because the beam is unidirectional, it can indicate the direction the signal is coming from. Unfortunately, most HF beams have such broad main lobes that an azimuth closer than ±5 degrees cannot be resolved.

Beam antennas are generally too large for mobile or portable HF DF. Instead, we need to look at smaller, more manageable antennas. *Loops* can exhibit deep nulls, which are ideal for DF. An open loop consisting of one or more turns of wire wrapped around a nonmagnetic frame is usually quite small in comparison to the wavelength of operation (diameter less than 0.03 wavelength).

A better solution is to build a loop using a ferrite rod (or loopstick) similar to those found in AM broadcast radios. Adding some electrostatic shielding, as in Fig. 2, will reduce man-made noise pickup.

Loops have their drawbacks, however. The perfect loop in free space has a symmetrical, bidirectional pattern, as shown in Fig. 3. If the loop is balanced to ground, and the receiver case or the coaxial feed line is not picking up RF, the pattern will have two sharp nulls. But these will be 180 degrees apart, resulting in *180-degree ambiguity*. Clearly, one LOB will not pin down a location. An LOB is just a line that runs through the DF location and the unknown transmitter location, with no distance information.

This problem can be solved by triangulation. Two or more DFers can be spread across an area, each providing an LOB. When plotted on a map, as shown in Fig. 4, these points will yield an approximate *fix* on the unknown transmitter location.

Common DF Enemies

A variety of propagation phenomena are likely to influence the RF signals received by a direction-finding receiver. These effects include reflection, reradiation, diffraction and refraction. They all act to make the DF antenna "think" the signal is originating from an area other than the real location, or make it impossible to obtain a reliable LOB.

Reflections from conducting surfaces pose an obvious problem to the DFer. An

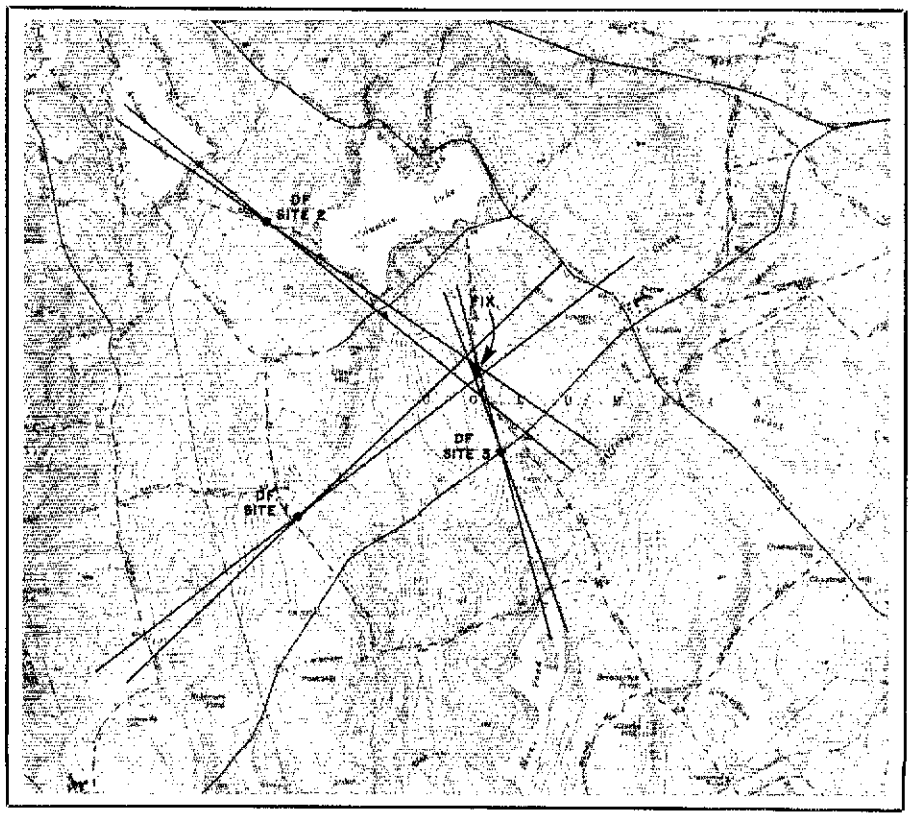


Fig. 4 — Triangulation using three bidirectional DF stations.

associated phenomenon — reradiation — occurs when RF energy is induced into a conductor, causing it to resonate and reradiate energy, much as parasitic antenna elements do. Reradiated energy arriving from several directions simultaneously makes LOB errors likely. RF energy can also give rise to harmonic reradiation, or products of mixing with other strong signals, leading to mysterious RFI effects.

Diffraction and refraction are well-known optical phenomena, and produce similar effects on the much-longer-wavelength radio signals. Diffraction is the breaking up of a wavefront, as when a wave bends over a mountain ridge. Refraction bends the wave as it enters a different medium, such as when a signal travels through humid air over a lake.

In addition to making the signal appear to come from the wrong point of origin, these secondary effects add to, or subtract from, the signal received via the closest route. In one place, the signal may be stronger; in another, the two signals may nearly cancel.

DF Techniques

There are a number of standard techniques used to reduce the many potential DF errors. One is using more than two stations to obtain a fix. The more LOBs taken from different locations, the more likely the fix will be accurate. If all the LOBs are plotted on a map, most of them will converge in a small area looking something like a circle or an ellipse. As all the DF stations move in toward the target, the area of uncertainty will keep getting smaller.

If two or more DF stations are going to be used at the same time, some intercommunication is needed between the DFers. The ubiquitous 2-meter hand-held transceiver makes a good way of coordinating a DF exercise, although higher bands, such as 220 or 440 MHz, would less likely be overheard by an intentionally interfering station.

In many situations, it is not feasible to have more than one DF station, such as when the other potential DFers are at their jobs. A single DFer can set out in a certain direction and observe what happens to the signal strength. Generally, as the signal source is approached, the received signal will get stronger. It will then broadly peak and decrease in strength as the source is passed. Unfortunately, this technique, which has been called *power profiling*, gives only a fairly crude indication of where the signal is coming from.

Once the general area of peak signal strength is found, bearings can be taken and plotted on a map. This is the solo approach to the multi-DF-site technique. It works best on long-winded, frequent transmissions, which allow the necessary data to be collected. Patience and plain good luck can both prove extremely helpful here!

Experience suggests that the DFer make his motor vehicle-bound DF environment as pleasant as possible — he may be in it much longer than originally planned. In winter, a blanket and a container full of hot brew will come in handy. In summer, solar skin and eye protection, as well as liquid refreshment, are heartily suggested.

A Group Effort

It's not impossible to perform DF alone, but the target emitter can be located much faster with some help. Like anything else involving a group effort, it pays to get things ready well in advance, and to have some drills to work the bugs out of the system. Teamwork can not only be enjoyable, it can help to bolster morale and provide the human intuition necessary when the going gets tough. And, of course, once the culprit is discovered, the pride of accomplishment will make all that time spent worthwhile. Talk it up at your next club meeting. New developments in DF equipment and techniques are always prime candidates for *QST!*

Strays

OCTOBER ARRL QSO PARTY

☐ The following are the top scores from the October 1983 ARRL QSO Parties. Scores list call, score, QSOs, multipliers, hours operated, ARRL Section.

Phone

K6LL	69,438-978-71-10-AZ
N6NF	59,924-844-71-10-SCV
WC4E	47,357-667-71-10-NFL
KZ2S	42,976-632-68-10-NNJ
NO4R	32,763-489-67-10-KY
KJ7K	20,313-333-61-10-VA

CW

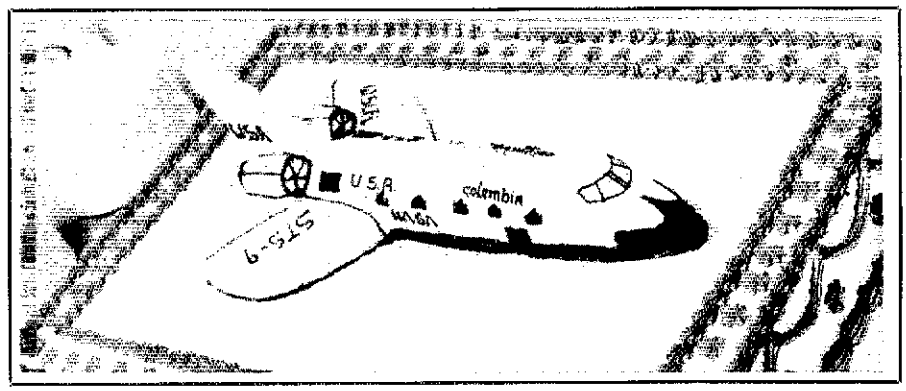
K6LL	40,704-636-64-10-AZ
KBØG	34,340-505-68-10-KS
KZ2S	33,605-517-65-10-NNJ
K1XA	32,256-512-63-10-CT
K1KI (N1EE, opr.)	30,752-496-62-10-CT
KB1W	29,315-451-65-10-WMA
AA3B	28,020-467-60-10-EPA
WC4E	27,279-433-63-10-NFL
KU8E	26,784-423-62-10-OH
N6NF	26,609-451-59-10-SCV
KM9P	25,260-421-60-10-IL
K1VUT	24,156-396-61-10-EMA
KB9S	22,326-366-61-10-WI
W7ZRC	22,140-369-60-10-ID
WA8MAM	21,411-351-61-10-WY
KB5UL	21,328-344-62-10-NTX
W9OP	21,060-351-60-10-WI
K9LJN	20,916-332-63-10-WI
WS4C	20,008-328-61-10-SC

ONTARIO BICENTENNIAL AWARD

☐ 1984 is being celebrated as the Bicentennial of the Province of Ontario. RSO, the Radio Society of Ontario, is sponsoring an Ontario Bicentennial Award for contacts or SWL reports with Ontario stations. The idea is to accumulate 200 points. Ontario stations count 1 point for Ontario stations; 2 points for Canadian stations outside of Ontario; and 10 points for stations outside of Canada, including the U.S. Ontario stations with a special bicentennial prefix (to be announced later) count for double points. All contacts must be made in 1984. To receive the award, send certified log data (no QSL cards) and $1 or 3 IRCs to VE3LSS Bicentennial Project, Geography Department, Listowel District Secondary School, Listowel, ON N4W 2M4.

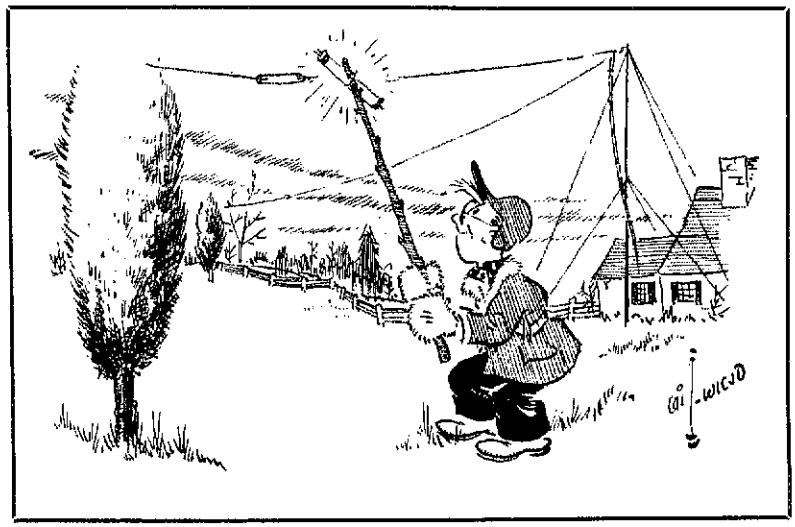
QST congratulates...

☐ Arlena and Dave Michael, WAØNXD and WAØVYS, of Salina, Kansas, on being named Hams of the Year by the Heart of America Radio Club.



The ARRL Hq. staff celebrated after the months of planning and hard work that went into the successful STS-9 Ham in Space mission by throwing themselves a Shuttle party. This unique cake was the featured attraction. *(K1ET photo)*

An Antenna System for the New Novice



Confused by the variety of information about antenna systems? Here's how one new ham solved his problem.

By John O'Keeffe,* N3DPF

As an aspiring Novice, I had a multitude of questions that needed answers before I could make my first QSO. Just preparing for the Novice exam was a formidable task. But the most perplexing question to be solved was: What type of antenna should I use and how should I install it? Most of the experienced hams I talked with agreed that a dipole or inverted V would be suitable and inexpensive.

But then the pesky little questions arose: (1) Should I use a balun? (2) What type of transmission line should I use? (What does RG stand for, anyway?) (3) Should I use an antenna-matching network or Transmatch, and why? and (4) How do I get trees to grow to heights of 66 feet in two weeks?[1]

If you have an Elmer, these questions may be readily solvable. But I soon learned that a true Elmer must be more than a knowledgeable advisor; he or she must also be a friend. I did not have a friend who was a ham, so I proceeded with what I called Project Overkill. I tried everything that was suggested, both by hams and instructional articles.

Antennas: Measuring and Mounting

I chose the basic dipole route. I figured I could make one of those. My wife's uncle came through with 200 feet of no. 12 soft copper wire and a box of assorted insulators. I carefully measured the wire to 132 feet 8 inches, cut it in half, and twisted an end of each wire through a small egg-shaped insulator. The other end of each wire was attached to an inexpensive balun, primarily for the purpose of having a way to connect the ends and the feed line together (although it also transforms the balanced antenna impedance to match that of the unbalanced feed line). I found a commercial balun that only cost $2 more than a commercial center insulator.

If you have been doing your homework, you know this is an 80-meter antenna. And what I needed to hang this wire was room, room and more room. I solved this problem by mounting a 10-foot TV antenna mast on the ridge of my house to support the center of my antenna. With the height of the mast, and a diagonal path across my property, I have just enough room for this behemoth. One end is attached to a tree, the other end to another 10-foot mast strapped to my back fence. The balun is bolted to a block of wood mounted to the rooftop mast. To keep the wire from breaking when the tree sways in the wind, I installed a pulley high on the trunk. I tied a piece of ¼-inch-diameter nylon clothesline to the end of the egg-shaped insulator, ran it through a pulley, and tied it to three bricks, which are suspended about 10 feet above ground. I found that an agile teenage son is a great benefit in tree work of this kind. So there you have it: an 80-meter antenna capable of snagging any radio signal that dares to invade the airspace over my property.

Height

Engineering data specify that for a low angle of radiation, a horizontal antenna should be installed at least ½ wavelength above the ground, which, for an 80-meter antenna, is 120 feet high. So much for good engineering practice, which assumes an absolutely flat landscape and no obstructions such as trees or buildings. The practical height is much simpler: the higher, the better. This does not mean that low is bad; it's a relative thing. You can get good performance from a dipole hung at moderate heights of 20 to 30 feet. Mine is 25 feet high at the center, and works just fine.

Feed Line

Every reference book I checked told me the magic number is 50 — 50 ohms of impedance at the transceiver, approximately 50 ohms in the antenna and, to match these, a 50-ohm feed line. But what kind? Coaxial cable seemed the best bet, principally because they don't make 50-ohm open-wire line, and also because coax is easy to run around rain gutters, through windows, against pipes, and so on. The most common cable (and the least expensive) is called RG-58 and has an impedance of 52 ohms. (The RG stands for "radio guide.") But, you say, if it's inexpensive,

[1]Notes appear on page 38.

*2616 Kinderbrook Ln., Bowie, MD 20715

will it work? For the Novice station putting out around 100 W in the 3.5- to 30-MHz range using less than 100 feet of cable, it is just fine.

If you can find it, there is something even better, though. It's called Mini 8 or RG-8X. This cable sells for nearly the same price as RG-58, and has considerably lower loss. This is the kind of cable I use.

The next step is to connect the feed line to the antenna on one end and to the transceiver on the other. First, you must determine the path the cable is to follow. There are many ways for the cable to enter a house — through a louvre in the attic, a window, or a hole drilled in the wall. I chose the hole-in-the-wall route. My ham shack is located in the kitchen and this was the easiest method. I needed only 40 feet of coax for the installation. ARRL's *Tune In The World With Ham Radio* describes how to install PL-259 connectors on each end of the feed line, but one point should be noted. If you use RG-8X cable, be sure to mention the cable type when buying connectors, since slightly larger adapters must be used. These are the same adapters used for RG-59 cable and are readily available.

At this point, it's time to stop and think. If you install both connectors onto the cable, are you going to be able to push it through a hole into the house? I found out the hard way that PL-259 connectors are much more difficult to remove than to install.

It is important to waterproof all connectors exposed to the weather. Water inside coaxial cable will not only change the impedance of the feed line, but can also cause a short circuit. I wrapped my connections with plastic electrical tape and then sprayed them liberally with clear lacquer.

The coaxial cable should be fastened securely where it runs along the house so the wind will not whip it around too much. If the cable is allowed to slap against a corner of the house or other objects, it might be damaged. A convenient attachment device is the TV standoff. These come in various configurations — some clip onto poles, some screw into wood, and some have bolt threads for attachment to metal objects. Obtain a sufficient number for firm mounting of your feed line, especially if it must come near the roof. The stones on asphalt shingles do nasty things to the plastic covering of the cable. Once the cable enters your shack and you have made sure it is long enough to reach your transceiver, cut the cable and install the remaining PL-259 plug or whatever connector is required to hook the feed line to your rig. (Heath uses phono plugs on some of their units.)

Transmatch

Antenna tuner, Transmatch, matching network — most people use these terms interchangeably to describe a device that matches the 50-ohm transmitter output impedance to the antenna input impedance. In simple terms, this device adjusts for errors in the length of your antenna. A more detailed explanation of this can be found in *The ARRL Antenna Book*.

In any event, I had an error, as evidenced by the fact that my SWR was far more than "unity," a term used to denote a 1:1 ratio. By careful lengthening or shortening of the antenna, you can tune it for minimum SWR. The easiest way to determine whether to shorten or to lengthen the antenna is through the use of a time-domain reflectometer. And since you probably do not have one of these, or know how to use one properly, a Transmatch is generally a good idea. Not only will it ensure that your transmitter is delivering full power to the antenna, but it will guard against damaging the final output transistors in your rig, if it is adjusted properly. There are many impedance-matching units on the market, some with very modest prices, or you can build one using a published design.[2] The unit I bought was recommended by a fellow ham. It has a built-in SWR/watt meter and cost about $75. It does an admirable job. If you choose to install one, you will need a short length of coax and two more connectors.

Conclusions

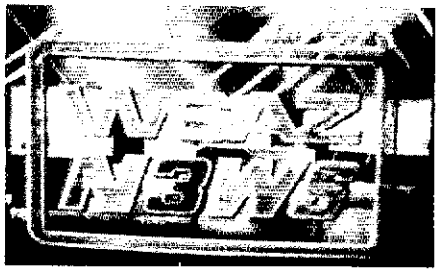
What would I have done differently? For one thing, I would have started with a 40-meter antenna instead of an 80. For the Novice, 40 meters is *the* band. It is almost always open, it has good propagation range and it is less bothered by static than 80. A dipole is only half as long as one for 80 meters, which means it is easier to install. In addition, a 40-meter antenna can be loaded up (with the use of a Transmatch) on 15 meters, which is a good Novice DX band. So with a 40-meter antenna, you get two for the price of one.

The final question is, "How well does all of this work?" My answer is, "Just fine." In my first month as a Novice, I have made QSOs to 36 states and four foreign countries. (I don't think the remaining states have any hams living in them!) I am certain there are many ways to improve the system (more height, for example), but this type of setup will not only get you on the air, it will get you there with some style.

Notes

[1]m = ft × 0.3048; mm = in × 25.4.
[2]G. Hall, ed., *The ARRL Antenna Book* (Newington: ARRL, 1982).

Strays



Dear N3WS: Every time I tune my television to Channel 3, I marvel at how you managed to convince the station to display your call sign — at least 15 times a day! I suspect your call sign is seen by more people each day than any other amateur in the world. Maybe you could tell me how you managed this feat? 73, Clark Stewart, W8TN, State College, Pennsylvania.

WHAT'S IN A NAME?

☐ Do you encounter difficulty getting the name of your QTH across while in QSO? You're lucky you don't live where GWs 2FLP, 3UAI, 3VVC, 3ZAO, 4BFU, 4JKR and others do. Their QTH is Llanfairpwllgwyngyllgogerychwyrndrobwyll-llantysiliogogogoch, Wales. Fortunately, it's been shortened to Llanfairpwll! — *F. Allan Herridge, G3IDG, Hampshire, England*

A CALL FROM THE PAST

☐ Recently, W9UP (ex-W9EZD) was going through his old W9EZD log books when he discovered the following notation: "3.5 MHz AM phone 1637 GMT 22 Oct. 1951 *W9UP* 5×9 Chicago, ILL." Unfortunately, QSL cards were not exchanged. *(tnx Phil Uehling, W9UP, Onaloska, Wisconsin)*

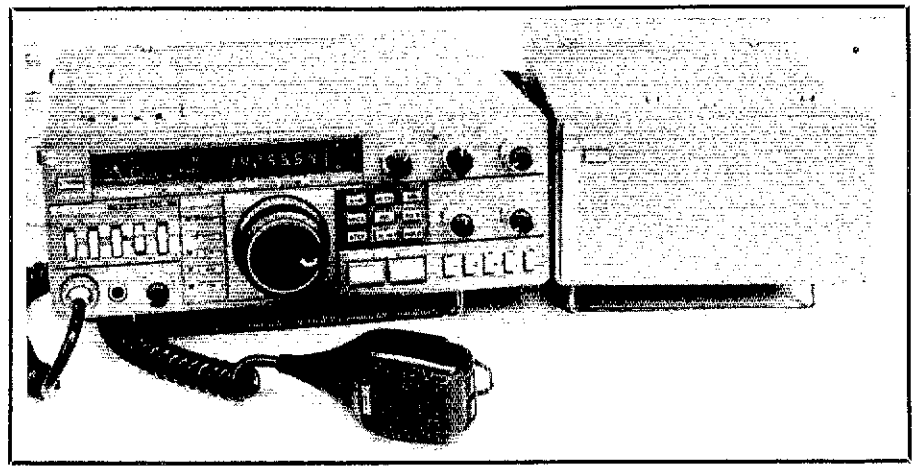
At the Mepkin Abbey in Moncks Corner, South Carolina, Charles R. Clark is known as Father Benjamin, but on the air he goes by the handle of Chuck, K4ZN. An avid traffic handler, Chuck writes a regular column on the subject for *Worldradio*.

Product Review

Conducted By Paul K. Pagel,* N1FB

Trio-Kenwood TS-430S HF Transceiver

The Kenwood TS-430S is an all-mode, 160-10 meter transceiver that covers the WARC-79 amateur bands and includes a 150-kHz to 30-MHz general-coverage receiver. The rig is small, lightweight and completely solid-state, and requires 13.8-V dc. Two VFOs, eight programmable memory channels and a variety of other "bells and whistles" combine to make this radio one of the more versatile on the market.



A Tour of the Front Panel

The front panel is divided into several sections; each section has a group of controls for the various functions of the '430S. The power ON-OFF switch is located at the upper-left corner of the rig. To the right is the multifunction meter, VFO A or B indicators, the operating frequency display, a memory channel display and three knobs: the VFO FUNCTION switch, the memory channel selector (M.CH) and the concentric NOTCH and SQUELCH controls. Below these last two controls are the RIT adjust and IF SHIFT on one shaft, and ganged AF and RF gain controls.

At the bottom-right corner are five push-on/push-off switches for various subfunctions: a band STEP control, RIT, noise blanker (NB), attenuator (ATT) and notch filter (NOTCH). To the left are the two large "press-and-hold" band-change switches — one for moving to a higher band, the other for going to a lower one. The transceiver keyboard is above the band change switches. The keyboard consists of three locking and six momentary contact switches. There's a switch to set the two main VFOs equal to each other (=), one to LOCK the operating frequency and mode, and one to STEP (change) the tuning rate. The other six switches control various memory channel functions: loading (M.IN), selecting (M.CH), scanning (MS), scan HOLD, programmed scan (PG.S) between two memory frequencies, and one to recall the selected memory's frequency and mode (MR) as the main operating frequency without switching into memory channel operation.

In the center of the front panel is the 2-inch main tuning dial. Immediately above are five LEDs that reflect various operating states: whether the rig is in transmit or receive mode (ON AIR), frequency lock (F.LOCK) on/off, frequency step (F.STEP) switch engaged, and on-off indicators for the RIT and NOTCH filter.

The left column next to the main tuning dial consists of five pressure-sensitive switches with accompanying colored LEDs. These select the transmission and reception modes. From top to bottom, LSB, USB, CW, AM or FM (optional) may be selected.

Below the name plate are five rocker switches. A SEND/REC switch, VOX or MANual transmit control, speech PROCessor on or OFF, meter function selector (ALC or collector current (IC)), and receive filter, NARrow or WIDE. The bottom-left section contains the ganged MICrophone gain and CARrier level controls, and the headphone and microphone jacks. The microphone jack has connections for a frequency-controlling (UP/DOWN) microphone.

*Assistant Technical Editor

Top and Side Panels

There are a few less-often-used controls that are placed out of the way on the top of the rig. These are the VOX GAIN, DELAY and ANTI-VOX controls, and the scanning speed control. Each has a slide potentiometer with small cloth fringes around the slides to keep out dust. One side of the rig has a carrying strap, and the other has four rubber feet for setting the rig down safely on its side.

Rear Panel

Most of the rear panel is occupied by the final amplifier heat sink. A fan is built into the heat sink. Other items here are: Ground terminal, CW key jack, external speaker jack, SO-239 antenna connector, 8-pin DIN transverter jack and a 6-pin REMOTE connector (for connection to a linear amplifier). The dc power and accessory connectors round out the rear panel.

Operation

Kenwood has managed to pack maximum versatility and flexibility into a radio that operates with a minimum of difficulty. Despite the apparent complexity of the front panel, one hardly needs to read the manual to operate the rig. With the optional PS-430S power supply, two switches are needed to turn on the rig: one on the supply, another on the transceiver.

Receive Frequency Tuning

Received-signal strength is displayed on the multifunction meter and the operating frequency is displayed to 100- or 10-Hz resolution on the fluorescent-blue digital display. A 10- or 100-Hz tuning rate is available, depending on whether or not the STEP function is selected. For fast frequency changes, the main tuning knob has an indentation for fingertip control, or the UP/DOWN buttons on the microphone can initiate a frequency scan.

When the 1-MHz STEP button is pressed, the tuning range spans 150 kHz to 30 MHz. When it is pressed again, the UP/DOWN switches select the ham bands only. For large frequency changes, the BAND UP/DOWN switches cause the operating frequency to jump exactly 1 megahertz higher or lower than the previously displayed frequency, or to the next higher or lower ham band (operator selectable). Two VFOs, A or B, may be selected, or A can be used for transmit with reception on B, or vice versa. Two LEDs indicate which VFO is in use. Since the VFOs recall mode and frequency, switching from VFO A to VFO B also changes the mode to the one entered, if it is different. A keyboard button, (A=B), sets the standby VFO to the same frequency and mode as the operating VFO.

Other Reception Pointers

FM reception from 150 kHz to 30 MHz is also possible, if the optional FM unit is installed. The squelch operates in all modes. RIT varies the receive frequency by about ±1.3 kHz. A tremendously sharp AF NOTCH filter is available and, when used in conjunction with the IF SHIFT control, can eliminate bothersome heterodynes. The IF SHIFT does not operate in the AM or FM modes, but enhances CW and SSB reception when used in combination with the RIT. Standard passband width is 2.4 kHz, but with optional filters, different IF passbands may be selected for CW or SSB; down to 270 Hz or 1.8 kHz respectively, or as wide as 2.4 kHz. Without an optional filter, the AM passband is 2.4 kHz wide; with the filter, 6 kHz. A pulse-type noise blanker is standard, and is designed for mobile operation. Signals are attenuated approximately 20 dB when the RF ATT switch is depressed.

Keyboard Notes

Eight programmable memory channels are selectable from the front panel. The memories are loaded easily by selecting the desired memory channel and pressing the M.IN button on the keyboard. Memory number eight can be programmed with different receive *AND* transmit frequencies. This is ideal for use with 10-meter FM repeaters. In this case, the two frequencies are loaded by pressing the M.IN switch twice —

Trio-Kenwood Communications TS-430S Transceiver, Serial No. 4010753

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive, 150 kHz-30 MHz; transmit, 160, 80, 40, 30, 20 17, 15, 12, 10 m (17- and 12-m band transmit inhibited by factory-installed lockout, removable by user).	Receive: As specified. Transmit: 1.601-2, 3-4, 6.999-7.5, 10-10.5, 13.9-15, 20.9-22, 27.9-29.999 MHz.
Operating modes: CW, SSB and AM (FM optional).	As specified.
Frequency display: 7-digit fluorescent blue.	As specified; ¼-in digits.
Frequency resolution: 10 Hz.	As specified.
kHz/turn of knob: 10-Hz steps, 10; 100-Hz steps, 100.	††*With 10-Hz Resolution* 10-Hz steps: min. 4.33 max. 7.21 100-Hz steps: min. 45.5 max. 73.1 *With 100-Hz Resolution* 10-Hz steps: min. 2.2 max. 8.5 100-Hz steps: min. 15.3 max. 73.9
Backlash: Not specified.	Nil.
S-meter sensitivity (μV for S9 reading): Not specified.	160 m, 40; 80 m, 40; 40 m 60; 30 m, 37; 20 m, 40; 17 m, 44; 15 m, 44; 12 m, 69; 10 m, 52.
Transmitter RF power output (W): Not specified.	160 m, 95; 80 m, 110; 40 m, 110; 30 m, 115; 20 m, 115; 15 m, 110; 10 m, 100.
Spurious suppression: Better than 50 dB.	−51 dB. (see photo).
Third-order IMD: Not specified.	−31 dB (see photo).
Receiver sensitivity:	Receiver dynamics measured with optional 270-Hz filter installed.

	80 m	*20 m*
Noise floor (MDS) dBm:	−138	−137
Blocking DR (dB):	N.L.	N.L.
Two-tone 3rd-order IMD DR (dB):	94.5	89.5
Third-order intercept:	+2.25	−2.75

Receiver quieting for 10 (dBQ): <0.25 μV.	−121 dBm for 10 dBQ.
Squelch sensitivity (dBm): Not specified.	−122 min.; −116 max.
Receiver audio output power (at 10% THD): 1.5 W into an 8-ohm load.	1.8 W.
Size (HWD): 3.8 × 10.6 × 10.8 in.†	
Weight: 14.3 lb.	
Color: Gray	

†mm = in × 25.4; kg = lb × 0.454.
††The review rig has a frequency resolution anomaly. When using the tuning knob and the 10-Hz tuning rate, the display indicates changes of 20 Hz, only occasionally showing 10-Hz changes. Ten-Hz steps are taken when the UP/DOWN buttons on the microphone are used, however. The kHz-per-knob revolution varied as shown. Two other '430Ss (serial numbers 4011493 and 4050827) showed no tuning anomalies in any mode or STEP switch setting.

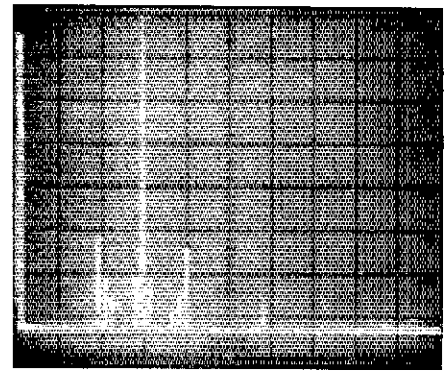


Fig. 1 — Worst-case spectral display of the TS-430S. Vertical divisions are each 10 dB; horizontal divisions are each 10 MHz. Output power is approximately 100 W at 10 meters. All spurious emissions are at least 51 dB below peak fundamental output. The TS-430S complies with current FCC specifications for spectral purity.

the first time for the receive frequency, and a second time when the desired transmit frequency is displayed on the main readout. In this mode, a string of beeps is heard until the M.IN button is pressed for the second time, reminding the operator that another entry is needed.

There are two ways to recall memory information. By pressing the MR switch, the frequency and mode in the chosen memory channel become the operating parameters, superseding the previous operating status and frequency. The second method enables you to save a VFO frequency while using the memory channels: While tuning one of the main VFOs, turn the M.CH selector switch to the desired channel and press the M.CH button.

As long as the M.CH is pressed (it is a locking switch), you can operate on any of the eight memory channels. When the M.CH is pressed again, and released, you go back to the VFO frequency and the mode you were in before entering the memory mode. This essentially gives the '430S *three* VFOs.

Scanning

To scan through the eight memories, press the memory scan (MS) switch. The scan spends approximately 1.8 seconds on each memory channel. If a memory has not been loaded with a frequency and mode, the scan skips that particular channel. Whenever a memory is addressed, the channel number is displayed to the far right of the frequency display. The HOLD button stops the scan. Memories can be selected manually by pressing the M.CH button and turning the memory channel selector switch to the desired memory channel.

Program Scan

Frequencies between memory channels six and seven are scanned with the *program scan* function. To start the scan, press the PG.S button. The scan begins with the frequency in memory six. Once the scan has reached the frequency entered in memory seven, it will jump back to the frequency in memory six. The receiver will scan every 10 or 100 Hz, depending on the position of the STEP button. The scan rate is adjusted by the slide potentiometer mounted on top of the rig at the front left. If you want to stop the scan on a particular frequency, press the HOLD button. While scanning, pressing the microphone transmit button will hold whatever frequency the scan is going through at the moment; once the button is released, the scan resumes.

Transmission

The TS-430S can transmit on any MF or HF amateur frequencies. To release the 18- and 24-MHz bands for transmission, a wire is clipped or a single diode is removed, depending on whether one or both bands are desired. Different transmission modes are selected, as in reception, by pressing the appropriate button to the direct left of the main tuning dial.

To transmit, use the PTT button on the microphone, or press the SEND switch directly under the POWER ON/OFF switch. VOX can also be used, and is turned on or off by another rocker switch. The MICrophone gain control is not active when the '430S is in the FM mode. The speech processor is turned on from the front panel. CW operation is either manual or semi-break-in; either the VOX circuitry or the SEND/REC switch may be used. On RTTY, LSB AFSK transmission is used. To operate RTTY, insert the RTTY signal into the microphone jack and turn the MIC level down. Power output should be reduced to half (about 50 W) for such operation. An optional narrow-bandwidth SSB filter is available.

Protection Circuitry

When SWR is too high, the final-output-transistor protection circuitry reduces power. When long transmissions or high-power levels cause the heat sink temperature to rise above 50° C (such as with FM or RTTY operation), the built-in fan turns on until the temperature falls below 40° C. If for any reason the temperature does not drop (when the air flow is blocked, for example), input power remains reduced.

Miscellaneous

The bottom of the rig has a bail that can be used to raise the front of the rig. The power supply also has a bail and an external 12-V dc

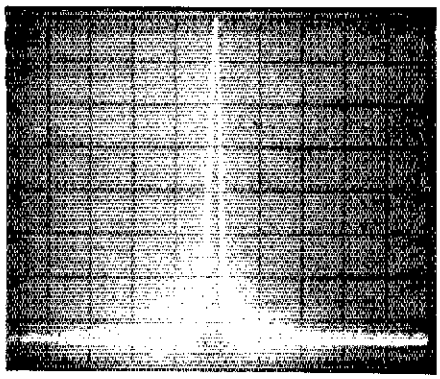


Fig. 2 — Spectral display of the TS-430S showing phase noise about the carrier. Vertical divisions are each 10 dB; horizontal divisions are each 10 kHz.

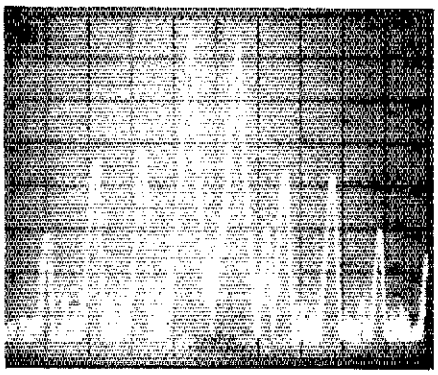


Fig. 3 — Spectral display of the TS-430S output during transmitter two-tone IMD test. Third-order products are 31 dB below PEP, and fifth-order products are 34 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was being operated at rated input power on the 10-meter band.

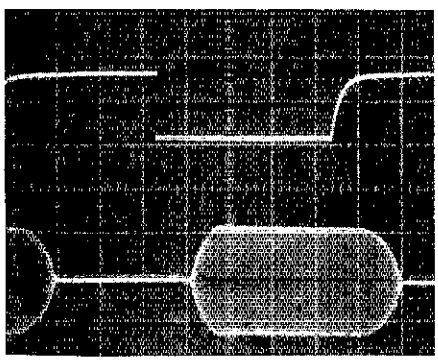


Fig. 4 — CW keying waveform of the TS-430S. The upper trace is the actual key closure; lower trace is the RF envelope. Each horizontal division is 5 ms. This RF waveform has good shaping.

terminal. A lithium-battery backup is provided to retain the memory frequencies. Estimated battery life is five years. Whenever a critical function is changed, a beep sound occurs, alerting the operator to the change in operating status. The CW monitor note is pleasant, and the volume can be adjusted after removing the top cover of the rig. The main tuning dial drag is also adjustable after removing the top cover.

Front panel styling is attractive, making use of three colors in various places. Combined with the various colored LEDs, the overall effect is quite pleasant.

The Book

Like the rig, the manual provides full coverage. Thirty-five pages long, it is almost redundant; it explains every control thoroughly. Two sections in particular are remarkable in their explanations: RF gain control and CW operation. There is even a page on radio frequency allocations that helps the user find the international BC bands. Two and one-half pages are devoted to mobile installation and operation, explaining antennas, good grounding principles and other useful information in a clear-cut manner, with excellent graphics.

Under the heading "Additional Information," topics covered include installing the various optional filters, transmission on the WARC bands, phone patch operation, transverter connections, 10-Hz frequency readout modifications and operation of the '430S as or with a separate receiver. The manual has a block diagram of the rig and schematic diagrams of the various subcircuits. A separate factory service manual is available.

Impressions

Receiver audio is crisp and sufficient from the built-in speaker. Performance with stereo headphones is also good; I didn't have to short out one of the connections in order to hear with both ears — Kenwood has provided a three-conductor jack for that purpose. Tuning-knob movement is smooth and satisfactory; I didn't have to take advantage of the variable dial drag.

I soon learned how to manipulate the multitude of frequency controls and was flitting around the spectrum, listening to ham and international broadcast (BC) stations around the world. I programmed a few frequencies into the memories, and had some fun with the Hartford 10-meter FM group. My signal quality and strength (barefoot) were praised in this mode, particularly, and there were no criticisms of my SSB or CW signal quality.

Radioteletype (RTTY) operation with the '430S is a pleasure. The 10-Hz dial accuracy allows precise tuning to bulletin-board systems on 20 meters. I kept things cool under the 100% duty cycle by turning the mic gain control down. The cooling fan did turn on after a long RTTY or FM transmission, but it was whisper quiet and soon shut down.

The front-panel meters, frequency readout and status indicators easily got their point across and are pleasant to look at. Even when I switched off the room lights, I was able to manipulate the controls with accuracy. This is a good point for mobile operation, and the TS-430S works well in such an installation. Another good feature for either mobile or home operation is the keyboard LOCK button. This locks the displayed frequency and mode, and disables most of the front-panel controls. After accidentally knocking the transceiver a couple of times and sending myself way off the net frequency, I learned to push this button as soon as I was settled somewhere on the band.

Doing It with Frequency Controls

To quickly speed scan through a band, program the desired frequency range into memories six and seven and press the PG.S button, or use the microphone UP/DOWN buttons. While using the PG.S method, I keep my index finger near the HOLD button in order to stop where I want to; although this particular scan speed can be adjusted by moving the top cover slide pot, it doesn't stop on any frequency unless manually commanded to do so.

This was my first experience with a rig having two *built-in* VFOs. I've used several rigs with outboard VFOs, and found them to be the best way to go when operating under pressure, such as during a contest or when net control tells me to go up or down a few kilohertz to send or receive traffic. Never before have I had the extreme pleasure that a second built-in VFO entails. Although I was dismayed at first not to find an XIT control on the '430S, I soon learned that the second VFO can easily accommodate the need for such fine transmitter tuning. Merely press the A=B keyboard button, and the unused VFO (be it A *or* B) assumes the frequency of the active VFO. By setting the FUNCTION switch to the appropriate A-R or B-R position, split-frequency operation results. This also takes care of cross-mode DX contacts. I soon became adept at varying these frequency controls, and it is a pleasure I will seek in other rigs.

When the main tuning dial is used, three factors affect the frequency change per knob revolution: the *mode, frequency readout resolution* (internally selectable) and *tuning rate*. The tuning rate is determined by the STEP switch (10- or 100-Hz steps). The minimum and maximum kHz-per-knob turn values for both STEP switch positions, and readout resolutions are shown in the specifications table.

Going Mobile

My "mobile" experience with the TS-430S consisted of placing the rig on the front seat of my car, collecting a premade 40-meter dipole and a heavy-duty power cord (provided with the rig), and driving up a local mountain to operate in a Field Day-like setting. I connected the power cord directly to my car battery, threw the dipole over some trees, and operated the rig from the hood of my car while the engine idled. Even in the cramped interior of my two-seater, there is sufficient room for the rig. During mobile operation, the scanner microphone and status change indicator (beep sound) is invaluable.

Shortwave Listening

This was my first experience with a sensitive general-coverage receiver, and it was a lot of fun. After 13 years of Amateur Radio operation I still enjoy the hobby quite a bit, but I have to admit that listening to the BBC or Radio Moscow is, at times, more interesting than "reading the mail" on 75-meter sideband.

A Few Criticisms

The AGC is not separately controllable on this rig. Neither is there full break-in, which is state of the art these days. The noise blanker, designed specifically for pulse-type noise found in mobile situations, is not adjustable; the noise blanker in the TS-530S is. It's true, however, that one rig cannot be everything to all people, and Kenwood definitely designed this rig with mobile use in mind.

To the discerning viewer, the main tuning knob on the review rig (and two others owned by Hq. staffers) appears slightly eccentric. This did not appear to affect performance in any way. The knob is also a bit too small for fast tuning through the bands, but this is understandable, considering the rig's size.

As noted earlier in the review, when the band UP/DOWN switches are pressed, the operating frequency jumps up or down 1 MHz. This is not always the case, however, and the instruction manual makes note of the exception: When the rig is in CW mode and is tuned from the very bottom of a band, i.e., 14.000.00 to 14.000.79,

and the band UP paddle is pressed, the operating frequency first jumps 500 kHz to 14.500, and *then* jumps up to the next highest ham band (18 MHz) at 18.500, *not* 18.000.

This is more puzzling than disturbing. Not only can it be avoided easily by simply making large band changes in any mode other than CW, it is also easy to tune down the 400 kHz or so to the CW portion of the next highest band.

The TS-430S is a fine amateur transceiver. Especially suitable in mobile applications, the '430S offers a wide variety of features for the money. If you're looking for compact size, good looks and high performance, your search is over.

The TS-430S is available from Trio-Kenwood Corporation, 1111 West Walnut St., Compton, CA 90220. Price class: $800. — *Leo D. Kluger, WB2TRN*

HEATH ACTIVE AUDIO FILTER HD-1418

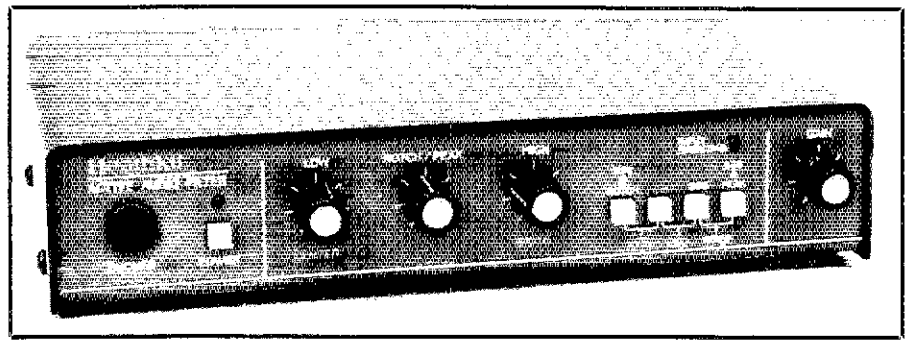
☐ An active-audio filter that offers a five-section high-pass, a five-section low-pass and a two-section peak/notch filter? Ever since becoming familiar with the variable-pass-band tuning and IF-shift features on most of the newer rigs, I have been keenly aware of the shortcomings of the IF filtering system used in my Tempo model 2020 transceiver. The new Heath audio filter sounded like just what I need to shore up the filtering in my rig. Audio filtering, no matter how sophisticated, is no match for a good IF filtering system. But for a rig that has only a fixed SSB and a fixed CW filter, a tunable audio filter can provide a definite improvement in received-signal intelligibility, by allowing you to reduce interference from a wide range of other signals and noise.

Assembly

In typical Heath fashion, the assembly manual is detailed and complete. This was my first Heathkit using their new procedure, whereby you are simply instructed to install components on the board, rather than having a detailed drawing for each step, with lines going to each component as it is to be installed. (Most hams probably ignored those drawings anyway, and just went ahead with stuffing the circuit board.) Each component location is labeled clearly on the two-sided circuit board, and large pictorial drawings are included for each group of assembly instructions. I spent about one hour, initially, doing an inventory of the parts and briefly reading through the instruction manual to familiarize myself with the procedures. I spent a total of nine hours assembling and testing the unit. I encountered no problems putting the kit together, and all check-out procedures went smoothly. Another few minutes of using the filter listening to signals off the air convinced me that I had a fine piece of equipment to complement my receiver.

Operating Controls

The unit is housed in a small aluminum box, and the front panel is uncluttered and clearly labeled. The HIGH- and LOW-pass filter cutoff frequencies can be varied from 300 Hz to 2500 Hz by means of front-panel-mounted potentiometers. The NOTCH-PEAK filter center frequency can also be varied over this tuning range by using a front-panel control. An audio-GAIN control allows adjustment of the audio output, with a maximum filter gain of 3 dB. Four push-button switches provide for the selection of one of seven modes of operation available from the filter. A POWER switch and headPHONES jack are also located on the front panel. Two LEDs indicate when the power is on and when the input signal is overloading the filter. (An input signal of more than about 3-V P-P will cause overload.)



Rear-panel jacks include a barrel type for POWER, phono types for received-audio INPUT, filtered-audio OUTPUT and a TAPE out jack for recording signals off the air. The filter has a built-in rectifier circuit along with a transistor and Zener-diode regulator. This means that the input voltage for the filter can be from 7- to 13.5-V ac or 9- to 18-V dc at 400-mA maximum current. The Heath PS-5012 power cube or just about any wall charger can be used.

Circuit Details

The model HD-1418 uses a total of 22 ICs and associated circuitry to provide 12 sections of audio filtering (see Fig. 5). The five-section high-pass and five-section low-pass filters and the two-section notch/peak filter are each controlled by a 22-kHz triangular wave that is generated by the control-oscillator circuit. An op amp compares the oscillator signal with a dc control voltage that is set by the position of a front-panel potentiometer. The comparator output pulse goes through two inverter/buffers, and is then applied to FET switches that act as variable resistors controlling the op amps for each filter section. U20, U21 and U22 are CD4066BCN ICs, each containing four FET switches. A higher resistance setting on the front-panel control provides a lower dc control voltage, and this results in a longer control pulse to the FET switches. They offer a lower resistance as the "on time" of the pulse increases. The end result is that the cutoff frequency of each filter is raised as the control is turned clockwise.

As the push buttons are used to select the various filtering options, the operation of the three individual filters is changed to suit the requirements of each mode. For example, with the CW button depressed, the LOW-pass filter control adjusts the center frequency of the passband and the HIGH-pass control varies the width of the filter passband.

The CW filter provides a variable bandwidth and adjustable center frequency characteristic. The passband has a slightly peaked response, while the CW2 mode has a flatter top. With the SSB button depressed, the passband has a flat top with steep skirts. The upper and lower cutoff frequencies can be adjusted to provide a bandwidth and center frequency that is tailored to meet many filtering conditions. If just the SSB & PEAK button is pushed, the filter passband has a definite peak. In this mode, only the NOTCH/PEAK control is operational. This mode

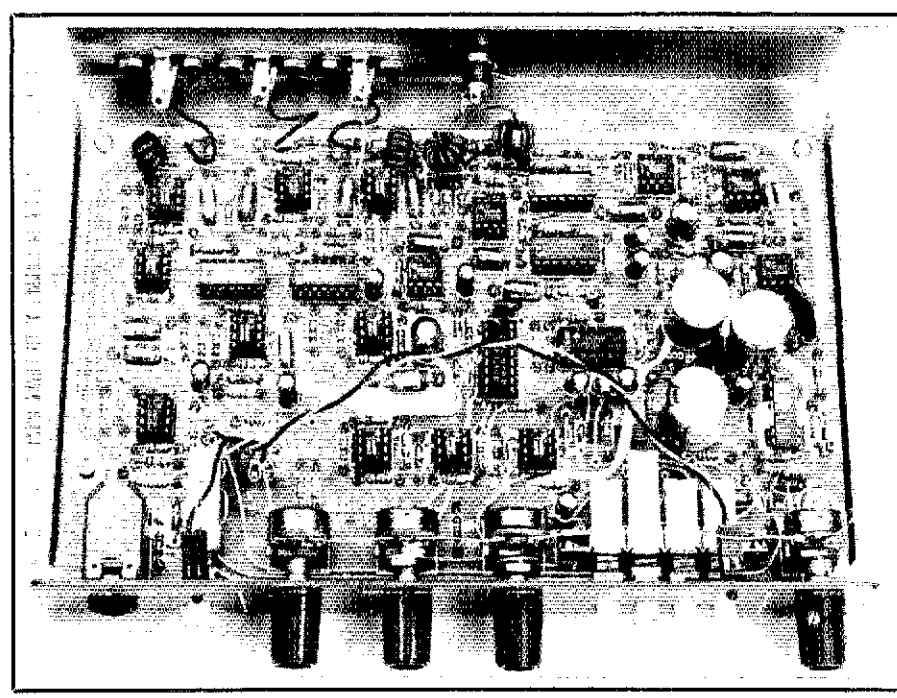


Fig. 5 — A peek inside the filter shows the large number of components used. The board layout is not too dense, however, and the board is easy to work on.

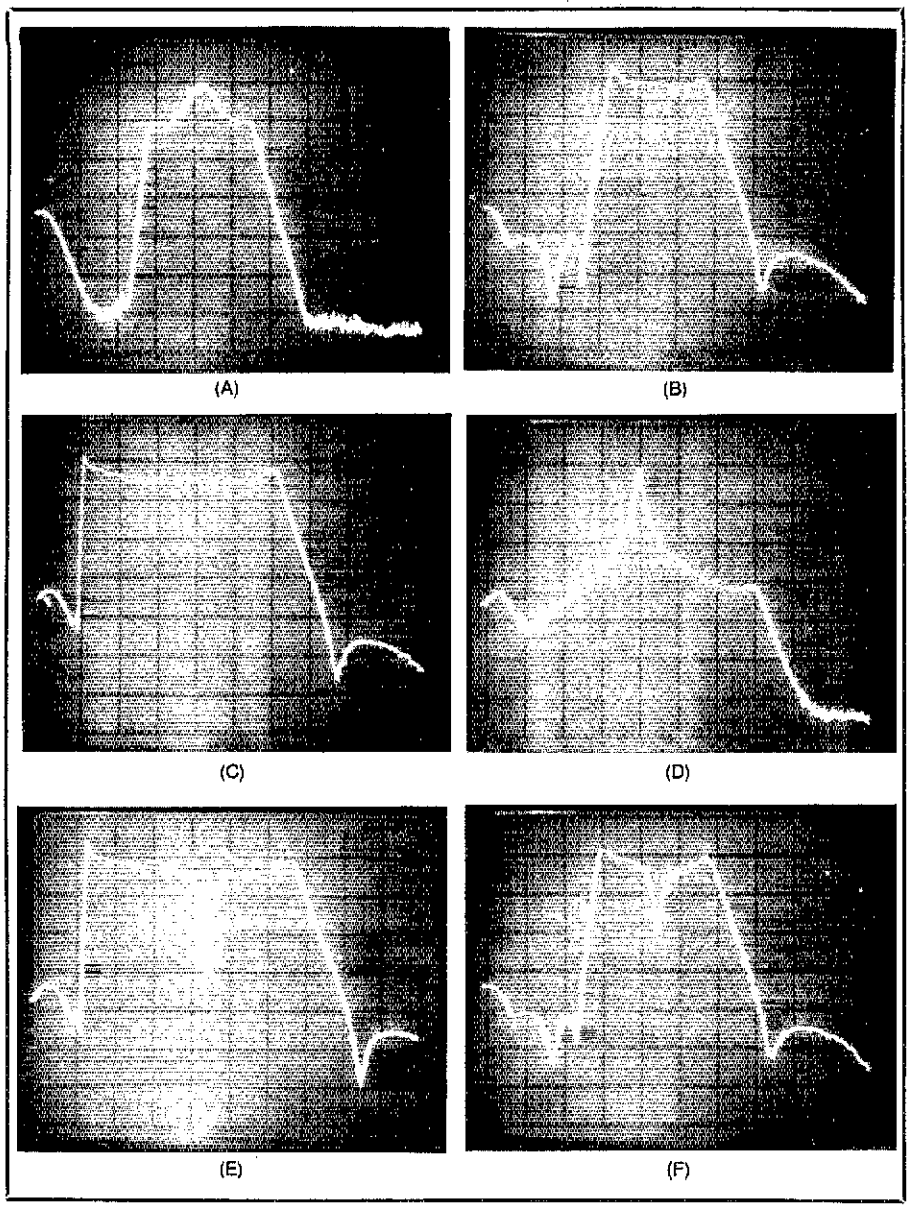


Fig. 6 — The Heath HD-1418 filter response characteristics. The horizontal scale is 500 Hz/division, and the vertical scale is 10 dB/division. The filter operating modes are shown as follows: (A) CW; (B) CW2; (C) SSB; (D) SSB & PEAK; (E) SSB & NOTCH; (F) RTTY.

Heathkit HD-1418 Active Audio Filter, Serial No. 01-4958

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
High-pass filter: 5-pole, tunable.	
Range: 300 Hz to 2500 Hz at −6 dB.	200 Hz to 3600 Hz.
Low-pass filter: 5-pole, tunable.	
Range: 300 Hz to 2500 Hz at −6 dB.	300 Hz to 3200 Hz.
Notch/peak filter: 2-pole, tunable.	
Range: 300 Hz to 2500 Hz.	300 Hz to 3500 Hz.
Width: 200 Hz at −6 dB.	Confirmed.
Depth: 30 dB.	32 dB.
Input impedance: 5 kΩ min.	
Nominal gain: Unity.	3 dB.
Audio amplifier power: 1 W into 4-Ω load.	
Power requirements: 7- to 13.5-V ac or 9- to 18-V dc, 400 mA.	Current drawn: 28 mA at 10-V dc; 33 mA at 12-V dc.
Dimensions (HWD): 1-7/8 × 8-7/8 × 6-5/8 in.†	
Weight: 1.5 lb.	
Color: Brown.	

†mm = in × 25.4; kg = lb × 0.454.

is useful to pinpoint the exact source of interference, and then the SSB & NOTCH mode can be used. In this mode, a notch of approximately 32-dB depth and 200-Hz width is inserted in the passband. If the NOTCH/PEAK control is not readjusted, the interfering station should be greatly reduced, compared to the signal you are trying to copy.

In the RTTY position, the filter provides a notch that can be moved through the passband, and adjustable high and low cutoff frequencies. In this way it is possible to tune the filter to match the mark and space tones of the station you are receiving, while rejecting any interfering signals. The final filter position selects a fixed filter, which provides a flat-top response from 300 to 2500 Hz. None of the controls have any affect on this filter combination, so there is nothing to adjust. Fig. 6 shows photographs of the filter response for each operating mode.

Operating Impressions

A first glance at the panel markings may lead you to think that operating the HD-1418 is somewhat confusing. After reading the operating instructions and spending about five minutes trying the various filter options, I decided that the controls are clearly labeled and that the unit is simple to operate. Control functions are marked in white above and red below the controls. Likewise, the filter modes are marked in white and red at the push buttons. If a filter combination identified in white is selected, the controls serve the function identified in white. If an option labeled in red is chosen, the control function is identified by the red label.

After tuning around in the phone portion of 20 meters without the audio filter, I turned it on and selected the SSB mode. By tuning to a station that was very difficult to copy, using the SSB & PEAK mode to pinpoint the interfering signal, then switching to the SSB & NOTCH position, I was able to obtain almost solid copy on most stations I tried listening to. Pretty impressive considering that I spend almost no time operating on that band because of the crowded conditions and inadequate filtering of my rig!

Next I tried the RTTY filter. I have recently been trying to use the Egbert RTTY program with my Apple® //e computer. This program uses software instead of the normal modem to demodulate the received tones. Most RTTY enthusiasts agree that while this is a neat application for a computer, it is not the best way to go. I had used the program to receive RTTY on several occasions, but copy was always far from solid. To my surprise, with the Heath audio filter in the line to my computer, I was able to achieve solid copy on most stations.

In the CW mode, I am again pleasantly impressed by the HD-1418. I leave the passband wide open for tuning around, then narrow it as needed to eliminate an interfering signal so I can copy a station. I seem better able to copy CW using the CW2 mode, with a flat-top response, but the peaked response can also offer some advantages.

Conclusion

If your rig has fixed IF filtering, the Heath Audio Filter can definitely help you. The filter is easy to build and simple to operate. The tunable filter response can be tailored to fit many operating requirements. I recommend it highly.

The HD-1418 Active Audio Filter is available from Heath Company, Benton Harbor, MI 49022. Price class: $130. — *Larry Wolfgang, WA3VIL*

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

EASY-TO-MAKE CONNECTORS FOR 1/2-INCH HARDLINE

☐ Most hams are aware of the large supply of surplus ½-inch Hardline.[1] They are also aware of the high cost and lack of availability of connectors for this cable. Over the years there have been a number of "solutions" to the connector problem, but most of them require a fair amount of metal work to construct adapters to fit between the coaxial cable and a PL-259 connector. Fig. 1 shows the connectors I use. The parts are inexpensive, and the only "special" tools required are a hacksaw and a tubing cutter. A vise would also be helpful.

Start with a compression coupling for 1/2-inch copper tubing. These are available in most hardware and plumbing stores, at a cost of approximately $1.50. Using your hacksaw, cut the fitting in two. The photo shows that the cut is made just to one side of the center "nut." Be careful not to damage the threads on the fitting. Add two PL-259 connectors, and you are ready to make a pair of Hardline connectors.

Use a soldering gun or high-wattage soldering iron to solder the back of a PL-259 to each half of the brass fitting. Be sure the coupling ring of the connector is in place first! A short piece of Hardline can be prepared and inserted into the assembly to keep the PL-259 centered on the fitting. Remove about 2 inches of the jacket and foam dielectric, so the center conductor fits into the center pin on the PL-259.

Fig. 2 gives dimensions for preparing the end of your feed line. Cut an extra 3/16 inch of jacket off the end that will be used with the longer connector. (The extra length is caused by the center nut on one half of the fitting.) Use a tubing cutter to cut the Hardline jacket, being careful not to cut into the dielectric. Then use a small diagonal cutters to start a cut on the end of the jacket. It should be easy to peel off the portion to be removed with a needle-nose pliers. Before installing the compression nut on the Hardline, you must ream the opening in the end of the nut a bit. Use a small round file to do this. You could also lightly sand the outside of the jacket for an inch or so, but if you choose this method be careful not to get aluminum particles into the foam dielectric. Aluminum particles imbedded in the dielectric will degrade the cable at this point, and may even result in a shorted connector. You should not use a hacksaw to cut the jacket on the cable for this same reason.

Slide the nut and compression ring onto the Hardline, apply a thin coat of antioxidation compound (such as Penetrox®) to the aluminum jacket, screw the connector all the way onto the cable (the threads inside the PL-259 will cut into the foam) and tighten the compression nut. The center conductor should come almost to the end of the PL-259 pin, and should be soldered to ensure a good connection. If the connector will be used outdoors, it should be sealed from the weather at the back of the nut. Use some RTV silicone sealer, such as GE RTV162 to provide this seal. — *John DeWitt, KO5B, Monroe, Louisiana*

[1]mm = inches × 25.4, m = feet × 0.3048

*Assistant Technical Editor

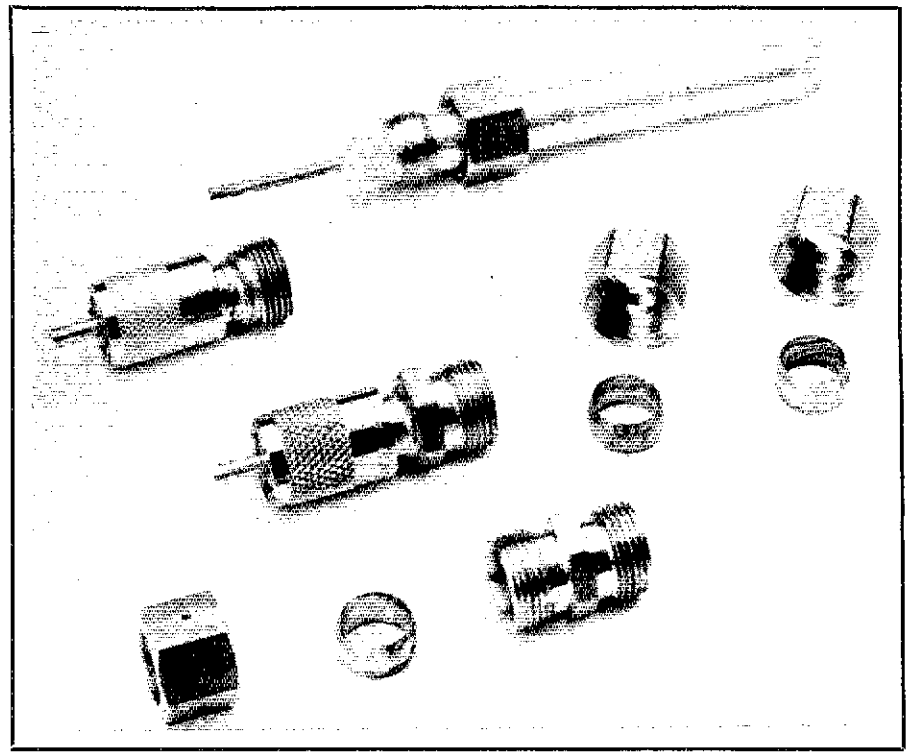


Fig. 1 — This photo shows two completed connectors for 1/2-inch Hardline ready for installation on the cable, along with an uncut compression fitting used to make the connectors.

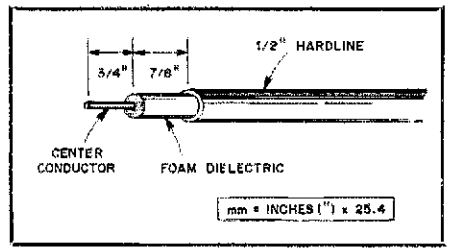


Fig. 2 — Dimensions for preparing the end of a Hardline cable for installation of a home-made connector. Remove an additional 3/16 inch of jacket for the connector that includes the center nut from the fitting.

TELEPHONE RFI CURES

☐ As more and more hams discover the increased economic benefits of owning their own telephones, and of maintaining the wiring inside the house, they also accept an additional responsibility with regard to their Amateur Radio stations. If your station causes interference to the phones in your house, *you* must solve the problem. Perhaps the procedures I tried, and the cure I used, will help others who experience such problems.

I own two Western Electric Touch-Tone® telephones. My normal amateur operation involves 40-meter QRP work. With this set-up I did not experience RFI, but when a friend lent me his Atlas 210B I found that my phones detected the 15- and 20-meter signals. The 20-meter signal was coming through on a wall phone, and the 15-meter signal was being detected by a desk phone.

First, I tried bypassing the microphone button inside the handset with a 0.01-μF capacitor. This had no effect on the interference. Next I disconnected the telephone line where it enters the house. The interference was still present! Then, I realized that the wiring inside the house must have lengths that are resonant on the two bands in question. I discovered that my desk phone would pick up the signal when it was entirely disconnected at the wall, as long as the 12-foot cord was stretched out. Gradually coiling this line reduced the interference, but then the cord was too short to reach the wall jack.

I finally cured the problem by winding 10 turns of no. 26 enameled wire on each of two Amidon FT37-43 (μ = 950) toroid cores and inserting these coils in series with the red and green wires inside the phone. I disconnected the black and yellow lines altogether. (These wires are not used if your phone line is a nonbusiness, residential private line.) Otherwise, you may have to install toroids in all four wires, where they enter the phone.

If you are renting your telephones and paying the phone company to maintain the wiring inside your house, then you should call them. Do not attempt any cures on your own. It may help if you are prepared to offer this solution when

the repairman comes to call, however. — *Tom Thompson, W0IVJ, Boulder, Colorado*

☐ Recently I purchased an I.T.T. Telephone, model PC230 (a tele-pulse type phone). When transmitting at full legal power on 20 meters, I had RFI problems with this phone. The person on the other end would get cut off at times, and the telephone audio was distorted.

I called the technical service number at I.T.T. Telecommunications Corp. in Corinth, Mississippi to ask for help with this problem. They suggested a 0.01-μF ceramic capacitor between the red and green wires. I performed this modification, but there was no difference in the operation of the telephone.

I found a powdered-iron toroid core that had been lying in my junk box for years. I disconnected the wire leading to the phone and wound it on the core, as illustrated in Fig. 3 — 10 turns in one direction and then 10 turns in the opposite direction. The idea is to form an RF choke. After reconnecting the cord at the wall, I had no more interference problem.

I have no idea what type of material the core is made of, and do not know what the permeability is. I am sure I wound more than enough turns on the core, but it does the job. — *Paul Atkins, K2OZ, Park Ridge, New Jersey*

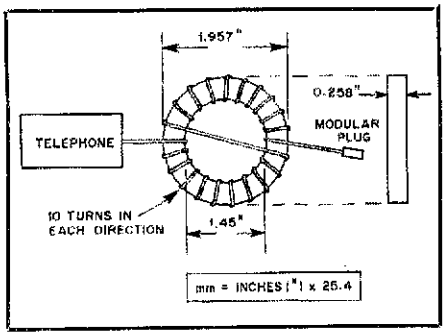


Fig. 3 — Details showing how K2OZ used a junk-box toroid core to cure a telephone RFI problem.

KENWOOD TS-830S MODS

☐ My TS-830S developed a problem that seemed odd to me. When I turn on my rig, I usually just use the power switch, and tune the receiver a bit. Then I flip the heater switch to allow the tubes to warm up. I began to notice that the receiver would die about 10 seconds after the heater switch was turned on. If I turned off the heater switch the receiver would come back in about 10 seconds.

I called Kenwood to see if they had a solution. They told me to tighten the screws on the front of the AF/AVR board. They were loose, and tightening them seemed to cure the problem. But within about 15 minutes the receiver began to go dead again. I called Kenwood again, and this time they told me to replace the 12BY7 tube. I was warned to use only a Japanese replacement, because the interelectrode capacitance is different from American-made tubes. I tried a new RCA tube that I had in stock, and it seems to work fine. I should point out that my TV tube checker indicates that the old 12BY7 is okay, but replacement has cured the problem.

While I had the radio open, I checked some of the screws inside the cabinet and found several loose. The sheet-metal screws holding the heat sink for Q30 and Q34 were very loose. It would probably be a good idea to check periodically to be sure all of the screws are tight. — *Russell Lawson, K1MOU, Suffield, Connecticut*

☐ After about six months of perfect operation with my Kenwood TS-830S I began to experience random frequency jumps of approximately ± 1 to 5 kHz. Not wanting to ship the rig back for service, I called Kenwood to see if they had a cure for the problem. They did. This malfunction is caused by a loss of ground connection to the AF/AVR circuit board. The ground connection is maintained by means of the contact between the board and an aluminum heat sink. Kenwood sent a copy of Service Bulletin no. 840, along with two toothed washers to make the needed repair.

The procedure consists of removing the top and bottom covers and removing the screws that hold the AF/AVR unit in place. Put a star washer between the board and the aluminum heat sink under the two self-tapping screws that do not already have one. [Jim Lommen, KC7QY points out that a later bulletin also suggests the addition of a solder lug as shown in Fig. 4. A wire soldered between the solder lug and the test point ground post on the board provides a positive ground connection. — Ed.] Reassemble the radio, and the frequency-hopping problem should be cured.

A similar malfunction, in which the digital display frequency changed intermittently but the actual operating frequency did not change, was described in the November 1981 Hints and Kinks column. That problem had a different cure. — *Barry Henderson, WA2JKS, Neptune, New Jersey*

☐ After purchasing a used TS-830S at a "real good" price, I found that it had a problem. When the radio was first switched on, the display would not light and the receiver seemed totally dead. After a few minutes the display would light, and the receiver functioned normally. I noticed that the colder the room temperature, the longer the radio took to come on.

I called Kenwood's Service Department and was told this is a common complaint with a simple fix. Transistors Q30 and Q34 are used as voltage regulators, and they depend on leakage current to begin operation. They are located on the AF Unit board. Apparently some batches of the 2SA473 transistors have a leakage current much lower than normal. If you get one of those transistors in your '830, then you may have to wait a while for the regulator to "fire" initially.

The simple cure for this problem is to install a 22-kΩ resistor between the base and collector of each transistor. Fig. 5 shows part of the AF Unit board, including the location of transistors Q30 and Q34. I removed the nuts retaining the circuit board and installed the resistors on the underside of the board. There is plenty of room for the new parts. Now my TS-830S comes alive the instant I apply power. — *Peter R. O'Dell, KB1N, ARRL Hq*

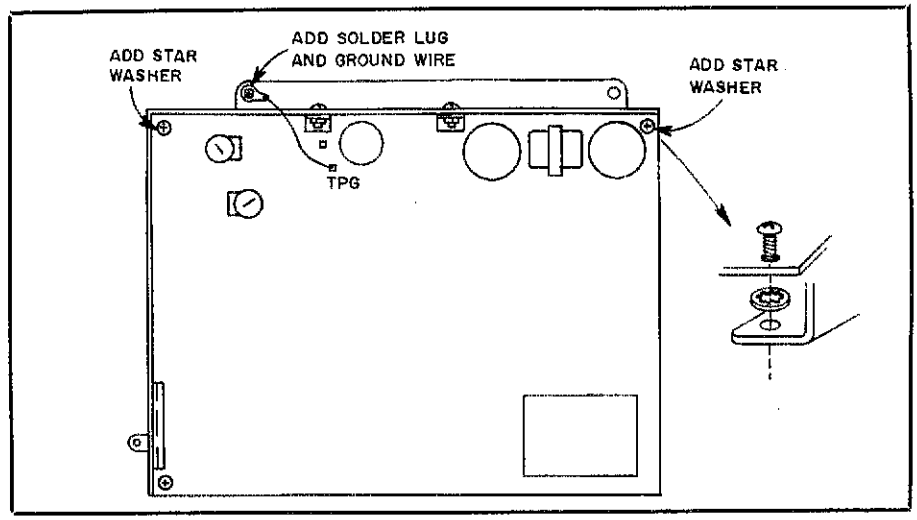


Fig. 4 — A view of the AF/AVR circuit board, showing the addition of two star washers, a solder lug and a ground wire to cure a frequency-jumping problem in the TS-830S.

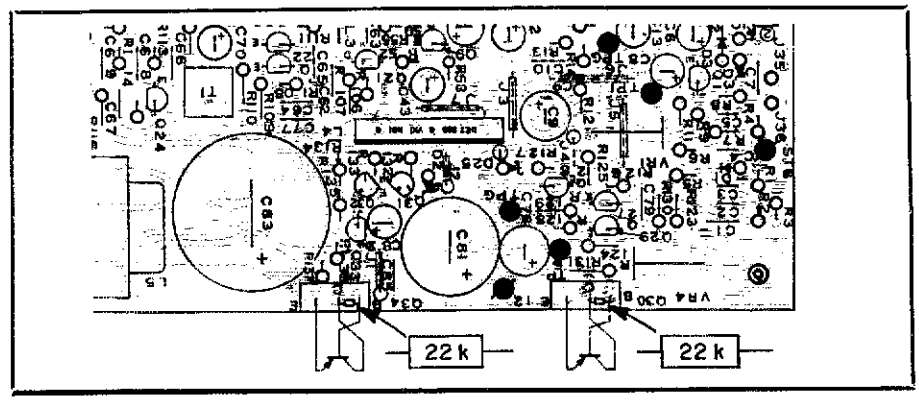


Fig. 5 — Part of the TS-830S AF Unit circuit board, showing the location of Q30 and Q34, where 22-kΩ resistors are added to cure a slow turn-on problem.

Technical Correspondence

Conducted By
Bob Schetgen,* KU7G

VERTICAL ANTENNAS WORK!

☐ I'm a vertical antenna buff and have been experimenting with them since 1971. My small book (based on the experiments) has sold thousands of copies, and letters from readers prove that, with a common-sense approach, vertical antennas are *not* poor radiators in all directions.

Vertical-antenna enthusiasts should pay close attention to DeMaw's statements in "Building and Using 30-Meter Antennas" (Oct. 1983 *QST*), on p. 29. I want to emphasize that, as operating frequency approaches the upper end of the HF spectrum, antenna height above ground is the difference between cooking earthworms and making contacts. Many letters that substantiate these findings have come to me from operators who have learned to appreciate vertical antennas.

I will "go out on a limb" by saying: Any vertical antenna will perform better (on the 15- and 10-meter bands) mounted 20 ft above ground level with four radials, than the same antenna mounted at ground level with 100 radials.[1] On the 20-meter band, height will most certainly help, but it is not mandatory. On the 40-meter band, there is no difference. Regarding the 75-meter band, I cannot prove that a 65-ft vertical, ground mounted with a tremendous number of radials, will not outperform a top-loaded vertical at 20 ft. If I had the room, I'd like to test it, but on a city lot — forget it!

Antenna height is important on 15 and 10 meters, not only for overcoming obstacles, but also because of the Brewster effect (see "DX and the Brewster Angle," C. L. Hutchinson, Technical Correspondence, May 1983 *QST*), which tends to cancel low-angle radiation at these frequencies. I explained this to a CBer who wrote to me from Kansas. After testing antennas on the ground and at a height of 20 ft, he also found the elevated version superior. As a by-product, he became so fascinated that he soon passed his Novice examination. Chalk one up for our side! — *Charles Schwartzbard, AF2Y, Clifton, New Jersey*

MINIMUF REVISITED

☐ The MINIMUF ("MINIMUF: A Simplified MUF-Prediction Program for Microcomputers," R. B. Rose, Dec. 1982 *QST*) model has been in use for a year now by the ham community, and I think it is appropriate to comment on the observations made by its users and some of the responses I have received. Overall, it has been a genuinely rewarding experience. I have received and responded to over 150 pieces of correspondence. Some individuals even shared their successful conversions with me. I now have a library of software conversions that includes versions for the HP-67, TI-59, Timex/Sinclair, Atari®, Apple® II, VIC 20™ and TRS-80® microcomputer.[2]

I have received many letters requesting help in the conversion of the original Tektronix BASIC to another dialect. Because of time involved in "debugging" someone else's software, these requests were handled on an "as time allows" basis. I am grateful to Mr. Jim Martin, a colleague of mine, who undertook some of the more "pathological" problems as a spare-time challenge. I think we have responded to almost everything, but there is a chance something fell through the cracks. If so, I apologize.

There have been repeated references to comparisons between MINIMUF and the *QST* propagation charts. *QST* predictions are developed at ITS (Institute for Telecommunication Sciences) on their biggest and best numerical codes — IONCAP 78.03. That MUF calculation is very large and complex, as it attempts to explicitly solve the physics of the MUF boundary. In MINIMUF, we attempt to implicitly solve the "dynamics" of the MUF. It is a heuristic model that has been extensively tested twice against actual measurements of MUF. The expected RMS error on any prediction is 3.5 MHz. Comparisons with IONCAP predecessors HFMUFES IV, ITS78 (three versions) and ITSA-1, all produced equal relative errors. *All* HF prediction programs do well on some paths and poorly on others (not necessarily the same paths). Comparing one HF prediction program against another is not valid unless all of the assumptions within the models are approached in the same manner. Such comparisons should be used with caution because they are comparisons of "apples and strawberries." With this in mind, experimenters can observe the passage of the MUF through a frequency where a reference transmitter operates. WWV, WWVH and many shortwave broadcast signals do nicely. Normally ±30 minutes, from the predicted time of MUF passage, is a good window.

In addition, many users expect absolute results from MUF predictions. In practice, if my prediction comes within 1 MHz of the actual MUF, I am quite happy. MUF predictions should be used as general indicators. Look for peak periods and low periods. Sometimes my predictions show a MUF of 26 MHz, but if I check the 10-meter band it is often open. The mechanics of HF propagation are sufficiently complex that no computer prediction program can exactly reproduce the characteristics along a path. To some extent it is like predicting the weather: Some predictions will be right, some wrong and some in between. However, HF predictions can give fair indication of high- and low-activity periods, and what part of the world may have the best chance of contact on a given band.

In Technical Correspondence (Oct. 1983 *QST*), Sheldon Shallon, W6EL, presents a correction for polar paths. His observations and approach to dealing with the problem are correct. The explicit solution is not trivial, and a correction that will not unduly complicate the MINIMUF model is being formulated. I do appreciate Mr. Shallons's comments, as it is impossible for one group to test for every situation. Hams are notorious for unearthing "pathological" scenarios for any prediction program, and the MINIMUF model is no exception.

I have found this whole experience fulfilling. The responses I received show a helpful, sophisticated readership who want to learn about propagation and how to use simple prediction methods. I wish to thank those who wrote and called for their interest and comments. There will be more coming — a new model with a field-strength algorithm and more. — *Bob Rose, K6GKU, El Cajon, California*

COAXIAL ANTENNA TRAP DESIGN

☐ A coax trap is electrically equivalent to a parallel LC circuit having the inductance of the shield and the total capacitance of the coax, C.[3] To understand this, consider a coax trap as a pair of unity coupled coils with the same number of turns but without capacitance between the conductors (Fig. 1A). Neglect resistance, inter-turn

[3]R. H. Johns, "Coaxial Cable Antenna Traps," May 1981 *QST*.

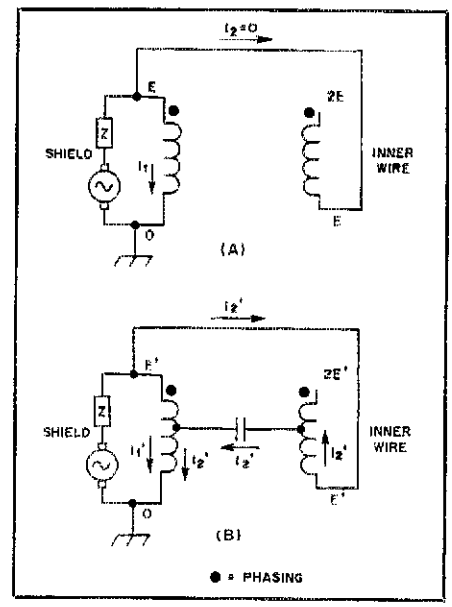


Fig. 1 — Schematic diagram of a coax trap as a coil with no cable capacitance (A), and with a capacitor connected across opposite points on the coil (B). Operation of the circuit is explained in the text.

[1]m = ft × 0.3048

*TIS Specialist, ARRL

[2]Mr. Rose's address is: Head, Ionospheric Assessment Systems Branch, Naval Ocean Systems Center, San Diego, CA 92152.

capacitance and delay time in the cable. The flux, ϕ, and its time derivative are the same in all turns, so the voltage across each turn is the same as the voltage across every other turn. Thus voltage varies linearly with position along the windings. (The dots in the figures indicate winding sense.) In Fig. 1A, I1 = EωL (L is the inductance of the shield), and I2 = 0. In Fig. 1B, a capacitor is connected between opposite points on the windings. A current, I2′ flows as shown. Because the current through Z changes, the voltage across the shield changes to a new value, E′ and the flux to a new value, ϕ'. Since the coils are unity coupled, the voltage ratios and their relative phase cannot change. Thus, the voltage across the capacitor is always equal to E′, the voltage across the shield winding, whatever the value of E′ may be. I1 changes to I1′ = E′ωL; I2′ = E′ωC. Now, note that I2′ flows in opposite directions through the coils, so the net flux produced by I2′ is zero. We may move the capacitor down to the bottom of the coils without changing anything. If we continue this reasoning for other capacitors connecting opposing points on the coils, we end up with a resonant circuit consisting of the shield inductance in parallel with the total capacitance of the coax. Therefore, a coax trap is identical to an ordinary trap having equivalent (including Q) component values.

To demonstrate this, disconnect the center conductor of a trap and connect an external capacitance equal to C in parallel with the shield. This arrangement will resonate at the trap frequency. Next, reconnect the center conductor and add capacitance, in parallel with the shield, equal to 3C. The resonant frequency of the combination will then be half that of the trap alone. Thus, differences in antenna loading must be explained by variations in reactance and Q, rather than any peculiar properties of the coax trap.

Design of Coax Traps

The capacitance of a coax trap is given by:

$$C = \epsilon (\pi\, d) n \qquad \text{(Eq. 1)}$$

where

ϵ = capacitance per inch of cable.[4]
d = diameter (to center conductor) of coil in inches
n = number of turns

The inductance of the shield is:

$$L(\mu H) = \frac{d^2\, n^2}{18\, d + 40\, bn} \qquad \text{(Eq. 2)}$$

for close-wound coils, where b is the cable diameter, in inches, and the other variables are as defined for Eq. 1.

The resonant frequency is then:

$$f = \frac{159}{\sqrt{LC}} \qquad \text{(Eq. 3)}$$

where

f is in MHz
L is in μH
C is in pF

[4]mm = in × 25.4

Table 1
Johns's Data Compared With Results From Eq. 5

		Turns	
Meters	*MHz*	*Eq. 5*	*Johns*
10	28	4.1	3.75
15	21	5.2	5
20	14	6.8	6.75
30	10	8.8	9.75
40	7	12.2	12.75

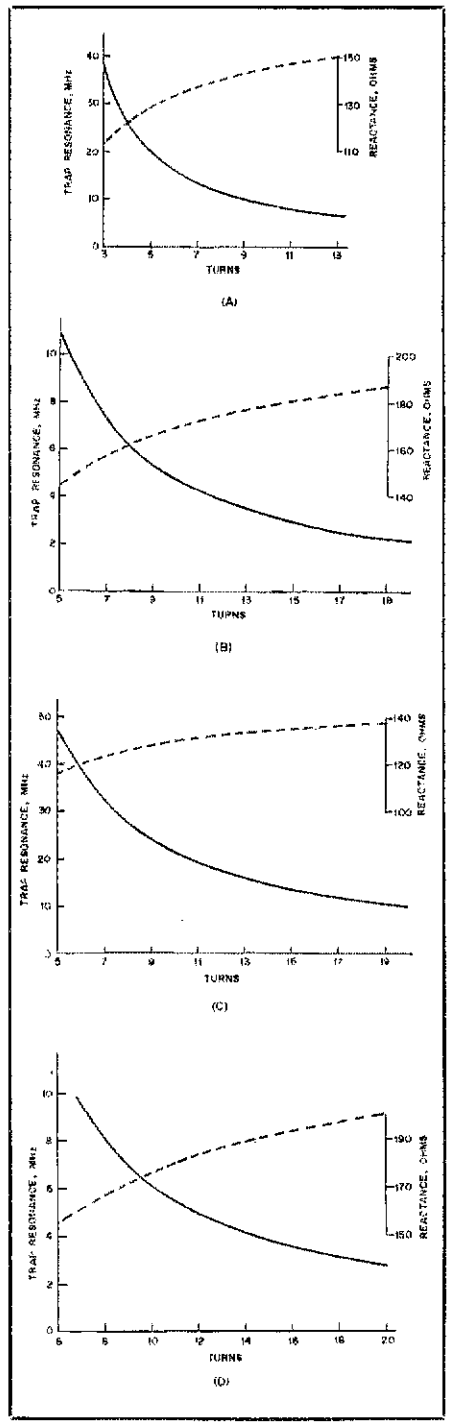


Fig. 2 — Graphic solutions of coax traps made with: RG-58/U on a 1½-inch form (A), and a 2½-inch form (B); RG-174/U on a 5/8-inch form (C), and a 1¾-inch form (D).

Substituting Eq. 1 and Eq. 2 into Eq. 3 and simplifying yields:

$$f = 127 \sqrt{\frac{9d + 20\, bn}{\epsilon\, d^3\, n^3}}\ \text{MHz} \qquad \text{(Eq. 4)}$$

where ϵ is in pF.

For RG-58/U:

b = 0.195 inch
ϵ = 2.375 pF per inch

$$f = 127 \sqrt{\frac{15.26 + 3.9\, n}{11.57\, n^3}} \qquad \text{(Eq. 5)}$$

Results from Eq. 5 substantially agree with Johns and DeMaw, and with my own experimental data.[3,5] Johns's data is compared with the results of Eq. 5 in Table 1. Fig. 2, A through D, show graphic trap solutions for the HF range using RG-58/U and RG-174/U. — *Frank Noble, W3MT, Bethesda, Maryland*

[5]D. DeMaw, "Lightweight Trap Antennas — Some Thoughts," June 1983 *QST*.

Feedback

☐ In Fig. 3 of "CW on a Chip," Dec. 1983 *QST*, the anode labels for D2 and D3 should be cathode labels. Also, D3 is missing from Fig. 2B; it should be shown across the coil of K1, with the anode end toward R16.

☐ Budd Meyer, K2PMA, points out several errors in the "Power Supplies from Old Battery Chargers" item in Hints and Kinks, Dec. 1983 *QST*, p. 42. A low-value resistor should be included in series with each pass-transistor emitter lead shown in Fig. 2. This will help balance the load carried by the pass transistors. The usual value is 0.1 ohms, 5-W wirewound. The relay contacts should be shown as normally closed. Also, the relay and SCR circuit will be much too slow to provide good overvoltage protection for sensitive solid-state equipment.

☐ The published S-meter sensitivity figures for the Kenwood TS-930, Product Review Jan. 1984 *QST*, are incorrect. Here are the correct figures (μV/S9): 160-40 m, 44; 30 m 42; 20 m, 47; 15 m, 58; 10 m, 50.

☐ Author Rautio points out that parts of Fig. 3 in his article, "The Effect of Real Ground on Antennas," Feb. 1984 *QST*, appear with the wrong captions. The plot over caption I belongs with caption K; plot K should be with caption L and plot L with caption I.

☐ One error crept into "A Keyboard Keyer and Code-Practice System" in Jan. 1984 *QST*. On page 15, in the second line up from the bottom of the first column, the new character being formed should read (— ···· —).

Volunteer Examiner Program: An Update

- A strong response from Prospective Examiners
- FCC moves to resolve cost-recoupment question
- ARRL preparing to be VEC
- VE program to provide more convenient test sessions
- Answers to your most frequently asked questions

By Curt Holsopple,* K9CH

Interest in the new Volunteer Examining Program is running high. More than 4000 Prospective Volunteer Examiners (PVEs) have expressed their willingness to help provide a vastly improved examination program for the Amateur Radio Service. More contact ARRL Hq. daily.

Over the past three months, the VE Program has seen several major developments. The strong response from the Amateur Radio community has dispelled any doubt that there will be enough examiners available to make the program work. The letters and phone calls to ARRL Hq. have shown that Prospective VEs are getting together and making plans to schedule regular Amateur Radio license exams in their area.

Field input has also been very helpful to the ARRL's VE Program office as we plan the details. The ARRL, as a Volunteer Examiner Coordinator, will be responsible for coordinating the work of the Volunteer Examiners, but the VEs themselves will do the actual testing. It is up to you to make the program go, and to let us know where it needs improvement. *Your input is necessary!*

Let's look at some developments that have emerged since our last report on the VE Program.[1] We'll also answer some questions that have been asked about it.

Table 1
Definition of Terms

Prospective Volunteer Examiner (PVE): an Amateur Radio operator who seeks to become a Volunteer Examiner.

Volunteer Examiner (VE): an Amateur Radio operator who prepares or administers Technician and higher-class examinations to applicants for Amateur Radio operator licenses, and who has been accredited by a VEC.

Volunteer Examiner Coordinator (VEC): an entity which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of Volunteer Examiners in preparing and administering examinations for Amateur Radio operator licenses.

Volunteer Examiner Team (VET): a group of three accredited Amateur Radio operators serving in the capacity of Volunteer Examiners.

"Over 4000 people have registered their interest in becoming Volunteer Examiners."

Test Opportunities: VEs Will Improve the System

This month's cover shows a map of the U.S. with pins designating the Prospective VEs who had registered through January 12, 1984. The red pins are Extra Class PVEs, while the greens stand for Advanced class prospects. Fig. 1 shows the FCC Field Office 1983 exam schedule. The letter "F" signifies Field Office locations, while the numbers indicate where and how often additional field tests were given in outlying areas during 1983. Comparing the cover photograph to Fig. 1, you can see the potential for expanding the distribution of test sites under the VE Program, particularly in less densely populated areas.

In urban areas, the convenience of local, more frequent test sessions will remove a major test shock factor: the often-harrowing drive over unfamiliar big-city streets, the search for a parking space and the uncertain wandering through concrete canyons. Although the FCC examiners were generally friendly and helpful people, the location of the exam rooms often seemed intimidating to those who took amateur license exams.

Accrediting Volunteer Examiners

Over 4000 amateurs have registered their interest in becoming Volunteer Examiners. Until now, this has been only an informal "show of hands," with each individual's call, license class, name and address included on the registration. To this point, the ARRL, in preparing to become a VEC, has not accredited anyone officially. The accreditation criteria have not been finalized, and the ARRL has not yet been given the authority officially as a Volunteer Examiner Coordinator by the FCC.

[1]Notes appear on page 50.
*Manager, ARRL Volunteer Examiner Program

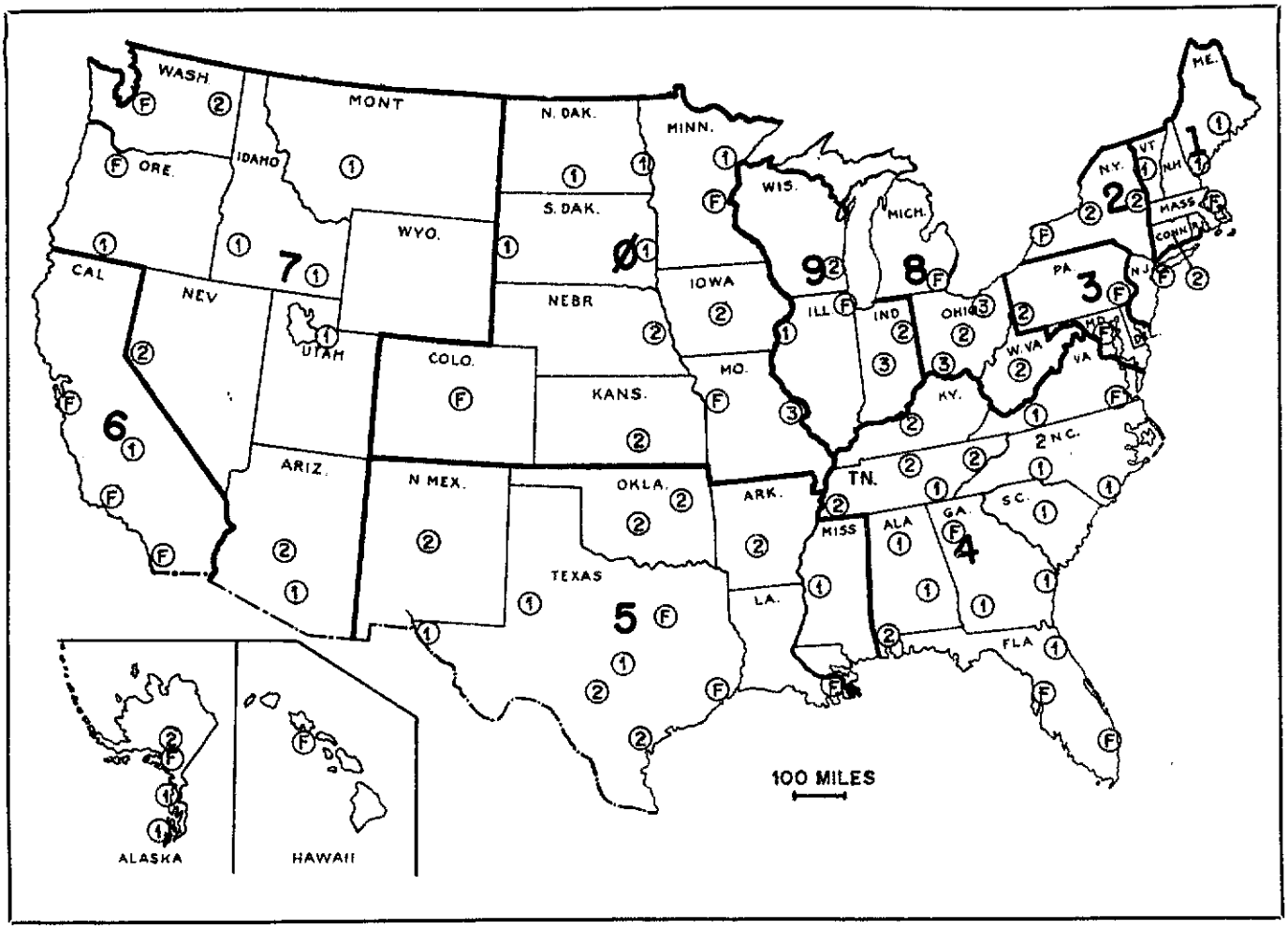


Fig. 1 — 1983 FCC Test Sessions. The letter "F" shows the location of each FCC Field Office, while the numbers indicate where and how often remote field test sessions were held during the year.

Once the ARRL Board finalizes the ARRL-proposed VE accreditation criteria, and these criteria are checked with the FCC, the ARRL can begin provisionally accrediting its pool of Volunteer Examiner prospects. This will save a great deal of start-up time later. This accreditation process will be *unofficial* until the ARRL and FCC formally sign the VEC operating agreement.

The Role of Clubs

Many clubs have been enthusiastic in their support of the Volunteer Examiner Program. We are grateful for their hard work and organization. Ultimately, clubs will be fulfilling a major role in supporting the test sessions and the work of the Volunteer Examiners. The FCC rules require the VEC to accredit *licensed radio amateurs,* however, and clubs as such don't qualify. In addition, the FCC Rules clearly state that a VE must be accredited without any regard to membership (or nonmembership) in any club or organization. During the accreditation process, therefore, the ARRL will need to deal with each Prospective Volunteer Examiner individually.

As a part of the accreditation process, we will ask Prospective VEs whom they would like to team up with, if they so choose, to form a VE team, and whether they will normally be associated with a particular club or hamfest committee that will sponsor test sessions. (Note that VE teams need not be permanently formed groups.) We will ask this only for convenience in coordinating the program. Once a team is formed for a particular session, it will communicate with the VEC via its chairperson, team captain or contact person.

Once the VE program is in full swing, clubs can sponsor test sessions and provide test session support services, such as running a talk-in station on 2 meters, or providing a hospitality table with refreshments and literature.

Table 2
1984 FCC Exam Schedule

Examinations are conducted by *appointment only.* To make an appointment, contact your local field office. Listed below are the examination dates and cut-off dates for accepting applications.

Examinations Will Be Held	*Applications Due*
May 7-11, 1984	April 15, 1984
August 6-19, 1984	July 15, 1984
November 5-9, 1984	October 15, 1984

The FCC conducts examinations at a number of other cities where they do not maintain offices. These examinations are given less frequently than at the field office locations. Contact your area FCC Field Office for details, or see January 1984 *QST*, page 59, for the complete list.

"Ultimately, clubs will be fulfilling a major role in supporting the work of the Volunteer Examiners."

The Role of a VEC

FCC Rules 97.503 and 97.507 explicitly define what kind of entity may become a Volunteer Examiner Coordinator (VEC): It must be an entity established at least in part for the furtherance of Amateur Radio, and must coordinate the work of Volunteer Examiners in one or more of the 13 FCC-designated regions (the 10 continental U.S. call areas, Alaska, U.S. territories in the

Caribbean, and Hawaii and the U.S. territories in the Pacific).

Will the ARRL Be the Only VEC?

The FCC Rules provide for no specific limit to the number of VECs that may be in operation. Indeed, more than one VEC may serve a particular area. In a few call areas, there may be a VEC in place and operating very soon. The ARRL, in preparing to serve *all 13* of the FCC-defined regions, will not be able to assume the expensive role of VEC until recoupment of expenses has been provided for through FCC rulemaking.

Please note that last month's League Lines stated that the ARRL intends to be *one national* VEC. After that issue of *QST* had gone to press, the FCC indicated that a VEC serves one or more *regions*. So while no entity will be called a "national VEC," there is nothing in the rules preventing an entity from applying to serve all of the 13 regions, thus providing consistent coverage nationwide.

The ARRL Hq. staff has been engaged all along in informal communication with the FCC staff about becoming a VEC. The League intends to make formal application once the ARRL Board approves the draft of the VEC operating agreement and the FCC concludes its rulemaking proceedings regarding recoupment of expenses. In the meantime, several other VEC candidates have indicated that they may cover a call district temporarily, but will join up with ARRL once the League is appointed VEC in their areas.

What is "Cost Recoupment"?

The FCC Rules require a VEC to be responsible for printing and distributing the test materials used in the Volunteer Examiner Program. The FCC further requires the VEC to perform certain data analyses on the test results, and to make frequent reports to all of the FCC field offices as well as the FCC offices in Washington, DC and Gettysburg, Pennsylvania.

The printing, two-way postage, computer time and necessary administrative coordination of the program will all cost money. The ARRL Board decided that ARRL members should not bear the cost of this program out of membership dues. It is far more appropriate for the League to recoup those out-of-pocket costs from the test candidates, those who derive direct benefit from the program.

Public Law 98-214, signed by President Reagan on December 8, 1983, makes it lawful for the VEC to collect reimbursement of expenses of not more than $4 from those who take exams. The Commission is working on bringing FCC rules into compliance with this new law, but the process could easily take until June or beyond to complete.

Radio amateurs licensed before 1977 will recall that the Commission formerly charged an application fee, which was *not* the same as reimbursement of expenses. That practice began on January 1, 1964 (with a $4 fee, which was raised to $9 on August 1, 1970) and was discontinued on January 1, 1977.[2] Please note, however, that Public Law 98-214 does not authorize yet another application fee; rather, it authorizes only the recoupment of prudent expenses incurred under the Volunteer Examiner Program.

Significant VE Rules at a Glance

§97.503 Definitions

a) Volunteer examiner coordinator (VEC): An entity which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

§97.507 VEC Qualifications

In order to be a VEC, an organization must:

a) be organized at least partially for the purpose of furthering Amateur Radio;

b) be at least regional in scope, serving one or more of the following regions: (each of the ten FCC-designated U.S. call areas), Alaska, the Caribbean insular areas, and the Pacific insular areas;

c) be capable of acting as a VEC in one or more of the regions listed in paragraph (b);

d) agree to coordinate all Amateur Radio operator examination elements for all Amateur Radio operator license classes;

e) agree not to accept any compensation from any source for its services as a VEC (except as provided for in Public Law 98-214 and pending FCC Rulemaking); AND

f) agree to assure that for any examination every candidate qualified under these rules is registered without regard to race, sex, religion, national origin or membership (or lack thereof) in any amateur radio organization.

Code Test Construction

The actual test administration procedures will not change much under the Volunteer Examiner Program. The ARRL as VEC intends to continue the use of multiple-choice questions on the written elements, as well as the 10-question comprehension code test.

Present plans call for the ARRL code tests to begin with a one-minute practice run, followed by a five-minute typical Amateur Radio transmission. Candidates who answer correctly seven of the 10 questions about the transmission will pass the code test. The ARRL-generated code tests will not always follow the same pattern of information from test to test.

1984 Exam Schedule

The FCC Field Operations Bureau announced the new 1984 exam schedule late last year. Test sessions have been reduced drastically at the Field Offices. For years, the Field Offices offered tests either weekly or twice monthly, but in 1984, Amateur Radio examinations will be offered only four times all year (see Table 2). Also, most of the exam opportunities at outlying test sites have been either cut back or dropped. Contact your local FCC Field Office for its latest exam schedule.

The FCC is finding it very difficult (or impossible) to honor requests for FCC exams at hamfests and conventions. Recent changes in government travel policies and liability insurance have forced them to end this useful practice. Several Field Engineers-in-Charge have indicated to the ARRL that they *wanted to* continue providing this service, but that it was no longer possible to do so legally.

The Volunteer Examiner Program will probably begin operation later this year. The FCC has indicated that the Technician and General class exams will be phased in first, with the Advanced and Extra Class exams to continue being handled by the FCC Field Offices for some time. The Commission has asked that educationally sound exam questions for the Advanced and Extra Class question pools (must be written by Extra Class licensees) be submitted to help get the program rolling.

The League will not assume the role of VEC until the FCC rulemaking on cost recoupment is completed, which will probably be about June 1984. We are certainly doing everything possible to prepare for that day, and are working to minimize the start-up time once the ARRL and FCC sign the VEC operating agreement.

Meanwhile . . .

The cover photo shows an abundance of Prospective Volunteer Examiners in and around urban areas of the United States. Take a moment to look over your area of the country. If things look well covered, fine. If the pins look a bit thin, and you've been considering registering as a Prospective VE, drop us a line at ARRL Headquarters. Ask for a "Volunteer Examiner Application Form." We especially welcome registrations from persons who are living overseas or travel overseas on a regular basis.

1984 will be a landmark year for the Amateur Radio Service. Now, more than ever, we hold our destiny in our own hands.

Notes

[1] C. Holsopple, "Another Step Toward Volunteer Examining," *QST*, Dec. 1983, p. 51.

[2] Happenings, June 1963 *QST*, p. 58; July 1971 *QST*, p. 80; and March 1977 *QST*, p. 70.

How Newsrooms Tick

Recent events on Grenada and on the Space Shuttle underscore the importance of good media relations. Here's how to improve your chances of getting your Amateur Radio-related story in the newspaper or on the 6 o'clock news.

By Richard S. Moseson,* N2BFG

"Politeness is often the first thing to go out in the crush of events." That candid comment from an editor at CBS News explains why some hams may have felt unappreciated during the Grenada crisis in October when they called a news organization to offer tape or information.

Being turned down or put off snappishly when you call a newsroom during a crisis doesn't mean the people there don't like you or don't appreciate your effort. It usually means they're incredibly busy. Or, that you called the wrong person.

There is always far more news coming into a newsroom than can possibly be used. During a crisis, editors have to be far more selective and make snap decisions. But why do they snap at you when you're only trying to help?

To understand why, it helps to understand what's going on around the editor when you call. According to Charlie Reina, the CBS News assignment editor on duty when the Grenada invasion began, "I had three phones busy, almost constantly, from 6:30 in the morning until noon."

If you have a story for the media, be sure it's timely, accurate and of general interest. Then get it in as soon as possible! *(photo courtesy CBS News)*

Looking at his news log for the day, Reina said, "Stuff was coming in from all over the place...at 8:10 A.M., Steve Mendelsohn [WA2DHF, a CBS technician and ARRL Hudson Division Vice Director] called with the frequency he was monitoring from Grenada. At 9:10, Haiti called with tape of ham radio from Grenada." During this time, Reina added, he was also getting calls from the chancellor of St. George's University medical school on Grenada, from Beirut (where more than 200 U.S. Marines had been killed in a bomb blast two days before) and from two CBS correspondents feeding in reports, plus "sound bites" about Grenada from Canada and an affiliate radio station monitoring the Caribbean Broadcasting Union. "Roughly every five to seven minutes," Reina notes, "there was something coming in."

Editors' Questions

Whenever a news item is offered to an editor, he or she has to quickly check the answers to several questions. Is the material accurate? timely? newsworthy? If it's tape for broadcast, is it clear and clean — air quality? Who is it coming from? Do we know this person? If the answer is a definite "no" to any of the first four questions, it'll be turned down.

Accuracy must be checked, even when material is coming from someone an organization knows. On the first night of the Grenada action, I recorded KA2ORK/J3 reporting, "I've just been told that the Cubans are coming over the airport. And the [Army] Rangers say they'll shoot them out of the sky." It was good stuff, if true. CBS News took it from me. But it couldn't be confirmed, so it wasn't aired. As it turned out, the report was wrong; there were no Cuban planes.

Next question: Is it timely? If you wait 20 or 30 minutes before calling in your news, new developments may already have made it outdated. Simply put, if a paper or station has information that's more up-to-date than what you're offering, you'll be turned down. Also, there's the matter of deadlines. If you call while a newscast is on the air, or after a newspaper has been "put to bed," you may also get turned down. You're too late for the current edition or broadcast, and your material will likely be out

*c/o CBS News, 524 W. 57 St., New York, NY 10019

of date by the next one.

Is it newsworthy? In other words, is it important and/or interesting to the general public? An offering that's of interest mostly to hams will probably not be considered by the general media. A story's newsworthiness also depends on the other news around it. The day after the Grenada invasion, President Reagan fired half the members of his Civil Rights Commission. Normally top news, it was completely overshadowed by Grenada and the terrorist bomb attack on the Marines in Beirut. It barely got covered.

Considering the Source

The question of who you are is also important. In the early hours of the Grenada invasion, WA1WMZ heard that Cuban construction workers "don't have shovels; they have automatic weapons." He hadn't taped it, though. The news people to whom he offered it couldn't confirm it, and they didn't know him from Adam. So, they turned him down. That was too bad. The story turned out to be true. But, as CBS's Reina noted, "When we get stuff from people we don't know,... [we] have to go slowly... We are very careful with what we put on [the air]." And while Reina said he tried to be polite to everyone who called, he admitted, "I might have put some people off because Mendelsohn (WA2DHF) was listening to the same stuff and taping it." News organizations would rather take material from their own people when they can.

Another example: Ray Sax, KC2XN, works for WTVH-TV in Syracuse, New York. When the Grenada story broke, the station sent a news crew and a reporter to his house and started taping. They spent about three hours there the first day and four hours the second. They had all the ham material they could use. As for anyone else who may have called offering similar material, Producer Lou Gulino said, "Things were kind of hectic and crazy in the newsroom and we might have been a little short with people." It didn't help, he added, that "every five minutes ...everything changed."

Improving Your Chances

How can you give yourself the best chance of getting newsworthy material on the air or in print? First, always try to have a tape recorder close to your rig. Radio news relies almost exclusively on taped "actualities" from newsmakers on the scene of the story. If you can feed your tape through the phone to them, you've given them something they can put directly on the air. TV news prefers pictures, but even audio tape over a slide is better than the newscaster telling you about something that someone else heard.

Second, try to contact the right person. At a radio or TV station, it's usually the assignment editor. For local stories at a newspaper, ask for the city editor. Offering your material to a clerk or secretary may often result in your being turned away simply because they don't have the authority to say yes.

Third, make sure it's newsworthy. Remember: A story of great interest to hams may be a real ho-hum to the general public. Be selective in what you offer.

Finally, try to remember the pressure under which an editor is working, particularly during a major, breaking news story. Deadlines always loom large. Don't be insulted if you're turned down, or even snapped at. And don't get discouraged. If you think you have something good, try the competition. And if something new and important comes in, start over again. This time, they may need you.

Rich Moseson, N2BFG, has been working in and around newsrooms since he was 15. Currently, he is an associate producer for CBS News in New York City, and is the Hudson Division representative to the League's Public Relations Advisory Committee.

Strays

METEOR-BURST ORIGINS

☐ I am a radio operator (ham style), so the letter regarding meteor-burst communication was most interesting (*AW&ST*, Oct. 17, p. 122).

In particular, your reply to the letter quoted an earlier article giving most of the credit to "a group of Stanford University scientists." Those scientists were headed by Dr. Mike Villard, W6QYT, and included many other amateur radio operators, including me.

We had minimal funding and were primarily doing — at least initially — high-frequency meteor-scatter studies at night after the F layer became transparent. We operated generally about 23 MHz, and on a fixed schedule with a station at Ft. Monmouth.

Normal ionospheric scatter gave us a signal level of only a very few hundredths of a microvolt. However, coincident meteor ionization in the E region (70-120 km above the Earth) could produce signal increases of hundreds of microvolts. It was very astonishing to me to hear that barely perceptible signal suddenly come roaring out of the loudspeaker for 5-15 sec., then rapidly recede into the noise again.

So no matter how thin you cut it, it comes back to a small, dedicated group of hams who basically took their direction from another ham, W6QYT.

I was extremely fortunate to be at Stanford at that time. The radio propagation laboratory was bursting with new discoveries.

Al Faries [W6OOU], Los Angeles, Calif.

[Reader Faries's letter provides added evidence, if it were needed, that widespread ham activities prior to World War 2 made a major contribution to this nation's preeminence in electronics during the war and in the postwar period. Collins Radio, now part of Rockwell International, was a direct outgrowth of Arthur Collins's ham activities, for example. — Ed.]

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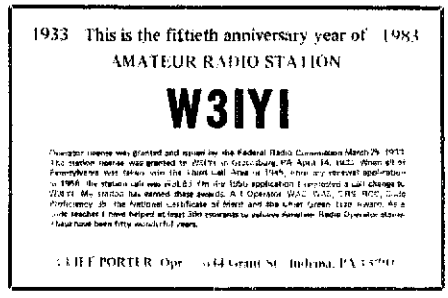
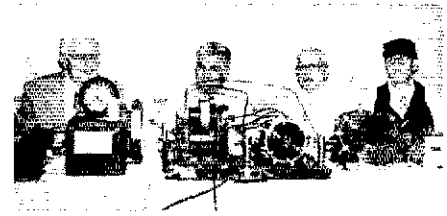

1933 This is the fiftieth anniversary year of 1983

AMATEUR RADIO STATION

W3IYI

CLIFF PORTER Opr

Cliff Porter, W3IYI, of Indiana, Pennsylvania, has an appealing way of celebrating his golden anniversary in Amateur Radio. His commemorative QSL card gives highlights of his 50 years in the hobby.

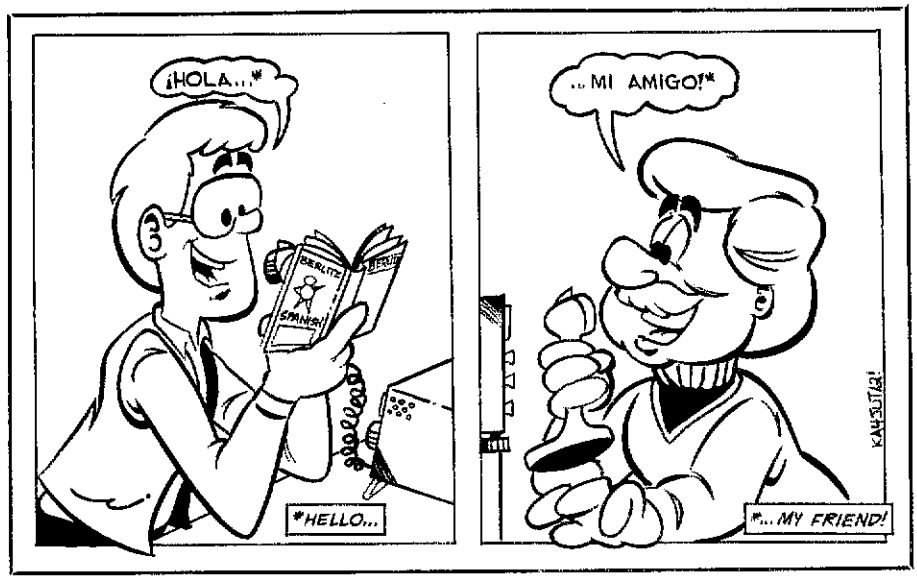


Sparks were really flying last September when these four ops gathered at the Antique Wireless Association National Conference in Canandaigua, New York, to reenact the 1921 ARRL transcontinental message relay. From left to right: W2LV represented Fred Schnell at 1AW; W2HYN was 6JD; K2WW portrayed Matty of 9ZN fame; and K1BH was 5ZA. *(tnx W2ICE)*

Learn a Language, Make a Friend

English is common on the amateur bands, but you'll impress your DX contacts by giving them a dose of their own language.

By Jack Sanders,* K1IFJ



In these tense times, when the news seems to bring dispatches of anti-American anger and animosity almost daily, one sometimes wonders what the ordinary person can do to promote international goodwill. As hams, we have opportunities that few others possess to reach out and touch others in faraway places.

There are no border guards, no censors and no jammers when we point our beams to Eastern Europe, Central America or Asia. While someone may be listening in on our conversations with stations in certain countries, a QSO is just two people talking to one another. Chances are, they are two ordinary people who may not be interested in international politics, but who would very much like to know more about the person on the other end of the key or microphone.

Yet, how often are we guilty of just cranking out formularized contact after contact with people who speak a different language? Worse, how often do we simply ignore calls from these countries because stations there are so common?

Building Friendships

If you are among the amateurs who want to get more out of DXing than statistics to brag about or wallpaper to cover the cracks in the walls of the shack, you can become an ambassador of goodwill, a ham who is out to make friends, not just contacts and records. A good way to do this is to approach people in their own language. That's right! Conduct a QSO in German, Italian or even Serbo-Croatian.

Before you stop and say "That's too hard!" or even "That's crazy!" consider this: The average person, lacking the gift of tongues, can pick up a working knowledge of a foreign language without spending hundreds of dollars on language school. With this new skill in hand, the English-speaking ham can fire up on a DX band and show others that we're not all self-centered fat cats who expect the world to learn our ways and words. We can demonstrate that there are interested individuals who care enough about the world to try to speak the languages of others.

Sure, you may falter at first. You're new vocabulary may be limited and your grammar atrocious, but no one expects to find a U.N. interpreter on 20 meters. The mere fact that you've made the effort to learn other languages will impress many an overseas amateur, and a good number of them will immediately warm up to you. They may be hams who, feeling insecure about their English, are standoffish, fellow practitioners of the quick QSO. But when you start talking to them in their own language, you'll find many will open right up and start chatting away. Some may even be hams who are experts at English, but who will enjoy talking to you in German, French or Spanish and will go out of their way to help you with your new language.

In addition to QSLs, you may get letters and pictures from people in faraway places who want to know more about you and your country, and who will be surprisingly open about themselves and their lands. Best of all, you can build lasting friendships.

Unfortunately, most of us don't learn a second (or third) language or have the occasion to use it in our daily lives. In many other nations, however, youngsters learn at least one other language as a matter of course. They not only have another language to work with, but also a better feeling for and understanding of the people who speak it.

Getting the Basics

Many of us may have taken a couple of years of Spanish, French or German in high school. Most have probably forgotten what little was learned, but chances are you can refresh yourself in that tongue easily, and perhaps even look into some others as well. Even if you haven't ever studied a foreign language, beginning a language is a lot easier than it's ever been. Many publications on the market will give you the essentials of a language — enough so you could get along as a tourist, and therefore enough to help carry on an over-the-air chat. There are even guides designed especially for hams to

*Box 502, Ridgefield, CT 06877

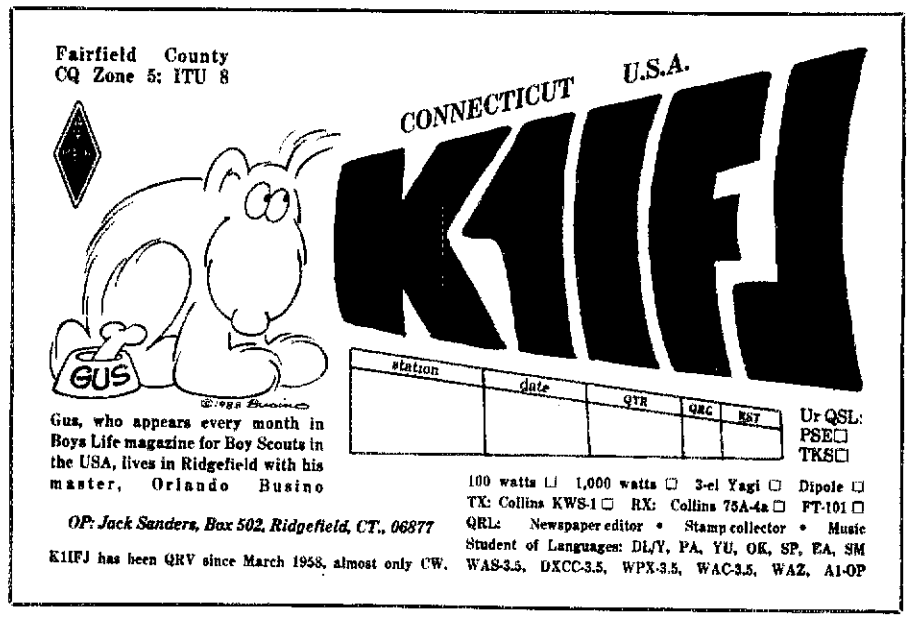
conduct a QSO in another tongue.

Begin your study the easiest way. If you have any background in a language — from previous study or perhaps from your parents' having spoken an additional language when you were a child — pick that one to start with. Most bookstores will have the "easy and fun" variety of inexpensive paperbacks designed to teach a language. Use one to refresh your memory in the basics.

If you're starting from scratch, a good bookstore should have tourists' phrase books in many languages. These are relatively inexpensive, and usually have brief dictionaries included. You may want to look into one with a larger dictionary as you progress. In addition, you may have a friend, neighbor or relative who speaks the language you're studying, and who can give you some help. Also, many free or inexpensive adult education courses in conversational languages are available. These are a great way to get started or to refresh your knowledge.

A wise investment is one of the ham-only guides. K3CHP has published the *DX QSL Guide*, which contains 12 frequently used sentences in more than 50 languages. It's handy for starting out. More extensive coverage of languages is offered in *The Radio Amateur's Conversation Guide* by OH1BR and OH2BAD. It includes more than 400 words and some 150 phrases you're apt to need when QSOing in the more common languages.

To prepare yourself, write down the words, phrases and sentences you commonly use on the air, and keep them in an orderly fashion on a help sheet. One sentence in your repertoire should definitely be: "I am a beginner, and do not speak the language well." In German, this would be, *Ich bin ein Anfaenger und spreche Deutsch nicht gut;* in French, it would be, *Je suis un(e) débutant(e) et je ne parle pas bien français.* This is a signal to the other fellow that he shouldn't use big words or fancy sentence constructions. Many a considerate overseas ham will even throw in an English word here and there if he thinks you're not apt to know a difficult word in his own tongue. Incidentally, another sentence to have handy is, "What does _____ mean?" There may be a lot of " _____ s" in your conversation when you start out.



A QSL card can tell a lot about the operator who sends it. In addition to station equipment and signal report, K1IFJ tells his DX contacts some things about himself, including the several languages he can converse in on the air.

Increasing Your Proficiency

As your code speed increases with the continued use of CW, so will your language proficiency increase as you speak it more. It's just as if you were living in another land and picking up the language in person. One of the nice things about talking to hams in other languages is that you are gaining a new skill, or at least perfecting an old one, that you may find worthwhile in work or recreation.

To build up your facility in a language, you should pay close attention to the people you talk to. Listen for words and phrases that are ham-oriented. (Who, in ordinary conversation, says "fine business" or "be seeing you"? Yet, it's everyday talk on the ham bands. The same is true in all languages.) Write down those words and phrases, learn them, and use them — it helps to show that you're not just reading out of a book. Speaking the way others speak gives you a sense of "knowing" the language, and you begin to feel more comfortable using it.

Once you've gotten one language down, consider looking into others. It's not as difficult as it seems. For example, if you are comfortable in one of the Romance languages — French, Spanish, Portuguese or Italian (even Romanian), check out the other languages. Many of the words are similar, and the ways they're used are frequently alike.

If you have the enthusiasm to try something really different, look into a Slavic language, such as Serbo-Croatian, used in Yugoslavia. While its vocabulary is entirely different from other European languages, its grammar is not. Once you pick up a basic knowledge of one Slavic tongue, you can begin handling others, such as Czech, Polish, Bulgarian, Russian or Ukrainian, which have many similar words among them.

Many hams speak these languages, and most will be surprised and excited to meet an American who knows some of their language. At one point I was getting almost a letter a week from different hams in Yugoslavia whom I had worked on the air and who wanted to correspond — despite my having only a rudimentary knowledge of Serbo-Croatian.

Learning languages must be tackled differently, depending on whether you are a sideband or a CW operator. As a dyed-in-the-wool CW man, I can speak with experience only for that mode, whose advantages include not having to know how to pronounce the language or to understand it while it's being spoken. To me, reading the spelled-out words is easier than deciphering the spoken word, especially in QRM.

Disadvantages include having to know how to spell words well and needing to pick up some new code characters to handle the alphabets used in Russian or Bulgarian, or even the few different letters found in Swedish, Danish, German or Norwegian (these actually aren't much trouble). On the other hand, a sideband operator doesn't need to know how words are spelled, just pronounced. If he knows how to tell the operator on the other end, "Please speak slowly," he can probably understand most of what's coming at him.

In either mode, the old saw, "Practice makes perfect," holds true. As you gain facility and comfort in another language or two, you also find yourself enjoying a new facet of Amateur Radio. It's a challenge, but one that will open up new vistas. You will gain a greater understanding and appreciation of the peoples of other lands and, through regular schedules or correspondence, build lasting friendships. In the process, you can be giving others a better view of what ordinary Americans and Canadians are like. Some friendly relationships via a few hundred watts of ham radio power may do more to promote international goodwill than even the megawatts of Voice of America. QST

Third ARRL Amateur Radio Computer Networking Conference

Digital communications experimenters head for Trenton, New Jersey for an April 15 conference to exchange ideas on building a global network.

By Paul L. Rinaldo,* W4RI

On April 15, 1984, starting at 10:30 A.M., the League will hold its third international conference on Amateur Radio computer networking at Trenton State College, Trenton, New Jersey. It will be held in conjunction with the Trenton Computer Festival, which will be April 14 (from 10 A.M. to 6 P.M.) and April 15 (from 10 A.M. to 4 P.M.). If you are interested in computers and digital communications, plan to spend Saturday at the Computer Festival and Sunday at the ARRL conference. The specific building and room for the ARRL conference will be announced in the Computer Festival program and in the registration area. No additional registration fee is required for the ARRL conference.

The conference will feature speakers representing the Amateur Radio organizations that are active in packet-radio experimentation, including the Amateur Radio Research and Development Corporation (AMRAD), the Florida Amateur Digital Communications Association (FADCA), the New England Packet Radio Association (NEPRA), the Pacific Packet Radio Society (PPRS), the Radio Amateur Satellite Corporation (AMSAT) and the Tucson Amateur Packet Radio Corporation (TAPR).

The conference will be an opportunity to compare all amateur packet-radio terminal-node-controller (TNC) or packet-assembler/disassembler (PAD) systems.

*ARRL Senior Technical Editor

Dr. Hank S. Magnuski, KA6M, speaking at the Second ARRL Amateur Radio Computer Networking Conference last March in San Francisco.

Packet-radio experimenters observing the printout of data from a computer-based message system in the San Francisco area.

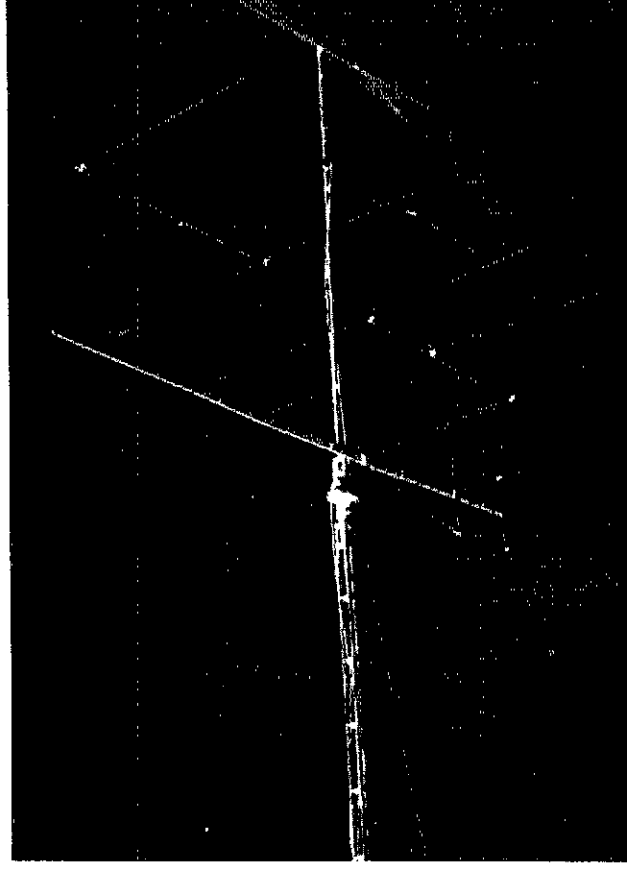
These will include those developed by AMRAD, Ashby & Son, GLB Electronics, Richcraft Engineering, TAPR, and VADCG (Vancouver Amateur Digital Communications Group).

Packet-radio protocols, software and network development will be subjects of high interest both at the conference and in informal conversations. Details of AX.25, the amateur version of the CCITT X.25 public-switched-data-network protocol, were presented at the second ARRL computer networking conference. Subsequent repeater-address expansion and other refinements will be reviewed at the April conference. Wide-area- and global-networking proposals and development plans will be discussed.

The *deadline* for camera-ready papers for this conference to be received at ARRL Hq. has been extended to March 15, 1984. For an author's kit, call 203-666-1541 and ask for Marian Anderson, WB1FSB. Briefly, papers are to be typed on 11- × 14-inch white paper, in two 50-character columns, the same format used for the second ARRL networking conference and for IEEE papers. All drawings must be camera-ready. Positive black-and-white photographic prints of good quality may be included. Use abbreviations listed on pages 53 and 54 of January 1984 *QST*.

Copies of the conference proceedings, including all papers presented, will be on sale at the conference. Extra copies of the proceedings will be available from ARRL Headquarters. The per-copy price will be announced in *QST*.

Announcing the ARRL Antenna-Design Competition



Do you have a knack for antenna design and construction? If so, here's your chance to contribute to the state of the art — and win some prize money, too!

Remember the "good ol' days" when a tribander took care of most antenna needs? Well, those days are rapidly coming to an end. With our acquisition of the 10, 18 and 24-MHz bands, a need exists for multiband designs that will cover our new HF spectrum allocations along with the old ones. To meet this demand, the ARRL is offering a challenge to all licensed amateurs: The ARRL Multiband Antenna Competition.

Radio amateurs have made, and continue to make, valuable contributions to the field of antenna design. A quick look through electronics history books will verify that. Very few of today's commercial antenna manufacturers exist without a licensed radio amateur on the staff. But you say, "I'm not an engineer!" *Don't* despair, for you need not be a professional to contribute a winning design. Believe us: Many of today's most popular antennas were originally conceived in a workshop like yours. Sound interesting?

Our Main Objective

The primary goal of the contest is to provide radio amateurs with new antenna designs that can be constructed at home. Not just any designs, because the intent is to cover as many of the WARC-79 bands as possible. The winning designs (and perhaps a few notable others) will be shared with your fellow amateurs through League publications: *QST, QEX, The Radio Amateur's Handbook* and *The ARRL Antenna Book*. So you compete not only for a prize, but also for the world-wide exposure that only ARRL can provide. Note: Headquarters employees, League officials and antenna Technical Advisor appointees are ineligible for entry.

There are two categories for entry: one for five-band and one for six-band antennas. The five-band category includes all amateur bands between 14 and 30 MHz; the six-band adds the 10-MHz band. There will be monetary awards for the top three entries in each category. The three top six-band winners shall receive $500, $250 and $125, respectively, and the five-band winners, $400, $200 and $100.

To enter, write to: ARRL Antenna Competition, 225 Main St., Newington, CT 06111. Requests for entry packages must arrive at Hq. by April 15. We will send you a complete information package that includes an entry form, rules of the competition and a complete description of how the antennas will be judged.

The package also contains information about the legal aspects of experimental transmissions on the 18- and 24-MHz bands, so you can test your design(s). *No one* in the U.S. may transmit on the 18- and 24-MHz bands without FCC authority.

July 30 will mark the deadline of the contest. By this date, your antenna design(s) must be put down on paper, with all of the supplementary information called for in the instructions (claimed gain, front-to-back ratio, etc.) and arrive at headquarters. These entries will be judged by a panel of several ARRL antenna Technical Advisors, each an established professional in his field. From your design information, the judges will vote and choose the four finalists in each category.

By September 3, the finalists will be notified by registered mail. They must then send a working, full-sized model of their antenna to the test site (we pay the shipping, of course!). ARRL technicians will then assemble the antennas and conduct an evaluation of physical attributes (ease of assembly, mechanical strength, wind loading, etc.).

The last phase of the evaluation is actual HF antenna-range testing at Telex/Hy-Gain's test range in Lincoln, Nebraska. There, the electrical characteristics of the antennas will be measured.

Following this final stage of evaluation, the antennas will be returned to their owners (again at ARRL expense), and all data will be compiled at Headquarters. The Technical Department and Technical Advisor panel will jointly determine the final standing of the antennas. The winners are to be announced in the January 1985 issue of *QST*, and in *QEX*.

Sound intriguing? You bet it is! So dust off your drafting table and put your thoughts down on paper. Who knows? You may end up $500 richer. Better yet, many radio amateurs may end up using your antenna design. Good luck! — *Bob Schetgen, KU7G, and Dennis Lusis, W1LJ*

Happenings

Conducted By Carol L. Smith,* AJ2I

- *RACES Expansion Allowed in Some Emergencies*
- *Volunteer Examining Errata*
- *Close Call with Nuisance Law*

RACES Frequencies Expanded During Certain Declared National Emergencies

The Commission has adopted rules to make additional frequencies, including the 144.50-145.50 MHz subband, available to RACES during an emergency that causes the President to invoke certain war emergency powers. (See August 1983 *QST*, p. 58, for details of this proposal, PR Docket 83-524.) Also adopted were proposals for operational limitations on the additional frequencies so as to provide protection to the Governmental Radiolocation Service, to the Aeronautical Radionavigation Service and to Canadian radio stations. Restrictions limiting RACES operations to 30 days and to specific geographical areas were deleted.

This proceeding originated in response to a request from the Department of Defense (DOD), which had reviewed the role of RACES in support of civil defense activities during a national emergency declared by the President. DOD concluded that additional RACES frequencies are needed under "war emergency conditions." "Since the presently available RACES frequencies have proven inadequate in peacetime," DOD said, "they would be completely unsatisfactory in wartime. In addition, although the number of Amateur Radio repeater stations has increased, they operate on frequencies that are not now available to RACES." Thus, DOD wanted repeater frequencies and HF-net frequencies to be available to RACES stations.

Nineteen comments, generally supportive, were filed. Several commenters suggested that the repeater subband 144.50-145.50 MHz be included for RACES operation. The ARRL favored this idea, and said that such a plan would "make it unnecessary for anyone to alter existing equipment, especially repeaters, to operate on RACES frequencies during a declared emergency since ARES members could switch from ARES to RACES immediately without a shift in equipment."

*Membership Services Assistant

The Commission referred this matter to the DOD, which did not object. Therefore, the 144.50-145.50 MHz subband is included in the final rules.

"Since the presently available RACES frequencies have proven inadequate in peacetime, they would be completely unsatisfactory in wartime." — Department of Defense

Some commenters suggested that additional frequencies in the 6, 10, 40 and 75-meter bands be added for RACES operations. Those frequencies were not included in DOD's original request, however, and the Commission did not include them in these final rules.

The FCC had stated that additional Amateur Radio frequencies in the 10- and 18-MHz bands might be considered for RACES wartime emergencies if the United States ratified the final acts of WARC-79. The U.S. did ratify that treaty on September 6, 1983, but the amateur rules have not yet been amended to make 10 and 18 MHz available for amateur use on a regular basis. Thus, the Commission decided that it "would not be appropriate in this report and order."

The following rule changes will become effective on March 26, 1984:

§97.185 Frequencies available.

(a) All of the authorized frequencies and emissions allocated to the Amateur Radio Service are also available to the Radio Amateur Civil Emergency Service on a shared basis.

(b) In the event of an emergency which necessitates the invoking of the President's War Emergency Powers under the provisions of §606 of the Communications Act of 1934, as amended, unless otherwise modified or directed, RACES stations and amateur radio stations participating in RACES will be limited in operation to the following:

FREQUENCY OR FREQUENCY BANDS

kHz	*Limitations*
1800-1825	
1975-2000	1
3500-3550	
3930-3980	
3984-4000	
3997	2
7079-7125	
7245-7255	
14,047-14,053	
14,220-14,230	
14,331-14,350	
21,047-21,053	
21,228-21,267	

MHz	
28.55-28.75	
29.237-29.273	
29.45-29.65	
50.35-50.75	
53.30	2
53.35-53.75	
144.50-145.71	
146-148	
220-225	4
420-450	3, 5, 6
1240-1300	3
2390-2450	3

(c) Limitations:

(1) Use of frequencies in the band 1975-2000 kHz is subject to the priority of the LORAN system of radionavigation in this band and to the geographical, frequency, emission, and power limitations contained in §97.61 (Subpart C of this part pertaining to Technical Standards).

(2) For use in emergency areas when required to make initial contact with a military unit; also, for communications with military stations on matters requiring coordination.

3) Those stations operating in the bands 420-450, 1240-1300 and 2390-2450 MHz shall not cause harmful interference to, and must tolerate any interference from, the Government Radiolocation Service; and also the Aeronautical Radionavigation

Be a Charter Contributor to the Goldwater Scholarship Fund

Here's your opportunity to thank Barry, K7UGA, for his long-term staunch support of the Amateur Radio Service and to let him know of your appreciation. Send in your contribution *now* and be a *Charter Contributor*. All Charter Contributors will have their name and call listed in a commemorative book to be presented to Senator Goldwater prior to the awarding of the first scholarship in his honor. The deadline for donations by Charter Contributors is August 1, 1984.

If your contribution is $25 or more, we will list your name and call in *QST*. If your contribution is $100 or more, in addition to your name and call appearing in *QST*, you will receive a signed photograph of the Senator, suitable for display in your hamshack. And for contributions of $1000 or more, in addition to the above, we'll put your photo in *QST* and you'll receive a personal thank you call from Robert York Chapman, W1QV, President of the ARRL Foundation, which is administering the Goldwater Scholarship Fund.

We welcome *all* contributions, regardless of size. Please help us achieve our goal of building an endowment sufficient to fund the Goldwater Scholarship in perpetuity. What better way to honor a great amateur, a great statesman and a great human being?

Contributors of $25 or more (as this is being written) include: Jarry L. Ayers, W9ET; Harold H. Blesy, N9CQX; Leland R. Crowell, K1AIK; Jerry W. Cooney, KA4TBC; Robert York Chapman, W1QV; Hester Clark, WA4PAE and Victor C. Clark, W4KFC (SK); Thomas W. Comstock, N5TC; Lee Aurick, W1SE; Larry G. Kettlewell, W3HHG; Hazard Reeves, K2GL; Ethel Smith, K4LMB; Hugh A. Turnbull, W3ABC; Ralph H. Turner, W8HXC.

Service in the case of the 1240-1300 MHz band.

(4) Those stations operating in the band 220-225 MHz shall not cause harmful interference to, and must tolerate any interference from, the Government Radiolocation Service until January 1, 1990. Additionally, the Fixed and Mobile Services shall have equal right of operation.

(5) In the band 420-430 MHz, no station shall operate North of Line A. Line A begins at Aberdeen, Washington, running by great circle arc to the intersection of 48° N, 120° W., thence along parallel 48° N., to the intersection of 95° W., thence by great circle arc through the southernmost point of Duluth, Minn., thence by great circle arc to 45° N., 85° W., thence southward along meridian 85° W., to its intersection with parallel 41° N., thence along parallel 41° N., to its intersection with meridian 82° W., thence by great circle arc through the southernmost point of Bangor, Maine, thence by great circle arc through the southernmost point of Searsport, Maine, at which point it terminates.

(6) In the band 420-450 MHz and within the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the Federal Communications Commission Engineer-in-Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

(i) Those portions of Texas and New Mexico bounded on the south by latitude 31° 45′ North, on the east by longitude 104° 00′ West, on the north by latitude 34° 30′ North, and on the west by longitude 107° 30′ West;

(ii) The entire State of Florida including the Key West area and the areas enclosed within a 200-mile radius of Patrick Air Force Base, Florida (latitude 28° 21′ North, longitude 80° 43′ West), and within a 200-mile radius of Eglin Air Force Base, Florida (latitude 30° 30′ North, longitude 86° 30′ West);

(iii) The entire State of Arizona;

(iv) Those portions of California and Nevada south of latitude 37° 10′ North, and the areas enclosed within a 200-mile radius of the Pacific Missile Test Center, Point Mugu, California (latitude 34° 09′ North, longitude 119° 11′ West).

(v) In the State of Massachusetts within a 160-kilometer (100 mile) radius around locations at Otis Air Force Base, Massachusetts (latitude 41° 45′ North, longitude 70° 32′ West).

(vi) In the State of California within a 240-kilometer (150 mile) radius around locations at Beale Air Force Base, California (latitude 39° 08′ North, longitude 121° 26′ West).

(vii) In the state of Alaska within a 160-kilometer (100 mile) radius of Clear, Alaska (latitude 64° 17′ North, longitude 149° 10′ West). (The Military Area Frequency Coordinator for this area is located at Elmendorf Air Force Base, Alaska.)

(viii) In the State of North Dakota within a 160-kilometer (100 mile) radius of Concrete, North Dakota (latitude 48° 43′ North, longitude 97° 54′ West). (The Military Area Frequency Coordinator for this area can be contacted at: HQ SAC/SXOE, Offutt Air Force Base, Nebraska 68113.)

VOLUNTEER EXAMINING ERRATA

The Commission has made corrections and filled in inadvertent omissions that appeared in the Report and Order in PR Docket 83-27, which allows volunteers to prepare and administer Amateur Radio exams. (See November 1983 *QST*, pp. 68-69, for details. Also see "Volunteer Examining Update," p. 48, this issue.)

Issues addressed are:

1) allowing VECs adequate time to collect application forms, answer sheets, test results, etc. from the VE, then make complete records of all required information and forward that to the FCC. The Rules had allowed only 10 days for this procedure, and was, according to the Commission, "not intended."

2) removing the "additional burden of grading telegraphy requirements on the basis of 'one continuous minute.' Inclusion of this new burden was not intended."

3) clarifying that an examinee who "fails to appear for readministration of an examination or who fails to pass the retested examination element(s) will have his/her operator's license cancelled and will be issued a new operator license for the operator license class previously held by the examinee."

4) rewording Section 97.513 to make clear that one regional VEC may not coordinate examinations in another region.

The following corrections to the Appendix of the Report and Order in PR Docket 83-27 are now effective:

(a) Paragraph (aa) of Section 97.3 is removed and reserved.

(b) Section 97.28 is amended by revising paragraph (i) and adding a new paragraph (j) as follows:

§97.28 Examination administration.

* * * * *

(i) The FCC reserves the right, without qualification, to:

(1) administer examinations itself; *or*

(2) readminister examinations itself or under the supervision of an examiner designated by the FCC to any person who obtained an operator license above the Novice class through the volunteer examination process.

(j) If a licensee fails to appear for readministration of an examination pursuant to paragraph (i)(2) of this section, or does not successfully complete the examination element(s) which are readministered, the licensee's operator license is subject to cancellation; in an instance of such cancellation, the licensee will be issued an operator license consistent with completed examination elements which have not been invalidated by not appearing for or failing readministration of an examination.

(c) The words "for one continuous minute" are removed from the first sentence of paragraph (c) of Section 97.29.

(d) The cross-references to Section 97.30 are removed from Section 97.503(b) and from Section 97.515.

(e) The first two sentences of Section 97.513 are revised to read:

§97.513 Scheduling of examinations.

A VEC will coordinate the dates and times for scheduling examinations (see §97.26) throughout the region(s) it serves. Any VEC may also coordinate the scheduling of testing opportunities outside of the regions listed in Section 97.507(b).

* * * * *

(f) Paragraph (c) of Section 97.519 is revised to read:

§97.519 Examination procedures.

* * * * *

(c) Forward the application within ten days of its receipt from the examiners to: Federal Communications Commission, Licensing Division, Private Radio Bureau, Gettysburg, Pennsylvania 17325.

CLOSE CALL WITH "NUISANCE" LAW

In December 1983, the Town of Indian River Shores, Florida, passed on first reading a new ordinance that provided, among other things, the following:

"No person shall maintain or operate any equipment, device, appliance or apparatus in the town which generates or causes high frequency oscillations which interfere with radio or television transmitting or reception."

Many hams in Indian River County and surrounding counties became aware of the proposed ordinance through a news article in the local paper. The matter was discussed on nets, especially the Treasure Coaster's Net, and it was agreed that the ordinance could be a real nuisance for hams.

Treasure Coasters KB2PY and WX4V did some digging into the law books. K4QM met with the town's attorney and advised him of case law and FCC Public Notice Number 87276, which support the proposition that the prevention of radio interference phenomena has been preempted by the Communications Act of 1934 and is outside the jurisdiction of local governmental control.

The town attorney and Town Council of Indian River Shores agreed with this interpretation. As a result, the following paragraph was added to the ordinance:

"The provisions of this section shall not be construed as regulating any equipment, device, appliance or apparatus used in interstate commerce or where the same is licensed or regulated by or under any Act of Congress of the United States."

Indian River Shores hams now breathe a bit easier. An interesting twist to the happy ending is that the town attorney, a former state representative, is now studying for his Novice license! — *Thomas C. Palmer, WX4V*

PAUL AND HELEN L. GRAUER SCHOLARSHIP RECIPIENT

Pamela Sue Hayward, WBØMUS, has been selected as the recipient of the 1983-84 Paul and Helen L. Grauer Scholarship. Pamela is a freshman at Missouri Western State College in

Extra Class licensee Jennifer A. Goble, KA3GXH, is congratulated by fellow Coloradans on her feat of passing the General, Advanced and Extra Class exams in one session! Shown (l-r) are SM KQØJ, ARRL President WØBWJ, KA3GXH and Director KØPGM. *(WBØDUV photo)*

Pamela Sue Hayward, WBØMUS

St. Joseph, where she is studying biology. She enjoys CW contacts on 15 and 40 meters, though dorm restrictions have curtailed her operating lately. Pamela was introduced to Amateur Radio early in life by her father, WØPEM, and her interest still is going strong. Congratulations, Pamela.

SECTION MANAGER ELECTION RESULTS

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

Uncontested

Louisiana	John M. Wondergem, K5KR

SM APPOINTMENT

In the North Dakota Section, Ronald Roche, KØALL, has been appointed to complete the term (ending September 30, 1984) of Dean R. Summers, KQØC (resigned).

"EXTRA" EFFORT IN COLORADO

Eleven-year-old Jennifer A. Goble, KA3GXH, of Colorado Springs, spent a grueling six hours last December 28, but she attained her goal: passing the General, Advanced and Extra Class exams all in one session! Jennifer is almost an old-timer in the Amateur Radio ranks, though, because she was first licensed at the age of eight.

Jennifer studied for the exams with her father Paul, ND2X, and has requested an Extra Class call, something sure to be rare in her 6th grade class. Her main interests lie in UHF and VHF work, though she may be found on HF mobile bands. Congratulations, Jennifer!

OUT-OF-BAND OPERATIONS BRING FINE

Ronald F. Arsenault, KA2QMX, of Clifton Park, New York, and Dave L. Goodfellow, KA2GWV, of Hampton, Virginia, were fined for illegal operations. Arsenault was fined $1100 for willful out-of-band operation, transmission of false call signs, and refusal to allow inspection of his amateur station. Goodfellow was fined $600 for willful out-of-band operation and transmission of false call signs. Both Technician class licensees have paid the forfeitures.

The Commission noted that both were part of a small group of amateur operators who regularly operated several hundred kilohertz outside of the allocated 40-meter amateur band. FCC investigations into these violations were made by several Field Offices.

AIRS PROGRAM UP AND ROLLING

Initial appointments have been made to the ARRL Interference Reporting System (AIRS). AIRS is a revitalization of the former ARRL Intruder Watch and is aimed at protecting the amateur bands from harmful interference caused by nonamateur sources. Appointments to AIRS are not automatic. Applications are carefully screened before appointments are made, and some don't make it. This is because we are looking for people with the skills, equipment and time to provide the quality monitoring data we need to make the program a success. But we don't mean to scare you off. Please see the article in October 1983 *QST*, and if you'd like an application, drop Hq. a line.

Charter AIRS members are: Arthur H. Adolphsen, K1VVT; Harry A. Arsenault, K1PLR; Michael J. Castellano, KM1R; Art Ericson, W1NF; Bob Wilson, KA1XN; John F. Gallagher, K2KN; Jack M. Janicke, K2JFJ; Steve Sykes, KA2KGM; Robert S. Walsh, W3YU; Glenn Haffly, WD4B; Henry L. Luhrman, W4PZV; Leland E. Patience, W4DRF; Norman M. Talley, Jr., W4ARH; F. Clarke Walker, Jr., KC4ED; Robert N. Douglas, W5GEL; Milton Demetrius Haines, W5FSP; John Hudelson, K5DL; Roger Brackney, K6ZTK; E. H. Conklin, K6KA; Harry A. Kline, W6ZT; M. L. Gibson, W7JIE; Dan Umberger, W8ZCQ; Merv Schweigert, K9FD; Donald D. Dory, WØHKN.

GOLDWATER, ARRL PRESIDENT SMITH TO SPEAK AT DELAWARE CLUB MEETING

Senator Barry Goldwater, K7UGA, and ARRL President Carl Smith, WØBWJ, will be the featured speakers at the March 15 meeting of AWARE, the Association of Wilmington (Delaware) Amateurs for Radio Education, to be held at the Brandywine Terrace in Claymont. Goldwater is scheduled to speak on current federal legislation affecting Amateur Radio, and Smith will speak on League happenings. Several other ARRL officials are also scheduled to attend. The meeting begins at 6 P.M. For more information and reservations, call 302-478-2757.

EXPERIMENTAL RADIO DEREGULATION

The FCC has issued a Report and Order in General Docket 82-469 adopting changes in the Experimental Radio Service, which exists for experimentation in the radio art or for providing essential communication for research projects. Changes resulting from industry comments to a Commission NPRM (47 Fed. Reg. 35535) and studies conducted by the FCC staff include deletion of constraints pertaining to power, antenna height, and transmitter measurements. Under the new rules, if the frequency tolerance of an experimental station is greater than the bounds of the already existing service sharing the frequency, the tolerance should be specified in the station application. The FCC reserves the right to impose restrictions on emissions in the experimental authorization if necessary to control interference to existing authorized services. Experimental stations will continue not to cause harmful interference to regular services and must accept any harmful interference.

The requirement that the experimental station operator hold an operator license is deleted under the new rules. The FCC emphasized, however, that this action does not relieve the licensees of the responsibility of maintaining control over their stations, but that it will give them more latitude on how they accomplish the control.

League Advisory Committee Members

Public Relations Advisory Committee

(Revised to January 31, 1984)

Atlantic Division — John Rouse, KA3DBN, 2703 Bartlett La., Bowie, MD 20715
Canada — John Gowron, VE4ADS, 229 Kisil Bay, Winnipeg, MB R2K 3E7
Central Division — Jim Romelfanger, K9ZZ, 1414 Martiny Ct., No. 6, Baraboo, WI 53913
Dakota Division — George D. Johnson, WØMD, 821 Dickerman Ave., Duluth, MN 55807
Delta Division — Jim Buffington, ND5M, P.O. Drawer 1240, Aberdeen, MS 39730
Great Lakes Division — †Jack T. Shepherd, W8OMY, 376 Danhurst Rd., Columbus, OH 43228
Hudson Division — Richard S. Moseson, N2BFG, 1-17 Wyndover Wood, White Plains, NY 10603
Midwest Division — Reynolds B. Davis, KØGND, 1922 Pawnee St., Lincoln, NE 68502
New England Division — Phil Temples, K9HI, 50 Catherine St., Roslindale, MA 02131
Northwestern Division — William W. Bingham, WA7VEH, 11605 S.E. 45th Pl., Bellevue, WA 98006
Pacific Division — Norman Brooks, K6FO, 5901 Adana Circle, Carmichael, CA 95608
Roanoke Division — Jim Davis, KU8R, 3913 Kanawha Ave., SE, Charleston, WV 25304
Rocky Mountain Division — Wilson F. Sellner, WB7RRZ, 930 Western Hills Blvd., Cheyenne, WY 82001
Southeastern Division — John G. Bolton, Jr., WA4PNY, 1025 Hammond Dr., NE, Atlanta, GA 30328
Southwestern Division — Joseph D. Moell, KØOV, Box 20-GJ, Fullerton, CA 92633
West Gulf Division — Frederick O. Maia, W5YI, P.O. Box 10101, Dallas, TX 75207
Board Liaison — Steve Mendelsohn, WA2DHF, 64 Malden La., Little Ferry, NJ 07643
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Emergency Communications Advisory Committee

(Revised to January 31, 1984)

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Great Lakes Division — Dale Williams, WA8EFK, 291 Outer Dr., Dundee, MI 48131
Hudson Division — Charles Johansen, Jr., KB2KW, 729A W. Whiterock Dr., Box 221, Holmes, NY 12531
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New England Division — John Carroll, AB1Z, 25 Evergreen Ave., Bedford, MA 01730
Northwestern Division — Cleo V. Congdon, N7AFZ, 8505 182nd Ave., E., Sumner, WA 98390
Pacific Division — †Ron Menet, N6AUB, P.O. Box 244, Cedar Ridge, CA 95924
Roanoke Division — L. R. Allison, Jr., K4SUG, 5 Gaston Dr., Rte. 5, Box 15, Travelers Rest, SC 29690
Rocky Mountain Division — Joe Knight, W5PDY, 10408 Snow Heights Blvd., NE, Albuquerque, NM 87112
Southeastern Division — Carl E. Weaks, Jr., N4DMA, 1341 W. Navajo Dr., Alabaster, AL 35007
Southwestern Division — James R. Varner, AE6N, P.O. Box 1452, Wrightwood, CA 92397
West Gulf Division — Roger Coday, N5FN, 213 Avenue G, RFD 4, Brazoria, TX 77422
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DX Advisory Committee

(Revised to January 31, 1984)

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Dakota Division — Robert G. Parlin, WØSFU, 1507 Kaltem La., Minneapolis, MN 55416
Delta Division — Joseph A. Butler, K5OS, 242 Woodland Circle, Ocean Springs, MS 39564
Great Lakes Division — Denny Burgess, K8DB, 495 Jeannette Dr., Richmond Hgts., OH 44143
Hudson Division — David Beckwith, W2QM, 151 Whitney Ave., Pompton Lakes, NJ 07442
Midwest Division — †James L. Spencer, WØSR, 3712 Tanager Dr., NE, Cedar Rapids, IA 52402
New England Division — George Hitz, W1DA, 37 Easy St., Sudbury, MA 01776
Northwestern Division — Phil Anderson, W7GN, 19120 S.E. Carmel Dr., Boring, OR 97009
Pacific Division — R. W. "Bob" Thompson, K6SSJ, 14703 Eastview Dr., Los Gatos, CA 95030
Roanoke Division — Col. John Parrott, W4FRU, Box 5127, Suffolk, VA 23435
Rocky Mountain Division — Ron Stockton, NØRR, Bonanza Star Route, Nederland, CO 80466
Southeastern Division — Robert R. Beatty, III, W4VQ, 11 Heritage Cove Court, Casselberry, FL 32707
Southwestern Division — James T. Rafferty, N6RJ, 178 Paseo Robles, Anaheim, CA 92807
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Board Liaison — John C. Kanode, N4MM, RFD 1, Box 73-A, Boyce, VA 22620
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Contest Advisory Committee

(Revised to January 31, 1984)

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Great Lakes Division — David A. Pruett, K8CC, 33136 Hampshire Rd., Livonia, MI 48154
Hudson Division — Lewis Tompkins, N2LT, RD 1, Box 246A, Stockton, NJ 08559
Midwest Division — Lynn Hanson, KNØO, 3606 Court St., Sioux City, IA 51107
New England Division — Doug Grant, K1DG, 157 Catamount Rd., Tewksbury, MA 01876
Northwestern Division — Robert L. Turner, AG7M, 4502 178th Ave., E., Sumner, WA 98390
Pacific Division — Attn: George Varvitsiotes, WB6DSV, Ham Radio Outlet, 999 Howard Ave., Burlingame, CA 94010
Roanoke Division — Jeffrey W. Hartley, N8II, Rte. 1, Box 415, Bunker Hill, WV 25413
Rocky Mountain Division — George E. Schultz, WØUA, 14891 Randolph Pl., Denver, CO 80239
Southeastern Division — James A. White, K1ZX/4, P.O. Box 524314, Miami, FL 33152
Southwestern Division — †Larry D. Tyree, N6TR, 1850 Stow St., Simi Valley, CA 93063
West Gulf Division — Randall A. Thompson, K5ZD, 1708 Lake Haven Dr., Irving, TX 75060
Board Liaison — Tod Olson, KØTO, 292 Heather La., Long Lake, MN 55356
Staff Liaison — Bill Jennings, K1WJ, ARRL, 225 Main St., Newington, CT 06111

VHF Repeater Advisory Committee

(Revised to January 31, 1984)

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Central Division — Bob Heil, K9EID, P.O. Box 68, Marissa, IL 62257
Dakota Division — Eric Foss, KDØZ, 4615 Oakview La., Plymouth, MN 55442
Delta Division — Lionel A. "Al" Oubre, K5DPG, Star Route A, Box 185-E, New Iberia, LA 70560
Great Lakes Division — John R. Weeks, Jr., K8RT, 773 Andover Rd., Mansfield, OH 44907
Hudson Division — Peter Glenn, KC2KI, RD 1, Box 603, Boonton, NJ 07005
Midwest Division — Joe Eisenberg, WAØWRI, 6627 Colby, Lincoln, NE 68505
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Rocky Mountain Division — †Whitman E. Brown, WBØCJX, 14418 W. Ellsworth Pl., Golden, CO 80401
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Southwestern Division — Karl Pagel, N6BVU, P.O. Box 6490, Orange, CA 92667
West Gulf Division — Ellene G. Spiegel, WA5WDW, 2812 Pritchett, Irving, TX 75061
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VHF/UHF Advisory Committee

(Revised to January 31, 1984)

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Great Lakes Division — David Smith, W8YZ, 530 Hollywood Dr., Monroe, MI 48161
Hudson Division — Richard T. Knadle, Jr., K2RIW, 316 Vanderbilt Pkwy., Dix Hills, NY 11746
Midwest Division — Richard G. Tucker, WØRT, Box 671, Parson, KS 67357
New England Division — David C. Olean, K1WHS, Poplar Hill Rd., East Lebanon, ME 04027
Northwestern Division — Hal Goodell, N7NW, 35916 11th Ave., SW, Federal Way, WA 98003
Pacific Division — H. Paul Shuch, N6TX, 14908 Sandy La., San Jose, CA 95124
Roanoke Division — Ted Mathewson, W4FJ, 1525 Sunset La., Richmond, VA 23221
Rocky Mountain Division — David J. Pedersen, N7BHC, 4206 S. 4800 W., Hunter, UT 84120
Southeastern Division — †Richard M. Jansson, WD4FAB, 1130 Willowbrook Trail, Maitland, FL 32751
Southwestern Division — Louis N. Anciaux, WB6NMT, P.O. Box 82183, San Diego, CA 92138
West Gulf Division — James D. King, W5LUU, 7335 Wild Eagle Rd., San Antonio, TX 78255
Board Liaison — Jay Holladay, W6EJJ, 5128 Jessen Dr., La Canada, CA 91011
Staff Liaison — Mark Wilson, AA2Z, ARRL, 225 Main St., Newington, CT 06111

†Chairman

QST

Strays

ECLIPSE WEATHERWATCH

On May 30, parts of central Mexico and the eastern United States will be treated to an unusual type of solar eclipse. Unlike the total eclipse that crossed the U.S. Pacific Northwest in 1979, the upcoming event will be *annular* — that is, the moon will be slightly smaller than the disc of the sun. As a result, a ring of sunlight (or "annulus") will shine around the moon's silhouette at maximum eclipse. It will almost be total in the sense that for parts of the Mid Atlantic states, 99.8% of the sun will be obscured by the passing new moon.

To aid professional astronomers and amateur observers as to where will be the best area along the eclipse path for viewing, an Amateur Radio *Eclipse Weather Net* is being proposed. The path of the eclipse will run through eight states: Louisiana, Alabama, Mississippi, Georgia, South and North Carolina, Virginia and Maryland. Interested amateurs and radio clubs in these states may contact the undersigned for more information on the eclipse and the preparations for setting up a weather-reporting net up to 48 hours in advance of the eclipse.

This would also be a good opportunity for amateurs to conduct HF propagation experiments during the darkest phase of the eclipse. See "Effects of a Solar Eclipse on the Ionosphere," January 1979 *QST*, page 26. — *Joe Rao, Meteorologist, Compu-Weather, Inc., P.O. Box 1122, 29-50 Union St., Flushing, NY 11354*

Moved and Seconded...

MINUTES OF EXECUTIVE COMMITTEE
No. 412
January 13-14, 1984

AGENDA

1. Approval of minutes of October 6, November 16 and November 21 meetings (Nos. 409, 410, and 411)
2. Recognition of new Life Members
3. Affiliation of clubs
4. Approval of conventions
5. Reports of progress in responding to previous Board Meeting actions
6. Report on FCC actions
7. Consideration of report on Federal charter
8. Report on local antenna/RFI matters
9. Consideration of report on legal assistance provided to ARRL members
10. Application for IARU membership from Belize Amateur Radio Club
11. REACT Memorandum of Understanding
12. QCWA cooperative agreement
13. Authorization for Treasurer to open security cash account at Dean Witter Reynolds, Inc.
14. Consideration of Mr. Nathanson's letter of December 13
15. Consideration of Board Meeting dates
16. Nominations for Honorary Vice President

Pursuant to due notice, the Executive Committee of the American Radio Relay League, Incorporated, met at 8:25 P.M. Pacific Standard Time, Friday, January 13, 1984, at the Hacienda Resort Hotel, Las Vegas, Nevada. Present were President Carl L. Smith, WØBWJ, in the Chair; First Vice President Larry E. Price, W4RA; Directors Paul Grauer, WØFIR, 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 President Gar Anderson, KØGA; Directors Mary E. Lewis, W7QGP, Edmond A. Metzger, W9PRN, and William J. Stevens, W6ZM; Vice Directors Fried Heyn, WA6WZO, and Marshall Quiat, AGØX; and Counsel Christopher D. Imlay, N3AKD.

Mr. Nathanson moved to exclude from the meeting those attendees who were not Directors of the League; but there was no second.

1) On motion of Mr. Grauer, with Mr. Nathanson dissenting, the Minutes of the October 6, November 16 and November 21, 1983 meetings were accepted in the form in which they appeared in *QST*. It was noted that the attendance of Director Metzger at the October 6 meeting had not been mentioned in the initial distribution of the Minutes of that meeting, but that the omission subsequently had been corrected.

2) On motion of Mr. Milius, the Committee recognized the names of 77 newly elected Life Members, and directed the General Manager to list their names in *QST*.

3) On motion of Mr. Milius, the affiliation of the following clubs was approved (Category I unless otherwise indicated):

Alcorn County Amateur Radio Emergency Service, Corinth, MS
America Radio Club, Inc., Hialeah, FL
Aurora Repeater Association, Aurora, CO
Cactus Net East, Oakhurst, NJ
Campbell County ARC, Gillette, WY
Eaglehead Repeater Association, Bozeman, MT
DeForest Amateur Radio Club, West Union, OH
God's Bible School ARC, Cincinnati, OH (Category III)
Hoosierland Amateur Mobile Systems, Inc., Ft. Wayne, IN
Indianapolis Repeater Association, Inc., Greenwood, IN
Lincoln Communications Society, Lincoln, NE
Long Island Repeater Association, Merrick, NY
Metropolitan Amateur Radio Club, Detroit, MI
Network Software Center Amateur Radio & Electronics Club, Lisle, IL
Northern New Mexico ARC, Santa Fe, NM
Northstar Amateur Radio Association, East Grand Forks, MN
Northwest Amateur Radio & Electronics Assn., Ferguson, MO
St. Mary Amateur Radio Transmitting Soc., Patterson, LA
Society of Contest Operators & Radio Experimenters, Denville, NJ
Suburban UHF Association, Union, NJ
Upper Valley Amateur Radio Group, Thetford Center, VT
Yolo Amateur Radio Society, Davis, CA

With this action, the League has the following number of active affiliated clubs: Category I, 1621; Category II, 11; Category III, 165.

4) Applications for the sanctioning of ARRL conventions were considered next. On motion of Mr. Nathanson, there being a conflict with the dates of the 1984 ARRL National Convention, the application for an Oklahoma State ARRL Convention on July 20-22, 1984, was tabled. On motion of Mr. Nathanson, the Committee approved the holding of the following ARRL conventions:

Arkansas State	April 7-8, 1984	N. Little Rock, AR
Louisiana State	May 5-6, 1984	Baton Rouge, LA
Alabama State	May 19-20, 1984	Birmingham, AL
Northwestern Division	June 1-3, 1984	Seaside, OR
Kansas State	June 2-3, 1984	Salina, KS
Joint Idaho, Montana and Utah State	August 3-5, 1984	Jackson Hole, WY
Texas State	October 6-7, 1984	Houston, TX
Dakota Division	July 5-7, 1985	Rapid City, SD

It was noted that approval had been given earlier, by telephone or mail vote, for the holding of the following ARRL conventions:

Mississippi State	April 14-15, 1984	Jackson, MS
Rocky Mountain Division	May 25-27, 1984	Aurora, CO
West Gulf Division	June 1-3, 1984	Dallas, TX
Indiana State	July 7-8, 1984	Indianapolis, IN

5) At this point, the following progress reports were rendered to the Committee:

5.1) Mr. Sumner distributed a written report on actions taken in response to directives from the 1983 Second Meeting of the Board. Committee members were invited to review the report for discussion the following day.

5.2) Mr. Price reported for the Ad Hoc Committee on ARRL Interference Reporting System (AIRS). The hardware/software combination to implement the AIRS database at Headquarters has been acquired and is operational. An article describing the AIRS program has appeared in *QST*, triggering a number of applications from potential members. An initial team of 25 stations has been appointed after coordination with the concerned Division Directors. AIRS Operating Instructions have been prepared by staff and approved by the Committee. New reporting forms to replace the previous Intruder Watch forms have been designed, printed and received. Finally, the necessary coordination of AIRS procedures with FCC staff has been accomplished. In short, the new AIRS program is fully implemented.

5.3) Mr. Price requested a clarification of the status of the Ad Hoc Committee on Volunteer Monitoring, appointment of which had been announced in Directors' Letter No. 1839. On motion of Mr. Nathanson, it was unanimously voted that the Committee be treated as a Subcommittee of the Ad Hoc Committee on Licensing chaired by Mr. Anderson.

5.4) Mr. Anderson reported on a meeting of the Ad Hoc Committee on Licensing held December 17 at ARRL Headquarters, and on progress being made on the drafting of a VEC agreement for Board consideration.

5.5) Mr. Stevens reported briefly for the Management and Finance Committee, which was also meeting this weekend. The Committee had conducted a review of two requests for deficiency appropriations for 1983 Division expenses, as required by Minute 64 of the 1982 Annual Meeting, and recommended that the requests be approved by the Executive Committee. On motion of Mr. Nathanson, it was unanimously voted that the deficits in the two Divisions are approved for payment.

At this point, on motion of Mr. Nathanson, it was unanimously voted at 9:56 P.M. that the Committee is in recess until 9 A.M. the following day.

The Committee reconvened at 9:07 A.M. Saturday, January 14, 1984. In addition to those previously mentioned, the following were present for all or part of the second day of the meeting: Director Clyde O. Hurlbert, W5CH; Vice Director Kip Edwards, W6SZN; and Treasurer James E. McCobb, Jr., K1LLU.

5.6) Mr. Nathanson reported that the Task Force on Federal Pre-emption planned to hold a meeting in the next three to four weeks. On motion of Mr. Nathanson, it was unanimously voted to authorize the reimbursement of Task Force expenses up to $10,000 during 1984.

5.7) Mr. Holladay reported on behalf of the Special Committee on Cerritos, California, which was established at Minute 80 of the 1983 Annual Meeting of the Board. After discussion, it was moved by Mr. Nathanson that, in view of the request by the plaintiffs' attorney that ARRL cease its involvement in the case of *Goumas, et al., v. City of Cerritos*, and there having been no acceptance by the City of the League's offer of a presentation since the action of the Executive Committee at its meeting of October 6, 1983, the decision that there be no fur-

ther ARRL participation in the case is hereby affirmed. A roll call vote being requested, Messrs. Grauer, Milius and Nathanson voted in the affirmative; Mr. Holladay abstained.

6) Mr. Imlay reported on FCC matters as follows:

6.1) The Society for Private and Commercial Earth Stations (SPACE) has filed with FCC a "Petition for Clarification" of the Commission's declaratory ruling in connection with the Federal preemption of Satellite Master Antenna Television regulation by state and local governments. The SPACE petition seeks preemption of "local zoning requirements not specifically and demonstrably related to public safety concerns" as these requirements affect antenna installations. Mr. Imlay noted that ARRL interest in this matter was limited to the preemption of local antenna regulations, and did not extend to other aspects of the SPACE petition. After discussion, on motion of Mr. Milius, it was unanimously voted that Counsel is authorized to file comments in this proceeding in consultation with the Task Force on Federal Preemption.

6.2) Mr. Imlay reviewed the status of 1900-2000 kHz following the release of the Second Report and Order in Docket 80-739 (WARC implementation), particularly as regards the petition to be filed seeking RTTY (F1 emission) privileges in the 1800-2000 kHz band (see Minute 51 of the 1983 Second Meeting of the Board). The status of the existing restrictions, designed to protect a chain of LORAN-A stations in Canada, is unclear; Counsel and staff will seek clarification. If it appears that the restrictions are to be removed, thus clearing the way for F1 privileges to be granted in the 1900-2000 kHz segment, the petition will be filed; if not, a recommendation for Board consideration will be formulated prior to the 1984 Annual Meeting. In the course of discussion it was noted that the Board's desire is to have no FCC-imposed mode subbands in the 160-meter band, but rather for operating patterns to be established through voluntary cooperation.

6.3) Mr. Imlay reported that amateurs in Southern California had contacted his office to express concern about the withdrawal of amateur operating privileges in the 2310-2390 MHz segment of the 2300-2450 MHz band. On motion of Mr. Milius, it was unanimously voted that Counsel is authorized to file a petition for reconsideration of the FCC action with respect to 2310-2390 MHz in the Second Report and Order in Docket 80-739, if such is deemed necessary to protect the interests of the Amateur Radio Service.

7) A report on Federal charters prepared by Washington Area Coordinator Perry F. Williams, W1UED, on behalf of the Ad Hoc Committee on a More Continuous Washington Presence, was presented and discussed. After discussion, the report was referred back to the Ad Hoc Committee for further consideration.

8) Mr. Imlay reviewed the status of local litigation involving Amateur Radio as follows:

8.1) *Guschke v. city of Oklahoma City.* The case is now on appeal by the plaintiff to the Tenth Circuit United States Court of Appeals. On motion of Mr. Nathanson, Counsel was authorized to file an *amicus curiae* brief on behalf of the League in support of the plaintiff's position.

8.2) *Thernes (WM4T) v. City of Lakeside Park (KY), et al.* This case involves a challenge to an ordinance which as interpreted permits *no antenna support structures whatsoever.* The plaintiff's attorney has been in contact with both Counsel Imlay and with Vice Director Wilson. On motion of Mr. Holladay, Counsel was authorized to file an *amicus curiae* brief on behalf of the League in support of the plaintiff's position.

8.3) Mr. Imlay noted that communication had been re-established between the League and the National Cable Television Association (NCTA) on the subject of cable television interference. The ARRL RFI Task Group will be monitoring the resolution of complaints referred to NCTA.

9) Minute 83 of the 1983 Second Meeting of the Board instructed the Executive Committee and Counsel to study the manner in which the League responds to members' requests for assistance in legal cases and to make recommendations to the Board for improvements in this area. A report prepared by Assistant to the General Manager Dale Clift, WA3NLO, was offered to the Committee. After discussion, it was agreed that the Committee members and Counsel would review the draft and submit comments to the Secretary, with subsequent coordination of a draft report by correspondence and telephone conference call, the objective being a completed report for the Board by February 26.

10) On motion of Mr. Price, the Secretary was instructed to cast an affirmative vote for the admission to the International Amateur Radio Union of the Belize Amateur Radio Club (IARU Proposal No. 175).

11) Correspondence between General Manager Sumner and Gerald H. Reese, Executive Director of REACT International, subsequent to the tabling of the motion concerning a memorandum of understanding between the two organizations at Minute 84 of the Second 1983 Meeting of the Board, was reviewed. On motion of Mr. Milius, the Secretary was instructed to write Mr. Reese, informing him that the Executive Committee had deferred action until the 1984 Annual Meeting of the Board. The Committee was in recess from 11:24 to 11:36 A.M.

12) The status of the draft cooperative agreement between ARRL and the Quarter Century Wireless Association (Minute 57, 1983 Second Meeting of the Board) was reviewed. Different texts of the draft agreement as prepared by the two organizations are now being studied; if possible, a coordinated text will be presented for Board consideration at the 1984 Annual Meeting.

13) On motion of Mr. Milius, the request having previously been endorsed by the Management and Finance Committee, the Treasurer was authorized to open a security cash account in the name of the League at Dean Witter Reynolds, Inc.

14) At 11:45 A.M. Mr. Smith departed from the meeting, and Mr. Price took the Chair. Mr. Nathanson had written to the Secretary with regard to an interpretation of the Bylaws and had requested that the matter be placed on the Executive Committee agenda. However, in view of efforts to draft clarifying language for Bylaw 32 which were already underway, on motion of Mr. Nathanson it was unanimously voted to defer the matter until the 1984 Annual Meeting of the Board.

15) On motion of Mr. Milius, it was unanimously voted to add to the agenda the reconsideration of dates for the 1984 Annual Meeting of the Board. After discussion, on motion of Mr. Milius, it was unanimously voted that the Executive Committee does hereby initiate a mail vote of the Directors in accordance with Bylaw 25 to propose a change in the dates of the meeting from March 26-27 to March 22-23, 1984. During the course of the discussion, Mr. Smith returned to the Chair, at 12:12 P.M. On motion of Mr. Nathanson, consideration of the date of the Second Meeting of the Board was deferred until the Annual Meeting of the Board.

16) At this point in the meeting, Mr. Grauer delivered to the Committee the nomination of George Hart, W1NJM, as Honorary Vice President, in accordance with the procedures established at Minute 84 of the Second 1981 Meeting of the Board.

It was tentatively agreed that the Executive Committee would meet on the day preceding the 1984 Annual Meeting of the Board. There being no further business, the Committee adjourned at 12:59 P.M.

Respectfully submitted,

Carl L. Smith, WØBWJ, President — David Sumner, K1ZZ, General Manager

LIFE MEMBERS ELECTED JAN. 13, 1984

List No. 1: Annette F. Barker, KA5MIM; Ann Moore Bradley, WA4APK; Larry Brooks, WBØECV; James E. Cochran, KØWIU; William I. Culpepper, WA4HQA; John E. Feltz, WA9LWJ; Geza L. Ferencz, NØBWJ; J. Gil Fuqua, Jr., WA4CQP; Karl W. Heller, N3APZ; Phillip D. Jones, WD8OTJ; James Gordon Kahn, WA2ILK; Jeffrey S. Katz, N1CLW; Guy Edward Lambert, KD3Y; Gale L. Leach, W8VX; John Lundberg, K7WME; Mark M. McCooey, N5BTO; Charles Robert Merrell, KØYRX; Ronald L. Nepote, K6UJG; Richard Nolan, VO1OM; Lee E. Peevy, KA6VAF; Lawrence E. Peterson, N6FFG; Paul A. Reh, Jr., AB7W; Alfred M. Sorenson, WA4HMS; Jack W. Stell, KA7FEZ; Robert L. Taylor, WAØJRP; Vicci K. Wallace, KA4KLG; Frank A. Williams, KA8PIV.

List No. 2: Herbert N. D. Cahan, KB2PR; F. Cecotti, W7JBH; Josephine Cornwall, KB4EJX; Alan B. Foster, KB7UI; Clifford Ray Gyger, II, KX5Z; James A. Harrigan, VE3KYR; C. Jon Johnson, WA4HFB; Rodger D. Johnson, KC7BC; Bernard M. Lavezza, N4FOC; David A. Lee, KY4K; Morris William Lyons, VK3BCC; Constance L. Morris, KA6JAM; Peter J. Polillo, W9SLO; Bruce Williams, KB4TQ; Lawrence M. Wright, KB4GCS.

List No. 3: Arthur B. Allen, WA1OZX; George W. Andrews, W1DCT; Raymond Edward Baycar, N2RB; B. J. Blaho, KA9FEQ; Gary E. Blanchard, KD8HF; Clifford H. Brommer, KA3KEL; Mark C. Collins, WB8OET; Brian Coryell, NØBFS; Aquiles C. Descallar, KA6HZH; Kenneth W. Dwight, WA6NYB; David C. Eanes, N4AZI; James A. Eldridge, WA6UWJ; Steven Darryl Evans, AE5W; Albert R. Goldman, KA2CHK; Joseph M. Hughes, WD4NUE; Clement T. Lambert, WB1DQA; Charles Keith Leto, N3DGA; John Littlejohn, WA9MTO; William C. Luebkemann, Jr., WB2LCC; Robert J. Mahan, WDØEIF; Michael L. Mauldin, K5NU; Devereux H. Murphy, Jr., AE9C; Kenneth J. Overton, KA6PIA; Jerome V. Prestel, KA9BSD; Leo Razgunas, WA8SEY; Stanley R. Rosenquest, K5RTI; Robert A. Scully, N6DEK; David L. Shiplett, WL7ACY; W. Sheldon Skiff, KA7K; Robert L. Strickland, WA3HWZ; Harry L. Styron, K6MFV; Thomas D. Taylor, WB2EFI; Dennis Vandyke, NR4I; Donald E. Weber, WDØDKW; Anne Marie Wilson, KA1JAN.

How's DX?

Conducted By Ellen White,* W1YL/4

1983: The DX Year in Review

The best that history has to give us is the enthusiasm which it arouses. — Goethe

It was a less-than-great year for conditions. Still, 1983 supplied appreciable DX opportunities for four of the "most needed" countries reviewed in the January 1983 How's DX? column. In that column, under the heading of "The Quality of Rareness," the 10 "most needed" countries were briefly reviewed. They included China, Heard Island, Laccadives, Albania, Cambodia, Burma, Yemen, Bouvet, Andamans and San Felix. Early in 1983, on January 21, the IDXF Heard Island operation got under way with K8CW and VK3DHF doing the honors. Just a few weeks later, the Heard Island DX Association crew arrived on Heard, with VK9NS, VK9NL, VKØSJ, WA8MOA and OE1LO delivering two-ways at an imposing rate. Who would have believed it? For years, since VKØRM in 1980 briefly activated Heard, no operation had taken place. Now, simultaneously, two excellent DXpeditions assured our Amateur Radio DX world that Heard Island was indeed being heard from!

During 1983, little by little, additional mainland China stations were activated and BY became a reachable commodity for those among us seeking the lofty heights of the DXCC Honor Roll. BY1PK, BY8AA and BY4AA were all operational, more or less, and hams were not only working them but visiting and operating from them! Mid-year, a group of Japanese hams activated XU1SS, and national Cambodians continued the operation with credits acceptable for DXCC. The Laccadives became reachable (albeit with difficulty) at year end, when VU7WCY (for World Communications Year) opened up. Now, anyone for Albania, Burma, Yemen, Bouvet, Andamans and San Felix? We'll see!

An event occurred in April that cast, in microcosm, a pall upon our world. Members of the Cologne DX Club had been enroute to Spratly, planning to have a good time and give out many 1S contacts. What happened became an unfolding horror story. On April 10, their ship was shelled; it sank, and DJ4EI perished. Survivors on the raft were sighted on the 10th day, but not before DJ3NG died. DF6FK and DJ6SI survived, along with the ship's captain and his wife. A frightful lesson on the perils of DXing.

It was a quiet year as far as country counting went. The only approved addition to the DXCC compilation was Peter I Island, to be added *when* and *if* an operation takes place. The ARRL DX Advisory Committee continued an ongoing study on ethics, recommended that Spratly not be deleted, and still hadn't concluded a vote on the Pribilof event (as of presstime). Late in August, the Alaska DX Association created that interesting excursion with their Pribilof DXpedition — one requiring surmounting numerous obstacles of jurisdiction, climate and geography! Nearly 6400 contacts were made, and a good time was had by all, with KL7RA/p on sideband and KL7PJ/p on CW.

Column items during the year included: a review of "The Quality of Rareness" with a discussion of the 10 most-needed countries (January); "Durability — KH6IJ" and a thumbnail sketch of the inimitable Katashi Nose, who late in April was nominated Ham of the Year at the Dayton Hamvention (February); "1982," a recap of that 12-month period (March); "Those Propagation Charts," which accompany this column monthly (April); "Getting the Cards" while using the incoming and outgoing ARRL QSL Bureaus (May); "Honor Roll Analysis," which deals with non-W "mixed" Honor Roll members (June); "Have You Heard?" regarding the early-1983 Heard Island expeditions, and the column's goof of the year, showing SMØAGD's photo with VKØJS/VK9NS caption (July). Yet another apology to Jim Smith (whose real photo appeared later in the year, in October!). "F8YM — A Photo Essay" (August); the chilling events of the Spratly disaster (September); "Peter I Island," which now has approval to "count" when and if a valid operation takes place from that forbidding place (October). The November theme, "Pitcairn Island," coincided with a *National Geographic* feature. This *QST* item detailed the start of Amateur Radio on VR6. December's column covered Palmyra and Jarvis Island, a rare DXCC entity these days, at least until the AD1S operation.

AN AID TO OPERATING

A family argument started not too long ago on the relative "purity" of using any of the various DX operating aids. (This is an obvious outgrowth of similar arguments over recent years that specify that, somehow, using a keyboard for CW isn't really "honest.") Those of us who have grown a bit long in the tooth remember that "good" operators learned DXing through application of the seat of the pants to the operating chair. That's how we found out how high the MUF was — through devoted listening. Things do indeed evolve, and regularly we see propagation charts in our journal, listen to local DX alerting networks, and read weekly and monthly bulletins that tell us where and when to look for a "choice" piece of DX. "Choice," of course, is whatever you don't have confirmed! Thus, it seems quite logical to see propagation forecasting evolve into home-computer-generated DX prognostication!

Your editor recently had an opportunity to play with the BASE(2) Systems MUFPLOT. This neat program imparts the relevancy of certain operating factors in a way that's difficult to explain in words. Almost immediately you really see the effects of present (and past) solar flux on band openings. In fact, with conditions so punk of late, it was almost as much fun to fool with the program as to "hope" 20 would open. With access to a C-64, I loaded the disk and was ready to answer just a few questions. You enter the date (month/day), the solar flux (available from WWV or W1AW), the time — your choice of UTC or local. For those who never managed to "think" in UTC, it is indeed handy to have a local-time presentation. You're then asked for "TO"? The target you use can be called up by call-sign prefix latitude/longitude or by just the response "DX" which would then get you an overview of the conditions in six world regions. I entered UA and got back a prompt requiring me to decide: European Russia, Franz Josef Land, Kaliningrad, or Asiatic Russia. I chose the latter and got back a bearing of 0° (aim that beam north!) with a distance of 6283 miles! I then watched in fascination as the monitor presented me with a shaded graph of MUF for that day, plotting frequency (vertically) and time on the horizontal.

The tutorial applications are obvious. Instead of describing DXing in the last sunspot maximum at a DX club meeting, you can actually illustrate them and amaze the tyro DXer. By plugging in various flux numbers, you can rapidly compare (and print, too, if you have the capability) graphs showing the demise of 10 meters, etc. — the forefront of burgeoning technology and fun, indeed (when the band is dead!). An informative pamphlet on propagation accompanies the program. Versions are available for the VIC-20 and Apple. Details from BASE(2) Systems, 2534 Nebraska St., Saginaw, MI 48602, tel. 517-777-5613.

Somehow, this all brings to mind that wonderful saying generated by the long-time editor of this column, W9BRD: "I hate the guys that criticize the enterprise of other guys whose enterprise has made them rise above the guys who criticize!"

DXing is what you make of it! WA4YDK worked his 100-bicycle mobile. Elliot previously earned WAS via this novel route. This is certainly a healthy application of country chasing!

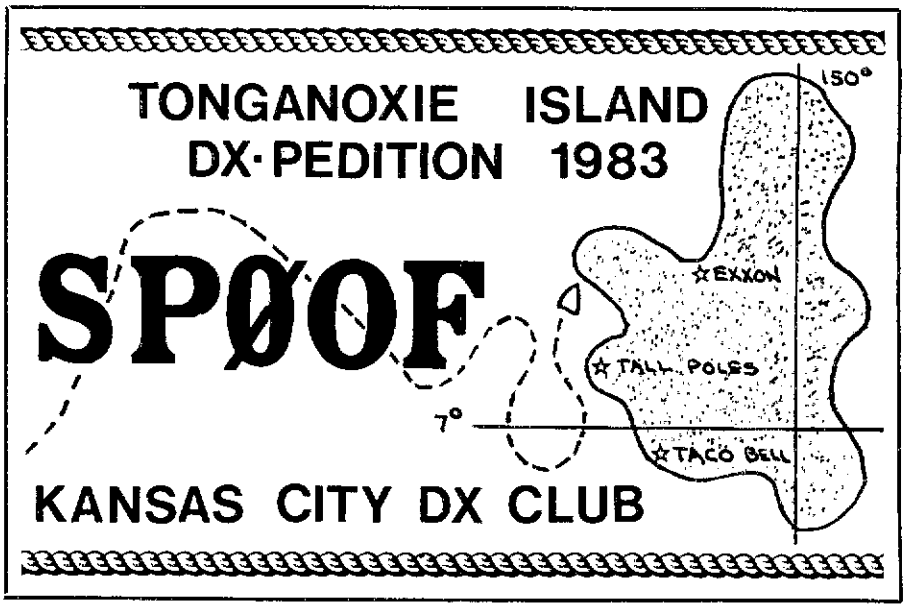
THE CIRCUIT

☐ International DX Convention: The Southern California DX Club is hosting the April 15, 1984 DXtravaganza from Friday night, April 13, through Sunday, April 15. The basic program will include both DX and contest forums in an atmosphere wholly devoted to those active in this field. At presstime, speakers included: 1AØKM, K7NW, JA1BK, VE7BC, TT8BC, K3ZO, 3B8CW. Pre-registration must be by March 15 ($38/person), payable to West Coast DX Convention 84, mailed to Nick M. Winter, WB6DXU, 1426 N. Avon St., Burbank, CA 91505. Your s.a.s.e. to Nick, on or before March 30, will bring you final program details.

☐ DXPO Atlanta: Mark your "plan-ahead calendar" for May 3-5, 1985 for this noteworthy event sponsored by the Southeastern DX Club. Need further early-planning details? Write to DXPO — Atlanta, 720 Starlight La., N.E., Atlanta, GA 30342.

*19620 SW 234 St., Homestead, FL 33031

3X4EX (LA2EX) saw past activity as 9L1EX. Arild's manager is N4CID.



This spoof QSL card is courtesy of the Kansas City (Missouri) DX Club.

☐ Algeria: KC2XK (ex-TU2GI/EL2ED) is awaiting an Algerian call. Andy has some cogent comments about those who leave ethics by the wayside when applying for cards for bogus contacts.

☐ Japanese Annual DXCC race: This domestic-only affair should create some interest during the year for JAs to haunt the bands in spite of declining sunspot numbers. Their internal race has both multiband and single-band awards for each of their classes of amateurs. Congratulations to the Japanese CQ Publishing Company for sponsoring this exciting operating challenge.

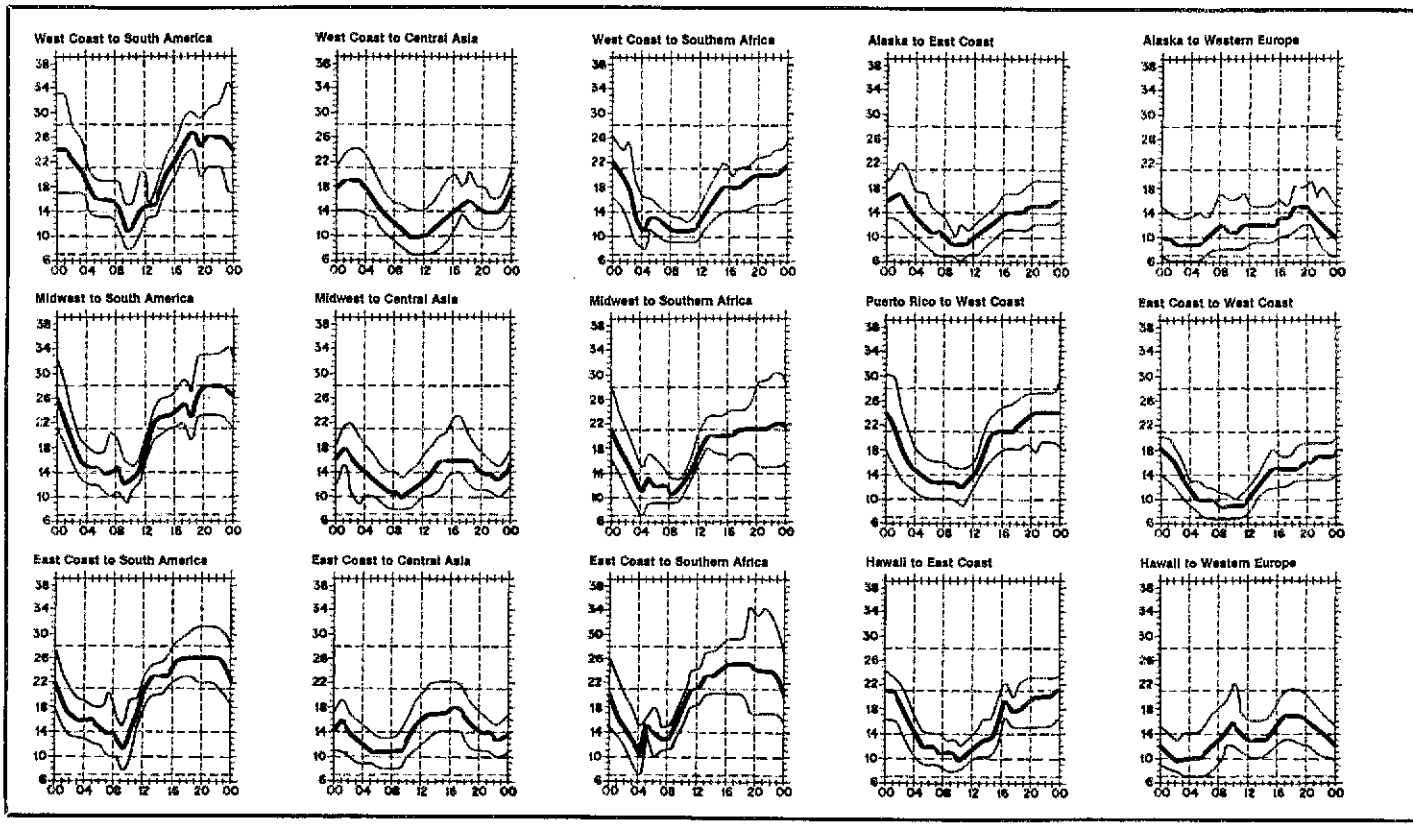
☐ DX Nets Around the World: OE2DYL is into his third edition of his list of DX Nets Around the World. In addition, Dieter continues to manage an impressive group of QSLs. Details from Dieter Konrad, OE2DYL, Bessarabierstr. 39, A-5020, Salzburg, Austria.

☐ BVI: K9GL, K9PW, WB9TIY and K4UEE — all /VP2V — were scheduled to start February 27 and last to March 12, with heavy activity on all bands. During the ARRL Phone DX Test, look for them to sign a local VP2V call. QSL all operators as announced. This is the same gung-ho bunch who activated VP5KMX in the '83 event.

☐ Brunei: The State of Brunei became independent from the U.K. on January 1. The Brunei Amateur Radio Transmitting Society had planned to celebrate the event with a special-events station this past February 24. If you worked VS5I, VS5IB or VS5IC, QSL via Box 222, Bandar Seri Begawan, Brunei.

☐ Antarctica: According to the Amateur Radio Society of India (ARSI), VU2IF was scheduled to operate ATØA through the end of March. QSL to his home call.

☐ Kansas City DX Club: New officers include President WØJLC, Vice President KØVBU and Newsletter



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

AI5P: ex-EP2DX, EQ2DX, 9C9DX, JY9DX, DA2DX, TA3DX and HL9DX. *(W1YL photo)*

Editor AB0X. That spoof QSL herein is courtesy of this interesting club.

☐ DXCC Package: The new ARRL DXCC Countries List packet includes DXCC rules and a seven-page log of prefixes/countries/continents/ITU and CQ zones, plus columns for band/mode record keeping. An extra notation shows the current list of countries for which QSLs may be forwarded by the ARRL Membership Outgoing QSL Service. $1 postpaid from Mecca, a.k.a. League Hq.

☐ K2FJ: Ken will be operating K2FJ/KH8, 5W1ER and from 3D2 through March 9. Specific frequencies include: 3797, 7027, 7087, 14,030, 14,052, 14,145, 14,230, 21,030, 21,052, 21,240, 21,355, 28,010, 28,490 and 28,580. Cards to K2FJ.

☐ Western Pennsylvania DX Assn.: New officers for this year include President AD8J/3, Vice President K3UA, and Newsletter Editor K3MC.

QSL Corner

Administered By Joan Becker, KA1IFO

ARRL-MEMBERSHIP OVERSEAS QSL SERVICE

Send outgoing cards to this address: American Radio Relay League, 225 Main St., Newington, CT USA 06111.

This is an "outgoing" service that allows ARRL members to send DX QSL cards to foreign countries at a minimum of cost and effort. While QSLing direct to foreign amateurs is faster, it is also more tedious. Time spent searching for addresses in the foreign *Callbook*, addressing and stuffing envelopes, and mailing could be better spent operating DX. And, the cost of IRCs, airmail postage and envelopes can be prohibitive.

An unlimited number of QSLs may be sent for distribution 12 times per year. The fee is just $1 per pound or portion thereof (155 QSL cards average a pound).

The ARRL-Membership Overseas QSL Service operates *only* in an "outgoing" capacity. To receive QSLs from DX stations, see "The ARRL DX QSL Bureau System," in December 1982 *QST*, page 77, or send an s.a.s.e. to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

U.S. amateurs may send SWL reports to foreign shortwave listeners. Unlicensed (associate) members may send SWL cards to foreign amateurs. QSL managers: write for details.

Requirements

1) Presort your DX QSLs alphabetically by call sign prefix (A3, AP, C6, CE, F, FG, G, GI, GM, JA, 3A2, etc.).

2) Enclose the address label from the brown wrapper of your current copy of *QST*. This information shows that you are a current ARRL member. Family members may also use the service by enclosing their QSLs with those of the primary member. Include the appropriate fee with each individual's cards and indicate "family membership."

Sightless members who do not receive *QST* should indicate that the QSLs are from a "sightless member."

ARRL affiliated club stations may utilize the service when submitting club QSLs by indicating the club name. Club secretaries should check affiliation papers to ensure that membership is current.

3) Enclose payment in the form of a check, money order or cash. Sending large amounts of cash through the mail is not suggested. Please do not send stamps.

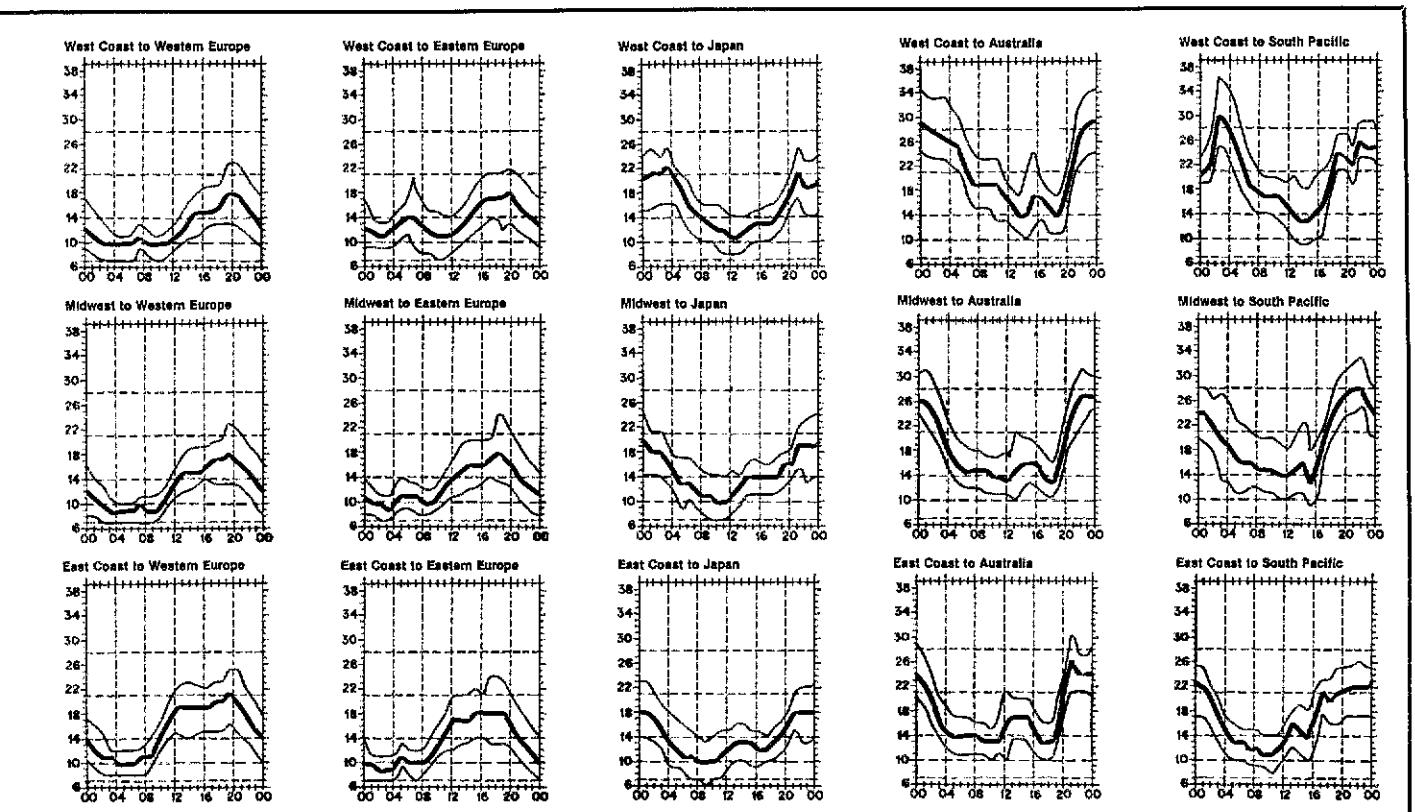
QSL Information

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

AZ5ZA (LU2A)
C30AAL (F6EYS)
CT2EV (WA3HUP)
FG0HYJ/FS7 (VE2EWS)
FM7WD (W3HNK)
FO8KP (F6GXB)
HB9P (F6FQK)
HC1SK/8 (SM6DYK)
HV3SJ (I0DUD)
V3CQ (N6ADI)
V30DX (N6ADI)
VP2EEW (WD8ALG/KU8E)
VP2KBZ (VE3KZ)
VP2MF (VE3GCO)
VP8ANT Box 146, Cambridge, England
ZF2FK (K9QVB)
4U2C (NQ4I)
6U0WCY (DF7ZH)

Special Notes

☐ December 1983 QSL Corner, page 75, contains information and addresses for the Incoming Bureaus. 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 fot). See April 1983 *QST*, page 63, January 1977 *QST*, page 58, September 1977 *QST*, page 35 and January 1979 *QST*, page 11 for a complete explanation. The horizontal axis shows Coordinated Universal Time (UTC); the vertical axis, frequency in MHz. Data are provided by the Institute for Telecommunication Sciences, Boulder, Colorado. These predictions, for March 15 to April 15, 1984 assume a sunspot number of 56, which corresponds to a 2800-MHz solar flux of 108.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 1 through December 31, 1983. An s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

AL7X/148	G3GWT/179	KX6SS/100	SM5BIH/101	ZS5QO/129	KC2WQ/141	KD3C/152	KA7JVW/109	KC8OD/104
DK5VP/202	G4JKS/109	LZ2RS/110	SM5ENX/104	4Z4UX/131	KI2Q/101	WA3UJE/110	W7HHP/106	KQ8J/133
DL2YBU/103	JH1QFA/284	OK1DLA/281	SM6DTG/102	5B4AU/114	N2CTE/100	WA4UQC/100	K8CYV/138	W8MEP/104
DL5YBD/120	JA4CQS/317	OK3KXR/109	SP2BRZ/238	KA1VT/103	W2GVX/220	K5LC/106	K8JE/104	W9KE/104
DL8NBE/123	JA5NSR/110	PAØJRW/128	V2AO/204	KN1M/101	W2VP/138	KW5E/104	KA8DES/105	KBØW/110
DL8UI/317	JA6GIJ/288	PY1DWM/139	VE3CWN/113	WA1YXL/102	K3AQH/100	WA5KBH/100	KA8GOM/124	KOØZ/102
F5VU/327	JA7BEI/200	PP2BNQ/206	VU2XO/109					

Radiotelephone

AL7X/108	EA1AYQ/166	I8JIA/115	ON7TK/163	UD6DER/297	KC2WQ/141	KC4HN/102	K5UBZ/102	KA8DZT/101
CE5CFR/103	EA5CXS/141	IT9TQH/217	OX3AE/111	ZL2VR/103	W2EQO/101	KE4VU/131	NS6K/129	W9IEM/176
CE5SG/124	EA5IW/168	JI2MBN/101	PP2BNQ/205	4Z4UX/130	W2GVX/185	N4HWD/111	W6PUW/105	W9VSL/109
CP8HD/131	GB3RSS/109	OK1DLA/261	PT7ACZ/174	5Z4CL/116	W2VP/127	WA4UQC/100	KC7XB/113	WØHSC/100
DL8NBE/115	I2JSB/204	ON7RD/141	UB5HAF/125	9Y4RD/4X/100	KD3C/106	ND5G/109	W7HHP/100	WDØFSV/110

CW

DF6EX/202	DL9HC/109	JR6CF/151	OK1DLA/224	PAØJRW/107	KI2Q/101	N5FN/105	KC8OD/102	WD8IXE/117
DL1LT/107	JH2TPI/110	HA3MQ/104	ON7CK/116	SM5BIH/101	W2GVX/170	W5LW/164	KI8G/100	K9CF/102
DL1VT/127	JA5NSR/110	OK1AFC/218	OZ4ZU/106	KA1RE/109	N4GVT/101	KA8IIC/105	KQ8J/129	WAØAXH/100

RTTY

KØJH	JA6GIJ

160 Meters

K1MM	K1MEM	DL1YD	N4SU	DJ8WL				

5BDXCC

KM9L	OK1AFC	K6ANP	DF2AL	HB9CIP	ON4SH	SP2BRZ	N6OC	OK1DLA
W8YGR	KD7P							

Endorsements

Mixed

CEØAE/300	JI1MNT/234	VE3NI/281	W1EO/169	W3IRE/295	W4VN/301	WD5AAM/274	WB6SRK/261	K9AGB/315
DF6EX/277	JJ1EEA/153	VE6KY/202	W1JNN/231	W3NF/311	WA4TLI/314	K6ICG/143	K7LAY/313	K9AJW/134
DF6TC/228	JA2OZI/251	YU2ARS/176	W1LMO/190	W3VQ/320	WD4RAF/176	K6UV/228	K7PM/238	K9BLY/262
DJ3GG/320	JA5CKD/199	ZS6JZ/180	W1MM/338	K4PR/254	WF4I/202	KB6JK/292	W7AHX/300	KA9FGD/126
DJ6BN/300	JA9GPG/155	AG1C/252	WA1ZLK/283	K4XQ/283	WI4K/200	KF6A/270	W7KWI/150	KB9OC/313
DK3KD/310	JHØGTL/200	K1DII/197	AE2A/278	KA4MPR/129	WM4Z/149	N6HK/260	W7TS/277	KK9Q/259
DK5QK/305	LA3WV/250	K1EFI/308	K2ON/300	KC4CT/295	AE5B/312	N6MM/319	AD8J/249	N9CHN/192
DL1LD/329	LA4YW/253	K1HDO/286	K2QPM/125	KC4ZH/228	KB5EK/250	N6OC/311	K8IAI/227	W9NT/131
DL2KL/227	LA5IU/294	K1HKI/150	KB2EN/300	KE4UC/150	KE5AX/266	N6ST/306	K8KAE/310	W9XX/308
DL7EG/318	OE6MKG/314	KA1RC/229	KB2RZ/289	N4CID/279	KM5A/175	NK6H/200	K8UE/300	W9YT/285
DL9HN/207	OK1AFC/258	KA1W/282	N2JV/302	N4CQ/308	N5DC/249	NO6H/235	KA8T/304	WA9BXB/150
DLØAA/301	ON4QP/265	KM1D/305	W2MT/293	N4GE/304	N5FN/223	W6ABT/312	KD8IW/251	WD9BBI/252
F6GBH/137	SK4BX/240	KN1U/292	W2NJ/301	N4GFI/200	N5JR/306	W6DPD/290	W8PBO/269	KCØXK/212
HB9AT/260	SM5HYL/281	N1AKX/292	K3NZ/314	ND4Y/200	ND5M/151	W6GYM/250	W8QID/200	KEØC/216
HB9NL/300	UK2PCR/314	W1BFT/290	N3ACU/250	NF4U/311	W5VJP/310	W6OB/318	WD8IXE/236	WØJCB/282
JA1RLV/312	VE2AGP/281	W1ENE/282	W3GTL/260	W4OMQ/320	WB5ZAM/246	WB6FGI/260		

Radiotelephone

AH6AY/228	JI1MNT/207	VE3NI/271	WA1LZL/175	N4CID/276	W5AL/290	W6DPD/290	K7LAY/288	KB9OC/313
DF3AO/269	JJ1KUV/180	AG1C/239	WA1ZLK/283	N4CQ/306	W5EFA/299	W6GTL/316	K7PM/199	N9AUV/285
DF5KX/230	JA2GHW/271	K1EFI/290	WB1GOO/225	N4JA/310	W5VJP/308	W6GYM/250	KB7UH/275	N9CHN/191
DF6EX/260	JH2LLE/153	K1HDO/264	K2UO/310	N4ZC/312	WB5ZAM/177	W6KON/320	W7TE/299	W9BM/325
DJ7CX/315	JR6RVG/150	K1LHT/323	KB2RZ/289	NF4U/305	WD5AAM/272	W6MDH/228	W7YR/313	W9DNE/326
DK3HL/316	JA9GPG/155	K1NMZ/152	WA2BGE/251	W4AXR/334	WD5DBV/300	W6PKB/175	WA7ZWG/300	W9XX/305
DK3KD/253	JHØGTL/200	KA1RC/229	WA2VJL/175	W4JD/281	K6JAD/318	W6SN/299	K8ZR/316	WD9BBI/176
DK4KL/313	LA5IU/292	KA1RE/226	KB3PY/260	WA4TLI/309	K6MA/308	W6TXL/309	KB8XT/152	KØGND/153
DL6QT/285	LX1FJ/213	KM1D/292	K4AEB/316	WB4YZC/217	K6PZ/314	W6XI/315	KC8YM/280	KØHSC/256
DL8UI/315	PP2JK/212	KN1U/279	K4CEF/313	WF4I/202	K6RK/297	WA6OET/315	KR8X/228	KBØSY/270
DL9HN/201	PT2BW/313	N1GL/203	K4XQ/278	WI4K/200	K6UD/306	WA6TLA/204	N8BLD/159	KCØXK/156
EA1AWW/160	PY2OB/299	W1AB/263	KA4MPR/129	AE5B/311	KB6JK/292	WB6FGI/260	W8BE/295	KEØC/199
EA8OZ/303	PY2TM/300	W1ENE/231	KC4CT/294	N5DC/200	N6DHX/153	WB6KRI/177	WD8IXE/207	WØJCB/277
F9JS/260	PY5PS/300	W1JNN/199	KC4ZH/228	N5JR/255	N6MU/311	WB6RSE/266	WD8PUG/281	WAØHWH/130
IØMBX/306	SM5HYL/267	W1NM/284	KX4A/132	ND5M/150	N6OC/310	WB6SRK/261	K9UAA/300	WDØAQJ/233
JH1QFA/284	V2AO/203							

CW

DJ2GW/212	JA3BQE/295	PY2TM/302	KM1D/181	K4AEB/207	KB5EK/125	NO6H/228	WB6RSE/302	W8DA/263
DJ7CX/276	JA8DNV/287	SM5BHW/304	KN1U/187	K4CEF/227	W5AL/252	NS6C/280	K7LAY/153	W8ZCQ/294
DK3KD/225	JA8EAT/300	SMØCCE/271	AE2A/229	KD4CA/170	K6JG/299	W6ID/268	K7PM/129	W9BW/303
JA1ELY/302	LA3XI/284	XE1VV/151	K2LFL/150	N4JJ/260	K6MA/225	W6TC/298	W7TS/233	W9XX/297
JA1HGY/261	LA4YW/203	K1EFI/261	K2UO/301	W4JD/275	K6RK/261	W6UY/278	K8ZH/301	WD9BBI/202
JA1UQP/263	OZ1DYU/226	K1HDO/155	W2FP/303	W4RHZ/150	N6MU/281			

DXCC NOTES

HONOR ROLL REMINDER: Those wanting to update their Honor Roll standings or make the Honor Roll must have their cards into Hq. no later than March 30, 1984. Cards arriving after March 30, 1984 will not be included in the Honor Roll listing in June 1984 *QST*.

Honor Roll

The DXCC Honor Roll is comprised of those call signs which have been credited with at least 306 of the 315 current countries on the DXCC list. Total DXCC credits given, including deleted countries, are shown after each call sign. The large, boldface numbers indicate total DXCC credits not including deleted countries.

MIXED

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DJ2BW/358
DJ7ZG/342
DL1BO/357
DL1HH/350
DL1JW/353
DL1KB/361
DL3BK/353
DL3RK/358
DL6EN/356
DL7AA/362
DL7AP/354
DL7EN/357
DL7FT/342
DL7HU/350
DL8NU/337
DL9OH/352
F9RM/350
G3AAE/360
G3FKM/358
G3FXB/358
G3HCT/352
GI3IVJ/355
GM3ITN/349
GW3AHN/360
HB9DX/348
HB9MQ/358
HB9PL/350
HB9TL/357
I2KMG/341
IT9TAI/357
IT9ZGY/356
I0AMU/359
JA1BK/348
JA1BRK/344
JA4ZA/342
LU4DMG/356
LU5DO/355
LU6DJX/365
OE1ER/363
OH2BC/342
OH2BH/343
OH2BZ/342
OH2QQ/353
OH2QV/346
OH4NS/341
OH5UQ/341
OK1ADM/346
OK1FF/359
ON4NC/361
ON4QJ/344
OZ3Y/355
PA0LOU/353
PY2BKO/341
PY2CK/364
PY2PA/342
PY2PE/342
PT7YS/351
SM3BIZ/358
SM7ANB/351
SM0AJU/353
VE3MJ/339
VE5RU/353
ZS6LW/354
4X4DK/359
4X4JU/356
W1AA/354
W1AFF/347
W1BIH/364
W1CKA/351
W1DGJ/345
W1DK/359
W1FZ/359
W1GKK/367
W1HH/352
W1HX/361
W1HZ/359
W1JR/357
W1NU/355
W1OO/340
W1UU/347
K2BK/355
K2BS/342
K2BZT/358
K2FB/348
K2FL/357
K2LWR/355
K2PXX/345
K2TQC/348
K2YLM/341
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W2AGW/365
W2AO/358
W2AYJ/359
W2BHM/354
W2BMK/352
W2BOK/357
W2BXA/365
W2CP/346
W2FXA/353
W2FZY/354
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W2GKZ/343
W2HTI/357
W2JVU/362
W2LPE/358
W2LV/360
W2OKM/359
W2QHH/361
W2QM/356
W2SSC/357
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W2TQC/354
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W3AFM/354
W3CWG/357
W3DJZ/347
W3EVW/361
W3GH/356
W3GRS/353
W3MP/363
W3NKM/358
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K4DJ/338
K4EZ/347
K4ID/343
K4IKR/339
K4JC/346
K4KQ/359
K4LNM/355
K4PDV/358
K4RPK/349
K4YR/357
K4YYL/341
N4EA/337
W4AAV/362
W4AIT/364
W4BFR/349
W4BQY/363
W4DR/357
W4EEE/357
W4EX/365
W4GD/361
W4NL/336
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W4QM/348
W4QQN/342
W4UG/343
W4VQ/345
W4WV/352
W4YJ/361
W4ZD/351
K5LIL/335
K5FJ/353
K5YY/338
W5AQ/352
W5HE/342
W5HJA/349
W5IO/359
W5KC/364
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N6AR/345
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W6RGG/341
W6RJ/344
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W6YA/346
W6ZM/351
WA6OET/340
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W8GZ/364
W8JBI/359
W8JIN/365
W8LKH/360
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W8PHZ/356
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W8RT/359
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W9CH/348
W9DWQ/354
W9DY/353
W9GIL/358
W9JUV/359
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W0DU/363
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W0LWG/352
W0MLY/362
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DJ6RX/335
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F9IE/336
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G3JAG/335
G4CP/361
G5VT/359
HB9MX/350
I1ZL/352
I8AA/338
I8KDB/353
JA1BN/345
JA1DM/354
JA1IBX/339
JA1MCU/336
JA1MIN/337
JA2JW/350
JA8ADQ/338
JA8ZO/336
LA1KI/339
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OK1MP/345
ON4DM/356
OZ1LO/337
PY1APS/336
PY1HX/353
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SM3CXS/335
SM5BHW/337
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SM6AFH/335
SM6CKS/336
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K2AGZ/334
K2BT/332
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K1NJE/327
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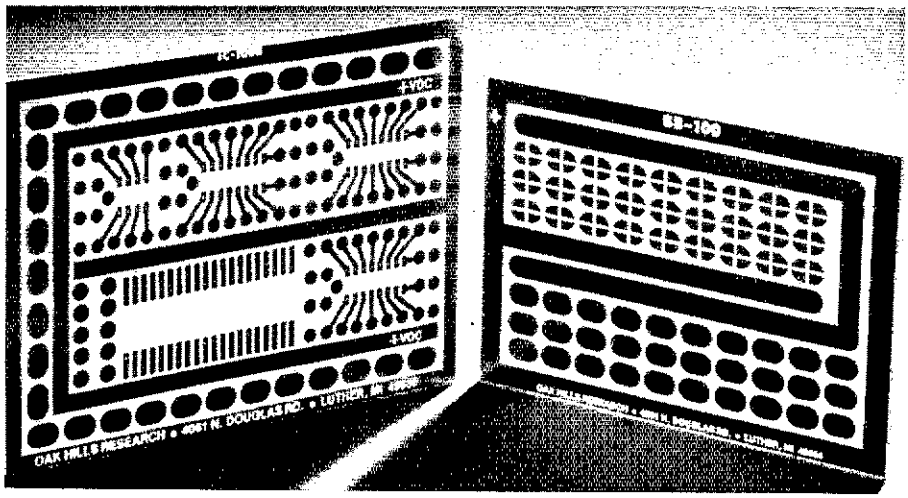
OAK HILLS RESEARCH AND PUBLISHING PC BOARDS



☐ Here are some novel circuit-design breadboards for the experimenter. The boards are available in three sizes: 5¼ × 3-5/16 in (IC-100A/B), 4-11/16 × 3-5/16 in (BB-100) and 2-3/8 × 1-11/16 in (BB-50).[1] Each board is made of high-quality G-10 glass epoxy and has B+ and ground foil buses for layout convenience. All foil patterns are tin plated. The boards are capable of being reused a number of times providing too hot a soldering iron is not applied. Board corners are drilled for mounting hardware; no component-mounting holes are drilled.

The BB-100 and BB-50 each have a 30-pad section and a 27-pad section. On the BB-100, the 27-pad section contains pads having four equal segments. These are useful when you're installing components having as many as four leads.

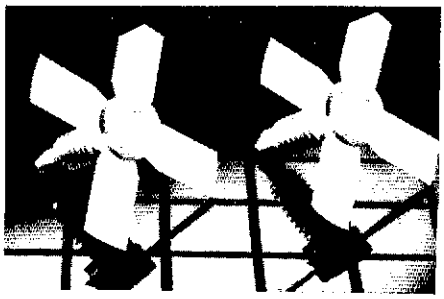
An IC-100 A and B board have different patterns on one-half (the lower half as depicted in the photo) of the board. The A version contains two 16-pin sites, an 8-pin pattern and numerous isolated pads in lieu of the 40-pin, 10-pin sites on the B model.

You may also purchase boards with the opposite side covered with a copper backing. These are special-order items. The added ground-plane surface helps eliminate ground loops and serves to aid overall circuit stability, necessary with some circuits.

In single-lot quantities, the IC-100 A/B boards cost $4 each, BB-100s $3 each and the BB-50s $2 each. Quantity discounts are available on request. On orders of less than $10, please include $1 to defray postage and handling costs. For orders over $10, postage is paid by Oak Hills. Postage and shipping instructions are required for all orders outside the U.S. For further information or orders, contact Oak Hills Research and Publishing, 4061 N. Douglas Rd., Luther, MI 49656; tel. 616-797-5251. — *Paul K. Pagel, N1FB*

[1]mm = in × 25.4

MOTOROLA UHF RF POWER TRANSISTORS



☐ The MRF652 and MRF841 are high-gain UHF devices that provide minimum power gains of 10 and 8.5 dB at 512 and 870 MHz, respectively. A typical efficiency of 65% at a power output level of 5 W is specified at these frequencies. The transistors feature improved ruggedness, which is tested at the high end of the supply voltage rating, under overdrive conditions and with an SWR of 30:1. These devices are designed primarily for driver and output stages in land mobile and hand-held radios operating at those frequencies. Pricing in quantities of 100 or more is: MRF652, $10; MRF841, $14.70. — *Paul K. Pagel, N1FB*

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

The Net Game

Nets are on-the-air clubs, folks coming together to discuss or engage in favorite activities of mutual interest. There are nets for traffic handlers, ragchewers, computer fans, DXers, historians, aviators, philosophers, county hunters and hosts more for countless other hams.

Nets meet regularly on prearranged days, times and frequencies, and can attract scores of members and passersby at any time. One merely must open the pages of the ARRL *Net Directory* to see just how much formal net activity exists for public-service-minded hams alone!

This month, we'll examine that curious creature of the forest, the net operator, and his habitat, the net.

Q. I noticed that there are quite a few nets meeting regularly on 75 meters. Do these nets have exclusive rights to a specific frequency?

A. There is nothing in the Rules that recognizes a net's special privilege to any specific frequency. It's generally a case of first come, first served. Before starting a net, the net-control station should take precautions to avoid using a frequency occupied by other stations. This should be accomplished by asking politely "Is this frequency in use?" Conversely, individual operators should ask the same question before engaging in operation to determine if another QSO or net is in progress on that frequency.

The bottom line is that no one owns a frequency. Whoever is on any given frequency first should, if possible, be protected from interference by other stations. Net-control stations should tell their charges that the net will convene on the prearranged net frequency "plus or minus the QRM," for example.

Q. If I am in QSO with another ham on a net frequency prior to net time, am I supposed to move to accommodate the net when it convenes?

A. Because there are so many hams on one frequency during a net, there must be a regularly scheduled, prearranged net frequency and time. Remember: These net members must *find* the net in the first place. Net operations are a bit more unwieldy than individual operations because nets involve so many stations. It is far easier for individuals to look out for nets than it is for nets to move 10 or 100 hams to other frequencies in a crowded band. There are no hard-and-fast rules concerning this policy. Indeed, it is not formally recognized by FCC as "good amateur practice." It's simply a matter of courtesy, nothing more. After all, nets are good ways to meet and exchange ideas with other hams having similar interests; and they occupy only one frequency. Many hams making use of but one frequency is efficient and sound spectrum usage.

Q. How does one identify while engaged in net operations?

A. The Rules say you must identify your station once every 10 minutes. The problem is that most net check-ins are idle for 10 or more minutes at a time. Thus, most check-ins give their call after every transmission or brief communication on the net to ensure that they will not have to identify while another station is transmitting (97.84).

If you're handling third-party traffic with a foreign ham on the net, you must also give his or her station's call sign as part of your ID [97.84(h)].

Q. Do I have to log my net operations?

A. No, the Commission no longer requires any log entries for amateur operations. If your station is operated by remote control, or is in auxiliary or repeater operation, certain station *records* must be kept, however.

Q. What types of things can we talk about on nets?

A. First and foremost, any item of discussion having business connections is out-of-bounds. Business communications is defined by the FCC as transmissions or communications "the purpose of which is to facilitate the regular business or commercial affairs of any party." So, you can't say things like, "Will you please call my broker and buy 4000 shares of Ajax Halibut Company stock." The only exception to the business communications prohibition is in the event of an emergency. But be prepared to justify your actions in case of an FCC inquiry. Often nets are the focal points of Amateur Radio operators participating in emergency relief efforts. For example, nets of organized hams are helpful in relaying medical traffic involving requests for doctors, nurses, syringes, bandages and other supplies on behalf of Red Cross officials at the scene of a disaster, for the public benefit only. Hams must never provide communications for the "regular business" of the Red Cross. Emergency communications must relate to the immediate safety of life and/or property (97.110).

Do not send messages involving material compensation, such as money, goods or services. For example, "I'll deliver your Acme-1,000,000 XS transceiver as soon as I receive your check" is a negative-negative. And don't send a message to the Ajax Halibut Company offering your group's communications services in their next "Run-For-The-Halibut" Marathon in return for 40 pounds of the catch of the day (97.114).

Q. Are there any special restrictions on international nets?

A. Yes. Hams involved in third-party traffic nets may not handle such traffic unless the countries of the two corresponding hams have a third-party-traffic agreement. Phone patches and radiogram messages to third parties between countries having no agreement constitute violations of each ham's domestic regulations and the international rules of the ITU. Some administrations are the first to cite these violations and abuses at international frequency-allocation conferences to thwart the efforts of international Amateur Radio representatives to gain new frequencies and privileges.

This is not to say that third-party traffic has no place in worldwide amateur communications. On the contrary, countries devastated by natural or man-made disaster often quickly implement temporary third-party-traffic agreements to facilitate the handling of international health-and-welfare messages by Amateur Radio. The radio amateur is well-known to the public for providing messages of relief to worried friends and relatives around the world from areas sealed off by the collapse of conventional communications.

During nonemergency times, messages between Amateur Radio stations of different countries must be limited to those of a technical nature, i.e., relating to tests, and to remarks of a personal character for which, by reason of their unimportance, recourse to the public telecommunications service is not justified (97.111). This rule exists on an international level to protect the interests of administrations who control their country's telephone system. In many countries, the telecommunication services provide valuable sources of revenue to the government, and unauthorized Amateur Radio communications can usurp those sources.

Q. In the United States there are many nets that cater to hams selling and buying their ham radio equipment. Are these so-called "swap and shop" nets legal?

A. Yes, within certain constraints. Amateurs may use their stations from time to time to discuss the availability of a piece of Amateur Radio equipment, but such activity would be limited to that of an occasional nature. It's best not to discuss price on the air. Instead, swap phone numbers with the interested party and finish the dickering off the air. Activities could not include any items of a personal nature, such as a camera or ordinary broadcast radios. Hams should not engage in regular "flea market" or business activities on swap nets so as to derive a profit by buying and selling ham gear on a regularly scheduled basis (97.112).

Q. Where can I find a list of traffic and emergency communications nets?

A. The ARRL publishes an annual *Net Directory*, available free of charge to all members. A 9- × 12-in. s.a.s.e. with 88 cents postage would be much appreciated.

[Note: Questions appearing in this column are typical of those frequently asked of the FCC and other agencies. Answers, prepared at ARRL Hq., have been reviewed by the FCC's Personal Radio Branch for agreement with current FCC interpretations and policy. Numbers in parentheses refer to specific sections of the FCC rules.]

*Deputy Manager, Membership Services, ARRL

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

Mode L — A Real Challenge

Once in a while, something unfortunate happens that can be turned into a worthwhile and rewarding challenge. One such incident befell the Mode L transponder on AMSAT-OSCAR 10. Unlike the Mode B 70-cm to 2-meter transponder, which is working very well, the Mode L unit is not functioning as designed. This presents experimentally minded and adventurous VHFers with an opportunity to turn a failure into a demonstration of what we can accomplish, while at the same time increasing the capability of our stations.

The problem with the satellite appears to be caused by the failure of a voltage regulator that furnishes bias to the L transponder final amplifier. Despite the careful design, extensive parts screening and exhaustive testing given the transponder, this type of failure does occur once in a while. The space business is never certain. The improper bias caused by the defective regulator apparently results in the power output's being much lower than the design value, and also leads to a loss of linearity.

Although the problem with the Mode L transponder has been concluded to be in its transmitter, with its 1269-MHz receiver working well, the greatest payoff for users wishing to take advantage of Mode L can be found in improvement to their 436-MHz downlink receiving systems. This situation is encountered normally in satellite work. In this case, a receive system performance at, or approaching, EME capability is called for. Constructing an antenna and receiving system of this caliber forms one portion of the challenge presented by Mode L.

It may seem inconsistent that a deficiency in the transponder's final amplifier should call for extreme performance in the downlink receiving equipment. This apparent dichotomy undoubtedly results from the fact that the transponder simply does not produce the power it was expected to. Thus, to take advantage of signals that do get through it, one must have a high-gain antenna and a low-noise preamp, preferably mounted at the antenna.

Some of the Stations Worked By KØRZ on Mode L

Station	Transmitter Output Power (W)	Uplink Antenna
F9FT	150	4 23-el Yagis
DJ5BV	400	16 23-el Yagis
VE7BBG	2.5	20-ft dish
K6MYC	20	16-ft dish
W8YIO	10	4.5-ft dish
DJ3OS	5000 W ERP	
DJ8QL	20	16-ft dish
JR4BRS	5.5	3-m dish
VK5QR	90	2-m dish
ZS6AXT	100	16-el Quagi
KL7NO	1000 W ERP	
HB9CAI	50	4 23-el Yagis
OE1VKW	50	16-turn helix
JA1UHY	10	2 14-el Yagis
W0HHE	100	20-ft dish
DL7YC	70	3-m dish
PA0SSB	2	Single Yagi
G3WGD	100	5-ft dish
OE9XXI	50	26-ft dish
DJ9PC	200	3-m dish
OE9FKI	50	2.6-m dish
DL1BU	100	2-m dish
GW3XYW	75	6-m dish
OE1HAB	7	4-23-el Yagis
JA1SYK	30	2-m dish

Nevertheless, in order to drive the ill-performing final amplifier to a power level sufficient to be useful, even by high-performance downlink receiving systems, about 10 dB more power than was originally predicated is indicated. This means roughly 10 kW effective radiated power (ERP), instead of the approximately 1 kW estimated prior to launch. This can be produced by 100 W and a 20-dB-gain antenna (assuming no feed-line loss) or any combination of transmitter output and antenna gain that yields an equivalent level of radiated power. It is no easy task to generate powers of this order on 23 cm. Therein lies the other part of the Mode L challenge.

One who has met this challenge is KØRZ Boulder, Colorado. For his 1269-MHz uplink, Bill has been using two 38-element loop Yagis with a measured gain of 22 dBd and 120 W for an ERP of about 20 kW. Currently, his 70-cm downlink equipment consists of eight 15-element NBS Yagis and a GaAsFET preamp at the antenna. Like the uplink array, the measured gain of this combination is about 22 dBd. The system yields sun noise in excess of 12 dB, which certainly puts it in the moonbounce category. Results have been noticeably superior to those obtained with his former system, which consisted of only two of the same type of antennas. He can now hear his own signal from the satellite at about 18 dB above noise and is just able to detect the transponder noise floor.

One aspect in which Mode L may offer some simplification over Mode B is that the use of circular polarization does not appear to be necessary. All the KØRZ antennas are horizontal, and he notes no sign of spin fading, which is quite prevalent at times on Mode B.

To indicate what combinations of 1269-MHz uplink power and antenna have been successful for others, some of the Mode L stations worked by KØRZ, along with their equipment, are listed in the accompanying table.

Seem like a real challenge? It is, but it's worthwhile from a number of standpoints. Just getting the job done is certainly cause for great satisfaction. One can also take pride in having joined a very accomplished group. In addition, building a station capable of consistent Mode L operation means achieving a large portion of what is needed for moonbounce capability on both 70 cm and 23 cm. Thus, the equipment involved will have great utility in addition to its use on the satellite.

The Mode L transponder cannot be operated simultaneously with Mode B because of the fact that its downlink is in the same band as the Mode B uplink. AMSAT's current schedule for Mode L is Wednesdays and Saturdays at apogee, plus and minus one hour. It is certain to be increased as more users appear and make their wishes known.

Good luck on Mode L.

ON THE BANDS

6 Meters — Not since 1977 have we experienced a winter on 6 meters like this one. Except for the Es which devotees of the band expect this time of year, there have been almost no reports of DX over the past month. All of us are spoiled, of course. The past five years has been absolutely phenomenal, much more productive of exciting contacts than even the most optimistic of us would have dared dream back in the fall of 1978, when the first F2 contacts were worked from this part of the world. All of us knew that it couldn't last forever, but the passing of such wonderful times is difficult to accept, nevertheless.

Of course, there's still the summer Es season to look forward to. By the time you read this, it's only a couple of months away. Last year proved that this mode can be very rewarding, indeed. So, keep the faith. Stay active on the band. There is still lots of excitement in store, and we should start to see F2 again in less time than has elapsed since those first contacts of Cycle 21.

Not all 6-meter operators are without DX. From the Far East, JA1VOK writes that his friend JR1MLT worked ZL4OY/C Chatham Island December 4, and that he worked the same station along with other ZLs and VKs the evening of December 16. Hatsuo also heard, with S9-plus signals, the ZL2VHM beacon on 52.25 MHz during the one-hour opening. The propagation responsible for these interesting openings was probably TE, or some of the exotic stuff that seems to inhabit that part of the world.

From the other end of the circuit, ZL1MQ writes that their summer Es season has been the best on record for his part of the world. Cliff says a number of his countrymen completed between 100 and 200 6-meter contacts outside New Zealand. Worked by many were VKs 1 through 6, H44PT, VK9NS, ZK2RF, VKØAQ, 3D2CM, ZL4OY/C (now ZL7OY), ZL3TJD/A (now ZL9TJD) as well as P29 and JA — 10 countries in all! ZL1MQ notes particularly that ZL7OY is very active on the band. His QTH of Chatham Island is located 400 miles off the coast of the South Island of New Zealand, and he has no TV restrictions to contend with.

In this part of the world, winter Es did provide some bright spots. K8TGC Germantown, Ohio reports a contact with VE5RA at 0430Z December 30. The first opening of the New Year that this conductor encountered occurred Saturday afternoon January 7. A number of Øs were heard and during an extended ragchew with WØANH, a phone call from KC2TX/1 in Maine alerted me that the band was open in that direction also. Even though Spence was running low power to an indoor antenna, he was easily worked for Grid FN66. He says he is the only 6-meter station in the grid, so he should be popular come next summer.

W7KMA, now /6 in Cameron Park, California, writes about the 6-meter DX box. Tom is strongly in favor of counting total countries and suggests a symbol system for noting those whose total represents more than one QTH. I have concluded that this is a fair approach because it doesn't penalize those who have been forced to move about the country because of work commitments. At the same time, it will provide a means of distinguishing them from those who have worked everything from a single locality. Henceforth, the 6-meter DX standings box will list the total countries worked according to the current DXCC Rule 9, but will include a symbol to indicate when multiple QTHs

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

beyond a 150-mile radius are involved.

Speaking of the 6-meter DX box, it will appear again in May. Those who have not sent in an update, and wish to, must get them to me very soon. It's too late to send for forms so, if you don't have any, simply list the stations worked on a sheet of paper, noting those for which QSLs have been received and clearly separating those that are via crossband. I must have them by March 15 to be able to include them in the May update.

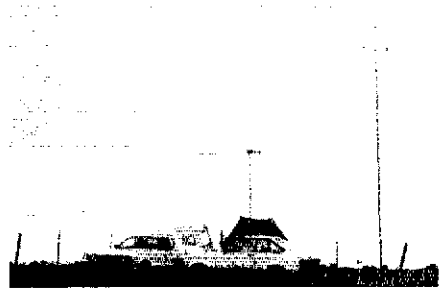
2 Meters — All of our 2-meter reports this month concern the Geminids shower. WA2FGK Bridgewater, New Jersey writes that the meteor trails netted him a new state, the first in a long time, according to Andy. It came as a result of a sked with W5SUS Rogers, Arkansas. They made the grade on SSB after 45 minutes of sequencing. WA2FGK's total now stands at 35. Another report is filed by N9AQ near Chicago. Many may remember Clint as WØPS. He ran 30-minute skeds beginning at 0300Z December 12, 13 and 14 with KØWLU/7 in Wyoming. The first night was "no dice." The other two produced contacts within the half-hour sked period. Attempts were also made with W1YTW Maine, KØALL North Dakota and WA4CQG Alabama. The first of these produced negative results, but the other two met with success. Two new states aren't to be sneezed at from any shower. Clint makes a plea for more schedules during major showers. He contends that the random "rat race" on 144.2 is a waste of time. Others have made similar observations, and they appear to be right from what this conductor has been able to bear on that very crowded frequency.

1¼ Meters — Last month, I termed the WØSD/WBØPJB EME trip to the East Coast "arduous." After reading their account, I am convinced that my choice of words was the understatement of the year! Ed and Barry began their journey in a snowstorm and braved icy roads and sub-freezing temperatures almost the entire trip. The traveling and much of the sleeping and operating was accomplished from a Chevrolet Citation. Incidentally, the car was brand new, having been delivered only two days before the intrepid pair set out. Their journey consumed 10 days, beginning late in the evening December 14 and ending the day before Christmas, with Ed having to trudge through deep snow the last three miles, arriving home just in time for the family's Christmas Eve festivities.

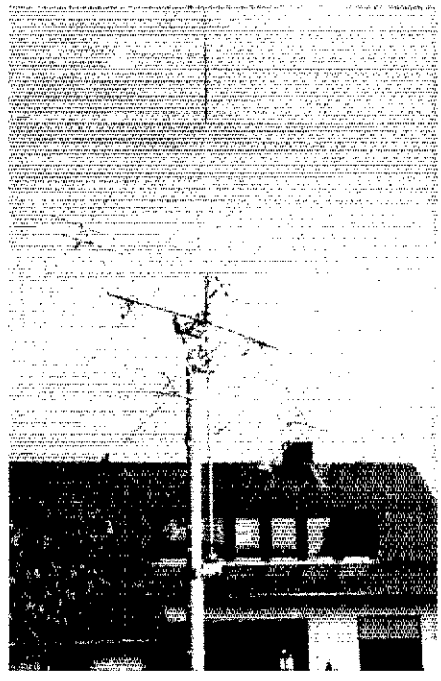
For its intended purpose, the trip was a great success. Altogether, they worked 14 different stations via moonbounce, five of them from all locations. In addition, a number of stations were contacted via tropo. Although Ed and Barry bore the brunt of the work and hardships, they did receive assistance at some of the locations. For the Virginia/West Virginia operation, WB3LJK and K3EUG came along and helped with set-up and tear down, and WB3LJK provided a place to sleep as well as a hearty breakfast. In Rhode Island, they operated from the QTH of W1UHE where they also were the recipients of fine hospitality.

It goes without saying that at Newington they enjoyed the help and cooperation of the staff at League Headquarters. The rest of the places, they were pretty much on their own. For the entire operation, WBØTEM was of the greatest assistance. It was Marc who built much of the equipment used, and it was he who repeatedly braved 25°-below weather to make the trip from his home in Akron, Iowa to Ed's QTH in Salem, South Dakota so WØSD could work the states to complete WAS. The QSLs confirming the contacts for his own station and WBØTEM were delivered personally and simultaneously by WØSD immediately following the operation from W1AW. It is only fitting, therefore, that, as noted last month, publication of the 1¼-meter standings box, WØSD and WBØTEM are tied for WAS Number 2.

It is hoped that this series of trips will stimulate interest in the band. If a 1¼-meter moonbounce station can be carried on a Citation and hauled across the country in the worst of weather, or packed in boxes and shipped to Hawaii, then some of the rest of us who don't yet have WAS on the band can certainly do more to increase our totals.



Contesting ZS style. For the South African VHF contest held October 29 and 30, club station ZS2BA was operated by ZS2OC and ZS2U from atop a 3000-foot mountain on the Eastern Cape. Results totaled 58 QSOs, which isn't bad considering the sparse population of the area, and the low power and small antennas used. *(photo via WA2HZR)*



The 70-cm EME array at DL9KR. *(photo courtesy of K7DVK and W4AMI)*

The Higher Bands — Serious weak-signal work is progressing higher and higher in the spectrum as witness the burgeoning 13-cm EME work. It has been some 15 years since W3GKP and W4HHK began their attempts at a two-way moonbounce contact on 2304 MHz. Following their success, not much happened until very recently. Now, thanks mainly to the availability of low-noise devices at less than astronomical prices, hams in various parts of the world are beginning to exploit the full capability of this band. A recent issue of the *432 and Above EME News* put out by K2UYH recounts the work being done by DFØEME and OE9XXI. The two have QSOed on 2320 MHz (the Europeans band now begins at 2320). DFØEME reportedly has several hundred watts from a Klystron. OE9XXI uses 70 watts output to a 25½-foot dish. During the QSO, G3WDG apparently copied both stations on his 13-foot dish. LX1DB is also active and beginning tests with both DFØEME and OE9XXI. In this country, WB5LUA is putting the same Klystron used by W3GKP so many years ago to good use. Now that our power is governed by output rather than input, the tube can easily, and legally be used to generate about 400 watts.

The 23-cm band is also coming in for more and more EME activity every month. As an example, OE9XXI has worked more than 30 different stations in 16 countries. A long-time devotee of the band, N6CA has shown it doesn't require huge antennas to make EME contacts on 1296 MHz. Using a single water-cooled 7289 delivering about 160 watts, and sixteen 24-el loop Yagis, Chip has worked VE7BBG, WB5LUA and K2UYH. With this antenna, Chip is receiving 9 dB of sun noise and can detect a difference in temperature between cold sky and the earth of 3 dB. Despite his relative success with this minimal set-up, his immediate plans are to go to a four-tube amplifier capable of 1 kW, and a 14-foot dish.

The same newsletter also provides news of one who is well known to a great many moonbouncers and who provided an African contact for a great number of them, especially on 70 cm. It's ex-Z25JJ (formally ZE5JJ), who is now in the Republic of South Africa. Peter's new call is ZS6CDD. He is currently working with ZS6NG to get that station on 23-cm EME.

An old friend from 6 meters, and recently very active on 2-meter EME, W7HAH writes that he is in the process of building a 70-cm moonbounce station. Step should be in a position to help with Montana contacts for those who need the state.

70 Cm Standings

For WAS holders, listing is WAS number, call, state, call areas worked. For others, call, state, U.S. states worked and call areas worked. Call areas are the 10 U.S. call areas plus KH6 and KL7, plus each VE and XE call area, plus DXCC countries not located within the continental limits of the U.S., Canada or Mexico. Those not showing some indication of activity or interest in remaining in the standings over the last two years have been deleted. Compiled January 15, 1984. Deadline for next update is July 1.

WAS Holders

1	WØYZS*	MO	—
2	K2UYH*†	NJ	48
3	K5JL*†	OK	—
4	WB5LUA*	TX	41
5	W5FF*†	NM	28
6	W1JR*	MA	44

AD1C*	MA	33	10
K1PXE*	CT	25	11
K1FO	CT	23	8
K1LPS*	VT	20	12
W1GXT	MA	13	6
WA1JOF	MA	13	4
W1HDQ	CT	11	4
K2RIW*	NY	28	12
W2VC	NJ	25	8
W2DWJ	NJ	22	9
K2GK	NY	22	9
W2PGC	NY	20	10
W2CNS	NY	20	9
WA2FGK	NJ	18	7
K2YCO	NY	17	8
K2QVS	NY	16	6
W2CRS	NY	16	—
N2EO	NY	13	5
WA2TIF	NY	13	5
WA2YWP	NY	12	6
WA2PVV	NY	10	5
NB2T	NY	10	5
W2MPK	NY	9	6
WA2ABN	NY	7	5
W2WW	NY	7	3
K3QCQ*	PA	35	26
W3RUE	PA	30	10
W3TMZ*	MD	25	9
K3WHC*	PA	25	9
W3IP	MD	25	7
K3HZO	MD	20	9
K3IUV	PA	19	5
W3UJG	MD	16	6
K3HCE	MD	16	5
W3ZZ*	MD	15	7
W3XO	MD	13	5
WA3DMF	MD	8	5
K4QIF*	VA	39	21
WA4MVI*	SC	30	19
W4FJ*	VA	25	8
W4ATC/4	VA	25	8
WA4CQG*	AL	25	5
W4ISS	GA	23	8
W4GJO	GA	23	—
K4CAW	NC	23	—
WA4SBC	VA	20	8
W3IY/4	VA	19	7
WB4NMA	GA	17	6
KC4P	AL	16	5
K4GL	SC	16	7
WB4NXY	KY	14	5
K4LHB	VA	12	6
WD4CXU	VA	11	4
K4KAE	SC	8	2
K4KJP	FL	6	2
K5FF*	NM	38	29
W5UKQ*†	LA	30	11
W5HN	TX	23	7
W5RCI	MS	22	6
K5SW	OK	17	7
WA5HNK	TX	16	6
K5JRH	TX	15	4
N4JS/5	MS	13	5
KB5MR	OK	13	4
K5LLL	TX	11	6
WA5DBY	TX	11	4
N5BBO	TX	10	3
W5UWB	TX	8	3
K5DHU	TX	8	3
W5NZS	TX	6	3
WA5YOU	LA	5	2
W6ABN*		40	34
WB6NMT*		8	7
W7JF*	MT	15	11
W7LUX	AZ	5	3
K7ICW	NV	4	2
WA7JUO	NV	3	2
N7EIJ	ID	2	1
K8WW*	OH	45	34
WB8BKC	MI	29	9
W8IDU	MI	27	8
WB8PAT	OH	22	9
WB2DIN/8	WV	13	6
WB9SNR	IL	33	11
W9UD	IL	28	10
K9XY*	WI	21	11
K9SM	IL	17	7
KB9NM	WI	9	3
KØTLM*†	MO	47	24
WBØTEM*	IA	42	—
KAØY*	IA	40	9
WØRAP*†	IA	39	30
WØPW*	CO	28	10
KØALL*	ND	20	12
WØOHU	MN	20	6
WØFY	MO	20	—
WØLER	MN	18	6
WØVB	MN	17	6
WAØNOK	MO	9	3
WAØRWC	IA	8	3
WØSD	SD	7	2
KL7WE*		28	23
VE7BBG*†		39	32
VE4MA*		23	28
VE2DFO		12	7
VE3AIB		11	7
VE1RC		3	2
JA9BOH*		18	31

*Indicates some EME contacts.
†Indicates WAC.
— Information not furnished.

Multiple-Cavity, Iris-Coupled Waveguide Filters

Waveguide filters have a number of applications in amateur microwave work. Examples are in suppression of the image response in a receiver and selection of a desired harmonic from a step diode multiplier. The type of filter described here is a waveguide-cavity, iris-coupled filter. It consists of a number of resonant waveguide cavities, each cavity being coupled to the next cavity by a circular iris.

The characteristics of the filter are determined by three parameters: the number of cavities, the size of the coupling irises and the length of the cavities. The number of cavities is principally responsible for determining the skirt response of the filter, i.e., the attenuation of the filter outside its passband.

*103 Division Ave., Millington, NJ 07946

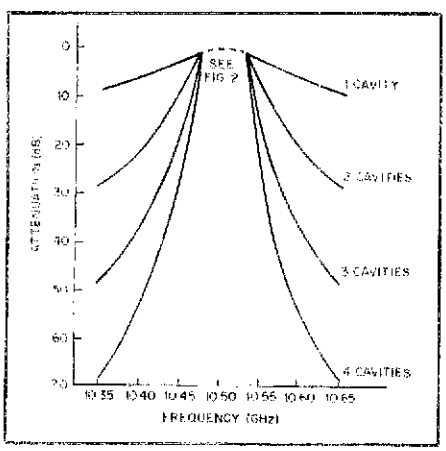


Fig. 1 — Skirt response of typical waveguide cavity filters having a 10.5-GHz center frequency, a 60-MHz passband (1-dB bandwidth), and a 1-dB passband ripple.

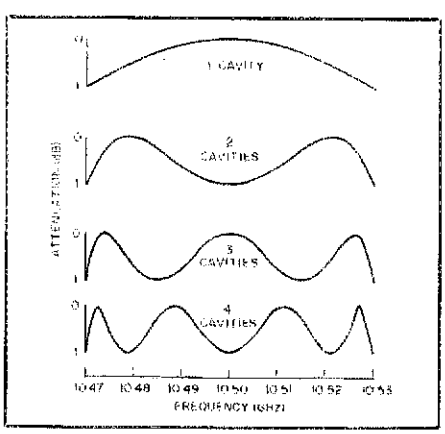


Fig. 2 — Passband response of typical waveguide cavity filters: a 10.5-GHz center frequency, a 60-MHz passband (1-dB bandwidth), and a 1-dB passband ripple.

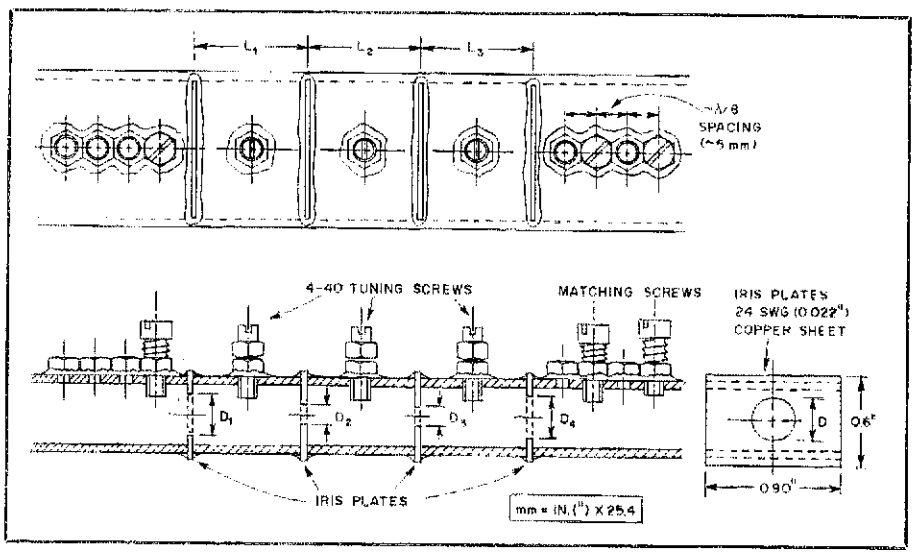


Fig. 3 — Three-cavity waveguide filter.

Typical skirt response curves are given in Fig. 1 for filters consisting of 1 to 4 cavities. The size of the coupling irises predominantly affects the response of the filter within the passband. All filters will have some passband ripple. The magnitude of the ripple is a function of the intercavity coupling, i.e., the size of the coupling irises. Ripple can be diminished by using larger irises, but at the expense of lower attenuation outside the passband. Fig. 2 shows the passband response of typical filters with 1 to 4 cavities designed with a 1-dB passband ripple. These are theoretical curves and, in practice, 0-dB insertion loss will never be achieved. In general, the more cavities there are, the higher the minimum insertion loss will be. Typical insertion losses will be on the order of 1 dB for a well-constructed filter. If the filters are redesigned for a 0.1-dB passband ripple, the passband pattern remains the same, but the amplitude of the ripple is reduced by a factor of 10, while attenuation outside the passband (see Fig. 1) is reduced by about 10 dB (for a 4-cavity filter) at all frequencies. The length of the cavities is responsible for the determination of the resonant frequency of the cavities. The resonant frequency can be lowered by the use of a tuning screw centered in the broad face of the waveguide (see Fig. 3). Since it is very difficult to construct the filter accurately enough to operate at a given frequency, it is usual to design it for a frequency higher than required (e.g., 10,500 MHz) and then use screws in the broad face of the waveguide to tune it down to the desired frequency. It is also possible to raise the resonant frequency by the use of tuning screws (¼-20) in the narrow face of the waveguide.

Construction of Waveguide Filters

Figs. 3 and 4 show the construction details of a waveguide filter. One important note is that in order to minimize the insertion loss and maximize the cavity Q of the filters, they should be made of copper, not brass, waveguide. If brass is used, it should be silver plated after construction. It is also important not to allow soldering flux to end up inside the cavities. Flux should be removed with a suitable solvent after soldering. Tuning screws should also be copper or silver-plated brass.

The first step in construction is to mark out the waveguide as accurately as possible. Slits should then be cut across the broad faces of the waveguide at the marked positions using a jeweler's saw or a thin hacksaw blade. The width of the blade cut should be just enough to allow the iris to be inserted into the waveguide (approx. 0.022 in). The irises should be cut to size from copper sheet.

Working with thin copper sheet may be easier if the copper is first sandwiched between two thicker sheets of another material, e.g. aluminum or brass. This minimizes distortion during operations such as drilling and sawing. Clearance holes for the tuning screws can now be drilled in the waveguide.

At this stage, the inside of the waveguide should be deburred and cleaned. The iris plates should now be inserted in the waveguide and soldered top and bottom with a large (~200-W)

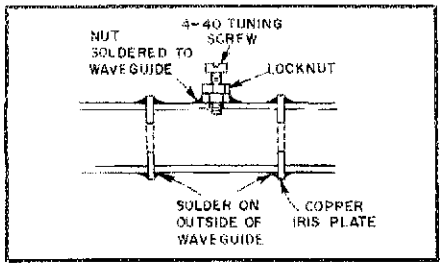


Fig. 4 — Detail of waveguide cavity.

Table 1
Dimensions for Multicavity Filters

No. of Cavities	D1	D2	D3	D4	D5	L1	L2	L3	L4	Attenuation at 10.530 GHz
1	7.54	7.54	—	—	—	17.1	—	—	—	1.7 dB
2	6.86	3.67	6.86	—	—	17.8	17.8	—	—	8.4 dB
3	6.74	3.40	3.40	6.74	—	17.9	18.2	17.9	—	19.2 dB
4	6.70	3.34	3.19	3.34	6.70	17.9	18.2	18.2	17.9	30.6 dB

Note: Dimensions are for a filter with a 10.5-GHz center frequency, a 0.5-dB bandwidth of 30-MHz and a 0.5-dB passband ripple. Iris plate thickness is 0.022 in. All dimensions are in millimeters.

soldering iron, taking care not to get solder or flux inside the waveguide. The iris plates do not need to be soldered to the narrow waveguide faces. The nuts for the tuning screws may now be soldered in place. They may be jigged in position with cadmium-plated screws (which do not take solder well). Remelting of solder on previously soldered parts can be prevented by applying wet tissues to the affected parts.

Alignment and Use

With the high insertion loss of multiple-cavity filters of this type when they are not tuned to the signal frequency, it is unlikely that the filter can be aligned using a signal source and diode detector. If a sensitive tunable receiver (Gunnplexer or narrow-band) is available, it should be possible to align the filter using a Gunn diode source at one end and the receiver at the other. If the equipment is available, one end of the filter should be connected to a dummy load and the other to an RF power source via a directional coupler. As the filter is tuned to the signal frequency, the reflected power measured by the directional coupler will decrease.

In either case, once the filter is tuned to the signal frequency, matching screws may be inserted as shown in Fig. 3. Four positions for matching screws, spaced about $\lambda/8$ apart, are available at each end of the filter. Screws should be inserted and adjusted to give minimum insertion loss. Usually, only one or two screws will be required at each end, depending on the degree of mismatch.

Table 1 gives dimensions for 1, 2, 3 and 4-cavity filters centered at 10,500 MHz (tunable down to 10,000 MHz) with a 30-MHz passband and a 0.5-dB passband ripple. Also given is the filter insertion loss 30 dB away from the center frequency.

24-GHz GUNNPLEXERS

24-GHz Gunnplexers should be available to amateurs soon. The Microwave Associates MA-87820 has been announced. It is, to quote the MA specifications, "a frequency modulated Gunn diode oscillator with a Shottkey mixer diode mounted in a waveguide structure. This is a commercial grade product specially designed to operate in the amateur 24-GHz band. This product is similar to the MA-87127 series Gunnplexer designed for X-Band."

Electrical specifications are:

Frequency	24.125 GHz
Mechanical tuning	±50 MHz
Electronic tuning	60 MHz min.
Operating voltage (Gunn)	6.0 V ±1.5 V (factory set)
Operating current (Gunn)	650 mA max.
Operating voltage (Varactor)	0-15 V
Frequency stability	500 kHz/degree C max.
N.F. (SSB into 1 dB preamp)	12 dB max.
Power output	25 mW typical; 20 mW min.

Advanced Receiver Research (P.O. Box 1242, Burlington, CT 06103) should have units in stock by mid March. The price of a pair of Gunnplexers with horn antennas will be $625.

10-GHz NEWS

From the *CRRL News*, October 23, 1983: "On October 2, VE1BCZ and VE2s AQU, DUB, DWG, HAK and XL made a possible first trans-border contact and apparently set a new Canadian DX record on 10 GHz. They worked over a 122-km path between Mount Mansfield, Vermont, and the Westmount lookout on Mont Royal, Montreal." QST

Strays

I would like to get in touch with...

☐ anyone interested in joining a Yoga net. Bali Maharaj, KC3FC, P.O. Box 18928, Philadelphia, PA 19119.

☐ former DL4 hams who worked at USASA 11th Field Station Radio Club, Baumholder, Germany, 1955-58. John Brandt, W4ORX, 3947 August Dr., Lake Worth, FL 33461.

☐ any XYL whose OM is not a ham. Roz Eiswirth, KA5QPA, 207 Saint John St., Luling, LA 70070.

QST congratulates...

☐ Joseph Pavek, WØOEP, of Hopkins, Minnesota, on receiving the 1983 Ralph Batcher Memorial Award from the Radio Club of America.

☐ Eric N. Schreiner, KA4VTP, of Sanford, North Carolina, on achieving the rank of Eagle Scout.

☐ Austin V. Signeur, KA2TPX, of Fredonia, New York, on achieving his Novice ticket at 76 years young.

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	This issue, p. 60	Novice Roundup Announcement	Jan. 1984, p. 79
Board Standing Committees (Minute 42)	June 1983, p. 55	Pending Dockets	Feb. 1984, p. 65
Call Sign Assignment System	June 1983, p. 61	QSL Bureaus Incoming	Dec. 1983, p. 74
Club Competition Rules	Jan. 1984, p. 80	Outgoing	This issue, p. 65
FCC Exam Schedule	Jan. 1984, p. 59	*QST* Abbreviations List	Jan. 1984, p. 53
International DX Contest Awards	Feb. 1984, p. 86	Reciprocal-Operating Countries	Nov. 1983, p. 71
License Renewal Information	Jan. 1984, p. 51	Section Emergency Coordinators	Oct. 1983, p. 95
Major ARRL Operating Events and Conventions — 1984	Jan. 1984, p. 52	Third-Party-Traffic Countries	Oct. 1983, p. 91
		U.S. Amateur Frequency and Mode Allocations	Jan. 1984, p. 51

IARU News

Conducted By Richard L. Baldwin,* W1RU

HF BC WARC

On January 10 the 1984 high-frequency broadcasting WARC (World Administrative Radio Conference) opened in Geneva. More than 90 countries are represented, with some 615 delegates. Their goal in this two-part conference (the second session is scheduled for 1986) is to develop a plan for the use of the frequency bands allocated to the high-frequency broadcasting service.

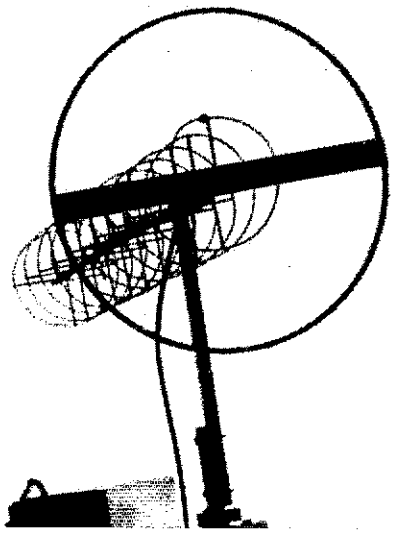
Their task is complicated because of the short-term and long-term variations in radio propagation and because the channel-hour requirements so far listed by the broadcasters somewhat exceed the number of channel hours available for assignment. The problems are therefore both technical and political, perhaps not in that order.

At the present time a number of HF broadcasters operate out of band, because they feel that the HF broadcasting allocation is not adequate, and some of that operation takes place in amateur bands. One country has, at this 1984 conference, proposed the text of a resolution that would admonish broadcasters to stay out of the bands allocated to other services. To monitor this and other developments that might affect the amateur service favorably or adversely, IARU is a participant in the conference, in the persons of G5CO and W1RU.

A number of other amateurs are also present at the conference as members of their national delegations. They include CE3LD, DL3SO, DL7FK, DU1RD, DU1SM, EL2P, G3HTF, HB9ACR, HB9UC, K3OYQ, K4BCD, LX1MA, OE1TBA, OH2AZN, OZ1HBZ, PT2TA, P29BH, SMØBHO, UA2FB, VE3CDF, VK3ZYK, W4SWP, ZL2BDV, ZL2MA, 4S7MS and 5A2TU.

We'll have a concluding report for you next month.

*President, IARU



This is the 10-turn chopstick helical designed and built by 9M2CR.

ITU SEC.-GEN. BUTLER VISITS A-O-10 STATION

At a seminar sponsored by the ITU in Kuala Lumpur, Malaysia, during December 1983, Colin Richards, 9M2CR (a retired ITU communications expert) set up an OSCAR 10 station. A number of successful contacts were made, ranging from KL7GNG in Alaska to VK6KJ in the extreme southwest of Australia. Highlight of the event was a visit to the station by ITU Secretary-General Richard E. Butler, who donned a second set of headphones and listened to the proceedings.

Mr. Richard E. Butler, Secretary-General of the ITU, visits 9M2CR/WCY. Operating is 9M2CR, while 9M2AP and 9M2RS look on.

The uplink antenna on 435 MHz was designed and built by 9M2CR. Called the ten-turn chopstick model, it has a "close-approach" first turn to give a perfect 50-ohm match. The mounting consists of crossed chopsticks on a wooden boom, and the reflector is aluminum mesh stretched across a bicycle rim. As 9M2CR says, that's alternative technology keeping pace with the satellite era.

ZK/ZL/ZM PREFIX CHANGES

Commencing January 1, you began to hear some different prefixes on the air. ZK1 is still the Cook Islands, and ZK2 still Niue, but ZK3 now designates Tokelau Islands (formerly ZM7).

Unchanged are ZLØ (visitors), ZL5 (Antarctica) and ZL6 (Intruder Watch Stations). ZL7 is now for the Chatham Islands, ZL8 for the Kermadecs, and ZL9 for Auckland/Campbell Islands. ZL1-4 is for "mainland" New Zealand, but the numerals no longer indicate a district in New Zealand. ZMØ-9 will be used by the New Zealand authorities for special occasions.

Strays

TRANSATLANTIC PIRATE PCII OFFICIALLY LICENSED 60 YEARS LATER

☐ The Transatlantic Tests of 1923, organized by the ARRL, resulted in several two-way contacts. One such contact was between U.S. station U2AGB and Dutch station PCII, operated by H. J. Jesse, at Leyden, with the assistance of J. W. Groot Enzerink and brothers R. and W. Tappenbeck — an event that brought Jesse more attention than he could have anticipated.

Personal transmitting licenses were not issued in The Netherlands until 1929, so Jesse could only operate during the transatlantic two-way as a pirate. His great success did not go unnoticed by the authorities, who brought charges against Jesse and put him on trial. The verdict was that Jesse had violated the Telegraph and Telephone Bill, but he would not be punished — a rather unusual situation. Jesse's transmitter, which had been seized, was returned to him. The judge even complimented Jesse on his accomplishment! The transmitter is now on display at the Netherlands Postal Museum, The Hague.

To commemorate the 60th anniversary of the first two-way between Holland and the U.S., the Dutch amateur society held a reception honoring Jesse. The most prominent guest was The Netherlands Under Secretary of Telecommunications. Knowing that Jesse had regained an interest in Amateur Radio after an absence of many years, the Under Secretary presented him with a full transmitting license (Class A, the highest in The Netherlands). The prefix PAØ is no longer issued to newly licensed hams, but an exception was made. His call is now PAØCII, as close as possible to his pirate call PCII. — *Dick Rollema, PAØSE, The Netherlands*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1NBC, William B. McGrath, South Weymouth, MA
K1QMR, Owen W. Penney, Kennebunk, ME
WA2AEZ, John H. Bracken, Richmond, VA
N2BC, Joseph H. Pettengill, Rutherford, NJ
W2CDO, Joseph H. Alterman, East Meadow, NY
W2CYE, Frank J. Mrozak, Kenmore, NY
WA2DWH, Laurence M. Connaughton, Philmont, NY
W2IIN, John J. Vitale, Sr., Elizabeth, NJ
WA2IPC, Ralph G. Fabrizio, Rome, NY
W2PZC, John W. Walrath, Rochester, NY
W2RKO, Robert J. Schulze, Webster, NY
K2RPQ, Arthur W. Bergman, Canastota, NY
W2VUS, John H. Hampton, III, Farmingdale, NY
W3CAQ, Winton R. Jones, Baltimore, MD
W3ENA, James H. Creutz, Chambersburg, PA
W3KNY, Horace D. Good, Reading, PA
W3LPP, Stephen P. Fridrick, Industry, PA
W3NVD, John H. Elrod, Fort Washington, MD
*W3QDI, Leo W. Scott, Chevy Chase, MD
W3RAE, Clifford T. Collins, King of Prussia, PA
W3ZUX, Robert Horner, Chambersburg, PA
K4AA, J. Alan Biggs, Horse Shoe, NC
W4AEC, Edward R. Dismukes, Jr., Nashville, TN
KA4AVC, Robert B. Young, Statham, GA
W4DAA, Ernest E. Haralson, Jacksonville, FL
W4DLD, Heyl C. Hartzell, Holiday, FL
W4EJP, Gerald G. Lindsay, Vienna, VA
WB4EZJ, Bobby F. Penland, Charleston, SC
W4GDK, James V. Wilson, Ft. Lauderdale, FL
*WA4HDU, Willis J. Howard, Gadsden, AL
WB4ISZ, James W. Hall, Sarasota, FL
K4IYS, Carl Bogart, Sr., Martinez, GA
WD4JYI, Robert E. Lamb, Jr., Deerfield Beach, FL
W4OA, James A. Robertson, Mobile, AL
K4PCT, Gill Machen, Bristow, VA
W4SI, John M. Eubanks, Coral Gables, FL
KA4SRE, Elizabeth H. DeVaughn, Columbus, GA
W4UJH, Charles F. Bullock, Bristol, VA
K4VIJ, William P. Mannon, Memphis, TN
W4VTJ, Jay H. Bronson, Lantana, FL
W4ZNQ, Jack O. Brazee, Port Richey, FL
WA5IKT, Thomas R. Wilson, Jr., Midland, TX
W5JA, Richard C. Harris, Denton, TX
W5JKS, J. Thomas Quincey, Rogers, AR
W5PMX, James R. Weaver, Kingston, TN
K5PTU, James P. Noland, Fritch, TX
W5SRF, Harold M. Brown, Edinburg, TX
N6AG, Lee J. Delworth, Lompoc, CA
WA6AXB, Ellen C. Peterson, Fresno, CA
W6BCV, Charles P. Webber, San Diego, CA
W6CZS, George A. Barber, Jr., Porterville, CA
KA6EYF, H. D. Person, Napa, CA
W6GOQ, Alexander McGalliard, Jr., Oakland, CA
WB6HUQ, Paul A. Meland, Alpine, CA
N6LM, Frederick E. Bolduan, San Mateo, CA
W6MT, William Murray, Apple Valley, CA
W6NTU, Robert E. Carter, Livermore, CA
W6PFM, Charles H. Hall, Capitola, CA
W6PIF, Thomas J. Cunningham, El Segundo, CA
W6SPW, Frank J. Nesmith, Santa Maria, CA
W7AXS, John M. Beaufort, Mercer Island, WA
W7BEY, George W. Brownfield, Seattle, WA
W7COR, Waymon D. Lowry, Portland, OR
K7DBF, Robert C. Jameson, Parker, AZ
KA7FXT, Roberta E. Strasberg, Spokane, WA
W7JOO, Robert E. Syversen, Everett, WA
W7MBQ, Robert P. Sanborn, Henderson, NV
K7NIY, George Mezey, Wickenburg, AZ
W7NYN, Philip J. Jacoway, Payson, AZ
W7PHG, Louis J. Roberts, Yakima, WA
W7UAD, Alvin M. Hopkins, Centralia, WA
WB7WIA, Martin G. Ware, Coeur D'Alene, ID
N7XA, Lionel E. Boisblanc, Payson, AZ
WA7ZVR, J. Franklin Hudkins, Wilbur, MA
W7ZY, Paul F. Peyton, Centralia, WA
WD8BHQ, Charles O. Call, Freeland, MI
K8KFO, Paul B. Gillespie, Toledo, OH
W8LHS, Gertrude M. Cole, Lyndhurst, OH
W8PDP, Cornelius G. Schreur, Kalamazoo, MI
W9AI, William F. Lueth, Indianapolis, IN
W9AUV, Russell G. Salter, LaGrange, IL
W9GRK, Fred C. Maier, West Allis, WI
W9MCB, John V. Marshall, Columbia City, IN
WB9OOI, Robert L. Endres, Lincoln, IL
KX9Y, Don H. Walther, West Lafayette, IN
WØAQZ, John K. Kirkland, Minneapolis, KS
WØBE, Robert W. Schoening, Minneapolis, MN
KBØBO, Thomas G. Ranney, Wheaton, MN
WØEJN, Emmett O. Sjoberg, Sr., Virginia, MN
WØHYR, Glen Brasch, Wichita, KS
WØLJD, Edward L. Imel, Fort Dodge, IA
WØMEJ, W. Sherm Timmons, Jr., St. Charles, MO
KAØNPR, Jeane S. Anderson, Fulton, MO
WØTUJ, William A. Fiske, Omaha, NE
WAØUKV, Leonard A. Von Fange, Lincoln, KS
WØWIR, Quentin R. Fuller, Denver, CO
WØWZK, Peter P. Mazurkiewicz, St. Paul, MN
ACØZ, Lawrence D. Greenawald, Monticello, IA
VE1BY, Alfred K. Smith, Saint John, NB
*VE3BJP, Milan Gecelovsky, Windsor, ON
VE3CT, Charles R. Grove, Ottawa, ON
VE3GLD, Robert I. Johnstone, Beeton, ON
VE3KE, John H. Clark, Mountain, ON
VE5BD, John F. Legebokoff, Yorkton, SK
DJ9SX, Gösta Hahn, Sylt Island, Hamburg, West Germany
G3IDF, Alan R. Dyer, Crawley, Sussex, England
G3JER, W. Taylor, Littlehampton, West Sussex, England
OE3SSC, Josef Spalek, Baden/Wien, Austria
VK5MF, Alan Smythe, Hazelwood Park, South Australia, Australia
ZS1ER, William H. Owens, Southfield, Cape Town, South Africa

*Life Member, ARRL

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*. QST

50 Years Ago

March 1934

☐ George Grammer takes advantage of the new tritet circuit to present a single-tube (Type '59, natch) two-band transmitter. It is so simple and basic that the Editor dares to suggest that future new amateurs may well start their career on crystal control, rather than graduate to that technique later.

☐ Some areas of the U.S. still lack commercial power, and for hams in such locations, W9BWX's design of a wind-driven battery charger should help put a signal on the air. A Ford axle serves as the main mount bearing.

☐ KA1NA furnishes some data on resistances of various-wattage light bulbs, from cold to maximum hot, as a guide to their use as inexpensive resistors.

☐ The new 906 cathode ray tube makes a scope a practical project for the average ham, and W2BRO of the Radio Corporation describes such a unit, along with illustrations of good and bad voice signal patterns.

☐ Suppressor-grid modulation has been on the back burner for lack of suitable tubes, but Technical Editor Lamb uses that mode with the relatively new Type '59 as a modulated amplifier — with promising results and the expressed hope that tube manufacturers will produce more practical transmitting pentodes in the 50-watt class.

☐ Many of us entered ham radio with the simple receiver featured in *How to Become A Radio Amateur*. Competition in the bands these days calls for something more sophisticated, so W1TS has designed an r.f. amplifier companion piece for better performance.

☐ W1QP has good luck on 5 and 10 meters with the Type '53 dual tube in a push-pull circuit using unity coupling — the grid "coil" is wire inside the hollow of a copper tubing loop used as a plate inductance.

☐ An engineering conference in Washington dealt with a proposal that a common set of frequencies be used by all radio services engaged in disaster communication. The League people pointed out that effective amateur performance in emergencies derives from our large numbers with each one completely free to provide service when and where needed, a system that the restrictive-frequency plan would destroy. (The proposal was dropped.)

☐ W8GZ's Fifth Corps Area amateurs' participation ranked highest in percentage of those copying the Armistice Day message from the Chief Signal Officer.

☐ A "B" eliminator can work nicely as a source of amplifier bias, says W1DF, but pay attention to the output voltage divider — it effectively becomes a grid leak in the circuit and provides its own bias.

☐ The National Company initiated an editorial-type ad series, the first one being helpful comments from James Millen on various company product applications.

25 Years Ago

March 1959

☐ Tetrode and pentode transmitting tubes, having high power-sensitivity, are subject to instability if their circuits are not properly grounded and bypassed. W1HDQ summarizes the techniques necessary to achieve effective performance.

☐ W6PZV wasn't afraid to dig into his brand-new Knight receiver — adding a crystal oscillator and tunable i.f. strip to cover the ham bands with results equal to those from much-higher-priced receivers.

☐ A *QST* survey shows that — no surprise — Hints and Kinks continues to rate tops in reader interest. The Editorials, Happenings and Correspondence, as befitting a membership organization, rated as well or better than the technical articles. Antennas, of course, topped the latter category.

☐ Particularly for the newcomers, W1ICP describes a combination coupler and matching indicator to get adequate performance from most any antenna on five major bands.

☐ FCC has proposed 144-148 Mc. for Technicians, and seeks comments. Separately, the League has taken strong exception to the Commission's decision to set up 100-kc. telegraphy-only segments in the high end of 6 and 2 meters, arguing that the low end is the only useful place for such activity.

☐ For those interested in the new 1 kW Penta PL-172, W9MC offers a number of practical pointers on its use in a grounded-grid amplifier, with details as well on power supply and antenna matching.

☐ A simple system of relays, mounted atop and controlled through the base section, tunes WØDAN's mobile antenna from the driver's seat.

☐ K4HWY added a loading coil and "carpet beater" loop to each end of the driven element in his 20-meter wide-spaced beam, and found his signal improved considerably. Use of open-wire feeders permitted use on other bands as well.

☐ Hams in Barren County, Kentucky, bought (inexpensively) in surplus and modified a number of BC-1335 f.m. transmitter-receiver units for AREC and civil defense use.

☐ The importance of advance preparedness is once again proved by outstanding performance of the RACES teams in providing emergency communications during the several devastating fires in southern California. — *WIRW* QST

YL News and Views

Conducted By Jean Peacor,* K1IJV

Sailing . . . and Radio, Too

For 11 years, Ruth and Bernie Levin of Oak Park, Michigan, dreamed of sailing across the Atlantic and cruising the Mediterranean in their 41-foot ketch, *Bel Canto*. This typifies the ultimate dream of all sailors.

In the beginning, Ruth pictured her role as first mate, cook and purveyor of provisions. As the years passed, however, she became caught up in the art of navigation. She attended navigation classes. She became an Amateur Radio operator (KA8CDW) just to be in touch with family while at sea. Ruth looked forward with great expectation to the day when their plans would become reality.

The date for culmination of their years of planning was set for May 15, 1983. As the time neared, Bernie suddenly learned that he would be unable to go. After that original shock had passed, Ruth began to wonder if she could possibly do it without him. Bernie could fly to Spain and meet her. At 55, she felt that it might be now or never. Their discussions concluded that Ruth was a capable skipper and that her dream of a transatlantic crossing should be realized. She enlisted the help of three interested, experienced sailors who would accompany her.

Robin Edelson, N8BUZ, was the real moving force behind all the joy, comfort and safety that Ruth experienced as a result of having Amateur Radio gear on board. He spent countless hours preparing inverted V antennas for 15 and 20 meters that could be hoisted and free from RF ground problems. He made a 40-meter wire vertical for use with a tuner. Because the *Bel Canto* has no backstay to load, shrouds that Bernie felt should not be used, and inaccessible keel bolts, the task wasn't without its complications. Robin circumvented all of the problems, however.

Traveling first to New York, Ruth used the vertical antenna with great success. When the masts were down as the *Bel Canto* worked her way through the New York State Barge Canal system, Ruth used the vertical from the deck with perfect results.

After provisions were replenished in New York City, the *Bel Canto* was seaward bound. According to the ocean charts, they could expect westerly winds. Instead, strong easterly winds predominated and they were headed east. The same weather pattern that hit California and some of the Southern states had hit them, too.

Ruth Levin, KA8CDW

Weather was too severe to attempt raising a dipole antenna. Ruth used the wire vertical to talk with Bernie and Robin several times a week. When their schedule, via the Maritime Mobile Net on 14.313 MHz was impossible, other hams provided assistance by relaying messages to Bernie.

About 1500 miles out, all contact was lost. Ruth suspected antenna problems, but was in no position to troubleshoot. A previous report from Bernie had confirmed suspicions that they were caught between two weather systems that were remaining stationary for much longer than usual. Easterly winds lasted for most of the voyage, causing constant difficulty in sailing a proper course.

Twenty-eight days after leaving New York, the *Bel Canto* sailed into the Azores. Phoning home was the number one priority, but Ruth's calls were just not getting through. For a week, they attempted radio contact using the vertical antenna, to no avail. Because the dipole had not been used at sea, they had almost been forgotten. Once hoisted, the 20-meter dipole opened up the airwaves. Bernie received a relayed message that all was well.

Ruth sailed from the Azores to Spain in 11 days. At this point, Bernie and Ruth were reunited. While walking along a boulevard in Torreviejo, Spain, Ruth spotted a ham shack. Using her limited Spanish, she met and talked with the local hams. QSL cards were exchanged, and instant friendships were the result. Ruth is now an honorary member of the Torreviejo ham radio club. The real thrills of Amateur Radio were just beginning for her.

Weather can be your friend or your enemy when sailing. Accurate weather reports are essential for any semblance of safety. As their Mediterranean cruise got underway, Ruth and Bernie quickly learned that weather reports in the smaller ports were practically nonexistent. A passing world cruiser relayed the good news of the British Maritime Mobile Net on 14.303 MHz. This net provided invaluable weather information for all Amateur Radio sailors in the Mediterranean. Those sailing without ham gear soon learned to stop by the *Bel Canto* for the latest weather update. The added excitements of Amateur Radio were evolving for Ruth. On several occasions throughout the voyage, she was able to help others through ham radio. She maintained schedules (surpassing her wildest expectations) with KB8DV on the Maritime Mobile Net, where she also kept in touch with N8BUZ.

Temporary licensing in the different countries is another story. Ruth started eight months in advance — none too soon. She completed the forms ARRL sent her, acquired the money orders and sent everything Registered Mail. How could anything go wrong? The fee for temporary licensing had changed in one country; another license came through with wrong dates; one arrived the day Ruth left; and one did indeed come right back.

Ruth feels it is impossible to adequately thank the many Amateur Radio operators who helped her along the way. Joe Pendergrass, W8UEY, who was instrumental in her becoming licensed, N8BUZ and KB8DV all aided in helping her realize her 11-year dream. Amateur Radio, which started out to be just a vehicle for communications while Ruth was on the boat has become a love of hers. The *Bel Canto* is still in Europe. Bernie and Ruth plan to return there in April, and will sail in the Mediterranean again. When she returns, Ruth plans to upgrade her radio station and become much more involved in Amateur Radio.

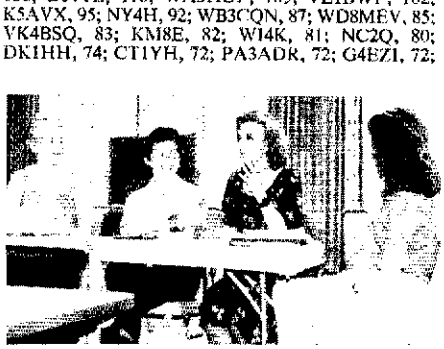
YLRL OFFICER CHANGES — 1984

Rose Ellen Bills, N2RE, YLRL's president for 1984, reports the following changes in some offices for this year: Vice President Marty Silver, NY4H; Receiving Treasurer (Districts 8, 9, 10, KH6, KL7, VE and U.S. possessions) Connie Hamilton, WD8MIO.

RESULTS OF HOWDY DAYS 1983

YLRL's Howdy Days was instituted 23 years ago for the purpose of chatting with old friends and finding new ones among the world's many YLs. It's an opportunity to acquaint YLs with the many YL nets and other YL activities, and to extend an invitation to nonmembers to join YLRL.

The 1983 YLRL Member Winner is WD4NKP; the Nonmember winner is VK4BSQ. Scores: WD4NKP, 136; DJ1TE, 110; WA3HUP, 105; VE1BWP, 102; K5AVX, 95; NY4H, 92; WB3CQN, 87; WD8MEV, 85; VK4BSQ, 83; KM8E, 82; WI4K, 81; NC2Q, 80; DK1HH, 74; CT1YH, 72; PA3ADR, 72; G4EZI, 72; KA2ESQ, 64; DK6FM, 56; OX3ZM, 53; VK3KS, 50; KU7F, 44; 11MQ, 44; PA3CEB, 43; DF2SL, 42; DF3TE, 40; WA1UVJ, 40; WA2NFY, 40; DF4JX, 31; DJØEK, 24; PAØHJL, 19; F5RC (TO5RC), 6; KD5MD and W3CDQ, check logs.



A very successful YL forum was conducted at the Atlanta Hamfest last June. Its purpose: to further the interest of women in Amateur Radio by providing information on various operating aspects. Pictured (l-r) are YLRL President N2RE; WD4NKP, contest operator, DXer and NCS of the Tangle Net; WN4FVU, well-known DXpedition operator; and WI4K, president of the Metro Atlantic Ladies ARC, YLRL's 4th District Chairman and the panel moderator.

*Country Club Dr., Monson, MA 01057

In Training

NEW RESOURCE UNCOVERED

"Okay, so I learned Ohm's Law even though it's not on the Novice test. After all, as my instructor said, 'It's one of those prerequisites to credibility'; how could I look the Old Man square in the eye if I didn't know, for example, that for a given voltage, increasing resistance reduces current? The basics. The essentials. So what!"

ARRL instructors have always taught more than just the test. They realize that passing the Novice license exam is but the first step in what should be a full and varied lifetime of learning, communication and service. As a graduating student with ticket in hand, however, do you still wonder *why* the so-called essentials are essential? As a Novice instructor, how well are you bridging the abyss between the abstract world of "Gotta pass the test," and the post-license world of "Now what do I do?"

The effectiveness of the learning/teaching process — and it doesn't end with the arrival of the eagerly awaited envelope from Gettysburg — is better measured in the months *after* the test. Are the newly licensed graduates of your class on the air, working toward goals like WAS, DXCC, traffic-handling proficiency, higher code speeds, more effective stations, upgrading, better community service and the like? Are they full participants in Amateur Radio? In other words, have you as an instructor successfully conveyed the relevance of "the essentials" to your students' post-ticket activity? Are you as a new licensee able to apply what you've learned now that you're a full-fledged, 100% Grade-A ham? If either of you missed the boat on this one, take heart. A new resource has emerged to help you out.

R_x for Technical Trauma

Well, not really new. It's been around for a few years ... about 70. I'm referring to *QST*, which in 1984 sports a few *very interesting* developments. In the January issue, Doug DeMaw, W1FB, started a series called "First Steps in Radio." Though the first installment speaks primarily to prospective hams (Novice instructors take note), subsequent issues are of interest to everyone wanting a better understanding of the basics. Warranting instructors' special attention is the emphasis on practical application and hands-on learning. In this issue (p. 11), for example, Doug gives you a sample practical circuit for an audio amp that you and your students can build to put your classroom concepts to the test. Increase resistance and, using a VOM or VTVM, watch current drop ... and hear the audio drop as well! Ohm's Law will suddenly sprout new meaning: "Hey, maybe there really is a reason for my learning this stuff."

Recent QST Items of Interest to Newcomers

In the April issue you'll find a basic practical discussion of capacitors and a circuit in which the theory is applied. But "First Steps in Radio" is far from the only useful basic technical information in *QST*. In January, did you catch the Beginner's Bench article, "Some Practical Antenna Considerations"? What's more useful after the ticket arrives than having a few simple, workable antenna plans up your sleeve when you assemble your first station? Whether your interest is in DX or local contacts, the article will help you optimize your approach for your own objective. In February *QST*, aside from the First Steps series' "How to Read Schematic Diagrams," there's a discussion of basic oscillators and a presentation of the effect of real ground on antennas. The latter may at first seem a little advanced; but if a picture is worth a thousand words, there's a wealth of material there for coaching students in how a horizontal dipole will perform in their own backyards!

Of course, though very important, technical theory and application are not the only important lessons for your students. Today's poorly taught Novice is tomorrow's QRM. Developing proper operating procedures and instilling a deep sense of tradition and the *privilege* of operating are equally important. Moreover, a well-rounded ham will appreciate the variety of interests shared by his fellow hams and act accordingly on the air. With this in mind, look back over *QST* to discover other features that could earn a place in your Novice curriculum. Don't confine yourself to the Table of Contents; you'll miss some amazingly useful items in Happenings, Public Service, How's DX?, It Seems to Us, In Training, Club Corner and any other of the *QST* columns that regularly carry information of interest to the newcomer to Amateur Radio.

What's in March *QST*? How can it be used in class to prepare your students for all of the wonders of Amateur Radio? It's in your hands. Just turn the pages ... — *Steve Place, WB1EYT*

Strays

IN SEARCH OF THE ELUSIVE SATELLITE

☐ It all started in mid-August when, on a vacation trip into North Carolina, I heard an interfering signal on the 146.82-MHz repeater output frequency. Others on the repeater seemed to be experiencing some interference, but not to the extent that I did while mobile.

On subsequent long-weekend trips through several Southern states, the interference persisted, some 3 kHz off center frequency. In early October, my curiosity was thoroughly aroused by the persistence of the signal on a trip to Florida. Back home, I resolved to locate the source of the interference.

Lacking a steerable directional antenna, I connected a 5/8-λ mag-mount antenna to the mobile receiver and moved it about by hand for maximum signal strength. A definite peak was noticed with the whip broadside at an elevation of about 45° and an azimuth of about 225°. To eliminate the possibility of a receiver spur, two other receivers were tried: a hand-held and the multi-mode base transceiver. The signal was present in both, raising the base S meter barely to S 1. In the SSB mode, a clean carrier was heard at 146.8171, interrupted for a few milliseconds at precisely 1-second intervals.

The hypothesis was now demonstrably fact. The unvarying signal strength over a large geographic area (except as the car passed nearby objects), the high arrival angle from a southerly direction and the regular pulsing of the carrier all pointed to one source: the beacon of a geosynchronous satellite. But whose, and at what exact position?

The signal could not be heard on the base-station antenna, but this was to be expected. The radiation pattern of the stacked collinear would not admit a signal from such a high incident angle. Indeed, the signal was almost lost in the 5/8-λ whip when it was held vertically.

Though these experiments took place at about 10 P.M., I called the nearby Powder Springs, Georgia, FCC monitoring station and explained my observations. A few minutes later, an observer called back and reported that he had a weak signal (not a repeater) about 100 Hz from where I had observed the signal. Since Powder Springs had no tracking antennas, he called the Laurel, Maryland, headquarters monitoring station and asked them to look for it.

Next day, a Mr. Magin called from Laurel and advised that they did not have a suitable tracking antenna, but that the FCC would be very interested in any information we hams might develop. I called ARRL, and Chuck Bender, WIWPR, agreed to do a search with the WIAW OSCAR antenna. Results were negative; perhaps the satellite footprint did not extend that far north. That evening, local OSCAR enthusiast NZ4Q searched, and he heard nothing. Nonetheless, the signal was present the same evening on my hand-held whip, emanating from the very same direction as before.

Despite the lack of corroborating receiving reports since the first evening, the signal *was* real. I searched for a common denominator underlying all occasions of reception. Perhaps the car? In addition to carrying the mobile rig, it resides evenings in the garage adjacent to the shack.

I pulled the mobile hand-held from the dash, installed the rubber duck and punched up 6.82. What I observed was full quieting punctuated by those brief, regular "off" pulses as the duckie was placed against the face of the dashboard quartz clock.[1]

I lost no time in notifying the FCC and ARRL of the true source of the signal. Though the acknowledgment entailed a morsel of crow, they were cordial and appreciative of being told the finding. I was much impressed by the cooperation offered by both men, and very appreciative of Magin's statement that the FCC always tries to provide a friendly and prompt response to hams' problems.

My conclusion is an enhanced appreciation of the fact that RFI can originate from the most unlikely sources, and great persistence is often required in locating it. Yes, I've taken a bit of razzing about my "satellite." More importantly, though, the source of the interference has been found. The proliferation of electronic devices in homes, offices, industrial plants and vehicles aggravates the problem of RFI, and increasing efforts must be made to locate and correct it. — *Henry Horne, W4MZP, Tucker, Georgia*

[1]The car is a 1980 Mercedes Benz 240D, though the same time clock is probably used throughout that product line. Since the reference oscillator for such devices normally runs at a much lower frequency, the 146.8171-MHz signal is probably a harmonic; but in my limited calculations it doesn't divide into a recognizable fundamental frequency. The car also has a very precise electronic cruise control that becomes highly erratic in the presence of a signal from the 2-meter hand-held barefoot, let alone with the 30-W amplifier activated (it is unaffected by the 100-W HF mobile rig).

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

New Generation of Transceiver

If you looked at the advertisements in recent issues of *QST*, you must have noticed the new VHF and UHF transceivers that are available. The primary characteristic of this new generation of transceivers is that they pack more features into less space.

The new radios have built-in scanners that can scan a band or scan the frequencies stored in the radio's memory. The number of frequencies that can be stored in memory is in double figures. Microphones with built-in Tone pads and built-in frequency control are almost standard. There are radios that can generate any of the 32 standard PL tones, and there are the radios that talk!

If you are in the market for a new VHF or UHF transceiver, you have a lot of interesting choices. One feature you might consider can open up a whole new radio world for you to explore. The feature I am referring to is multimode capability; that is, transceivers that offer CW and SSB, as well as FM. This feature can be very interesting.

Sub-Zero Hill-Topping

For example, the day after New Year's a couple of locals decided to forgo the various parades and bowl games proliferating on the boob tube and braved the sub-zero (celsius) New England winter to climb to the top of a 1000-foot hill in the middle of Connecticut carrying an ICOM IC-290A transceiver, a 7-element beam, a Squalo antenna and some gel-cells. When they got to the top of the hill, they called "CQ" and worked stations throughout 1, 2 and 3-land running about 7 W of power! And band conditions were ordinary.

Next weekend (as of this writing) is the ARRL VHF Sweepstakes, and 2 meters (144.070-144.230 MHz) will be wall to wall with stations working the contest. Many dyed-in-the-wool FMers will switch to another mode to join the fray and have a good time knocking off some new states and new grid zones.

Repeater in Space

And then there is OSCAR 10. In between the 144-145 MHz and 146-147 MHz repeater subbands, you can hear stations throughout the world working each other through that repeater in the sky. You might find it so interesting that you may start building a UHF transmitter and antenna in order to join the fun.

If any of this sounds the least bit interesting, make sure that among all those bells and whistles you find on the next transceiver you purchase there is a switch designated FM/CW/USB/LSB.

NEW EQUIPMENT PREVIEW

Here's a little secret. How would you like to preview all of the new Amateur Radio equipment coming down the pike from JA-land? Dayton Trek, you say? No. Simply pick up a copy of *CQ Ham Radio*, the monthly magazine published by the CQ Publishing Co., Ltd. It is full of advertisements for equipment now being sold in Japan but not yet imported stateside, and you don't have to be able to read Japanese to comprehend what the ads are selling.

You say you can't find a copy of *CQ Ham Radio* at your local newsstand or radio store? Well, subscriptions are available (CQ Publishing Co., 1-14-2 Sugamo, Toshima, Tokyo 170, Japan). Or, if you happen to be touring ARRL Hq. in Newington, stop by the Membership Services Department. A copy of the current issue of *CQ Ham Radio* is usually available for your perusal.

Incidentally, Japan has another monthly Amateur Radio magazine, *Mobile Ham*, published by Denpa Jikken-sha, 6-15-4 Shimouma, Setagaya, Tokyo 154. This is also popular among Japanese amateurs, but unfortunately for us, does not have as many advertisements as *CQ Ham Radio*. *Mobile Ham* is also available for perusal at ARRL Hq.

220 SCANNER

No one makes a scanner for 220 MHz. In fact, there is a dearth of any kind of ham equipment for 220. But, I needed a scanner for the 1¼-meter band.

There are a half-dozen active repeaters around here, and the locals are always jumping from one repeater to another, and, like the proverbial cop, I can never find one when I need one without wearing out my wrist and the dial on my Midland 13-513 transceiver.

The solution: I have an Azden PCS-2000 2-meter transceiver with a built-in six-channel scanner. It was collecting a lot of dust, so I mated it with a 220-MHz receiving converter, and voilà! I now have a six-channel 220 scanner. If you need a 220 scanner and you have an unused 2-meter scanning radio lying around, that's one solution. Another solution is to mate a 220 receiving converter to a public-service-band scanner. Either way, the task is simple, yet the desired results are achieved.

W5LFL POSTSCRIPT

I hope you had a chance to hear W5LFL's 2-meter transmissions from space. Perhaps you were one of the lucky ones to "work" him.

Here in downtown Wolcott, I heard W5LFL loud and clear on four occasions. It was amazing how strong his signals were considering the flea power he was running and the antenna he was using. I guess it proves that height makes the difference. (I and others in the area copied W5LFL while he was flying over Houston and, according to my calculations, was well below my horizon and I should not have heard him. Try and figure that out.)

Biggest Thrill in Ham Radio

The first time I heard W5LFL's voice coming out of the speaker of my radio was one of the biggest thrills I have experienced in Amateur Radio. I'm sure many others feel the same way. Some of us were so excited that, when it was our turn to transmit, we mistakenly transmitted on W5LFL's downlink frequency; but we soon regained our senses and switched over to one of the uplink frequencies.

If I hadn't been so busy calling W5LFL myself, I would have logged all of the stations I could hear calling him. During the Sunday morning East Coast pass, the level of activity was unbelievable. Imagine being up there at the receiving end of that cacophony.

Anyway, a great time was had by all. By the time you read this, the QSL cards should be in the mail.

REPEATER LOG

According to reports received between November 10 and January 10, repeaters were involved in the following public service events: 19 weather emergencies, 2 crimes, 8 medical emergencies, 257 vehicular emergencies, 5 fires, 6 search & rescues, 42 public safety events, 62 drills/alerts and 5 power failures.

The following repeaters were involved (followed by the number of events): WA1DGW 9, K1FFK 1, K1HF 1, KB1J 1, W1UWS 1, WB2IWT 1, W2ODV 13, K2QIJ 11, WB2RUH 1, W2VL 46, WB2ZII 7, WA2ZWP 3, N3BDJ 1, W3GV 1, WA3JDX 1, W3LIF 1, W3MIE 1, WA3PBD 1, W3SGJ 1, VE3TTT 3, W3UER 3, W3VRZ 5, W4BWS 14, KA4CLL 1, N4DMA 2, WA4GIC 2, K4HY 5, KD4JL 1, W4KCQ 1, WA4SWF 2, WB4UDS 18, K5LQP 1, W5RVT 1, WB5SBO 1, W6APZ 1, WD6AWP 13, WA6EFW 3, WD6EVM 7, WB6FMC 1, KH6H 1, KH6HHG 9, WB6IIY 1, WA6OFT 1, W6RHC 9, WA6UGY 1, W7EX 158, K8AJR 1, K8DDG 12, WA8EFK 1, WD8IEL 12, KØCY 3, KØSCM 6, WAØTAU 4, WAØYRS 1.

*75 Kreger Dr., Wolcott, CT 06716

Special Events

Conducted By Edith Holsopple,* N1CZC

Port Talbot, Wales: The Port Talbot ARS will operate the St. David's Day Special Event Station GB2SDD from 0001Z until 2359Z *March 1* to celebrate the National Day of Wales. A special QSL card will be available to all those working GB2SDD. A special award will be available for those working the special event station and five other (for stations outside the U.K.) Welsh Amateur Radio stations during the months of February and March 1984. Send info to R. R. Jones, GW4HOQ, "Bryn-Ynys," Strawberry Pl., Morriston, Swansea SA6 7AG, Wales, United Kingdom.

Washington, Texas: The Brenham ARC will operate WB5STR/5 from 0001Z *March 2* through 2359Z *March 4* from the Brazos State Park in celebration of Texas Independence Day. Phone frequencies will be the General class portion of 80 through 10-meters, and 2-meter FM and SSB. There will be CW operation in the Novice bands. Special QSL to BARC, P.O. Box 44, Brenham, TX 77833.

Dublin Georgia: The Dublin ARC will operate WA4HZX from 0001Z *March 17* through 0500Z *March 18* during the annual Dublin-Laurens County St. Patrick's Festival. Phone and CW operation is planned for the General class portions of the 80- through 10-meter bands. Certificate for QSL to Dublin ARC, P.O. Box 4015, Dublin, GA 31040.

Green River, Wyoming: The Sweetwater ARC will operate N7ERH from 1900Z *March 24* until 1900Z *March 25* to honor John Wesley Powell. Operation will take place 40 kHz up from the General class and Novice class band edges. Send QSL information to N7ERH, P.O. Box 717, Green River, WY 82935.

London, England: The North Finchley Branch London N12 of the Royal British Legion will operate GB2RBL from 1100Z *March 31* until *April 8*. Frequencies are 2, 20, 40 and 80 meters, and 14.185 MHz for DX. Contacts with military establishments would be appreciated also. QSL via the RSGB Bureau.

Note: The deadline for *receipt* of items for this column is the 15th of the second month preceding publication date. For example, your information would have to reach Hq. by March 15 to make the May issue. For the convenience of those wishing to operate, please be sure that the *name* of the sponsoring organization, the *location, dates, times (Z), frequencies* and *call sign(s)* of the special-event station are included.

*Communications Assistant, ARRL

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

That Five-Year Plan

There's been a lot of change in CRRL. Four years after incorporation, CRRL is a far cry from the old Canadian Division of ARRL. Now there's a seven-man elected CRRL Board, Canadian training materials, a complete CRRL incoming and outgoing QSL service, a CRRL news service, and a CRRL headquarters office prepared to supply materials and process League memberships in Canadian funds. All this and more has been provided by *volunteers* located in all parts of Canada. We think it's quite an accomplishment.

Now, more changes are on the way. The framework for these changes is contained in what has come to be called the Five-Year Plan. There's nothing secret about this plan. Reference to it has been made in both ARRL and CRRL Board minutes. Let's see what's in the plan.

First year: (1) Replace the term "Canadian Division" with "CRRL" or "Canada" in *QST* and other League publications. (2) Conduct Canadian Section Manager elections entirely within Canada. (3) Begin shipping *QST* to Canada in bulk for placing in the Canadian postal system, to improve delivery. (4) Implement section-level restructuring, modifying it to meet Canadian needs.

Second year: (1) Develop a CRRL affiliated-club program. (2) Change the ARRL bylaws so the CRRL President automatically becomes the ARRL Canadian Director, and the CRRL Vice President automatically becomes the ARRL Canadian Vice Director (at present, the reverse is true); conduct elections for these positions entirely within Canada.

Third year: Have CRRL collect and retain all dues from Canadian members in Canada; CRRL would then purchase *QST* and other services from ARRL.

Second to fourth years: Have CRRL begin to administer nets and emergency-preparedness activities in Canada (NTS would continue on a bi-national basis, with ARRL and CRRL support).

Fifth year: Eliminate Canada as a "division" of ARRL. One scenario would have the CRRL President sit on the ARRL Board as an observer; the ARRL President would sit on the CRRL Board as an observer. Other scenarios are possible.

Several provisions of this plan have already been implemented. You'll rarely see the term "Canadian Division" in *QST* anymore. The recent election of the Maritimes-Newfoundland Section Manager was conducted entirely in Canada. Most Canadian Section Managers have established good working relationships with their CRRL regional directors and regularly call on the CRRL headquarters office in London, Ontario, for support materials. The new ARES Canada Net is now in operation, and work has begun on a National Emergency Plan. One first-year provision that has not happened is the mailing of *QST* from Canada. CRRL did apply for a Second Class mailing permit, but Canada Post rejected the application and all subsequent appeals. Apparently, this is not because *QST* is published in the U.S.; it's because *QST* is lacking in "scientific content"!

So where would all this leave us in five years? There would certainly be a proper CRRL headquarters office, but not necessarily located in London, Ontario. Members would pay dues to CRRL rather than to ARRL and, first and foremost, be members of CRRL. CRRL membership would continue to include nominal membership in ARRL, and members would continue to receive *QST* and support and share in many ARRL services. These would include the Technical Information Service, insurance programs, W1AW, and printed materials such as operating aids and public information materials. What would be supplied by ARRL Hq. and what would be supplied by CRRL Hq. would depend on what was the most cost-effective way of delivering a service to CRRL members.

Will all this happen — in five years? That depends on a number of factors. One is the extent to which CRRL must continue to rely on volunteers who now do their League work in the context of commitments to jobs and families. This will begin to change this year. CRRL budgets will provide for one full-time employee (or equivalent in part-time employees) and rental of office and storage space. Another factor is the speed with which CRRL can acquire some assets. CRRL will soon need a proper computer system, some typewriters, a copying machine and more. The most important factor, however, is *you*.

There's a general feeling among Canadian League members that we ought to do more for ourselves and not depend so much on our friends to the south. That's why what's been done so far has met with fairly enthusiastic response. For more changes to happen, that response has to continue. Both CRRL and ARRL will be monitoring CRRL membership reaction to the changes as they are implemented. Whatever develops must represent the wishes of CRRL members.

Some of us hope that all CRRL members will someday share in a dream that some of us now have: for CRRL to acquire some property and set up a real CRRL headquarters, with a couple of offices, some work rooms and a CRRL headquarters station — something that could become a focus for Canadian Amateur Radio just as ARRL Headquarters is the focus for Amateur Radio across North America, and something that Canadian amateurs could visit and be proud to call their own. That would require a leap of faith by many CRRL members, a fund-raising campaign and, likely, a few generous gifts from some individual Canadian amateurs. Perhaps, someday. The Five-Year Plan is a start.

How do you feel about all this? We'd like you to contact your CRRL regional director and let him know. It's your League.

CRRL NEWS

☐ Don Welling, VE1WF, is new manager of the CRRL Outgoing QSL Bureau. When you use this bureau, be sure to pre-sort your cards in alphanumerical order, include a mailing label from a current *QST* and ship them to the proper address (see above). Don will confirm their arrival via NTS, do the additional sorting and forward them to their destination. Remember: This service is free, but for CRRL members only.

☐ CRRL is offering a new service for Canadian amateurs seeking licencing in foreign countries. CRRL now has information sheets and licence application forms for over 150 countries, and more are on their way. Many of these countries do not have reciprocal-licencing agreements with Canada, but may still be worth a try. Send inquiries to Naralon Thorn, VE3LRU, at the CRRL headquarters office in London, Ontario.

DOC NEWS

☐ DOC will hold Amateur Radio examinations across Canada on April 18. If you plan to write, submit an application before March 21. Other dates for DOC examinations this year are June 20 and October 17.

☐ DOC has informed CRRL of new third-party-traffic and reciprocal-operating agreements with Antigua, V2A. These agreements became effective on November 15.

☐ Fees for Amateur Radio station licences will be going up, from $13 to $13.50 a year, effective this year.

NOTES FROM ALL OVER

☐ Congratulations to John Henry, VE2VQ, of Alymer, Quebec, who was re-elected to the AMSAT Board of Directors.

☐ Devere Worral, VE3AJN, of Kemptville, Ontario, was one of several amateurs named by U.S. Senator Barry Goldwater, K7UGA, in a speech delivered in the U.S. Senate commending Amateur Radio operators for their role in the Grenada intervention. [QST]

Bill Gillespie, VE6ABC, is 1983 CRRL Amateur of the Year. Bill holds down several League appointments, runs the Alberta Tube Bank and a depot for CRRL books and supplies, and provides on-the-air code practice that has helped hundreds of Western hams get their tickets. — *(VE6AW photo)*→

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

Coming Conventions

FLORIDA STATE CONVENTION

March 9-11, Orlando

The Orlando Hamcation-Computer Show, sponsored by the Orlando Amateur Radio Club, Inc., will be held at the Orlando Expo-Centre again this year from 5 P.M. to 9 P.M. Friday, from 9 A.M. to 5 P.M. Saturday and from 9 A.M. to 2 P.M. Sunday. Swap tables are $15 per table for the duration; no split days. Advance admission, $5; at the door, $7; under 14 free. Expanded facilities provide air-conditioned comfort for all phases of the Hamcation-Computer Show. Free parking available. Plenty of nearby dining and entertainment for all members of the family. "STS-9: Amateur Radio's Finest Hour," a talk by Peter O'Dell, KB1N, ARRL Public Information Officer, featuring the post-flight version of "Amateur Radio's Newest Frontier;" technical forums; DX forum; ARRL programs; AMSAT forum; PACKET Radio forum; antenna forums; ARES (EC) forum; and computer forums to go along with the commercial exhibits and swap-shop interests. Hotel reservation card available on request. Talk-in on 16/76. For information and reservations, or advance admission tickets, write to Al Huber, KC4CT, Chairman, P.O. Box 15142, Orlando, FL 32858.

NORTH CAROLINA STATE CONVENTION

March 17-18, Charlotte

The Mecklenburg Amateur Radio Society presents its 1984 North Carolina State ARRL Convention and Charlotte Hamfest and Computerfair on Saturday, March 17, and Sunday, March 18 at the Charlotte Civic Center. Featured are over 160 dealers from throughout the Eastern U.S.; major manufacturers; 700 flea market tables; full schedule of women's activities for both days, including country crafts and microwave cooking classes. ARRL forums and meeting. Forums, including RTTY, ATV, sound enhancement, computer-oriented, historical amateur and satellite operations, are scheduled. Big-screen TV entertainment for children. Beautiful all-indoor facility with VIP lounge for women, refreshments, plentiful parking, and special area available for RV and truck parking in vicinity. From 9 A.M. until 5 P.M. Saturday and from 9 A.M. until 4 P.M. Sunday. Admission is $5 in advance and $6 at the door. Tables are $10, with reservations taken. For information, write to Mecklenburg Amateur Radio Society, Inc., 2425 Park Rd., Red Cross Building, Charlotte, NC 28203. Talk-in on 34/94 and 52 simplex.

MIDWEST DIVISION CONVENTION

March 30-April 1, Kearney, Nebraska

"Where the West Begins and the East Peters Out"

Ten Great Reasons to Attend

1. *Central, easy-to-get-to location:* in the Center of Nebraska, right off Interstate 80.

2. *Funtastic facilities for the whole family:* over 350 Rooms at the Convention Centers. Nearly 40,000 square feet of exhibitors/flea market space. Two indoor swimming pools, several game rooms, numerous indoor floor games, live entertainment and great restaurants.

March 9-11, 1984
Florida State, Orlando

March 17-18, 1984
North Carolina State, Charlotte

March 30-April 1
Midwest Division, Kearney, Nebraska

April 7-8
Arkansas State, North Little Rock

April 7-8
Missouri State, Kansas City

April 14-15
Mississippi State, Jackson

ARRL NATIONAL CONVENTIONS

July 20-22, 1984
New York, New York

October 4-6, 1985
Louisville, Kentucky

September 5-7, 1986
San Diego, California

3. *Super symposiums:* The cornerstone of this convention is the great symposiums and national experts in their respective fields: Bob Heil, K9EID, Art Polley, VE1EG, Pete Eaton, WB9FLN, Emory Rodabaugh, WØEXK, Jim Larsen, K7GE, and David Hughes, Colorado City, Colorado, to name a few. They will be covering topics from antennas to computers.

4. *Fun family activities and entertainment:* From the Nebraska Western Ho-Down on Friday evening to the hilariously funny Mayor of Hooterville at the Saturday night banquet, this convention has been designed to keep the whole family involved in a great fun weekend.

5. *Flea Market and Ladies Bazaar:* This is one of the most popular events of the convention. The Ladies Bazaar consists of homemade gifts and articles that sell out as fast as they are put out on the tables. This all-indoor Flea Market and Ladies Bazaar provides for a center of attention for all members of the family.

6. *CW contest:* A trophy is presented at the Saturday night banquet for the Annual Winner. We hear of 40 and 50 WPM copiers, but 32 WPM has been the tops so far in six years of competition. Everyone receives a certificate.

7. *Ladies Day:* Simply stated, "There is none better." Tours, demonstrations, hands-on shows and great socializing. Don't miss the teas.

8. *FCC testing — Novice through at least General:* If everything goes on schedule, this will be one of the first conventions to offer Volunteer FCC Testing. Send your Form 610s in a.s.a.p. Any questions? Please write for answers.

9. *Great fraternalism:* Annual QCWA, MARS, Flying Hams, Farmering Hams, get togethers to name a few. Net meetings, ARRL Forum, Royal Order of Wouff Hong, and coffee for everyone.

10. *People:* This is the sixth convention put on by the Midway Amateur Radio Club. Great hams, like Chuck Kemery, WØCRK, Tim Loewenstein, WAØIVW, Lynn Miller, WBØPRH, Delaine Loewenstein, WBØMMI, and Vern Fiala, WDØCMG, are out to serve you.

For much more information and a brochure, write to Midwest Division Convention, Box 1231, Keaney, NE 68847, or contact Chuck Kemery, WØCRK, via the airwaves. Hope to see you.

ARKANSAS STATE CONVENTION

April 7-8, North Little Rock

The ARRL Arkansas State Convention and All-Arkansas Hamfest, sponsored by the Central Arkansas Radio Emergency Net, Inc. (CAREN), will be held April 7-8, at the North Little Rock Community Center on Pershing Blvd. (just off the Hwy. 107 exit near the intersection of I-30 and I-40). Three motels within walking distance. Close to McCain Mall for shopping, fun for the whole family. Banquet Saturday night at the Burns Park Hospitality House. New equipment dealers, flea market. Hours: 9 to 5 Saturday and 9 to 3 Sunday. Free admission; talk-in on 34/94. Many awards. For full details on the 1984 All-Arkansas Hamfest, contact Dale Temple, W5RXU, 1620 Tarrytown, Little Rock, AR 72207, tel. 501-225-5868.

MISSOURI STATE CONVENTION

April 7-8, Kansas City

The PHD Amateur Radio Association, Inc., of Liberty, Missouri, will sponsor the 1984 Missouri State ARRL Convention (15th Annual Northwest Missouri Hamfest) on Saturday and Sunday, April 7-8, in the Trade Mart Building at the Downtown Kansas City, Missouri, Airport.

There will be a complete program of forums — ARRL, DX and XYL — commercial booths and swap tables, all inside the 45,000 square-foot, one-level, air-conditioned building. Unlimited free parking adjoins the site. RVs welcome; no hookups. Missouri-Kansas CW and Amateur of the Year Awards. Homebrew contest. Doors open 10-5:30 both days. Commercial exhibitors may set up 7-9 P.M. Friday or 7-10 A.M. Saturday. Swappers, 9 A.M. Saturday.

There will be a Saturday night banquet at the world-famous Gold Buffet. Guest speakers will include ARRL Counsel Chris Imlay, N3AKD, and Midwest Division Director Paul Grauer, WØFIR.

Registration, $4; banquet tickets, $10.50; swap tables, $10 for both days (includes one registration per table). Those desiring banquet tickets and swap tables are urged to order in advance. All pre-registrations will be held at door. Talk-in on 34/94. For information, write to PHD Amateur Radio Assn., Inc., P.O. Box 11, Liberty, MO 64068, tel. 816-781-7313 or 816-452-9321.

Hamfest Calendar

By Marjorie C. Tenney,* WB1FSN

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

California (Visalia) — April 13-15: The International DX Convention sponsored by the Southern California DX Club will be held at the Holiday Inn. Registration, which includes cocktail parties Friday and Saturday, banquet, Sunday breakfast, exhibits and programs, is $42. Preregistration (postmark by March 15) is $38, which will include a free traditional patch to the first 500. Checks made payable to "West Coast DX Convention 1984" should be sent to Nick Winter, WB6DXU, 1426 N. Avon St., Burbank, CA 91505. Hotel rooms are $40 single/$47 double, and must be reserved in the name of the convention. Do not use the 800 telephone number when calling for reservations; use 209-651-5000. Many invited speakers and well-known hams are expected to attend. Women's program will include a luncheon for an additional $5. In addition to traditional contests, there will be an "original QSL card contest."

Colorado (Grand Junction) — March 31: The Grand Mesa Repeater Society will hold the fifth annual Western Slope Hamfest on Saturday, March 31, from 10 A.M. to 4 P.M., at the Plumbers and Steamfitters Union Hall, 2384 Highway 6 & 50. Admission is free;

*Convention/Travel Coordinator, ARRL

swap tables, $5 each. Features include an indoor swapfest, an informative talk with ARRL Rocky Mountain Division Director Lys Carey, KØPGM, Novice exams, a technical session on Repeaters and Remote Bases with Ted Wetzel, WBØPDU, an auction and refreshments. Talk-in on 146.82 and 449.20. To reserve a swap table and for further information, send an s.a.s.e. to Larry Brooks, WBØECV, 3185 Bunting Ave., Grand Junction, CO 81504, tel. 303-434-5603.

†**Florida (Fort Walton Beach) — March 17-18:** The 1984 North Florida Swapfest, sponsored by the Playground ARC, will be held at the Fort Walton Beach Shrine Fair Grounds, State Rd. 189, on Saturday, from 8 A.M. to 4 P.M., and Sun., from 8 A.M. to 3 P.M. Admission is $2 in advance, $3 at the door; children, ladies and those over 65 free. Forums, contests, craft tables, and ARRL, QCWA and MARS information booths. Talk-in on 19/79. Plenty of free parking; RV parking available. Large indoor swap area; table rent $6/day or $10/weekend. Advance reservations accepted. Info and reservations from PARC, c/o Joe P. Giangrosso, WD4JZG, P.O. Box 3075, Fort Walton Beach, FL 32548, tel. 904-863-2829.

†**Georgia (Columbus) — March 31- April 1:** The Columbus ARC hamfest will be held at the Columbus Municipal Auditorium, Saturday, March 31, from 9 A.M. to 5 P.M. (EST), and Sunday, April 1, from 9 A.M. to 3:30 P.M. Ticket donations: 13 for $10, 6 for $5, 1 for $1; ARES Forum, MARS, open-air flea market, free coffee and hot chocolate, free parking for self-contained RVs (no hookups). Indoor tables are $5 per table per day. Talk-in on 01/61. Further information from George M. Reitz, N4AGO, RR 2, Box 22D, Seale, AL 36875, tel. 205-855-2204.

Illinois (Sterling) — March 18: The Sterling-Rock Falls ARS 24th annual hamfest will be held March 18 at the Sterling High School Fieldhouse, 1608 4th Ave. Commercial distributors, dealers and a large flea market. Free parking, and space for self-contained RVs overnight. Doors open at 7:30 A.M. Concession stand available. Tickets are $2 in advance, $3 at the door. Flea market tables requiring electricity, and all commercial tables $5; all others $3. For advanced tickets, tables, or information, contact Sue Peters, KA9GNR, P.O. Box 521, Sterling, IL 61081, tel. 815-625-9262. Talk-in on 25/85.

†**Illinois (Grayslake) — March 25:** LAMARSFEST 1984, sponsored by the Libertyville and Mundelein ARS, will be held at the Lake County Fairgrounds, Rts. 45 and 120, March 25. Setup from 6 A.M.; public admitted at 8 A.M. Advance admission $2; at the door, $3. Ham radio, personal computer, and general electric swapfest and sales. ARRL booth, FCC and American Red Cross invited to exhibit. Free parking; food concession on premises. Talk-in on 63/03 and 94 simplex. For further information, write to LAMARS, P.O. Box 751, Libertyville, IL 60048.

†**Illinois (Dixon) — April 8:** The 18th annual Rock River ARC Hamfest will be held on Sun., April 8 at the Lee County 4-H Center, one mile east of junction of 52 and 30. Camping space available at nominal charge. Tables available (8 ft) at $5. Advance ticket donation $2, at the gate $3. Auction for amateur-related gear. Breakfast and lunch will be served. Talk-in on 37/97. Doors open at 8 A.M. for general public. For more information or advance tickets, tables, write to or call Shirley Webb, KA9HGZ, 618 Orchard St., Dixon, IL 61021, tel. 815-284-3811. Advance tickets available until April 1.

†**Indiana (Winchester) — March 11:** The Randolph ARA 5th hamfest is Sunday, March 11, from 8 A.M. to 5 P.M., in the Winchester National Guard Armory. Dealers, flea market, programs, and food and drink all inside. Ticket donation $3; under 12 years free. Table space (by reservation only): $5 with table, $2.50 without. Setup on Sat., from 6 to 8 P.M., and Sun., from 6 to 8 A.M. Talk-in on 90/30, 224.90/223.30. For reservations and information, contact RARA, Box 203, Winchester, IN 47394, or Jake Life, W9VJX, tel. 317-584-9361.

Indiana (Indianapolis) — March 11: The Martinsville Hamfest, sponsored by the Morgan County Repeater Assn., will be held indoors at the Indiana State Fairgrounds Pavilion Bldg. on March 11. Admission is $4 at the door. Premium table $30; flea market table $8; flea market space without table $1. All tables must be reserved in advance. Setup for reserved tables available Sat., March 10, from 1 to 9 P.M. Space setup on Sun., March 11, from 6 to 8 A.M. Free paved parking. Talk-in on 147.21 and 52 simplex. For table reservations or information, send an s.a.s.e. before March 1 to Aileen Scales, KC9YA, 3142 Market Pl., Bloomington, IN 47401.

Indiana (Greencastle) — April 7: The Putnam County ARC will hold its second Amateur Radio and Electronics Auction on April 7 at the Putnam County Fairgrounds, north of Greencastle, on U.S. 231. All activity will be inside, with food available on site. Admission $1; commission on sales 5%; and $1 service charge on buy-backs. Doors open at 8 A.M.; auction to start at 10 A.M. This is a consignment auction: Bring your equipment and let us sell it for you. Talk-in on 93/33. For more information or a flyer, contact John Underwood, K9IIB, RFD 1, Box 10, Fillmore, IN 46128.

†**Kentucky (Elizabethtown) — March 24:** The 5th annual Elizabethtown Hamfest, sponsored by the Lincoln Trail ARC, Inc., will be held at the James R. Pritchard Community Center on March 24, from 8 A.M. to 5 P.M. Admission is $3 in advance, $4 at the door. ARRL forum, Women's activities. Talk-in on 38/98 and 52 simplex. For further information, write to Lincoln Trail ARC, P.O. Box 342, Vine Grove, KY 40175, tel. 502-737-2260.

†**Kentucky (Paducah) — April 8:** The Paducah ARA will sponsor the annual Paducah Amateur Radio Swap/Hamfest at the Paducah Parks and Recreation Civic Center Bldg., 2701 Park Ave., from 9 A.M. to 3 P.M. (CST), on April 8. Doors will open to vendors at 8 A.M. Admission $2, including limited table. Varied activities; food available within the building. Talk-in on 66/06. Information and reservations from Greg Englert, WB4ECB, Rte. 11, Box 172, Paducah, KY 42001.

Massachusetts (Framingham) — April 1: The Framingham ARA, Inc., will hold its annual spring flea market on Sunday, April 1, in the Framingham Civic League Bldg., 214 Concord St. (Rte. 126), downtown Framingham. Doors open at 10 A.M. (sellers may begin setup at 8:30). Admission is $2, and tables are $10 — pre-registration required. Talk-in on 75/15 and 52. Radio equipment, computer gear, food in-house, bargains galore! Contact Jon Weiner, K1VVC, 52 Overlook Dr., Framingham, MA 01701, tel. 617-877-7166.

Michigan (Marshall) — March 24: The 23rd Annual Michigan Crossroads Hamfest will be held at the Marshall High School, Saturday, March 24, from 8 A.M. to 3 P.M., with setup for sellers at 7 A.M. Plenty of free parking and carry-in help. Snack bar and full food service. Tickets are $2 at the door or $1.50 in advance. Table space: 50 cents per ft, minimum 4 ft, reserved until 8 A.M. For reservations, send s.a.s.e. to SMARS, P.O. Box 934, Battle Creek, MI 49016, or call Wes Chaney, N8BDM, at 616-979-3433. Talk-in on 52 and 07/67. Sponsored by Southern Michigan ARS and the Marshall High School Photo-Electronics Club.

Michigan (Grosse Pointe) — April 8: The South Eastern Michigan ARA (SEMARA) will hold its 26th annual hamfest swap and shop April 8, from 8 A.M. to 3 P.M., at the Grosse Pointe North High School, located at Vernier Rd., between Mack and Lakeshore. Talk-in on 75/15. Ample parking and plenty of good food. Advance admission $1; $2 at the door. For further information, please send an s.a.s.e. to SEMARA Swap & Shop, Box 646, St. Clair Shores, MI 48083, or call Pat Ninness, WD8QVL, at 313-445-8651.

Minnesota (Rochester) — April 7: The Rochester ARC and the Rochester Repeater Society will sponsor the 7th annual Rochester Area Hamfest on Saturday, April 7. Doors open at 8:30 A.M. at John Adams Junior High School, 2535 N.W. 31 St., Rochester. Large indoor flea market for radio and electronic items, refreshments, plenty of free parking. Talk-in on 22/82. For further information, contact RARC, c/o WBØYEE, 2253 Nordic Ct., N.W., Rochester, MN 55901.

Missouri (St. Louis) — March 9: The 24th Annual Jefferson Barracks ARC Ham Auction will be held at the new St. Louis Firefighters Hall, 5856 Gravois at Christy in south St. Louis City, on Friday night, March 9. Doors open at 6 P.M. Auction starts at 7:30 P.M. Free admission. Used Amateur Radio equipment auction; free coffee, and cake and other refreshments available. Talk-in on 34/94. For further information, contact Carl H. Hohenberger, WBØBZP, 5266 Parker Ave., St. Louis, MO 63139. Missouri SM Ben Smith, KØPCK, is planning to be present.

New Hampshire (Hudson) — March 17: The annual Interstate Repeater Society Flea Market will be held on St. Patrick's Day at the Hudson Lions Club, Lions Ave., from 9 A.M. to 4 P.M. Doors open at 8 A.M. Admission $1; tables $7 each. Food and drink on location. Talk-in on 146.85 and 52. Call WAINYS at 603-882-6859, or write to Interstate Repeater Society, P.O. Box 693, Derry, NH 03038.

†**New Hampshire (Rochester) — April 7:** SPRINGFEST '84, the 4th annual hamfest-fleamarket sponsored by the Great Bay Radio Assn., will be held on Sat., April 7, from 9 A.M. to 3 P.M. at the Rochester VFW Post 1772 Hall, Pickering Rd., Rochester (Gonic). Plenty of free parking, food and refreshments available. Talk-in on 147.57. Admission $1. For advanced table reservations and further information, write Great Bay Radio Assn., P.O. Box 911, Dover, NH 03820.

New Jersey (Egg Harbor City) — March 10: Shore Points ARC, Inc., invites you to Springfest '84, to be held Saturday, March 10, from 9 A.M. to 4 P.M., at the Atlantic County 4-H Center, approximately 15 miles west of Atlantic City. Buyers and sellers can make their deals inside 8000 square feet of heated selling space (covered tailgating available weather permitting). Sellers $5 per space (bring own table); buyers $2.50 advanced, $3 day of hamfest. For more information write to SPARC, P.O. Box 142, Absecon, NJ 08201.

New Jersey (Upper Saddle River) — March 24: A Ham Radio flea market sponsored by the Chestnut Ridge Radio Club will be held Saturday, March 24, in the Education Bldg., Saddle River Reformed Church, East Saddle River Rd. and Weiss Rd. Tables: $10 for the first, $5 each additional table. Tailgating: $5. Food and soda. No admission fee. Contact: Jack Meagher, W2EHD, tel. 201-768-8360, or Roger Soderman, KW2U, tel. 201-666-2430.

†**New Jersey (Trenton) — April 1:** The Delaware Valley Radio Assn. will hold its 12th annual flea market and computer show on Sunday, April 1, from 8 A.M. to 4 P.M., at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Rd., Lawrence Township. Advance registration $2.50; $3 at the door. Indoor and outdoor flea market area, commercial dealers, refreshments. Sellers are asked to bring their own tables. Talk-in on 52 and 07/67. For advanced tickets and space reservations, write to KB2ZY, 140 Susan Dr., Trenton, NJ 08638 (s.a.s.e. please).

New Jersey (Flemington) — April 7: The Flemington Hamfest, sponsored by the Cherryville Repeater Assn., Inc., will be held on Saturday, April 7, at the Field House, Hunterdon Central High School, from 8 A.M. to 4 P.M. Admission is $3. Seminars, movies, slide shows, packet radio demo, ARRL booth. Talk-in on 147.375, 147.015, 224.12 444.85 and 52 simplex. Further information from Bill Inkrote, K2NJ, RD 10, Box 294, Croton-Quakertown Rd., Flemington, NJ 08822, tel. 201-788-4080.

Ohio (Circleville) — March 4: The Teays ARC will hold its seventh annual King of the Pumpkin Hamfest on Sunday, March 4, from 8 A.M. to 4 P.M. The location has been moved to the new, modern K of C building at 2489 N. Court St. Large parking lot. Tickets are $2 in advance and $3 at the door. Tables are $4 in advance and $5 at the door. For more information, contact Dan Grant, W8UCF, 22150 Hulse Rd., Circleville, OH, tel. 614-474-3026.

Ohio (Canton) — March 17: The Canton ARC annual auction at the Nimishillen Grange, Easton St., N.E., will be held March 17, at 5 P.M. Flea market 8-foot table, $1; tables limited. General admission is $3 at the gate and $2 in advance. For general information, call Scott Duncan, KK8D, at 216-484-6722 (evenings). S.a.s.e. to W8FEC, 505 E. Mohawk Dr., Malvern, OH 44644. Talk-in on 72/12.

†**Ohio (Maumee) — March 18:** The Toledo Mobile Radio Assn., Inc., presents its 29th annual Ham/Computer Fest and Auction Sunday, March 18, at the Lucas County Recreation Center, Key Street. Hours are 8 A.M. to 5 P.M. Auction starts at 10 A.M. Ample free parking all day and overnight. Tickets are $2.50 in advance and $3 at the door. Flea market tables are available, and displays are limited to electronic, ham and computer gear only! Commercial exhibitors, refreshments, women's programs. Talk-in on 52. Area repeaters are on 01/61, 19/79, 34/94, 87/27, 975/375 and 447/442. For further information, write to Elmer Clark, KR8U, 5520 Edgewater Dr., Toledo, OH 43611.

†**Ohio (Madison) — March 25:** The Lake County ARA hamfest will be held on Sunday, March 25, from 8 A.M. to 4 P.M. Setup starting at 6 A.M. Advance admission $3; at the door $3.50. Talk-in on 81/21. Information and reservations from LCARA, P.O. Box 150, Mentor, OH 44061, tel. 216-953-9784.

Oregon (Milton-Freewater) — March 25: The Walla Walla Valley RAC will hold its annual swapfest at the Milton-Freewater Community Building Sunday, March 25. Doors open at 8 A.M. Tables are $5 each. Radio and electronic gear only. There will be an auction at 1 P.M. Talk-in on 52. For further information, write to W7DP, P.O. Box 321, Walla Walla, WA 99362.

Texas (Midland) — March 17: The Midland ARC will hold its annual St. Patrick's Swapfest beginning Saturday, March 17, from 10 A.M. to 6 P.M., and Sunday, March 18, from 8 A.M. to 2:30 P.M., at the Midland County Exhibit Bldg., east of Midland on Highway 80

†ARRL Hamfest

on the north side. Preregistration is $5; $6 at the door; tables are $6 per table. Talk-in on 16/76 and 33/93. For further information and reservations, please contact Midland Amateur Radio Club, P.O. Box 4401, Midland, TX 79704.

Texas (San Antonio) — April 7: San Antonio Area Radio Clubs are having their first annual swapfest and barbecue on April 7 at Comanche Park, from 7 A.M. to 5 P.M. Talk-in on 147.36. Send for details to Melvin Anderson, 8932 Saddle Trail, San Antonio, TX 78255.

Vermont (Milton) — March 4: The Northern Vermont Electronics Show will be held on Sunday, March 4, from 9 A.M. to 3 P.M., at Milton High School. Flea market, talks on Ham in Space mission and computers, demonstrations, and Novice tests. Sponsors are the Burlington ARC and the Essex Junction RC. For more information, call Horace, N1HC, at 802-893-7078.

Washington (Puyallup) — March 10: The Mike & Key ARC is sponsoring its 3rd annual electronics flea market and computer show on March 10. The event will be held in the 20,000-sq-ft EXPO Hall at the Puyallup Fairgrounds. Admission is $2, and tables $15. Commercial space available. Call Deborah DeJohn, N7AVO, at 206-883-3012 for table reservations. Talk-in on 146.58 and 147.08.

Wisconsin (Jefferson) — March 18: The Tri-County ARC will hold its annual hamfest on March 18, from 8 A.M. to 3 P.M., at the Jefferson County Fairgrounds. Tickets are $2.50 in advance and $3 at the door. Tables are $3 in advance and $4 at the door. Free parking and plenty of food. Doors open at 7 A.M. for sellers only. Talk-in on 52, 22/82 and 144.89/145.49. For more information, advance tickets and tables, send an s.a.s.e. to Bob Barker, K9RIJ, 724 Burdick, Milton, WI 53563.

Wisconsin (Omro) — March 25: The 4th annual O.A.R.C. Auction, sponsored by the Oshkosh ARC, will be held on March 25, from 11 A.M. to 4 P.M. at the Winro Hall. Setup starts at 9 A.M. OARC charges 10% commission on all sales. Auction items must have a $15 minimum value. Professional auctioneer; new, larger location (no stairs); free parking; food and drinks available. Tickets: $3 at the door, $2 in advance. For advance tickets, send $2 per ticket and an s.a.s.e. to Tickets, K9WWW, 1646 Michigan, Oshkosh, WI 54901. Deadline is March 11. Orders without s.a.s.e. will be held at the door at buyer's risk. Talk-in on 147.945/345.

Wisconsin (Madison) — April 8: The Madison Area Repeater Assn., Inc. (MARA), is pleased to announce its 12th annual Madison Swapfest, to be held on Sunday, April 8, at the Dane County Exposition Center Forum Bldg. Doors open at 5 A.M. for commercial exhibitors, 8 A.M. for flea market sellers, and at 9 A.M. for the general public. Over 20,000 sq ft of space, as well as plenty of parking in the adjacent paved lot. Hotel accommodations available within walking distance. A large variety of equipment and components for hams, computer hobbyists and experimenters. Admission is $2.50 per person in advance and $3 at the door. Children 12 and under admitted free. Flea market tables are $4 each in advance and $5 at the door. Be sure to reserve early — tables were sold out last year. Talk-in on 16/76. For reservations or more information, write to MARA, P.O. Box 3403, Madison, WI 53704.

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.

Club Corner

Conducted By Sally O'Dell,* KB1O

YOUR CLUB PROGRAM

Are your club meetings stale? Do members show up for two meetings and never come again? No matter how strong your club is, attendance probably varies. Even a few slow months can cause a small club to disband. Here's a suggestion to bring your club back to its peak: Improve club meetings.

Important information can be included in the *short* business meeting. Having an agenda is valuable. (This list is sometimes included in the club bylaws.) Begin with introductions around the room, followed by a brief synopsis of the minutes from the last meeting. Then, listen to the officer and committee reports. Old business (unfinished from previous meetings) is followed by new business (not brought up at a previous meeting). A skillful president can proceed through most of this quickly to the next order of business, the program for the evening. Finally, there's adjournment, followed by refreshments and ragchewing.

Sometimes, the program chairperson searches for a program but comes up blank. Then comes the announcement, "I couldn't find a speaker for the meeting tonight, so there's no program." The program doesn't have to be a speaker every month. Here are some suggestions:

Talks by outsiders. Members of the ARRL official family, such as ACCs, SMs, EC and QSL bureau persons, or others, such as DX visitors, radio engineers, telephone and power company engineers, radio station executives and other experts in related fields can present subjects of interest to the club.

Talks by club members. Demonstrations of home-built gear or net operation and message-handling procedures, talks on contest operating and a series of lectures on radio theory for general advancement are all appropriate.

Open discussion. Questions are proposed by a member and discussed by all as everyone takes a turn. When a satisfactory answer is approved, another question is proposed.

Audiovisual shows. Local power or telephone companies frequently have movies or slide shows available and will display or lend free films. Entertainment films can be rented for a nominal fee. The ARRL library has videotapes, slide shows and films available on a "you-pay-return-postage" basis.

Contests. Attract attendance and interest with a code-speed or diagram-drawing contest.

Visitor night. This once-a-year program focuses on people who are interested but not yet licensed. It can also serve as an introductory meeting between club members and other local hams.

Old-timers night. This special program concentrates on your members who have been licensed a while. If your club consists of mostly newer members, one or two members may wish to present an Amateur Radio history program.

Miscellaneous programs. (1) A club auction can be fun *and* profitable for everyone. Members bring their surplus gear and parts to be auctioned off to the highest bidder. (2) Bunny (hidden transmitter) hunts. Plan your next bunny hunt well in advance. Be sure everyone knows the rules before you begin. A new videotape in the ARRL library (*All China Amateur Radio Direction Finding Competition*, VT-28) was produced by the Japan Amateur Radio League and depicts an exciting transmitter hunt on foot in China. The tape is in VHS format and is available to affiliated clubs and members. (If you are not familiar with the library, write for additional information.)

All program suggestions are designed to help you plan your next few programs. These ideas don't cover every area, but may help the next time your program chairperson says "no program this month."

*Club Program Manager, ARRL

SSC Kudos and Contacts

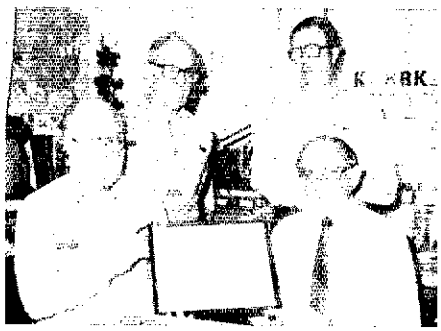
Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Falmouth Amateur Radio Assn., Inc.
c/o 51 Barnabas Rd.
Falmouth, MA 02540
Club membership — 87

Greater Toledo Amateur Radio Assn., Inc.
c/o P.O. Box 498
Toledo, OH 43601
Club membership — 95

Key Beepers of Sedro Woolley High School
c/o 3rd and Nelson
Sedro Woolley, WA 98284
Club membership — 29

Okaw Valley Amateur Radio Club
c/o P.O. Box 247
Greenville, IL 62246
Club membership — 34



Newly affiliated Iron Range Amateur Radio Club (Michigan) celebrated their affiliation with a charter party. The club officers are (l-r) Vice President WD9JHW, Secretary KA8PNL, Treasurer KA8TDR and President NE8Y (seated).

Correspondence

Conducted By Peter R. O'Dell,* KB1N

STS-9

☐ (An Open Letter to Dr. Owen Garriott, W5LFL). This is to acknowledge that on several occasions, you were heard within the walls of my radio shack in the past week! Now, on the other hand, I have my doubts that I was heard in your shack. Maybe my melodious voice is on your tape; however, chances are slim, so that is why I'm conversing with you on paper. Not that I didn't give it the old college try, either. I spent more time with you and W1AW RTTY bulletins than I spend watching my soapies! The shack is upstairs and the carpet on the stairs is shaggier now than it was a week or so ago!

Every time I heard you, I just hollered my heart out and if you would have come back with KA8MJY, I would have had heart failure! My husband was beginning to think that you and I had "something going!" I may or may not be on your tapes somewhere, but whether or not, I just wanted you to know that in Southern Ohio, you have an admirer who chased you across the skies in December of 1983. W5LFL will be a call that will long be remembered in the world of Hams. I'm sure your experience will be something that you will cherish as long as you live.

It was a challenge and a pleasure for myself and others to "try our luck." You make sure, that on the next mission, there is a Ham Operator aboard and then *you* will have *your* chance to chase him or her across the skies.

For myself and the thousands of Hams across the world, you certainly did enhance the art of Ham radio! — *Sylvia Havs, KA8MJY, Oak Hill, OH 45656*

☐ I would like to express my appreciation to the League for their help with the publicity packets regarding the Space Shuttle "Columbia" and the ham activity of Owen Garriott aboard.

We had excellent press coverage in this area from The Sun City *News-Sun*, (front page) as well as the Sun City *Independent* and the highly circulated Phoenix *Gazette*.

The Sun City Amateur Radio Club involvement in STS-9 included the construction of seven special turnstile antennae which were deployed around the city. Would hope that at least one of our local hams made it into Owen's tape recorder. It was a great thrill in any event when we first heard him coming through. We were able to tape four of his transmissions on various passes. — *Edward Blaszczyk, N7EB, Sun City, Arizona*

☐ Every amateur is aware of the various classes of amateur *licenses*. The recent major events involving amateur radio have shown, however, that there are several different classes of amateur *operator*.

During the Grenada incident, first class operators monitored the frequencies used, resisted the urge to transmit, and allowed those directly involved in the operation uninterrupted access to the frequency. Second class operators broke in, asking if they could "help," or wanting to know what was "going on" — enough so that the FCC had to authorize out-of-band operation for those really involved.

Likewise, during the recent STS-9 event, first class operators monitored the ARRL bulletins and nets, poured over orbital calculations, and made sure that they had all of the information necessary to correctly work the shuttle. They resisted the urge to transmit on 145.55, knew to transmit only on the odd minutes, and generally followed the guidelines set down. Second class operators didn't do their homework, didn't know the frequencies, times and procedures (although they were perhaps the major topic of conversation of the repeaters for the last two weeks) and got embroiled in heated arguments on the downlink frequency, destroying their chances for a successful contact or reception. — *Jonathan W. Pearce, WB2MNF, Medford, New Jersey*

☐ I think your readers will enjoy this, heard on the downlink, after a long period of inactivity: "Hello, this is Lawrence, Kansas . . . Is anybody out there?"! — *Bob Lee, WBØUBL, Mt. Vernon, Iowa*

☐ W5LFL in the Spacecraft *Columbia* was to be one of ham radio's finest hours. Never had anything been hyped so much. The news coverage was fantastic. For months the frequencies had been published. Everyone was giving updates: ARRL, Goddard on HF freqs., Houston on HF freqs., local 2-meter nets, the transcon 2-meter net, and on and on. Could there have been a single ham left who did not fully understand the drill? Obviously!

I monitored the downlink frequency for most of the day and evening during much of *Columbia's* flight. What I heard was the most disgusting display of ignorance and lack of common courtesy I have ever monitored on the ham bands. Anyone in a big city heard the same nonsense, so I need not list the specifics.

All this talk about code vs. no code and "canned" test questions seems to be missing the point. The *Columbia* fiasco, among others, seems to point to the need to give an *intelligence* test to prospective hams.

All in all, the conduct of hams in this "shining hour for ham radio" was abysmal. The next time, I'm sending a message to the spacecraft by Federal Express and spend my time more productively. — *Richard Rhodes, KH6IO, Dallas, Texas*

☐ Thanks for the Press Kit on the Shuttle and Amateur Radio. We put the kit to good use, especially the sheet indicating when Owen would be passing over. We also talked on our show about Amateur Radio and how it was possible to make contact with the Space Shuttle. I was able to record at home on my own rig several transmissions from W5LFL which we played back on the air. The transmissions from his 4:18 P.M. pass Tuesday, December 6 were of excellent quality to put on the air.

Thanks again for your help in bringing this fascinating event to our listeners' attention. — *Dick Stout, KA9PGS ("Breakfast with Dick & Ellen," WBCS), Milwaukee, Wisconsin*

☐ The recent STS-9 ham in space operation was a total disaster for amateur radio. There could never, in the history of our hobby, have been anything so detrimental to the amateur community. It is unfortunate that those who were instrumental in cutting red tape, so as to allow W5LFL to operate from space, did not have the foresight to realize that what they were doing would set amateur radio back, in the public's eye, to the dark ages of time. How *quickly* and *easily* so much good effort can be torn to shreds and, by only a small percentage of the whole.

In spite of all the informative articles, chit chat on repeaters, on HF, in person and via a lot of media coverage, we had a large number of hams that persisted in attempting to make a contact with W5LFL on his transmit frequency! The effort at policing, justified or not, resulted in utter chaos. Profanity, name calling, unidentified transmissions and, in spite of well meaning "policemen," supposedly good operators just went right ahead and kept on with their attempts at making a contact on the publicized listening frequency while the "policemen" continued to make the situation worse. — *Al Berg, WB7SIC, Beaverton, Oregon*

☐ Thanks to NASA and W5LFL for an exciting time in Amateur Radio.

Some Hams say it was the darkest time. That may be true in some areas. However, in this area, I found that although there were some Hams who, in the excitement, transmitted on the downlink (including myself for a brief time), and a few jammers, generally everyone was courteous.

I found that, in most cases, the most interference on the even minutes was from Hams who were telling people to get off the downlink frequency.

Now that we are over the first experience, let's all hope that this is the first of a long list of "Ham in Space" projects. — *Jay Maines, N6IGI, Pacifica, California*

NO-CODE: THE END

☐ I would like to thank you personally for your efforts and success in our battle against the codeless class license. We must continue to fight in order to maintain the high standards of Amateur Radio. My personal pledge, along with many others in our club, was to renew our ARRL memberships to show our support for the League. — *David Adams, Sr., WD5BZO, Little Rock, Arkansas*

☐ I feel that FCC's denial of this action is almost 100% due to the outstanding effort by the League and its officers and hearty congratulations are in order to all those involved. I wish that I could shake the hands and offer my personal kudos to each individually. — *Dan Umberger, W8ZCQ, Columbus, Ohio.*

☐ On behalf of the Randolph Amateur Radio Association, I congratulate the ARRL on a job well done in eliminating the no-code license proposal.

RARA feels that the no-code proposal is contrary to the fundamental ideas and principles that have made Amateur Radio the fine hobby it has been for many years and will continue to be for many to come through the outstanding efforts of the League.

President Clark would have been proud. — *Jeff Naylor, N9DGO, Secretary, Randolph ARA, Winchester, Indiana*

W4KFC

☐ You and our other colleagues who paid

*Public Information Coordinator, ARRL

tribute to Vic Clark in "It Seems to Us . . ." did so with style and grace; I commend you for it. Just a week before his death, my XYL and I enjoyed visiting with Vic at the Radio Club of America banquet. It was a pleasant opportunity to renew a friendship that dated back to hamfests at Jackson's Mill in West Virginia many years ago.

To the end, Vic was a gentleman, a leader, an outstanding amateur, and — most of all — a friend. His now silent key blazed a remarkable trail through a lifetime of accomplishment. Amateur Radio and all of us are better because he passed our way. — *William R. Gury, K8CSG/5, Houston, Texas*

☐ It is with considerable difficulty, and with the tears flowing, that I write you this time. I just received my January issue of QST.

The night before receiving it, I had a dream that Vic's photo would be on the cover, and sure enough it was. The tribute that QST, and you, have paid to Vic was done in a superb way. Certainly no set of words could describe the Man, and what he has done for Amateur Radio.

My own Amateur Radio career was fortunate enough to be aligned with one of Vic's primary interests . . . that being DXing and Contesting. Over the past almost 3 decades I was able to work him many times, and I always had a lump in my throat when doing so.

Also over the years, I was able to spend some personal time with him at hamfests and Conventions. Most recently I had the opportunity to spend some private time with him at the ARRL National Convention in Houston. In August, we both attended the annual Arizona hamfest in Flagstaff, where I grew up. We both competed in the CW receiving contest there.

The loss of Vic to Amateur Radio is incalculable. He is a loss to mankind. He is also a personal loss to me, since he was my own Grand Elmer. He was W7RFE's Elmer in Phoenix in the late 1930's, and Rich was my Elmer in the mid-1950's when I was growing up in Flagstaff.

I will miss Vic, and I will cherish the knowledge that I am an Amateur Radio Operator because of him. — *Dale D. Jones, K5MM, Lewisville, Texas*

☐ I recall what may have been my last radio contact with Vic. We encountered each other one New Year's Eve, while operating Straight Key Night. In that CW operating event, all participants vote for the best "first." When SKN results were published in *QST*, I looked to see if I got any "first" votes. I wasn't listed, but W4KFC was. Using an antique key, Vic placed second in the voting. That key is silent now. I shall miss him. He touched my hobby and my life. — *Mike Bellinger, KØUAA, Heart of America Radio Club, Kansas City, Missouri*

ARE YOU AN APATHIST?

☐ This letter is in reference to the "It Seems To Us" in the December 1983 issue of QST. In the ninth paragraph you bemoan the fact that there are amateurs who are apathetic. This is a common situation in any hobby or professional organization. Count your blessings (the membership) amongst which are those of us who are apathetic. Any large group, either hobby or professional, will have three levels of membership: (1) the paid full-time staff, (2) the unpaid who devote much time, money and effort to the group activities (semipros), and (3) the apathetic. I am one of the apathetic group. I believe that most of us apathists have held a license for a long time, and have other interests besides ham radio. I tinker around, build kits and get on the air when I feel the urge, and always read *QST*. If this bugs you pros, I am sorry.

Now that I have gotten rid of my minor bellyache, I have a suggestion to make. You have successfully started a new publication, *QEX*, which is very good and answers a need. I suggest that you start another publication, which would be devoted to the phases of Amateur Radio that are very popular and highly structured, such as: third-party traffic handling, emergency nets, contests, DX, etc. It would, of course, be named *QRL*. This would leave *QST* the job of taking care of general news, general theory, newcomers, and probably all of the low-frequency techniques. Each ARRL member would get one of the three publications, and the others for additional fees. — *Norman S. Land, Lovingston, Virginia, W4KOM*

IT DOES COMPUTE

☐ *Please* keep the computer articles on the front burner. So far, they have been super. Could consideration be given to a monthly column to keep us abreast of the latest developments?

The computer (as applied to Amateur Radio) is the greatest thing since the wheel and sliced bread — they have FUTURE pasted on every side. — *Ray Haney, WA0FZM, Bellevue, Nebraska*

[Editor's Note: On Line, the computer column that has run every other month in *QST*, will soon appear two months on, one month off. We hear you!]

HAM OR AMATEUR?

☐ In response to the letter from K8SS in January *QST*: I looked in my Webster's *New Collegiate*. Ham: A licensed operator of an amateur radio station. Amateur: One lacking in experience or competence. One who follows a pursuit without attaining proficiency or professional status. Oh well, what's in a word, anyway. HI. — *Ron Desautels, KQ6X, Canyon Country, California*

ANOTHER RARE ONE

☐ Yesterday, I was more than delighted to hear a 2-lander on the West Coast announce that he had just received his "14th, 15th or 16th" QSL card from China. I was even more impressed to hear him say that he "routinely" works all 40 zones in the major contests.

With this much humility, I'm just glad this individual is not sitting in 9-land with a "rare" prefix. — *George M. Winford, KL7VZ, Fairbanks, Alaska*

HABITS

☐ I think it is about time we brought back "The Old Man" for a lecture on rotten signals. I've come to the conclusion that the speech compressor is one of the worst ideas that has come to ham radio, as most operators seem to have no idea of how to use them properly. The number of over-compressed signals on the band is a disgrace!

Since SSB has taken over, few of us use monitors so please, fellows, get someone to give you frank quality reports and cut back on the compression and overdriving. — *Jack Fulmer, W4YF, Ponte Vedra Beach, Florida*

☐ One of the more recent operating trends that really troubles me is the increasing SSB activity at the low end of 10, 40 and at times, even 80 meters.

Many of these stations splatter, appear to be running very high power, fail to use call signs, and come up on frequencies already in use by Morse operators.

Although these stations are apparently outside of the U.S., I try to remind myself that this lax style of operation began and is still permitted on the FCC-created Citizens Band.

My only suggestion is that we make it a point to devote some of our operating time to CW on the affected bands. Since SSB requires a wider bandwidth than does code for comfortable operation, increased Morse activity will encourage these "operators" to move.

Simply operating our stations in a friendly yet proficient manner may be the single most important contribution to Amateur Radio that any of us can hope to make during the months ahead. — *Bob Zittnan, K9UJA, Schaumburg, Illinois*

WHAT'S A KEEBREEDER?

☐ "Quick, Henry — the Flit! The Keebreeders are here!"

A Keebreeder is an individual who has transferred his Pac-Man expertise to a keyboard, which is wired to an amateur-band transmitter, with a readout device that is wired to an amateur-band receiver. (Keebreeder, short for keyboard-reader.)

He is further characterized by a distressing tendency to run his speed control at 50 WPM, even in the Novice band, and by making derisive remarks at straight CW operators who may not print out 100 per cent on his screen/reader; never mind that the two guys on bugs or straight keys are copying each other solid. This insect will come in on top, or in between, sending "LID," "QLF," and "IDIOT" when he is unable to pick up the gist of the ongoing QSO. In so doing, of course, he is telling you his first, middle and last names.

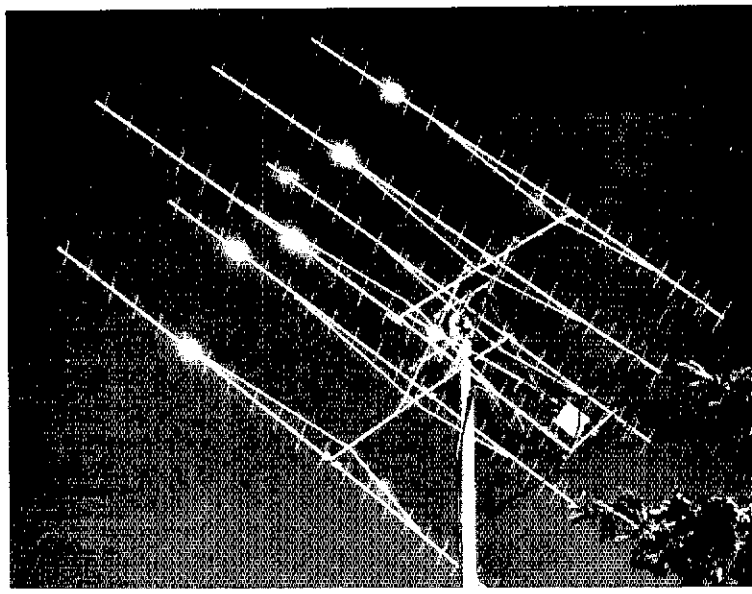
He can be heard on SSB telling all and sundry how much fun he is having, working CW, and how he can "burn 'em down." But this fellow is no more working CW than a guy lip-synching Caruso is singing opera. The Keebreeders do not know, from the time they tap the keys on the keyboard, what happens. They might as well be on RTTY, FAX, or hard-wired to the other guy. Same deal.

The Keebreeder is an unfortunate mutant, spawned by technology. He can easily be discovered . . . This guy with the perfect 45 WPM signal suddenly cannot read someone who jazzes up his sending a bit, changing the dash lengths, the spacing, and sending out-of-proportion dots to dashes . . . in other words, CW, as it is known in the real world. While the two OT brasspounders are reading each other solid, he is unable to participate, as he gets gibberish on his screen.

I am not attacking the keyboard. It has its place, and it is sure nice copy. But the Keebreeder is distinguished by his lack of tact or courtesy, an inability to read code without machine help, and by forays into the Extra Class portions with bogus, or no, call sign.

But we will overcome. After all, keyboards don't kill CW — people do. — *A. W. "Bill" Edwards, K5CN, Corpus Christi, Texas 78412*

Results, Seventh ARRL International EME Competition



From Alaska, "the last frontier," KL7WE's 6 × 22-element Yagis search the sky for signals from another frontier.

By Edith Holsopple,* N1CZC

The tide is turning as more and more stations become equipped to join the once elite group of radio-lunarians. EME enthusiasts in many parts of the globe fought high winds and stormy weather to work other EME stations in the Seventh ARRL International EME Competition. Participation is rising, as this year we received 123 logs from the October 29-30 and November 26-27, 1983 event.

Weather systems did not cooperate as much this year as last. K2UYH rated the 1983 conditions as average at best and even poor at times. In Europe, he reported, weather conditions were at their worst during the November weekend with rain and hurricane force winds present over much of the continent. Working EME stations is the ultimate challenge of amateur radio. For more information, see the *Radio Amateur's Handbook* and *The Lunar Letter Magazine*, 312 12th Ave. S., Nampa, ID 83651, and write to Allen Katz, K2UYH, editor/publisher, *432 and Above EME News*, c/o Department of Engineering Technology, Trenton State College, Trenton, NJ 06825.

This year the single-op 2-meter-band category was again the most populous, accounting for over half of the entries received. WA1JXN/7 retained his position as the leader of the pack, beating his last year's score by 165,000 points and working 19 more stations. Fifty-eight percent of his contacts were with DX stations. W5UN was right on his heels, with the same number of contacts but with two fewer multipliers.

DL9KR was the star of the 432 MHz band, working 86 stations after rebuilding his antenna. N9AB shared the limelight by completing 83 QSOs, all on random. Activity levels were superb on this band both weekends, and things stayed interesting with the appearance of many new stations.

The EA2BK team was very happy to complete the first EME QSO on 432 MHz from Spain during the contest.

On 1296 MHz, activity was incredibly slow, with only three logs received. According to K2UYH, N6CA achieved just about the ultimate in low-power EME QSOs. Using a single water-cooled 7289 (160 W at the antenna) and 16 × 24-element loop Yagis, he worked VE7BBG (O/O) on random. Chip also copied K2UYH (2-dB peak), W7GBI (4-dB), K4QIF (2-dB) and OE9XXI (1.5-dB).

The highest position in the multiop division was taken by another EME pioneer K2UYH, up from third last year. This score is impressive, especially considering that none of the contacts were on 144 MHz. OZ1EME zoomed up to second place from seventh last year.

Congratulations to all who conquered the difficult and made at least one EME contact. Certificates should be in the mail by the end of March.

SOAPBOX

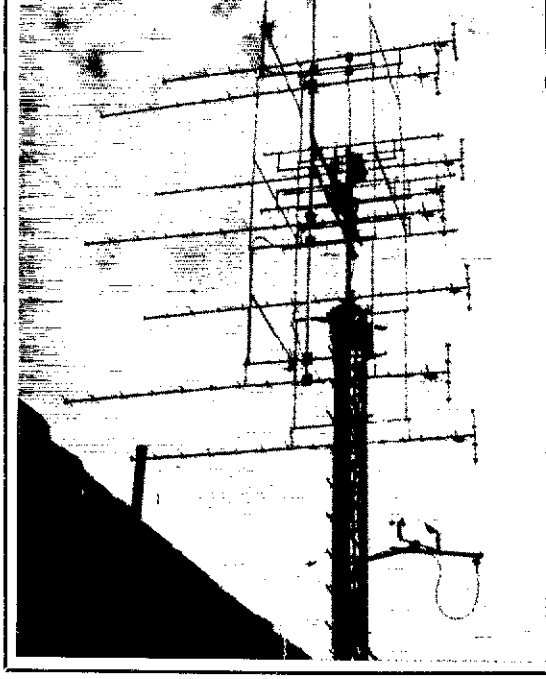
Selective scheduling produces a significant scoring advantage (N4GJV). I get rather perturbed to hear the fellows in the southern part of the country complaining about the heat and sunlight while I am dressed up in fur lined parkas and face masks with a blow torch trying to heat up electrical tape in a 40-mile wind. Anyone for checkers? (K1WHS). As we move away from the sunspot maximum, the auroras are much less frequent and so the conditions should become more stable. At last we are spreading out on 432 away from .010 (G3LTF). The November part was severely hampered by a stormy weather situation (DJ8QL). Conditions were very changeable, mostly bad. I worked 42 new stations (YU3USB). This was the best contest for EME yet. Both weekends were clear and 70 degrees (WA4NJP). The test was nice, but conditions were very poor here in the first part. Why not have two contests, spring and fall (SM4IVE). It was a hard fight against the monstrous antenna stations (SM4GVF). QRM was incredible at times. Imagine 2 meters from Connecticut sending QRZ THE SM4 ONLY PSE (K1FO). I had lots more fun this year with a big antenna. I could not operate the second weekend because of holiday/family commitments (W7IUV). The last weekend of November I operated in a blizzard with a manually aimed antenna. Try keeping an array on the moon in driving snow and 50-mph winds. Eleven of the 45 contacts were with other 4 yagi stations. This is very good considering that WB0COR and GW3NYY were using only four Junior Boomers and were 1.5-2 dB down from my four yagis (KX0O). I would like to see an indication of the antenna system used by each station (DJ5DT). If you run high power you need a "high power RX" and a brain. I have the first but I'm still trying for the latter, as I find it hard to get call signs from a weak pileup (G4DZU). I spent much time listening and getting familiar with the antenna. Many hours were completely dead — like the moon had disappeared (K9MRI). I operated only the October weekend. My antenna relays failed just before the second weekend. I lost two

*Communications Assistant, ARRL

GaAsFETs and two MOSFETs before deciding to quit and rebuild the whole works (K2QR). The weather just could not have been any worse! (60-mph gales and torrential rain). I was out at 2 A.M. on both mornings, struggling in a sea of mud to lash down the antennas with ropes (GW3NYY). Moonbounce is supposed to be synonymous with problems, right? . . . I enjoyed it immensely. I'm hooked. Now bigger and bigger amp, ant., etc. (K9RX). The nowadays crowded community behaved politely. I was crazy enough to rebuild the antenna completely, sometimes working in the dark and sub-zero temperatures. The antenna survived its initial test — 85-mph gusts. Thanks for another fine contest (DL9KR). I enjoyed my first EME contest very much. I would like to see the multipliers changed to include each state as a multiplier, instead of the call areas (WØRRY/5). There were also heavy winds in west and central Europe at this time (Switzerland winds peaked at 125 mph!) and kept off many EME activities (OE9PMJ). The appearance of KL7WE shortly after our moonrise caused a heated argument as to whether he could be genuine, but we managed to convince ourselves that he was genuine and worked him. Being a long way to the north must give you a very different perspective on the moon (G4EZN). As newcomers in EME, it seems to be difficult to be heard. Even if DK8MA/p was a real portable station (antenna was built up one week before contest, operator shack was a trailer coach), we all thought that the contest time in autumn was chosen very well. But after antenna breakdown during the second weekend, we weren't sure at all (DB5ML). Our results are much better than last year. The conditions were "FB" during nighttime, but during one hour at the sunrise time they went down and nobody was heard. After that, conditions here in Saturday were poor; on Sunday good, with lots of QSB. Really, we think that a contest with more nighttime would be better (EA3LL).

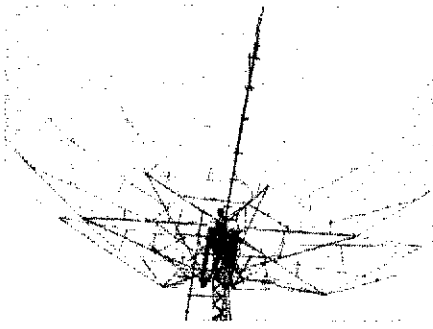
Antennas Used by Leading Stations

Class	Call	Antenna
Single Op, Multiband	K9HMB	16 × 19-el Yagi (144 and 432) 8 × 11-el Yagi (220)
	OE5JFL	(not specified)
	YU1AW	12.2-meter dish (144 and 432) 6.5-meter dish (1296)
	HB9SV	16 × 16-el Yagi (144) 16 × 21-el Yagi (432) 4-meter dish (1296)
	N4GJV	16 × 3-el quad (144) 16 × 13-el quagi (432)
Single Op, 144 MHz only	WA1JXN/7	12 × 19-el Yagi
	W5UN	(not specified)
	SM2GGF	16 × 15-el Yagi
	SM7BAE	(not specified)
	YU3USB	24 × 12-el Yagi
Single Op, 432 MHz	DL9KR	16 × 13-el Yagi (Oct.) 16 × 20-el Yagi (Nov.)
	N9AB	16 × 19-el quagis
	WØRRY/5	8 × 21-el Yagi
	JA6CZD	30-ft dish
	W6ABN	24-ft dish
Single Op, 1296 MHz	WA8NLC	17-ft dish
	ZL3AAD	(not specified)
	N6CA	16 × 24-el loop Yagis
Multiop	K2UYH	28-ft dish
	OZ1EME	12 × 9-el Yagi
	OE9XXI	25.5-ft dish (432 and 1296)
	I5MSH	11-meter dish
	G4EZN	40-ft dish
Commercial	K3NSS	84-ft dish

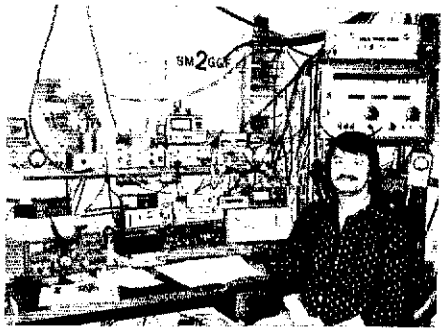


DJ6MB used this 8 × 20-element Yagi to work on 432 MHz.

Dr. John W. Thompson, K3MD, operated 2 meters from here.



JA6DR worked 40 stations with the help of this 40-ft dish.



Evald Karlsson, SM2GGF picked up third place on 2 meters.

Scores

Scores list: call, score, stations heard, stations worked, multipliers, band (A — 144 MHz; B — 220 MHz; C — 432 MHz; D — 1296 MHz).

Single Operator

Multiband

K9HMB	715,500	114	114	37-A
		1-	1-	1-B
		20-	20-	15-C
OE5JFL	423,000	74-	74-	28-C
		94-	94-	45-D
YU1AW	377,300	22-	22-	19-A
		48-	48-	24-C
		7-	7-	6-D
HB9SV	315,000	40-	40-	23-A
		32-	32-	17-C
		3-	3-	2-D
N4GJV	248,400	43-	20-	13-A
		65-	49-	23-C
K1WHS	241,800	77-	77-	30-A
		1-	1-	1-B
G3LTF	176,700	80-	47-	22-C
		11-	10-	9-D
F6BSJ	100,800	28-	28-	22-A
		8-	8-	6-C
SM3AKW	74,400	10-	10-	5-A
		21-	21-	16-C
JA6JCJ	58,000	37-	29-	20-A
		3-	0-	0-C
W4WD/7	57,200	9-	9-	8-A
		2-	2-	2-B
		15-	15-	12-C
K4QIF	54,000	20-	20-	14-C
		7-	7-	6-D
K9XY	47,500	36-	20-	14-A
		6-	5-	5-B
VE7BBG	32,300	4-	4-	4-C
		15-	15-	13-D
VK5MC	12,000	7-	7-	6-C
		5-	5-	4-D
DJ8QL	7200	6-	6-	6-C
		3-	3-	2-D

144 MHz Only

WA1JXN	528,900	134	129	41-A
W5UN	503,100	129	129	39-A
SM2GGF	467,400	123	123	38-A
SM7BAE	387,600	107	102	38-A
YU3USB	385,200	121	107	36-A
WA4NJP	357,200	94-	94-	38-A
KB8RQ	290,500	83-	83-	35-A
YU3ZV	281,800	77-	77-	34-A
SM5FRH	244,900	79-	79-	31-A
OH7PI	183,000	61-	61-	30-A
SM4IVE	182,900	59-	59-	31-A
SM4GVF	167,400	54-	54-	31-A
F6CJE	156,800	56-	56-	28-A
K1FO	156,000	67-	60-	26-A
W7IUV	124,800	58-	48-	26-A
KX8O	117,000	45-	45-	26-A
K8MYC	116,100	43-	43-	27-A
DJ5DT	100,000	52-	40-	25-A
UA1ZCL	98,400	41-	41-	24-A
OK1MBS	93,600	36-	36-	26-A
JA6DR	92,000	40-	40-	23-A
Y22ME	86,400	47-	36-	24-A
OK2TU	81,600	34-	34-	24-A
UA3TCF	69,300	65-	33-	21-A
W5LUU	80,000	46-	30-	20-A
K2OS	49,400	38-	26-	19-A
WA8ZHE	42,500	25-	25-	17-A
G4DZU	35,200	30-	22-	16-A
WD8ISK	34,500	39-	23-	15-A
SM5CFS	28,600	19-	19-	15-A
ZS6AVL	25,200	18-	18-	14-A
N6AMG	25,200	18-	18-	14-A
KG6DX	23,800	23-	17-	14-A
WØRWH	23,400	24-	18-	13-A
OH5IY	22,100	17-	17-	13-A
WA4CQG	22,100	17-	17-	13-A
K9MRI	20,000	20-	20-	10-A
W9BOZ	18,000	15-	15-	12-A
W7HAH	16,800	14-	14-	12-A
W7HAH	16,800	14-	14-	12-A
DL2OM	15,400	32-	14-	11-A
GM4IPK	15,400	28-	14-	11-A
LX1GR	15,000	15-	15-	10-A
DK4MM	14,300	30-	13-	11-A
WB8PAT	13,000	24-	13-	10-A
KE5C	12,100	11-	11-	11-A
OK1KRA (OK1GO,opr.)	12,000	25-	12-	10-A
K2QR	12,000	12-	12-	10-A
WA3DJG	7200	9-	8-	8-A
F1HI (F6DRO,opr.)	7000	29-	10-	7-A
K5WE	7000	10-	10-	7-A
GW3NYY	5400	14-	9-	6-A
OZ1ASL	4800	8-	8-	6-A
VE3EQQ	4800	8-	8-	6-A
EA3ADW	4200	25-	7-	6-A
K9RX	4200	12-	7-	6-A
K3MD	4200	10-	7-	6-A
K9TI	4200	7-	7-	6-A
W2CNS	3600	6-	6-	6-A
W7ID	3600	6-	6-	6-A
WB8CDR	3600	6-	6-	6-A
K7KOT	3000	6-	6-	5-A
K1BKK	2900	7-	7-	4-A
XE2BC (WB6NMT, opr.)	1600	8-	4-	4-A
W5UWB	1600	7-	4-	4-A
WB8ART	400	2-	2	2-A
GM4JJJ	100	15-	1-	1-A
SM3LBN	100	1-	1-	1-A

432 MHz Only

DL9KR	275,200	86-	86-	32-C
N9AB	257,300	83-	83-	31-C
WØRRY	246,400	77-	77-	32-C
JA6CZD	134,400	56-	56-	24-C
W6ABN	71,300	32-	31-	24-C
JA4BLC	62,700	33-	33-	19-C
DJ6MB	57,000	30-	30-	19-C
KL7WE	53,200	37-	28-	19-C
JA9BOH	39,000	26-	26-	15-C
DK1PZ	32,200	43-	23-	14-C
G3SEK	32,200	24-	23-	14-C
F2TU	30,000	20-	20-	15-C
W5ITI	24,000	16-	16-	15-C
SP5CIC/SMØ	23,800	28-	17-	14-C
N2CB	22,500	15-	15-	15-C
WØRAP	18,000	36-	15-	12-C
SM5CPD	15,000	15-	15-	10-C
DF7VX	9000	16-	10-	9-C
DF6NA	3600	6-	6-	6-C
W1ZX	3600	6-	6-	6-C
JA7UIQ	2000	12-	5-	4-C
ZL2AQE	1600	4-	4-	4-C

1296 MHz Only

WA8NLC	11,000	11-	11	10-D
ZL3AAD	3600	6-	6-	6-D
N6CA	100	8-	1-	1-D

Multioperator

K2UYH (+ W3GPY,WB3ESS)	555,900	7-	7-	4-B
		89-	83	31-C
		24-	19	16-D
OZ1EME (OZs 1FTU,2GZ,5IQ,oprs)	306,000	90-	90	34-A
OE9XXI (OE9s MCI,PMJ,oprs.)	196,000	54-	36	20-C
		21-	20	15-D
I5MSH (I5s MZY,TDJ,W1CJ,oprs)	147,500	59-	59	25-C
G4EZN (+ G3IOR,G4JNX)	140,000	61-	56	25-C
OZ5VHF (OZ1s BGQ,EXZ,OZ4MM, oprs)	96,000	40-	40	24-A
DK8MA/P (+ DB5ML,DL1MBV, DL8MAS,DL9MCC)	78,200	10-	10	9-A
		24-	24	16-C
EA3LL (+ EA3AEO)	66,000	66-	30	22-A
W8SD (+ WB8TEM)	45,600	8-	8	7-B
		16-	16	12-C
F1FEN (+ F1GHU,F6s GRB,GRC, IED,F9HS, oprs.)	30,800	22-	22	14-C
UK5JAX (UB5s JIN,JMR,JW,oprs.)	24,700	49-	19	13-A
YU3DAN (YU3s HBW,ULM,UMV, oprs.)	13,000	13-	13	10-A
EA2BK (EA2s AFM,AVY,HO,LU)	7000	16-	10	7-C
LA1K (LA9MW,LA9UX, oprs.)	1200	8-	4	3-C

Non-Amateur Equipment

K3NSS (K3LFO,W1ZX,oprs.) 10,800- 12- 12- 9-C

SWL

PA-3249 (26 stns-144 MHz)

Check-Log

I2ODI

Public Service

Conducted By Robert J. Halprin,* K1XA

Slow Nets

If you are a CW operator anxious to increase your sending and receiving skills, an ARRL slow-speed traffic and training net in your locality may be just what you need to smooth out that fumbling fist. What's a slow-speed net? Remember back when you were first licensed and ARRL Hq. sent you *New Ham News?* One of the issues contained information on trafficking, but perhaps it was misplaced. Never mind; stick around and learn some of the things slow nets have to offer.

"Traffic and training" say a lot about the basic purposes of these nets. They offer a way for the neophyte CW traffic handler to send messages across the state or across the country at a comfortable 10 WPM or less. It is also a means of training, both in code speed and in traffic handling.

These nets are not limited to slow-speed operators. In fact, the workhorses of slow-speed traffic nets are usually experienced traffic handlers who can be found on the National Traffic System (NTS) phone and CW nets. They know CW and they know traffic handling. They give their time to the training nets because they love their hobby and want to train others to the point where entrants into the higher speed nets can be both competent and comfortable. They are the Elmers of traffic handling.

In other words, checking into a slow speed net is a great way to make some "FB" contacts with experienced operators who want to help the newcomer. You may meet someone who has been on SSB for so long that he needs to brush up on his code. A lot of nice QSOs can be held after the net is over, too. That last part needs emphasizing: Nets are not for ragchewing!

If you are discouraged by nearly impossible DX propagation and have become bored with the run of QSOs about name, QTH, RST, WX, etc., it is time to listen to your slow-speed net just to get the hang of things. Just as in other types of contacts, nets have standard procedures, and an evening or two spent just listening will be helpful in becoming aware of net protocol.

So where do you find your slow-speed net? Virtually all of them are in the 80-meter Novice band, but there are some exceptions. All nets are listed in the *ARRL Net Directory,* and you'll find yours listed under your state with the net's name, coverage area, time, frequency, etc.[1]

If you don't have an 80-meter dipole up, remember you can still listen in. That might be enough to push you into putting up an antenna that will work 80 meters.

The *Net Directory* is full of hints from previously published *QST* articles on traffic. More information is available in the ARRL booklet *Operating an Amateur Radio Station.*[2] A beginner needs to know little more than how to check into and be checked out of a net — a matter of five minutes' reading in either manual.

Later on, you will probably want to send a radiogram to Aunt Mary for her birthday. How to do that is covered by the ARRL publications, too. Imagine the thrill Aunt Mary will get when she receives birthday greetings via Amateur Radio!

And once the NCS (net control station) is sure you can handle it, you will be on the receiving end of a message, possibly with delivery responsibilities, too. Imagine the personal satisfaction of the operator who delivers that greeting to Aunt Mary from her nephew across the country. It is possible that you could be the only amateur in your town linked to the ARRL National Traffic System!

You may hear one criticism of traffic nets from those who just don't happen to care for that aspect of Amateur Radio: "You check in and just sit there waiting." True! But don't just sit there — do something. Something like copying the different fists and speeds of those checking into the net. If you aren't checked in or have been excused, follow the stations to their traffic-passing frequency. That is good code-copying practice, too. Some nets handle traffic on frequency, giving an opportunity to copy without touching the dial.

Traffic handling is a facet of Amateur Radio as old as the ARRL itself, so why overlook it? Traffic handling doesn't appeal to every amateur, but a look at the small type at the end of this Public Service column will show that if it does prove interesting to you, you will have a lot of company — good company, too.

This is not a pitch from a long-time traffic handler. The writer is a member of two slow-speed nets,[3] and by his own evaluation is not ready for the "big leagues" yet. But someday, we could be passing traffic to each other at umpteen words per minute. All it takes to start is an open mind, an open ear, a pad, a pencil and a little practice. QNI? — *William G. (Bill) Jackson, KA5PEX, Seguin, Texas*

[1]Available from ARRL Hq. for a 9- × 12-in s.a.s.e. and 88 cents postage.
[2]Available from ARRL Hq. for an s.a.s.e. and 37 cents postage.
[3]TSN (Texas Slow CW Net) and LSN (Louisiana Slow Speed Net).

OUR FIRST MAYDAY

Nearly every evening at 2300Z, W2CHZ and WB8IGU, meet on 7177 kHz for an SSB chat. W2CHZ is at Cape Cod, Massachusetts, for four months of the year, and WB8IGU is at Point AuGres, Michigan for six months. During the winter, they are neighbors in Englewood, Florida.

On the evening of August 12, at 2240Z, just as they were starting their QSO, they both copied an urgent call for help from Jay, WA1ONB/MM who was approximately 70 miles east of Provincetown, Massachusetts. WA1ONB's 28-foot sailboat, the *Resolute,* and an accompanying 31-foot sailboat, the *Frugal Two,* were on a trip from Nova Scotia to Provincetown and were encountering winds at up to 40 knots and waves 20 to 30 feet high. Both boats were taking on some water, and the seven people on board were seasick, hallucinating, suffering from exposure and in danger of being swept overboard.

W2CHZ called the nearest U.S. Coast Guard station — at Chatham, Massachusetts — to advise them of the emergency. They referred the call to the Woods Hole Coast Guard station. A landline established between W2CHZ and the Coast Guard remained in effect until 0320Z.

WA1ONB/MM had a low-power transmitter and was putting perhaps 50 W into the 45-foot backstay he was using as an antenna. His signal was being copied by both W2CHZ and WB8IGU, but he could copy only WB8IGU consistently. Both boats were equipped with Loran "C" and VHF marine radios, but only the *Resolute* had Amateur Radio equipment, which was to save the day.

Position reports from the boats enabled the Coast Guard to plot their travel and to direct a helicopter to the *Frugal Two,* which was in the most trouble and its three passengers in need of evacuation. Conditions, however, prevented lowering a basket and taking the people off. The helicopter stayed with the boats until 0530Z, when surface craft were nearby.

The 40-meter band changed skip at about 0320Z, and both W2CHZ and WB8IGU lost contact with the marine mobiles owing to foreign broadcast interference. During the contact they had great help from KF4J, WB4GCG, KA1WG and K3RGL, who helped guard the frequency.

Both the destroyer *U.S.S. Nickerson* and a Coast Guard cutter out of Gloucester arrived at the scene. The cutter placed a line aboard the *Frugal Two* and towed it into Provincetown harbor the next morning. The *Resolute,* with WA1ONB aboard, made it to the harbor with great difficulty but without additional help. It was a great day for Amateur Radio! — *Howard Hawkins, WB8IGU and Howard Eitelbach, W2CHZ*

THE OXFORD TWISTER

At approximately 4:30 P.M. December 3, a tornado watch was issued by the National Weather Service (NWS). At 5 P.M., the civil defense director called me and asked that the local hams go on standby alert.

At about 6:25 P.M., the town of Oxford, Alabama, and all surrounding areas had lost commercial power. All TV and radio stations had gone of the air. We had lost all communications with the public except via Amateur Radio. At this time, we set up a liaison with W4CUE in Birmingham, who had contact with the NWS personnel, who remained on the air with us most of the night. By the time that liaison with NWS had been established, WA4QZF and KA4LRL had arrived at the emergency operations center (EOC). KA4LRL assumed net control of the ARES net and remained until the storm system was almost cleared. WA4QZF manned the civil defense radios, as we had the only base station left on the air. Our generator was running, and we got very busy.

At about 6:35 P.M., we were told that a tornado had touched down and destroyed a shopping center, houses and mobile homes. NN4R and N4FJM reported to that disaster scene immediately to provide communications. Soon they requested ambulances, fire trucks and police.

*Deputy Communications Manager, ARRL

We alerted all concerned about the situation from the EOC. We soon received a request from the two amateurs at the touchdown site for a crane, as there were still people trapped under heavy beams in the shopping center. Quickly, they called the gas company to take care of a gas leak in the building where people were still trapped.

N4EXO had arrived at the scene about this time and began helping out. However, things did not slow down until about three hours later. By 4:30 the next morning, most of the hams had gone home, except for a few who were still on the scene helping Red Cross personnel. The possibility of finding trapped people still existed until 9 A.M., when the last of the rubble was finally cleared.

When things had settled, we learned that there were 48 injuries, but only two deaths. There were about 35,000 people still without power. During the crisis, 30 very tired hams passed 110 messages, 45 of which were emergency precedence, covering everything from emergency medical teams to delivering oxygen and generators to local nursing homes.

I would like to thank WA4QZF, KA4LRL, N4EXO, NN4R, N4FJM, N4HIG, WA4PZM, WA4NDE, N4F1V, N4DRZ, WA4URC, and many others who participated. *(Jim Blackmon, WD4DJL, EC Calhoun Co., Alabama)*

PUBLIC SERVICE DIARY

☐ Burk's Falls, Ontario — December 27, 1983. While driving on Rte. 10, just outside of town, VE3KLK encountered a two-car head-on collision, with injuries, which had just occurred. He called into the Trans-Provincial Net on 40 meters to ask for help. VE3CU and VE3LZI answered. The Ontario Provincial Police and an ambulance were called, and they arrived at the scene shortly thereafter. (VE3EFX)

☐ Clearwater, Florida — November 20, 1983. Amateur Radio operators from clubs throughout Pinellas County provided communications for the American Red Cross and medical staff associated with the 1983 British-American Marathon. WB4TEJ and WB4PEL provided key planning and coordination with Red Cross officials and amateurs to be sure key medical personnel and stations had communications facilities. WB4ZVO and KO4J parked their vehicles to block off portions of the roadway to protect runners from passing automobiles. WB4WOU stayed with the last runner, who was determined to complete the course despite a severe limp. WB4TEJ worked with race officials to relay times and runner positions until the first runner crossed the finish line. Pinellas County EC W4GPL deserves much of the credit for his many hours of coordination with organizations participating in both the 1982 and 1983 events. Twenty-one other amateurs also worked in support of the event. (ND4K)

☐ Owensboro, Kentucky — November-December 1983. During two successful searches for missing persons — one a deer hunter and the other a retarded child in need of medicine for a physical problem — 20 local amateurs expended nearly 200 man-hours helping with communications among DES Rescue Squad personnel, sheriff's deputies and volunteer searchers. Later, during the unsuccessful search for a person who had jumped into the Ohio River from a bridge, 13 hams worked an additional 120 man-hours providing communications for police, Coast Guard and rescue squad personnel. (W4OYI)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Clemmons, North Carolina — October 15, 1983. The ARRL Simulated Emergency Test (SET) wasn't simulated for members of the Forsyth County ARES and the Winston-Salem Civil Air Patrol (CAP) squadron. The local SET had been designed to test the ability of ARES and CAP to work together, but a missing-person search in Clemmons accomplished all the test goals in an actual emergency situation. Eighteen hams, nine of whom were also members of CAP, aided CAP and the Forsyth County Sheriff's Department in the search. It was clearly demonstrated that in Forsyth County, ARES and CAP can work effectively together in both the test and reality "modes." *(Winston-Salem CAP)*

☐ Spokane, Washington — October 28, 1983. Local ARES members were placed on alert when an earthquake centered in Idaho produced tremors in the Spokane area. Although no damage was sustained in the immediate area, 27 amateurs remained prepared to handle any emergency American Red Cross traffic going into the stricken area. (WB7USZ, EC Spokane Co.)

☐ Columbus, Ohio — November 29, 1983. Thirty-five members of the Central Ohio ARES provided communications for the Secret Santa Parade. Nets on both the K8DDG repeater and simplex were used for relaying parade information among Red Cross first aid stations, Columbus police and the Secret Santa Charity. (W8BKO, DEC Central Ohio)

COMMUNICATIONS SERVICE OF THE MONTH

At approximately 1613Z November 16, an earthquake measuring 6.4 on the Richter scale hit the Hilo, Hawaii, area. The epicenter was thought to be on the south slope of the Mauna Loa volcano, about 30 miles southwest of Hilo and about 2 miles from the town of Volcano, Hawaii.

ARRL Emergency Coordinator AH6K immediately activated the Big Island Emergency Net on the 146.22/82 repeater (AH6J/R). This repeater was the only machine left on the air after the quake; it was running off of emergency backup power. Over the next four hours, 32 check-ins were logged by net control W6ORS, who was taking damage reports for relay to the American Red Cross and local civil defense agencies.

Since the AH6P emergency net repeater (146.16/76) wasn't operating, AH6J took off for the Kaulani Cone site to check on that repeater's status as well as the status of the repeaters owned by the electric company, the telephone company and the police department. Since the repeater site was near the epicenter, rather remotely situated, AH6J encountered extreme difficulty in reaching the equipment room, owing to rock and earth slides. AH6J walked the last mile or so to the equipment site to report to the local police department on the amount of damage to their gear. A general report was then forwarded to the civil defense office, and included the recommendation to use a helicopter to make further visits to the site.

As the day progressed, local hams continued to relay damage reports at the Red Cross's request. By 2030Z, things were quiet on the Big Island Emergency Net frequency, and the net was closed soon after. *(Corky Kirk, W6ORS)*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For December, 42 SEC reports were received, denoting a total ARES membership of 22,150. Sections reporting were: AK, AB, AZ, CT, DE, ENY, EMA, IL, IN, IA, KS, KY, LA, ME, MI, MN, MS, MO, NE, NH, NLI, NC, NFL, NTX, OH, OK, ON, ORG, PAC, RI, SV, SDG, SJV, SD, SFL, TN, UT, VA, WA, WV, WNY and WPA.

NATIONAL TRAFFIC SYSTEM

Kudos go out to all those who, despite lousy band conditions, hung in to pass the enormous Christmas traffic load. KF7R announced that PAN/cycle one will now meet at 1830Z. Certificates: CAN/c4 — NG5G, N5RN, W9CBE, N9HZ, K9WWJ, KA4GFU, KA9OBP, W9XD; 2RN/c2 — KA2OIW W2PKY W2VY; 2RN/c4 — N2EKS, W2PKY, WA2NKC (1st annual); 4RN/c4 — KR4V, N4GHI, WD4ALY, WD4OCW, AA4AT, W4WAI, WD4CNR, KP4DJ; 8RN/c4 — W8UE; TEN/c2 — VE4BI, WAØYJX, WØKK, WBØSUM.

December Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	2618	84.5	1.456	94.6	
CAN	33	2983	90.4	1.362	100.0	
PAN*	62	2462	39.7	.868	100.0	
Region Nets						
1RN	60	1091	18.2	.572	91.1	100.0
2RN	60	1159	19.3	.664	90.0	100.0
3RN	31	583	18.8	.564	93.5	100.0
4RN	62	1847	29.8	.833	79.7	100.0
RN5	62	1723	27.8	.653	98.4	100.0
RN6	62	1303	21.0	.485	96.8	100.0
RN7						100.0
8RN	62	926	14.9	.494	100.0	100.0
9RN	64	1398	21.8	.561	100.0	100.0
TEN	65	1752	26.9	.685	88.1	100.0
ECN						71.0
TWN	62	670	10.8	.380	74.5	100.0
TCC						
TCC Eastern	124[1]	1328				
TCC Central	79[1]	1283				
TCC Pacific						
Cycle Four						
Area Nets						
EAN	31	4149	133.8	2.655	96.2	
CAN	31	1855	59.8	1.346	100.0	
PAN	31	2284	73.7	1.383	98.4	
Region Nets						
1RN						93.5
2RN	94	1275	13.6	.627	95.3	93.5
3RN	62	682	11.0	.675	97.3	100.0
4RN	62	1319	21.3	.715	96.5	96.8
RN5	62	1341	21.6	.772	97.1	100.0
RN6	62	1517	24.5	.789	100.0	100.0
RN7	62	969	15.6	.809	98.6	98.4
8RN	58	655	11.3	.533	90.0	100.0
9RN	62	779	12.6	.535	96.0	100.0
TEN	62	848	13.7	.602	89.1	100.0
ECN	62	854	13.8	.769	83.3	93.5
TWN	58	722	12.4	.537	86.1	96.8
TCC						
TCC Eastern	182[1]	2135				
TCC Central	74[1]	696				
TCC Pacific	164[1]	1999				
Sections[2]	7419	50,141	6.8			
Summary	8876	96,691	10.9			
Record	7987	106,074	28.5			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (261): APSN ATN (AB), MG (AK), AENB AEND AENK AENR AENW AENX AENY AENZ ATNM ECAAN WAEN (AL), ACN ATEN HARC (AZ), BCEN (BC), NCN RTTY/V SCN/1 SCN/2 SCN/V (CA), CN CPN RTN WCN (CT), DEPN DTN SEN (DE), MDD (DE/MD), DEN ENMC FAST FMSN FMTN FPON FPTN GCVTN GN LCEN LSTN NFPN PEN PRVAN QFN SEFTN RRRARC SVTN SWFTN TPTN (FL), CGVHFN GCN GSBN GSN GTN RAEN WGEN (GA), I75MN TLCN (IA), IMN (ID/MT), ICN ISN ITN (IL), ICN ITN QIN (IN), CSTN KPN KSBN KWN KMWN QKS QKS-SS (KS), 4ARES 5ARES 7ARES 11ARES BARES CARN KNTN KYPON KTN KYN MKPN NKARC PAEWTN TSTMN WTEN (KY), CITN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN RIEM2MTN WMN (MA/RI), MEPN MMN MTN WRIN (MB), AEN CMEN MPSN OXRACES PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MNAMWXNT MSN MSPN MSSN PAW (MN), CMEN CPRN HBN IFN JCCAN LO2CW LOZRN MEOW MON/2 MOSSB PHD RRARN SARN STLAN (MO), APN (MR/NF), MTN (MS), BSN MTN (MT), CEN CMN CNCTN PCTN (NC), CN CSN (NC/SC), BV2MN CC2MN EN2MN MNARES NCHN NCN NE4O NE75 NE160 NMPN NSN SBARES TCARES WNN (NE), GSFM GSPN NHN (NH), HCAETN JSARS MCN NJM NJN NJPN NJVN OBTTN SJVN TCETN (NJ), NSN (NV), CDN CNYTN EPN HVN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN SDN WDN (NY), ALERT BN BNR BRTN BSSN HCARES LCNWOARES MCN O6MN OSN OSSN (OH), CARA NON NWOSN OLZ OPEN OTN OTWN STN (OK), BSN LBLARES MPARES ORARES OSN PDXARES PTTN SOFM (OR), NWPA2MTN WPA WPA2MTN WPAPTN (PA), PTN (PAC), QSN (PQ), GPD2MN LC2MN SCNTN SCSSBN (SC), SDEEN SDN SDSMEN SDTIN WCEN (SD), TNCN TNPN TNVN (TN), DFW NET TEX TSN TTN (TX), BUN DCESN (UT), VTN (VT), SVEN STARES VLN VN V6BN VSN VTN (VA), EWTN NTN PSTS WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVARN WVFN WVMDN WVN WVNN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

Overall, traffic was down somewhat from last December, but every TCC director commended all the troops who handled the extra work during the Christmas barrage. W2CS appointed W1AF/KN1K to be assistant director for TCC-E/c4.

1	2	3	4	5
Cycle Two				
TCC Eastern	134	92.5	2651	1328
TCC Central	122	88.5	2678	1283
TCC Pacific				
Summary	256	90.5	5329	2611
Cycle Four				
TCC Eastern	192	94.8	4056	2135
TCC Central	88	84.1	1519	696
TCC Pacific	182	90.1	3961	1999
Summary	462	89.7	9536	4830

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (December) *Cycle Two* — Eastern Area (AFBV, Director) — AA4AT N1BHH WB1BYR N3COY WB2EAG K1EIC KA1GBS VE3GOL WB3GZU KO2H KB2HM VE3HTL K4JST WD8LRT W2MTA K8OZ W8PMJ W8QHB W1QYY WD8RHU K3RZR KA1T KB3UD KR4V AK1W N2XJ W1XX WB8YDZ. Central Area (N5AMK, Director) — N5AMK WA5BHF K5BNH K5BT W5CTZ N5DFO WB5EAY WØFRC W5FW NG5G WX4I KW9J W9JUJ W4JL WA4JTE K5KJN WØKK KD5KQ W5KVL KA4MZY WB9NVN WB5OXE WBØTED KB5UL K5UPN WF4X WB5YDD KT5Z. Pacific Area (WØHXB, Director) — KT6A WA7GBN VE6CHK N7CSP

NØCXI KU6D WD5ESV KD7EY KB7FE W7GHT WØHXB KM6I W5JOV KR7L KBØMB KØOVK K6OWA WAØOYI KF7R ND5T W7TGU K6UYK WB7WOW K6YBV KM7Z.

Cycle Four — Eastern Area (W2CS, Director) — AA4AT VE3AWE K1BA W3BBN KI3C WA4CCK N3COY W2CS N8CW KA3DTE WA2EAG W1EFW W2FR WD4FTK KA1GBS W2GKZ VE3GOL WB3GZU KB2HM WB9IHH W1ISO K4JST KN1K N4KB AH2M W2MTA W1NJM WB4PNY W3PQ WØQHB W1QYY W2RQ K3RZR KA1T KB3UD WB4UHC W4UQ W2VY VE1WF W2XD N2XJ W1XX N8XX WB8YDZ K4ZK W2ZOJ. Central Area (K5GM, Director) — WØAM W9CXY KØEZ W5GHP K5GM WØHI K5OAF W5RB N5TC W5TFB K5TL WB9UYU KB9X KV5X. Pacific Area (KN7B, Director) — ADØA NI6A WDØAIT KN7B VE6BLY KØBN KA7CPT KCØZ W7DZX NØEBM W6EOT W7EP W7GHT N2IC W6INH W5JOV W7LG W7LYA WB7NHR WØOGH N5SJ ND5T WA7TEH W5UH W7VSE W6VZT KX7W VE7ZK.

Public Service Honor Roll December 1983

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into CW nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS CW nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12. (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points each, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or any for 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

346
K7VW
333
WØKJZ
227
KC9CJ
222
KA3DLY
220
WB7WOW
212
W2AHV
202
KA8CPS
186
K5CXP
185
VE3KK
157
WA4QXT
155
KB7FE
153
KB5EK
150
N4GHI
149
KB5W
148
WF4Y
146
KA1GBS
144
KBØZ
139
N1BGW
138
AI6E
NI6A
137
KD7ME
WD8LRT
WX4J
135
KM9B
N4PL
133
KA2OIW
130
N2AKZ
129
KBØMB
128
W1EOF
WA2FJJ
127
WA9BXB
126
KX7W
W9YCV
125
W3YVQ
W8UE
WB2MCO
123
KCØUJ
AL7W
KA1BBU
N5AMK
W6VOM
122
WB4RUJ
WB2UVB
KB4WT
121
AG2R
120
AD7G
WB2EAG
119
K4JST
KC5NN
KA1T
WF4X
118
WB3GZU
W2VY
117
KC2QQ
115
W1PUO
WB2IDS
114
KT9I
KK3F
KW9J
113
WB1GXZ
N2XJ
112
WD8MIO
WA4CCK
WA7MEL
111
KAØEPY
KR4V
WD8RHU
KA1EXJ
110
KØDKM
K7GXZ
W4ANK
109
WB6QBZ
KB2HM
K2ZM
108
WØOYH
KV5X
W9JUJ
107
KK1E
W2MTA
W2PKY
106
WB1HIH
KFBJ
KA4SAA
105
W7GHT
WBØTED
104
KC3Y
W6INH
103
AK1W
WA2NKC
WB2KLF
102
WB5YDD
KT6A
WB2RBA
KZ8Q
101
VE3FGU
KT6D
KA1KML
NG4J
W7VSE
AG9G
WD4ALY
100
VE3HGJ
WB1GLH
KB3UD
99
KJ3T
K6UYK
KD5FR
K8KQJ
98
W3VA
WB2VUK
WB2ZCM
97
N5DKW
N5EZM
KA3EJG
KA5HDT
WB4TZR
96
W6RNL
WA1YNZ
KA2BHR
95
KAØARP
W5CTZ
VE3DPO
94
WB1ABQ
K9EHP
93
W1TN
VE3HTL
VE3WM
KB4OZ
K8CW
WA8GMT
WA8ZUD
KB2WI
92
KQ3T
K8JDI
KA1BHT
K3NTD
W2AET
KD2BE
WB4GHU
KC2TF
W2BIW
91
WAØTFC
N1ARI
N5TC
AA4AT
90
NDØN
KJ3E
KA5AZK
KB5UL
VE3GT
KA4MTX
89
KAØBWM
VE3BDM
N3COY
WB4YQP
88
WB3KJT
WA3WIY
WB2OWO
WA4LTO
87
W6NTN
W1RWG
KA7AID
KA1EPO
WD9FRI
WA2HEB
WD4BSC
WB6DOB
86
WBØHOX
WØKK
WB5MMI
N7BGW
KA3GHT
K4VWK
85
KI1M
KA6BNW
KL7IJG
K5OAF
W2XD
WB8MTD
K2ZVI
84
VE2RDO
N6AWH
N6GIW
ND2S
N4DDV
KA9OBP
83
N1AS
KA8NCR
WD4HBP
82
K1JHC
W3DUM
N1BJW
W7LG
WD8OUO
81
K1CB
KA4BCM
WA4YPQ
K9BVE
80
W3DKX
W5KLV
N9BDL
NN4I
NCØR
WDØFWB
79
AIØO
KØGND
K3JL
KS6V
KX7T
W9PRD
WB7NHR
WDØAIT
78
WA2PUU
WA2KOJ
KB8GT
WB8SYA
77
WB9IHH
KR7L
K8TP
W4HON
W2UYE
76
VE3GOL
W7EP
K2VX
WB2OHR
75
KC3DW
WD2AFI
KD7MW
W9NXG
74
KAØBCB
WA1DXT
W2ZOJ
KA8PQH
73
NØEEH
KN3B
WB5LBR
N2DZZ
WD4OCW
72
KT5Y
KA7GQP
KG9B
WA4EYU
71
W1JRA
N1AJJ
KP4DJ
K4WJR
70
KØSI
K6APW
69
WB6RTE
N6CVF
NØCFS
KA2QIK
WB2OMZ
68
WØZTP
W4FMZ
67
W9UMH
W5GHP
WB2GHN
WA2DHB
66
N1CPX
AE1T
KA1GWE
WA3UNX
WA6QCA
WB2PID
KA9IKR
WB5NCM
65
KAØKWM
K1QGF
KA9LAU
KF7R
KB4OG
KF4U
64
W9DM
NW4A
WD4PBF
KA2OPG
K4ZN
63
K3NNI
WA5OUV
WA4JTE
K6AGD
62
KCØOO
WD8KBW
KA2DQA
KO7V
N2EOV
KA4SKV
KD9K
AK2E
61
W6IPL
WD5GKH
WB2RMJ
60
WØOUD
KØPCK
WB8KWD
KA6HJK
K3RZR
WØIKT
52
KA2OVL/T
51
WB8NHV/T
49
KA8GGZ/T
47
WB2ANK/T
44
KA2CQX/T
43
KA1HPO/T
42
NØDGM/T
N3CMC/T
41
WA2MGV/T

Brass Pounders League December 1983

BPL Medallions (see April 1979 *QST*, page 77) have been to the following amateurs since last month's listing: N2CER KAØCIR WF4Y K2GXT.

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	721	1536	1818	136	4211
WAØHJZ	0	1922	91	1238	3251
KA9CPA	32	1268	146	851	2297
KBØMB	784	235	935	50	2004
W9JUJ	2	977	968	7	1954
KA1GBS	5	905	892	50	1852
VE3KK	522	418	691	131	1762
WA4JDH	16	740	734	11	1501
W1EOF	7	506	719	32	1264
KCØUJ	235	237	712	42	1226
N4PL	88	492	545	81	1206
N5AMK	4	636	552	17	1209
KB5W	31	523	618	29	1202
W7VSE	1	614	555	12	1182
W7DZX	20	579	571	8	1178
AA4AT	59	520	483	16	1078
KT6A	5	595	421	13	1034
WB7WOW	28	574	332	89	1023
N4GHI	49	444	442	70	1005
KN7B	4	459	474	7	944
W3ATQ	0	473	461	8	942
WB2EAG	5	451	466	19	941
W3VR	271	223	396	49	939
WF4Y	240	246	401	34	921
AA4FG	336	126	389	63	914
WB2IDS	81	373	390	61	905
KA8CPS	43	372	341	147	903
VE3HGJ	102	357	419	20	898
K6YBV	66	407	309	25	888
KC9CJ	22	430	315	121	888
NØBQP	0	497	96	274	866
KA1T	0	424	413	27	864
NI6A	7	399	398	38	842
K8NCV	14	407	413	8	842
K4ZK	2	408	406	20	826
K6UYK	103	359	357	28	834
WØFRC	25	340	440	25	830
WF4X	10	373	398	20	807
KT9I	0	337	450	3	790
K4EUK	119	270	352	29	770
K4WJR	0	397	367	0	764
WB3GZU	20	367	355	20	762
WB5YDD	5	385	334	38	762
KR4V	4	372	364	22	762
ND5T	19	382	322	15	738
KW9J	0	369	314	13	721
WA4QXT	23	287	343	67	720
KB4WT	0	355	335	27	717
WB1GXZ	6	340	403	12	716
KD7ME	18	306	333	53	710
KR7L	6	332	348	21	707
W8PMJ	0	382	325	0	707
W9UIJ	15	345	339	9	705
WB9NVN	0	327	359	5	691
N5DFO	3	339	320	26	688
WDØFWB	62	282	383	41	688
W5CTZ	0	336	336	6	678
W8UE	10	307	321	32	670
WA4CCK	2	306	342	11	661
K4JST	15	330	302	13	660
KU6D	14	313	322	8	657
AK1W	3	314	332	7	656
KB3UD	5	299	338	2	644
KC3DW	4	293	312	16	626
W2MTA	2	344	272	6	624
K8JDI	0	318	279	23	620
WA4PFK	39	306	232	41	618
W1EFW	23	273	310	11	617
N3COY	4	283	323	2	612
W5TFB	0	303	301	9	612
WD8MIO	55	356	168	33	612
W5KLV	2	293	302	13	610
VE3BSY	40	271	276	17	604
WD4HBP	31	281	268	24	604
WAØTFC	0	288	307	6	601
VE1WF	108	220	259	8	595
WB2MCO	15	305	255	14	589
KA1EXJ	3	279	281	22	584
W7GHT	0	227	299	4	580
AL7W	7	260	285	27	579
N1BGW	28	279	193	80	578
WB8KWD	0	285	285	6	576
W6IPL	0	294	275	2	571
WB2UVB	215	96	218	41	570
WD4ALY	1	294	264	5	564
N6GIW	0	246	260	0	560
AD7G	7	249	260	42	558
WB4ADL	12	276	209	59	556
WD4CNR	1	317	236	1	555
WØBMA	134	143	232	45	554
KZ8Q	0	292	259	1	552
WØFPT	0	216	336	0	552
N2XJ	5	258	272	12	547
KAØJAN	0	321	31	191	543
W9PRD	139	132	234	37	542
KK1E	0	282	271	6	539
WD4KBW	10	263	255	9	537
K8OZ	9	252	272	2	535
KA6BNW	133	161	232	7	533
K3RZR	7	266	254	2	529
N3AIW	86	179	81	180	526
W6RNL	0	263	260	3	526
W2AET	0	246	278	0	524
WX4I	38	240	237	10	523
VE3FGU	0	286	235	0	521
WB2OWO	79	185	230	27	521
W3BGK	1	255	257	3	516
WD8KFN	1	264	238	5	508
WA2HEB	52	224	213	18	507
AI6E	42	218	186	61	507
W2VY	13	226	240	27	506
WB7NHR	60	178	260	8	506
W8QZK	13	240	247	2	502
KT6A (Nov.)	5	389	280	10	684
Multioperator stations:					
WD4IIO	578	241	748	62	1629
W1TKZ	354	24	357	8	743
BPL for 100 or more originations plus deliveries:					
KA3DLY	154				
WA9BXB	133				
W2AHV	131				
KE4O	123				
K9GDF	121				
KB5XI	117				
W9FZW	117				
KA5DQP	114				
KØCY	113				
K5CXP	113				
KB5EK	111				
WA2HEB	110				
WA4HXU	110				
WA2YBM	107				
KH6B	106				
KA1BBU	101				
Multioperator station:					
WA1NPO	169				

1 — CALL.
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (December 1983)

1	2	3	4
Amateur Radio Telegraph Society	31	768	324
Central Gulf Coast Hurricane	31	429	2677
Clearing House	31	434	411
Early Bird	31	480	1438
Empire Slow Speed	31	114	435
Golden Bear	31	373	2287
IMRA	27	749	1558
International Assistance & Traffic	31	274	—
Mission Trail	31	855	966
New England Novice	31	285	351
North American SSB Traffic	27	385	253
Vermont Sideband	31	189	571
West Coast Slow Speed	31	60	—
20-Meter ISSB	27	1796	503
75-Meter ISSB	31	1269	1264
7290 Traffic	51	1969	4256

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

AMATEUR RADIO EXPERIMENT PLANNED FOR SPACE SHUTTLE MISSION

The Marshall Space Flight Center Amateur Radio Club is planning to fly an experiment on STS-17 (41G), scheduled for lift-off in August 1984. The experiment is a 70-centimeter beacon with a carrier frequency of 435.033 MHz. This frequency was coordinated with AMSAT so it would be compatible with AMSAT-OSCAR 10. Project Explorer is the name of the program for the seventh GAS (Get Away Special 007) in NASA's small, self-contained payload program. It is sponsored by the Alabama Space and Rocket Center, which paid the fee to NASA for GAS 007, and the Alabama section of the Institute of Aeronautics and Astronautics.

The primary package will contain three University of Alabama student experiments involving the solidification of alloys, the study of primary root systems and the crystal growth of metallic-appearing needle crystals in an aqueous solution. A fourth experiment, called MARCE (Marshall Amateur Radio Club Experiment), will provide information on the "mission elapsed time" and the operational status of the student experiments.

MARCE will provide power, control and on-board storage of the experiments' environmental and housekeeping data. A synthesized Digitalker system will convert the experimental data into "English Language" and will modulate the transmitter beacon.

Measurements will be stored in a microprocessor memory for post-flight analysis. This data will be taken every 10 minutes, for a total operating time of 120 hours. Amateur Radio and short-wave listeners will record the measurement data and relay the information via Amateur Radio channels, or by mail to the Marshall ARC or to other NASA centers that might want to participate.

The primary objectives of this experiment are:

1) to demonstrate the feasibility of Amateur Radio data communication from the Space Shuttle's cargo bay during a shuttle mission;

2) to encourage broader participation of Amateur Radio enthusiasts in this space research adventure, capitalizing on the pioneering spirit of volunteer Amateur Radio operators and shortwave listeners throughout the world; and

3) to involve educational groups from grade school through college, and to emphasize space communication opportunities for like-type ventures through volunteer research and creativity.

More information about this next Space Shuttle mission will follow as it becomes available. Thanks to Ed Stluka, W4QAU, of the Marshall ARC, for the mission information.

AMSAT-OSCAR 10, UoSAT-OSCAR 9 and Soviet RADIO Schedules

AMSAT-OSCAR 10

Mode B will be turned on from mean anomaly 40 to 220, except when in Mode L.

Mode L on UTC Saturday and Wednesday from one hour before until one hour after apogee.

Monday is QRP day. Use 100-W ERP or less.

UoSAT-OSCAR 9

Sat.: 1200-baud bulletin, telemetry, Digitalker, 21-MHz beacon.
Sun.: 200-baud bulletin, telemetry, Digitalker, 21-MHz beacon.
Mon.: Whole orbit, fast-scan radiation data.
Tue.: Check-summed telemetry data.
Wed.: CCD imager data.
Thu.: Whole orbit telemetry data scan.
Fri.: Load bulletin, Digitalker, telemetry schedule.
The 2.4-GHz beacon is being activated on alternate weekends. On these occasions, the precision magnetometer and radiation detectors are powered down for power balance.

Soviet RADIO Satellites (when charging batteries)
RS-5 transponder on Sat. and Sun.
RS-7 transponder on Sat. and Sun.
RS-6 transponder on Tue. and Sun.
RS-8 transponder on Thu. and Sun.

UoSAT-B Launch Status

UoSat-B is still go for launch on March 1 with a window of 1759-1809 UTC. The Spacecraft underwent a successful spin-balance test at British Aerospace on January 20. The spacecraft was also vibration tested for three days, with good results.

AMSAT-OSCAR 10 Keplerian Data

Catalog Number: 14129.
EPOCH time: 84015 27200481.
Sun. Jan. 15 06:31:41. 216 1984 UTC.
Element set: 75.
Inclination: 25.8148 Deg.
RA of node: 220.4854 Deg.
Eccentricity: 0.6087206.
Arg. of perigee: 237.1847 Deg.
Mean anomaly: 49.5265 Deg.
Mean motion: 2.05849943 Rev/day.
Decay rate: 9.2E-07 Rev/day.
Epoch rev.: 444.
Semi-major axis: 26106.090 km.
Anom. period: 699.538693 min.
Apogee: 35,622.124 km.
Perigee: 3839.494 km.
(tnx KA9Q)

U.S. Amateurs Win Radio Sport Medals

ARRL received from the Soviet Radio Sport Federation medals and certificates for five U.S. amateurs. The Radio Sport Federation sponsored a series of activity weekends throughout the month of October 1982 to commemorate the October 3, 1957 launch of Sputnik and the October 28, 1978 launch of RADIOs 1 and 2.

1st Category winners were: W1NU, 1st place Gold medal with certificate no. 261 and score 243; N4AR, 2nd place Silver medal with certificate no. 266 and score 202; and K9GQ, 3rd place Bronze medal with certificate no. 269 and score 181.

2nd Category: N2AA, 1st place Gold with certificate no. 271 and score 114; and WB5EUC, 3rd place Bronze with certificate no. 274 and score 34. Congratulations on your awards.

Post-Flight Negative Reflections of the W5LFL Flight

Some amateurs are a little upset by the actions of a few negative elements who did more than call W5LFL on 145.55 MHz. During any major Amateur Radio activity, this element does raise its ugly head and has to be reckoned with. I would prefer to overlook and forgive the ugliness, as most people will. But if there are some who want to deal with these elements, I suggest they work at it on a local level with an organized group. Many repeater wars have been fought, and a few of them won, by such groups.

Self-policing has always been obvious in Amateur Radio, and it does work. Many amateurs have found, even with FCC help, it is sometimes difficult to catch offenders. Laws are broken by those who put themselves above the law, but I think our problem is more than just that.

Just who is that "negative element"? I think the basic thing that some of these elements suffer from is the need for attention. We all have our egos, and we try to deal with them daily, but a lot of people think they could do with a little more attention. So this "hidden hunger" is probably what the "negative element" is trying to satisfy. Give them a microphone and a large audience, and the stage is set.

How do we deal with the problem? This can be determined by an organized group willing to tackle the offender. Check your group for experience in dealing with interference problems. You could start with a repeater group; most of them have had to deal with a problem or two, and may have some good suggestions.

If you don't like what you hear on the ham bands, and it's illegal or immoral, try to do something constructive and find an answer.

We will probably always have the negative element, but we can combat some of it that now exists. The best defense is self-policing.

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $22 ($30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ AMSAT Membership is available for $24 per year; $26 outside North America. Life Membership is $600. Subscription to six issues of *Orbit* magazine each year is inseparable from membership. Write to or call AMSAT Headquarters, P.O. Box 27, Washington, DC 20044, tel. 301-589-6062. VISA/MC cards accepted.

Strays

QST congratulates...

☐ Brian D. Smith, KA9OIH, of Fort Wayne, Indiana, who contributed to his newspaper's winning the 1983 Pulitzer Prize for General Local Reporting for its coverage of the 1982 Fort Wayne flood.

At the ARRL National Convention in Houston last October, Vic Clark, W4KFC (SK), received a Golden Anniversary Certificate from the Quarter Century Wireless Association in recognition of his 50th year of continuous amateur operation. An active member of QCWA over the years, Vic was elected as a national director in 1981, just prior to his becoming ARRL President. *(LX1JW photo)*

*Satellite Program Manager, ARRL

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By
Edith Holsopple,* N1CZC

MARCH

1

West Coast Qualifying Run, 10-35 wpm, at 0500Z March 2 (9 P.M. PST March 1). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3.590/7.090 MHz. Underline one minute of the highest speed you copied, certify that your copy was made without aid and send to ARRL for grading. Please enclose your full name, call (if any) and complete mailing address. A large s.a.s.e. will help expedite your award/endorsement.

3-4

ARRL International DX Contest, phone, Dec. *QST*, page 95.

7

W1AW Qualifying Run, 10-35 wpm at 0300Z March 8 (10 P.M. EST March 7). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See March 1 listing for more details.

10-11

IARS/CHC International Contest, CW, Feb. *QST*, page 90.

11-12

Virginia State QSO Party, Feb. *QST*, page 90.

11-12

Wisconsin QSO Party, Feb. *QST*, page 90.

17-18

YL-ISSB-Commo-System QSO Party, CW, Feb. *QST*, page 90.

IARS/CHC International Contest, phone, Feb. *QST*, page 90.

Kentucky QSO Party, sponsored by the Western Kentucky DX Assn., from 2100Z to 0700Z March 17 and from 1400Z to 2200Z March 18. No repeater or list QSOs. Work stations once per band and mode. Work portables and mobiles again as they change county. Stations must remain on a band for 10 minutes after making a QSO. Exchange signal report and QTH (county for KY stations; state, province or country for others). Suggested frequencies: CW-1815 kHz and 60 kHz from lower band edges; phone-1.840 3.985 7.285 14.285 21.385 28.585; Novice-3.725 7.125 21.125 28.125. Count 2 points per 1.8 MHz QSO, 2 points per CW QSO, 1 point for each phone QSO on 80 and 40 meters, and 1.5 points per phone QSO on 10, 15 and 20 meters. KY stations multiply by total states, VE call areas and KY counties (max. 120) worked. Others multiply by total KY counties worked. Portables/mobiles add 1000 bonus points to total score for each county operated from outside of home county (min. 25 QSOs from each county). Plaques and certificates. Mail logs by May 5 (include large s.a.s.e. for results) to William Shipe, WM4N, Rte. 1, Adairville, KY 42202.

Spring QRP Activity Weekend, sponsored by the G-QRP Club. Times (UTC)/frequencies: 0900-1000/14.060; 1000-1100/21.060 and 28.060; 1100-1200/7.030; 1200-1300/3.560; 1300-1400/10.106; 1400-1500/3.560; 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 further details, contact Christopher J. Page, G4BUE, "Alamosa," The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW, England.

Bermuda Contest, sponsored by the Radio Society of Bermuda, from 0001Z March 17 until 2400Z March 18. Operate 36 hours maximum. Off-times must be clearly indicated and must be at least three hours each. Single operator only. All stations must operate from their own private residence or property. 3.5, 7, 14, 21, 28 MHz., phone and CW. No cross-band or cross-mode QSOs. Work the same station on phone and CW on each band provided that the contacts are separated by 30 minutes or more. Exchange signal report and QTH (W stations send state; VE stations send province; U.K. stations send county; West German stations send DOK number; Bermude stations send parish). W/VE stations work W. German, U.K. and Bermuda stations only. West German and U.K. stations work W/VE and Bermuda stations only. Count 5 points per QSO, and multiply by number of VP9 stations worked per band. The top scorer in each state, province, county and DOK area in West Germany shall receive a printed award. The top scorer in Canada, USA, U.K. and W. Germany shall receive a trophy, to be awarded at the Society's Annual Dinner, held in October. Round-trip air transportation plus accommodations will be provided to overseas winners: 1 VE, 1 W, 1 G and 1 DL. Logs must be received by May 31. Air mail to Radio Society of Bermuda, Box 275, Hamilton 5, Bermuda.

Tennessee QSO Party, sponsored by the Tennessee Council of ARCs, from 2100Z March 17 until 0500Z March 18 and from 1400Z to 2200Z March 18. Work stations once per band and mode. Work portables and mobiles again as they change county. No repeater or list QSOs. CW QSOs in CW subbands only. A minimum of 10 minutes must be logged for each change of band or mode. Exchange signal report and QTH (county for TN stations; state, province or country for others). Suggested frequencies: CW-1.815 and 50 kHz up from lower band edges; phone-1.860 3.980 7.280 14.280 21.380 28.580; Novice-3.725 7.125 21.125 28.125. Count 1.5 points per CW QSO and 1 point per phone QSO. TN stations multiply by total states, VE call areas and TN counties (max. 95) worked. Others multiply by total TN counties worked. Portables/mobiles add 500 bonus points to total score of each county operated from excluding home county (min. 10 QSOs from each county). Mail logs by May 1 (include s.a.s.e. for results, return of log and/or certificate earned) to Oak Ridge Amateur Radio Club, Attn: Mel Wardell, K4PJ, P.O. Box 489, Oak Ridge, TN 37830.

22

W1AW Qualifying Run, 35-10 wpm, at 1400Z (9 A.M. EST March 22). See March 7 listing for more details.

24-25

CQ World Wide WPX Contest, phone, sponsored by *CQ Magazine*, from 0000Z March 24 until 2400Z March 25. Single ops are allowed a maximum 30 hours operating time; off-times must be taken in no more than five periods and must be clearly indicated in the log. Multioperator stations may operate entire 48 hours. Phone only, 1.8-30 MHz (excluding the WARC bands). Categories: single-op, all-band and single-band; QRP (5-W output maximum); multiop (multiband only) multi and single transmitter. Multi-singles must remain on a band for at least 10 minutes after making a QSO; multi-multis are allowed only one signal per band. All transmitters must be located within a 500-meter-diameter circle or limits of property; no remote stations. Work stations once per band. Exchange signal report plus serial number starting with 001. Multi-multis use separate numbers on each band. QSO points: Contacts between stations on different continents count three points on 28, 21 and 14 MHz and six points on 7, 3.5 and 1.8 MHz. For non-NA stations, contacts with stations in other countries but on the same continent count one point on 28, 21 and 14 MHz, and two points on 7, 3.5 and 1.8 MHz. QSOs between stations in the same country count zero QSO points but are valid for multiplier credit. Multipliers are prefixes, to be counted only once. A prefix is the three letter/number combination that forms the first part of an amateur call sign, as in W1, G4, DF3, 8P6, etc.) Stations operating outside the call area indicated by their call signs must sign portable. The portable prefix counts as the multiplier; for example, AA1K/3 in Delaware counts as an AA3 multiplier. Final score is total QSO points times sum of prefixes worked. Awards and club competition. Mail logs by May 10 to Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424.

24-26

Spring RTTY Contest, sponsored by the British Amateur Radio Teleprinter Group, from 0200Z March 24 until 0200Z March 26. Operate 30 hours maximum. Off times must be no less than three hours each and must be indicated on log. Single operator, multioperator and SWL categories. Work stations once per band, 3.5-28 MHz. Exchange UTC time, signal report and message number starting with 001. Count two points for RTTY QSOs with stations in your country, 10 points for others. Count 200 bonus points for each country worked per band. For final score, add (QSO points × total different DXCC countries + W/VE/VK call areas/band) plus (band countries × 200 × continents). Mail logs to be received by May 31 to Peter Adams, G6LZB, 464 Whippendell Rd., Watford, Herts. WD1 7PT, England.

March 31-April 1

Connecticut QSO Party, sponsored by the Candlewood ARA, from 2000Z March 31 until 0200Z April 1, with a rest period from 0500 to 1200Z. Exchange signal report, serial number and ARRL Section (county for CT stations). CT stations work DX for QSO points (only one multiplier). Club station W1QI counts 5 points per band/mode. Novice QSOs count 2 points; OSCAR QSOs 3 points. CT stations multiply QSOs by ARRL sections worked, others multiply CT counties worked. Suggested frequencies: phone-3.927 7.250 14.295 21.370 28.540; CW-40 kHz from low end; Novice-3.725 7.125 21.125 28.125. Mail by April 30 (s.a.s.e. for results) to CARA, c/o R. Dillon, N2EFA, Box 954, Danbury, CT 06810.

APRIL

4

West Coast Qualifying Run, 10-40 wpm, at 0500Z April 5 (9 A.M. PST April 4). See March 1 listing for more details.

7-8

The SP-DX Contest, phone, sponsored by the Polski Zwiazek Krotkofalowcow, from 1500Z April 7 until 2400Z April 8. Suggested frequencies are 3.5-28 MHz. Non-Polish stations transmit a five-digit number consisting of RS plus serial; Polish stations send a signal report plus two letters denoting the province. Count 3 points for each SP station QSO. Each different province counts as a multiplier (49 max.). Categories: single op, multi-band; single op, single band; multi op, single transmitter (all bands); SWL. Include complete logs, summary sheet and multiplier check list. Certificates. Mail entries by April 30 to Polski Zwiazek Krotofalowcow, SP-DX Contest Committee, P.O. Box 320, 00-950 Warszawa, Poland.

12

W1AW Qualifying Run, 10-35 wpm at 0300Z April 13 (10 P.M. EST April 12). See March 7 listing for more details.

16

ARRL VHF/UHF Spring Sprints, 144 MHz, from 6 P.M. until midnight *local time*.

21-22

QRP ARC, International QSO Party

24

ARRL VHF/UHF Spring Sprint, 220 MHz, from 6 P.M. until midnight *local time*. Other Spring Sprint dates are 432 MHz on Wed., May 2; 1296 MHz on Thurs., May 10; and 50 MHz on Sat., May 19. The rules will be listed in April 1984 *QST*.

28

County Hunters SSB Contest

28-29

Helvetia Contest

Massachusetts QSO Party

*Communications Assistant, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADA

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. A/SM: VE6AMM. STM/DEC/NM (APSN & ATN): VE6ABC. NARC coord scores for Bantama Hockey games. Abt 24 NARC mbrs are engaged in playing and learning to play chess on 2M & HF. If interested contact VE6ABC. AARCS net stalled due poor sigs on 75M. Considering Sat A.M. time; Keep tuned to APSN for instructions. Traffic: VE6CHK 494, VE6BLY 250, VE6ABC 100, VE6CPE 11, VE6BJD 5, VE6EB 5, VE6BKP 2.

BRITISH COLUMBIA — SM, H. E. Savage, VE7FB — With 80 meters being so poor at net times Xmas QTCs took plenty of time to send. But we are sorry to report that many errors in addresses & phone numbers did occur. But with the sincerity of the receiving station most were delivered promptly, some by much researching. Many members of BCEN were awarded a Section Net certificate for their efforts in 1983. VE7XQ and VE7ZQ arranged another successful Christmas Party for the Communication Group. Seventy or more enjoyed the food supplied by the XYLs. BCPS Phone net check-ins high 230, low 130, total 525. Traffic: VE7BMI 441, VE7CDF 228, VE7EDM 191, VE7EWI 108, VE7FB 46, VE7BZI 2.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: VE4AJE. STM: OO. SEC: HK. NMs: VJ TE IX NM. Congrats to VE4RO and VE4AJE for handling the bulk of the traffic in Dec. VE4IX also had a busy month. VE4DT is now handling the Swap and Shop on 75 meters. VE4TL does it on 2 meters. Thanks, all, for a good job done in 1983. My best wishes to all. MEPN QNI 1178, QTC 46, sess. 31. MTN QNI 189, QTC 72, sess. 30. MMN QNI 597, QTC 40, sess. 31. WRIN QNI 285, sess. 9. Traffic: VE4RO 168, VE4AJE 127, VE4IX 85, VE4PG 48, VE4JA 45, VE4TE 35, VE4AAD 21, VE4OO 16, VE4FK 13, VE4ALO 12, VE4DT 10, VE4HK 10, VE4AAU 7, VE4BI 7, VE4AGR 6, VE4NM 6, VE4AFZ 5, VE4NE 4, VE4HA 3, VE4ADS 2, VE4AGT 2, VE4DS 2, VE4JK 2, VE4CR 1.

MARITIME/NEWFOUNDLAND: SM, D. R. Welling, VE1WF — ASM: VO1FG: NMs: VO1JN VE1WF: Many thanks for all of your support during the past two years. Will be starting a new term of office in April. Xmas sees an influx of people attempting to get on RTTY using micros. Several amateurs in the Halifax area worked several W4, W5 and W6 stns through VE1LHR and links to 10-meter FM repeaters. Hope many will be active in the VE1 test. The CRRL Outgoing QSL Bureau handled 60,460 QSLs for Canadian amateurs. Trips are planned to Moncton and Fredericton this spring. Other areas are also possible. APN 31 Sessions, QNI 181, QTC 130, QND 429 mins. Traffic: VE1WF 595, VE1XF 167, VE1BKM 107, VE1BXA 34, VE1ALU 33, VE1BPM 21.

ONTARIO: SM, Larry P. Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. TC: VE3EGO. Christmas was, as usual, a busy month for the NTS with all nets very active. BPL were earned by the following: VE3KK (19), VE3HGJ (6); VE3FGU (3). The Toronto Open Line Net on VE3RPT/R handled a record, for OLN, of 269 pieces of traffic. Thanks to all who participated. Congrats to the following new appts.: OBS — VE3FQV VE3KXB VE3WM; EC — VE3MFO Burlington. The Radio Society of Ontario has announced a very attractive award in commemoration of the 200th anniversary of the Province of Ontario. RSO bulletin stations heard on the various nets can provide the details. The Windsor ARC, under the direction of VE3KO, assisted the annual Goodfellows Fund Drive. VE3LDU presented an interesting talk to the Oxford Co. ARC on a "homebrew" TU11 circuit board for an RTTY and CW interface for the VIC-20 and Commodore 64. VE3MGL is producing circuit boards for interested club members. Two new Toronto repeaters sporting open phone patches, for the time being are: VE3YYZ 443.045/448.05 MHz and VE3ULI 443.8/448.9 MHz. With DOC approval of the Telidon on Canadian amateur frequencies, DOC has requested amateurs using Telidon, transmit the ASCII characters NAPLPS (North American Presentation Level Protocol Syntax) before transmitting a Telidon data file. The section's TC VE3EDO is active in this mode of transmission. VE3FIO and VE3KQS are new members of CARTG. Congrats to the Nortown ARC for placing first in Ontario in the 1983 Field Day. Skywide ARC has several club awards for membership participation and VE3UR leads in their Skywide Worked All Members award with 130. Now's the time to start that '84 Field Day planning. Traffic: VE3KK 1762, VE3HGJ 898, VE3FGU 521, VE3CYR 322, VE3HTL 303, VE3GT 302, VE3KCZ 198, VE3DPO 184, VE3GOL 165, VE3KXB 158, VE3JSM 142, VE3GFN 97, VE3BCZ 95, VE3AJN 88, VE3WM 79, VE3BVG 75, VE3DZK 70, VE3WG 62, VE3EWD 56, VE3BDM 48, VE3MCO 44, VE3EHL 40, VE3EST 36, VE3MPF 24, VE3BAJ 20, VE3JHA 19, VE3DZH 13, VE3KLX 8. (Nov.) VE3DZH 3.

QUEBEC: SM, Harold Moreau, VE2BP — STM: VE2EDO. PIO: VE2YW. BM: VE2ALE. TC: VE2ED. NMs: VE2EDO VE2FSA. New appointment: VE2QO as OBS. 119 cassettes (*QST* on tape) were sent to whitecaners during 1983, courtesy of VE2EKC. This service is still available in 1984. If interested, send a 90-minute cassette to your SM. On New Year's Eve midnight nets on VE2TA and VE2MO amateurs exchanged wishes. Le premier reseau du jour de l'an, sur VE2MO, a ete un succes. Avec regret je dois vous annoncer le deces de VE2YE. Traffic: VE2EDO 126, VE2EC 62, VE2BP 53, VE2EKC 27.

SASKATCHEWAN: SM, W. C. Munday, VE5WM — SEC: VE5RP. STM: VE5HG. TC: VE5GF. BM: VE5WM. NMs: SATN VE5BAF; SPN VE5HG; 2 meters MJARC VE5AFA; RARA VE5OI; SARC VE5HG. IT is with regret to announce VE5WC became a Silent Key. The weather was not the only element to set records in SK. A total of 570 messages were handled from traffic counts received. RARA hosted a successful senior citizen's Christmas message roundup with 61 messages originated. Special thanks to VE5AAA VE5AEJ VE5AGM VE5CS and VE5OI. Amateurs on the move in SK include VE5ACM to Rosetown and VE5KA to Toronto. Good luck in your new endeavours. Traffic: VE5ADZ 272, VE5AEJ 152, VE5UX 90, VE5AAT 39, VE5AFQ 17.

ATLANTIC DIVISION

DELAWARE: SM, John Hartman, WA3ZBI — STM: W3DKX. SEC: W3PQ. PIO: N3DIP. PSHR: WA3WIY W3DKX WA3DUM K3JL. Column by outgoing SCM WA3WIY. My deepest gratitude to all for the fine cooperatin during my term of office; please extend it to WA3ZBI. New officers SARA K3ZXP, pres.; KA3CDF, v.p.; N3DCK, secy. Congrats to KA3HAE on upgrade to Adv, and a warm welcome to new Novice KA3LWJ. On a sad note, our condolences to K3ZXP on the loss of his mother. New manager of SEN KC3JM. Delmarva Hamfest Aug. 19, to be hosted by U of D ARC. DTN QNI 385, QTC 58 in 22 sessions. DEPN QNI 81, QTC 23 in 5 sessions. SEN QNI 28, QTC 3 in 3 sessions. Traffic: W3PQ 155, W3DKX 70, WA3WIY 62, W3QQ 58, WB3DUG 45, WA3DUM 31, K3JL 18, W3FEG 15, W2AGR 14, N3AXH 13, K3ZXP 7, W3WD 3. (Nov.) WA3DUM 24. (Oct.) WA3DUM 13.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — ACC: KB3NE. PIO: W3AMQ. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DEC: K3QXC KB3LR KB3UD N3AIA N3BFL W3EEK AA3C.

Net	Time	Freq.	QNI	QTC	Sess.
EPAEPTN	6 P.M. Dy	3917	577	484	32
EPA	7/10 P.M. Dy	3610	491	366	62
PTTN	6:30 P.M. Dy	3610	282	158	31
PFN	5 P.M. Dy	3958	154	224	31

Local and VHF nets reporting (QNI/QTC/sess): D3ARES 118/25/4; D5ESN 60/9/4; D6ARES 49/18/5; CCAREC 39/0/4; CSVARES 33/2/4; LCARES 45/9/7; PWARES 59/2/4. D5ESN (Nov.) 62/4/4. Totals for 1983: D3ARES 1800/211/54; D5ESN 846/119/54. New appt.: KA3EJG to NM. BPL: KA3DLY KB3UD N3AIW N3COY; congrats to all. OBS reports: KA3EJG K3EBZ W3CL W3VA. OO reports: N3DMB W3FAF. PSHR: K3NTD KA3DLY KA3EJG KA3GJT KB3UD N2BSK/3 N3CMC N3COY W3VA WA3JRL WB3FKP. EPA welcomes N3DKC KA3ENK W3SD. EPAEPTN welcomes N3CWE. PTTN welcomes KA3IVS. New officers: Murgas ARC WA3ZTM, pres.; WB3FAA, v.p.; KA3JMH, secy.; K3JML, treas. Philmont MRC KB3IV, pres.; W3IIM, v.p.; WB3KOH, secy.; W3IIN, treas.; K3GNM W3ZPP, directors. New gear: W3NWP TR2500, WB3FYT TS930, K3EBZ Azden 2000. Congrats to KA3DLY N3AIW and N3COY for making BPL for first time. N3DKC and W3SD report for first time; welcome aboard. Upgrades to Extra — N3DCG N3DPX N3CSG K3CBP KA3BCO; to Advanced — KC3KT KC3LM KA3HBK N3DRZ N4IOR; to Gen. — KA3LEZ. New call signs: KC3KT (KA3JJJ); N3DRZ (KA3GYY). W3HK slowly recovering from serious fall and expects to be active shortly. Congrats to K3NB for top score in Mich QSO Party, out-of-state class. N3DAP/rpt now covering the Wilkes-Barre area on 224.240 MHz. K3NTD proudly reports his XYL now new Novice KA3LYC. Mid-Atlantic ARC reports 15 new Novice ops from their recent Novice class. Many local and VHF nets covered the river and stream watch during the December floods. Traffic: KB3UD 644, N3COY 612, N3AIW 525, KA3DLY 457, W3IPX 341, AA3B 216, WB8KPE 207, KA3GJT 204, K3NTD 179, W3KAG 166, WA3WQP 159, W3VA 123, N3GD 109, KA3EJG 70, W3ADE 67, K3QXC 45, WA3QIN 44, W3TWV 40, N3DKC 23, W3FAF 23, KA3IME 20, WB3FKP 17, W3CL 16, N3CMC 14, N3DMB 14, N3BFL 13, N2BSK/3 13, AF3Z 12, WA3CKA 9, W3SD 7, K3EBZ 6.

MARYLAND — DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — Mini Sermon: From the sound of things these days we all need a rededication to the "Amateur's Code." This is something you have to do for yourself, but it helps our overall image! KA3R has been finding a bunch of bum signals these days. W3FA rediscovers 80-meter wintertime skip the hard way! KB3WL benefits; he makes it into the south of the state better. W3CDQ may have lost her report cards, but not her skeds. W3ZNW is just too business-like with that new keyboard! WB3KJT's big move from the basement workbench to the family room is planned. KC3AV's MSN Honor Roll KK3F KJ3T KC3Y KC3AV N3DE N3DPE WB3KJT KA1KML and K3NNI. Congrats to each of you. KC3DW made BPL with a mobile antenna clamped to a lawn chair. Great! KJ3E is going to be the most computer oganized amongst us. W3LDD was pushed into a higher traffic count. The numbers are ascending for KJ3T. KC3Y has broad coverage. W3YVQ is the man to see for RACES. He has everyone in that wants. WA3TAI is SEC. KA3DRO is ACC, and KA3DBN is PIO. All are ready to help. KA3EWV signs the K3AA BRASS Special Event Certificates. K3NNI was more than active. N3QA supports NTS. N3IT and N3DPE come out even in traffic count. WB3BFK expects some PON relief with W3DFW retired and back home. KA3LIJ upgraded to General and sports new call N3DTD. Congrats. W3DQI is looking for ways to ease the burden! WB3GZU's big time is weekends. They paid off this time. W3FZV motored to Florida and brought the cold wx with him I bet! W3UT is muttering something about men, boys and size of toys as he looks over his 28 ASR RTTY set up. KK3F provides expanded delivery service. Sounds good anyway. With the nets (net/manager sessions/traffic/QNI average): WC 2-Mtr/KC3DW 5/4/11.4; WR PON/WB3BFK 22/72/15; MSN/KC3AV 31/104/9; MDD/W3PQ 62/479/10.3; MDD/W3PQ (Nov.) 60/301/11.9 with KJ3E and W3FA top Brass. MEPN/WB3GZU 30/251/30.5. Brass KC3Y KJ3E and W3FA. Toppers W3BRZ and W3DKX. Three or less WB3BFK W3LDD KC3Y and W3YVQ. Tnx to Columbia ARA, FAR, AARC, and Chesapeake Bay ARA for bulletins and news letters. Traffic: WB3GZU 762, KC3DW 628, W3YVQ 463, KJ3E 315, KC3Y 273, N3QA 219, KK3F 188, W3FA 180, WB3KJT 160, KA3EWV 156, KB3WL 132, W3UT 131, KJ3T 127, KC3AV 106, K3NNI 91, W3DQI 62, N3DPE 49, N3IT 49, WB3BFK 47, W3LDD 40, W3FZV 16.

SOUTHERN NEW JERSEY: SM, Richard Baier, WA2HEB — SEC: K2NE. STM: WA2HEB. ACC: K2IXE. PIO: WB2RVE. BM: WB2UVB. TC: W2IJX. SGL: W2XQ. I occasionally receive requests from people looking for Novice training classes and/or upgrading classes and I inevitably have trouble locating them. To help me, could any of you in the section who are planning to conduct training classes drop me a line and let me know the details? Also, if you would let ACC K2IXE know of these classes, we'll be able to touch all bases. Thank you. Those of you who regularly report their monthly traffic totals are urged to become an Offical Relay Station (ORS). If you're not one already. The only requirement is to report your totals to the SM. Contact me for details. Copies of the SNJ emergency plan are now available from the SEC or STM. All interested parties are asked to get a copy and to comment on this important document. We still need an OO/RFI Coordinator. Anyone interested, please get in touch with me. 73. Traffic: WB2UVB 570, WA2HEB 396, WA2CUW 124, KA2CQX 49, KC2PB 45, N2AEP 36, WA2MGV 25, KA2ANJ 7.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — ACC: N2EH 716-624-1929. BM: W2GLH 315-782-8796. OO/RFI: W2AET 716-433-2358. TC: K2QR 607-785-5464. SEC: W2BCH 315-672-3695. PIO: WA2PUU 315-469-0590. SGL: KO2X 607-533-7585. STM: W2ZOJ 315-446-2275. These ARRL Leadership Officials need your support. Get involved through your local club or write or telephone one of us. W2BCH appoints OES and EC for all forty counties, plus five District Emergency Coordinators for inter-county mutual aid, training and coordination. W2GLH appoints OBS and COBS and directs Bulletin Program. N2EH assists all clubs and recommends affiliated clubs that have applied for Special Service Club. WA2PUU appoints Public Information Assistants and promotes ham radio public relations in WNY. K2QR provides technical assistance to all, including RFI matters in support of W2AET, who also appoints Official Observers. KO2X follows state and local government matters related to Amateur Radio. W2ZOJ appoints ORS and net managers while guiding traffic handling in WNY. PSHR: W2AET WD2AFI KA2BHR KA2DQA WA2FJJ WB2IDS WA2KOJ W2MTA WA2NKC KA2OVLT WB2OWO WB2PID WA2PUU KA2QIK KC2QQ WB2RBA ND2S W2UYE W2ZOJ. BPL: W2AET WA2HSB WB2IDS W2MTA WB2OWO. HAMFESTS: Owego May 5, Rochester May 18-19. Net Data (QNI-QSP-QND): NYS/1 353-381-31; Mike Farad 228-119-27; NYPON 786-672-31; NYSPTEN 608-96-31; ESS 435-114-31; OCTEN 593-71-31; Q Net 336-22-31; WDN/E 582-218-31; WDN/L 552-257-31; Blue Line 293-18-26; NYS/4 497-394-31; OARC 53-0-4; CNYTN 489-137-31; NYS/5 410-443-31. Reports: LCARES, SLVARES, THIN, VHFTHIN, WNYEN. New NOVICES: Tompkins grew 23 — NC2T WB2NDN KC2YF; RARA begot 24 — N2EH; Rome spruced 14. Classes starting: DeWitt — KC2OY; Black River Valley and Lewis Co. ARES — WA2OEP; Rome RC — K2GVI WA2NKC KA2NIL; RARA: Tompkins Co. GREAT! Club Officers: BARA KF2X N2CIC WB2SGS N2CFN; BARRA WA2ZSJ WB2CJL N2IE K2GUG; Kodak Park KW2X KZ2R WA2JRP; Orleans N2CUK KZ2R N2CWG WA2FRO; STARS WB2GIM KC2EU KA2LDL KA2DDP WA2ZFU; RAWNY KM2L W2CUU KA2IWJ KA2JWQ; Rome KC2RN KA2NIL KA2JXA WA2YES; Utica WB2BIN NA2A K2XU; Skyline N2AGF WA2IBL N2DBW K2LFB K2IWR; LARS WA2MYG WA2ZUG WA2DHB; SUARC KA2GCZ WA2YMS KD2CF N2GHA; Salt City KU2X K2ZJ WB2KCI KB2G; Oggdensburg KA2JXI KA2CEO K2JPM WA2FDJ. CONGRATS: WA2OVT Ham-of-Year Chemung ARES. Traffic: WB2IDS 905, W2MTA 624, W2AET 524, WB2OWO 521, WA2HSB 507, WA2FJJ 476, W2FR 428, WD2AFI 410, WA2NKC 410, W2ZOJ 280, W2GJ 276, KC2QQ 266, WB2QIX 243, ND2S 224, WA2KOJ 200, WA2PUU 200, KA2BHR 166, KB3RG 154, KA2DBD 139, KG2D 120, W2UYE 108, WB2RBA 90, KA2QIK 77, KA2OVL 71, KA2DQA 70, K2GXT 68, WB2PID 53, WA2RXO 51, KA2HRS 40, WB2KCT 39, K2IUT 22, W2PHQ 20, N2ARD 17, K2RN 12, WA2OEP 11, KC2SJ 10, WB2NAO 8, K2VR 3. (Nov.) KA2OVL 26, WA2SDY 15.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. ACC: N3EE. OO/RFI: KN3B. PIO: WB3IZJ. SGL: W3OKN. TC: W3FE. BM: WN3VAW.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	424	302	31	3585	7 P/D
WPAPTN	646	271	31	3983	6 P/D
WPA2MTN	488	157	30	146.28/88	8 P/D
NWPA2MTN	445	10	27	145.13/53	1400Z

New club officers for 1984: WACOM KA3GSE, pres.; WB3GWR, secy/v.p.; Gene Schirra, treas. Radio Amateurs of Corry W3KJE, pres.; WB3BNK, v.p.; W3AHH, WA3SJM, treas. Radio Assn of Erie KB3A, pres.; WB3BHY, v.p.; KA3IXW, secy.; KA3FKT, treas. KC3AW KA3CKO, directors. Triple "A" ARA N3ACE, pres.; K3NPX, v.p.; K3NPW, 2nd v.p.; KA3CNP, secy.; N3ALL, treas.; KA3DJO, chief eng.; W3VRZ, trustee. WB3CEW, editor of the Irwin Area ARA, is being transferred from KDKA Radio in Pgh to KYW in Philly. She was Technical Supervisor at KDKA. We wish her lots of happiness there. She did a fine job at the club. W3FVU, editor of the Indiana County ARC *Sine of the Times* newsletter has been appointed president of the Amateur Radio news service. Congrats. Thirty four amateurs participated in the 100-mile walk-a-thon staged by the Phi Theta Phi members from Thiel College in Greenville PA to Children's Hospital in PGH. As they passed through an area each the local hams took up the job of providing communications. The cooperation of each was great. On Dec. 24 & 25 the Erie area was hit by a heavy snowstorm which stranded many motorists. Amateurs provided communications and sent out 73 messages assisting the people there. Traffic: W3EGK 516, W3OKN 478, AC3N 440, KQ3T 159, N3FM 140, WA3UNX 137, KQ3M 133, WA3QNT 128, KN3B 125, K3SMB 121, KB3DT 110, K3NPW 89, W3NGO 68, WN3VAW 61, W3RUL 60, KB3NV 57, W3KMZ 55, W3KUN 52, K3LTV 43, WA3COX 40, WA3GMF 40, N3CYV 36, KC3JQ 35, K3NPX 32, K3HCT 24, W3MML 23, W3GVI 18, W3TTN 13, KA3JGN 12, WA3DBW 11, W3SN 6, AB3X 4, N3KB 3, WA3HJC 1, W3LOD 1.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT. ACC: WB9SFT. ASM: K9ORP.

Net	Freq.	Times (Z Wtn)	QNI	QTC	Sess.
ILN	3690	0030/0400 Dy	587	307	62
ITN	3705	0100 Dy	210	97	29
ILPN	3915	2230 Dy (X Sn)	—	—	—
NCPN	3915	1300 Dy (X Sn)	511	93	—
NCPN	7270	1815 (Dy (X Sn)	292	267	—
IEN	3940	1500 Sn	119	6	4
IARES	3915	2230 1 + 3 Sn	54	—	2
ISN	3905	0000 Dy	395	194	31

Illinois was represented to D9RN by stations W9HOT WB9NVN KW9J K9EHP W9NXG WB9ODN KA9FEZ WA9BXB W9HLX W9KPI W9OBU WB9WGD WA9BFV and K9AZS. D9RN was represented 100% to CAND. Illinois

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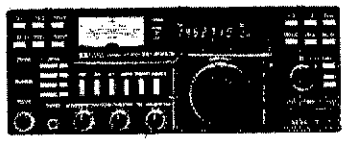

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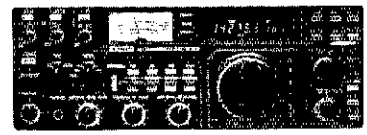

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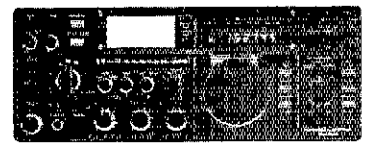

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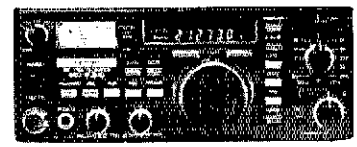

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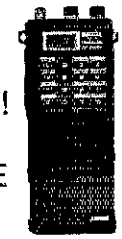

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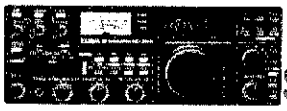

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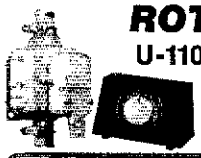

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HD-73

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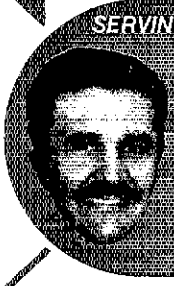

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stations were K9EHP W9HOT KW9J WB9NVN W9NXG and W9EHQ. There was no 9RN report received this month. Many reports from some of our newer appointees indicate some confusion regarding the CD-210. The CD-210 or a message containing the same information must be received by the SM by the 6th of each month for inclusion in this column. All stations, not just ORS, can and should indicate traffic figures. Please list all the appointments you hold on the card so that all of your appointments are credited with monthly reporting. ECs should send the CD-210 to the SM and the CD-212 to the SEC. All other appointees send your reports to the SM. They are entered into a computer file and Hq. and the appropriate section cabinet members are kept advised of your activities. Don't forget the PSHR section on the back of the card. Reporting is an important part of any volunteer activity. . . Remember, no job is finished 'til the paperwork is done. Hi! Special thanks to N9DR for a copy of the ILN gang at the Peoria SUPERFEST this year. KW9J looks like she has her hands full with the QLF award!! K9EHP reports that he will be /4 for a while from Lake Wales, FL, and says he'll be on the Florida nets. CONGRATS to Illinois December BPL winners KW9J W9JIJ WB9NVN and WA9BXB!! Great work!! KB9UM is justifiably proud of his son Scott newly licensed as KA9QZO. Scott is 10 years old and will be on the air soon. We'll be looking for him in Novice Roundup. AA9D, EC for Kane Co., reported that his major activity for the month of December was freezing, which about sums up the weather traffic for the month. Best wishes to all in 1984 and let's keep the Public Service ball rolling. Traffic: KW9J 721, W9JIJ 705, WB9NVN 691, W9HOT 446, K9BVE 334, WA9BXB 319, W9HLX 298, W9NXG 295, K9EHP 290, KA9FEZ 219, KB9X 188, WB9UEA 171, WA9SHE 93, K9QEW 80, KD9K 64, WD9IBH 58, KN9BAM 50, N9DR 46, KZ9I 37, W9LNQ 22, K9CMO 19, W9DBO 18,W9KR 14, KA9NBH 12, WD9EED 11, WD9CJB 11, WA9RUM 6, W9HBI 6, KW9L 6, W9VEY/M 5, WA9HQW 4.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. OO/RFI: KJ9G. SGL: WA9VQO. PIO: K9DIY. SDXC: N9MM. BM: KC9TA. SRC: N9WB. ACC: K9TUS. SOC: W9OBF. TC: WD9ADB. SHC: WA9FUD. NMs: ITN W9QYY; QIN KJ9J; ICN KA9CZD; IRN KB9SU; VHF W9PMT; IWN KA9ERC.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2130/2300	3240	741	3242	93
QIN	3656	1430/0100/0400	663	605	2324	93
ICN	3708	0015	86	31	597	31
IRN	3629	0000	149	11	1335	23
IWN	3910	1310	1759	8	653	31
IWN	VHF	Kokomo	1109	—	517	31
IWN	VHF	Bloomington	1102	—	517	31

Hoosier VHF nets: QNI 7328, QTC 296, QTR 7999, bulletins 62 for 26 nets. D9RN 100% 1398 messages in 2493 minutes. Congrats and thanks to all for a job well done. IN stns W9JUJ K9CGS W9URQ W9QLW W9PRD WA9WJA KJ9J KB9NR. CAN-D 2983 messages in 33 sessions. D9RN 100% IN stns W9JUJ W9URQ KD9DU. Silent Key W9AI long time secretary treasurer of the Indianapolis RC. Appts: EC KA9IYJ Grant Co.; ORS KA9DHL; DECs K9KTH Brown, Green, Monroe, Lawrence and Owen Cos.; K9PQP Henry, Rush, Decatur, Franklin, Fayette, Union and Wayne Cos.; WB9ZQE Marion, Boone, Hamilton, Madison, Hancock, Hendricks, Morgan, Johnson, Putman and Shelby Cos. W9PRD made Christmas a little nicer by soliciting messages from several nursing homes in his and surrounding communities. It takes a great amount of patience to deal with the elderly and often addresses are not current or complete. It required more than one trip to the homes. He sent all messages with HXE, and personally delivered many messages and passed others by phone. I would like to see others willing to take the time and patience to do this. W9PRD did get recognition in the local paper for his efforts although that is not the reason for him doing it. A big thanks to all who went the extra mile for traffic this Holiday Season. Additional appts: N9CJT PIA for Bartholomew Co.; WD9IRL EC for White Co. WB9TOW reports XYL upgrade from Novice to General call KA9NRD; congrats. Congrats also to WD9EKA KA9R N9BOG K9ESK K9VQD KB9JD WD9EYB KA9JSM KC9XR and WA9UKK for the new antennas at W9UUU Terre Haute Red Cross in the rain in December. They should work. Get well wishes for N9AST K9DCX and W9OYY after their visits to the hospital. Traffic: W9JUJ 1954, W9PRD 542, KJ9J 417, WB9UYU 376, W9URQ 316, W9QYY 248, WD9DWD 180, KM9B 169, W9EI 151, K9WWJ 127, W9UMH 115, KB9HH 109, WA9QCF 108, N9HZ 97, KA9LAU 87, WD9HII 84, N9AEI 64, WB9AWI 55, W9JZV 55, W9PMT 53, W9CNE 43, KK9N 39, AB9A 37, W9XD 30, KW9C 28, KA9FFO 26, K9OUP 20, WA9OKK 18, WD9ART 16, WB9OZZ 16, WB9ZQE 16, KA9EIV 15, W9RTH 14, WB9AJY 13, K9GBR 13, W9DKP 12, K9CGS 12. WB9GET 11, N9DHX 10, W9OZJ 9, W9ZGC 9, WD9EXI 7, KJ9G 7, WD9CIV 5, W9BDP 4, W9UPI 4, WB9TOW 3. (Nov.) W9QLW 73, KC9WE 10, KW9C 3. K9FW 1.

WISCONSIN: SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1200Z QNI 1357, QTC 1503 WD9IID. BEN 3985 1800Z QNI 790, QTC 372 WB9ESM. WSBN 3985 2300Z QNI 1025, QTC 513 K9ANV. WNN 3723 0000Z QNI 161, QTC 20 KA9HPQ. WSSN 3645 0030Z QNI 195, QTC 101 KC9GJ. WIN-E 3662 0100Z QNI 394, QTC 253 W9YCV. WIN-L 3662 0400Z QNI 209, QTC 125 K9LGU. NWTN .34/.94 0030Z QNI 418, QTC 54 N9BDL. Gr. Bay .72/.12 (Thur) 0245Z QNI 39, QTC 3 WB9NRK. WCWTN .31/91 0030 QNI 390, QTC 27 N9AUG. FLARC is the first and only club in Wisconsin to apply for Special Service Club. W9QA retired from Oscar Meyer after 27 years of service; congrats. KC9JP has 204 BAS for 20 meters. Tri-County swapfest March 18 at Jefferson Co. fairgrounds. I trust everyone enjoyed their Christmas parties; all have a Happy New Year. Did you contact W5LFL? Sure was an interesting trip. Wisconsin QSO Party March 11-12 1800-0100Z, get on the air and have some fun. KA9OBP is new NM for WNN; thanks to KA9HPQ for a fine job well done. BPL to KA9CPA KC9CJ K9GDF. WNA picnic slated for Sept. 15 at North Wood Park; mark you calendars. W9YCV needs Vermont, Nevada and Wyoming for WAS on mode A satellite. He has 155 countries confirmed on HF bands. Traffic: KA9CPA 2297, KC9CJ 888, K9GDF 479, WA9WYS 378, W9CXY 342, KC9KO 338, W9CBE 315, WD9IID 255, W9YCV 239, W9UCL 232, KA9OBV 151, W9IEM 129, KA9BHL 127, W9LDO 120, K9FHI 118, AG9G 117, WD9FRI 109, KG9B 90, K9AKG 85, N9BDL 78, K9UTQ 74, K9SAO 66, WB9ESM 60, KA9HPQ 59, WB9ICH 59, W9DND 58, K9ANV 57, KA9IKR 53, N9BGE 41, WB9JSW 41, W9UW 41, K9VSO 41, K9LGU 39, KY9V 38, W9IHW 35, KN9P 34, K9BED 37, N9BCX 35, WB9PKL 35, KB9NG 28, KA9AFB 27, WB9NRK 17, N9DCF 15, KY9P 13, KA9BHK 11, KB9FM 11, KA9NOT 6, KV9U 6. (Nov.) WD9FRI 43.

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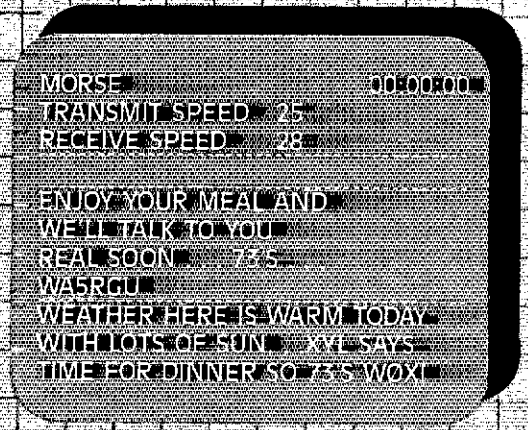

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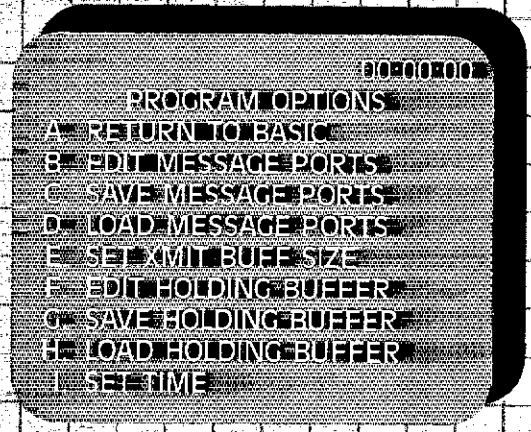

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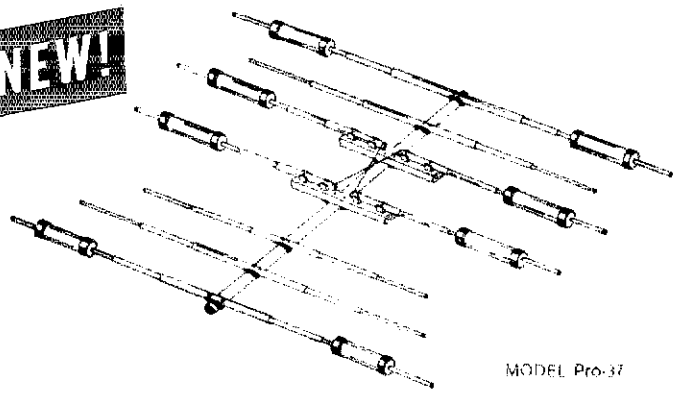
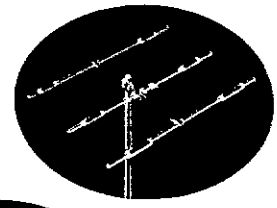


MODEL Pro-37



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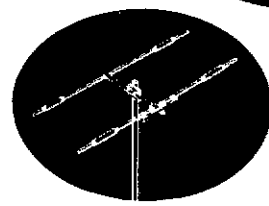
10-15-20M.
Rated to 300W.



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The Pro-37 follows in the Mosley tradition of high performance, dependability, and quality construction. The Pro-37 is pre-drilled for easy assembly. No adjustments or measuring. Average assembly is about 1½ to 2 hours. As with all the Mosley antennas we use stainless steel hardware throughout. Rugged construction makes our antenna the cleanest, strongest of its class, no cluttered elements or boom to cause electrical and mechanical problems down the road. Put it up and leave it up. In performances it has no peers...it is as broadbanded or broaderbanded than any antenna made. Its gain and front to back is as good or better than other antennas in its class, even those with longer booms. Mechanically we feel it's the best built.
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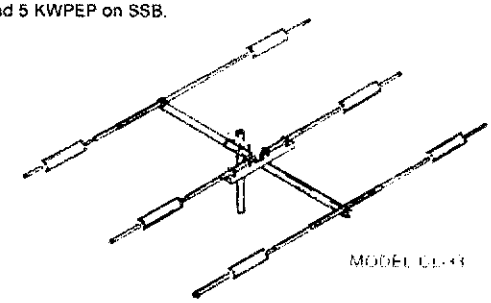

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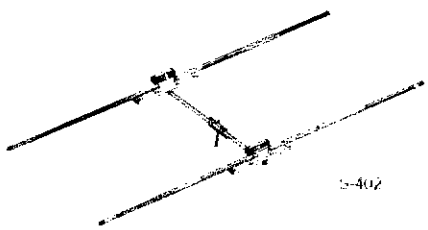

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DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — SEC: KAØARP. STM: KDØCI. Hello again! The Faribault "Handi-Ham" hamfest was on Dec 3rd. The highlights included a two-part film on the training of guide dogs and how their prospective owners are trained to handle them. KØHR talked about the Handi-Ham System in general, and a Certificate of Merit was presented to WAØTFC. December brought a severe cold snap that even those of us who LIKE cold weather had a hard time coping with. Amateur Radio turned into a media of good fortune for some travelers during the worst of it. A motorist from Kansas, whose car was hung up in a snow bank after her car left the road 25 miles from International Falls, was spotted by KØHKZ. He called on the 97 rptr for help and WAØCEL in turn notified authorities. Help arived in 11 minutes. Meanwhile near Dassel, WDØBGS experienced car trouble late at night in –24F cold. He called on the Willmar rptr for assistance; both WDØDTV and KAØMZJ answered the call, thanks to these and other stations who monitored 2 meters to aid those who were travelling during those treacherous days and nights. Congrats to NØEYR who upgraded from Advanced to Extra. Net news: Subject matter is being gathered together for 15 minute training and information sessions as a prelude to the evening MSPN. These pre-net sessions were to begin in January. Club news: KØJYB is now pres of the Amateur Radio Assn of Bloomington (ARAB). ADØS, who has been coordinator for the Paul Bunyan Wireless Assn since its beginning, has moved to Texas. KCØYG is the new coordinator for the group. The Bemidji ARC's new pres is KCØMJ. A note that the Bemidji hamfest will be Sat, April 28th at the Middle School. Watch for details in *QST* or tune in on the MSPN/E pre-net for further info. In closing I deeply regret to inform you of the passing of WØBGY. Our condolences to his family.

Net	Freq.	Time	QNI	QTC	Sess.
MSN/1	3685	6:30P	288	180	31
MSN/2	3685	10:00P	231	56	31
MSSN	3710	7:00P	105	25	25
MSPN/N	3945	12:05P	716	230	31
MSPN/E	3929	5:30P	1223	775	31
MNAMWXNT	3929	6:15P	668	488	28
PICONET	3925	Daily	3433	313	27

Net Mgrs: MSN/1 WØEHI; MSN/2 KAØEPY; MSSN WBØWXU; MSPN/N KAØJUX; MSPN/E KCØUJ; MNAMWXNT WDØBAC; PICONET WØHZU. Traffic: KBØMB 2004, KCØUJ 1226, KT9I 790, WAØTFC 601, KAØARP 401, KAØJUX 319, WØEHI 283, KAØEPY 243, WØHZU 231, WBØHOX 187, WDØBAC 176, KZØH 158, KDØCI 157, NØCLS 144, KCØT 140, NØBEI 105, KØCSE 94, KAØCIR 88, KTØR 59, WØMFW 56, KØOGI 53, NØEXP 50, WDØHDD 50, NØJP 50, WØKYG 43, KAØKWM 37, KØIKU 33, KCØNL 33, KBØRW 28, KDØKK 27, KXØV 21, WDØBGS 19, NØEYR 19, WBØJUL 17, WBØLRK 16, WBØUKI 15, KYØX 15, WØDM 14, KN9U 10, KAØBFP 9, KAØAJF 5, KNØJ 5, KQ9F 4, KCØYG 4.

NORTH DAKOTA: SM, Dean R. Summers, KQØC — Upgrade NCØZ: Congrats! Everyone interested in volunteering to give FCC exams should submit to ARRL Hq. as we need as many as possible who would be willing to participate. My records to date show that the *Fork Feedline*, *BARK Noiseletter*, and the *TRARC Newsletter* are the only functioning newsletters in the state. Congrats to those who take the time and effort to contribute to those vehicles. Looks like the No-Code license is finally dead. Thank you all who took the time to write to ARRL Hq., FCC and others. This is my last *QST* column as SM. Jane and I are going to attempt to build a new house, and owing to the divestiture of the Bell System, I will probably be traveling more. I've sent my letters of resignation to Director KØTO and to Hq. Thanks to all for ur past support. 73 KQØC.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — STM: WØKJZ. SEC: WØYMB. SGL: NBØD. BM: NØCFS. TC: KØAS. ACC: WBØPWA. OO/RFI: KCØOO. We need your help with section emergency coordination; especially in those parts of S.D. that have sparse population. While you are still thinking about it, contact WØYMB. Get ready for the BIG DX CONTEST this month. New to our section is WA6YBT who is operating VHF and OSCAR. Welcome and good luck. NTS TEN and DTEN liaison stations were KØFRE WØKJZ WBØLTV WBØKWX WBØSUM KCØOO KCØAF. PSHR: WØKJZ NØEEH NØCFS KCØOO. Traffic: WØKJZ 207, KAØHMI 58, WBØKWX 56, WBØLTV 43, NØCFS 29, NØEEH 26, KCØOO 19, WBØSUM 12, WØYMB 11, WBØOMF 10, WØDVB 9, NBØD 8, KAØKXG 7, WBØYDG 6, KØFRE 5, KAØKPY 4, WBØSSC 4, WAØBZD 3, WAØVRE 2, WAØAOY 1. Informal Messages: WAØUEN 55, WØDVB 49, WAØVRE 36, WBØOMF 31, W7UDB 27, WØYMU 24, WBØYDG 22, WAØBZD 20, KCØOO 16, NBØD 7, NØCFS 6, WBØLTV 5, WØKJZ 3.

DELTA DIVISION

ARKANSAS: SM, Joel Harrison, WB5IGF — SEC: N5BPU. STM: AE5L. TC: W5FD. SGL: W5LCI. ACC: AD5M. Don't forget the All Arkansas Hamfest and ARRL State Convention April 7 and 8 in Little Rock. All clubs that haven't contacted AD5M concerning their ARRL status should do so. I apologize for being so inaccessible the past few months. My work situation had changed temporarily, and I appreciate those who took over while I was out. EC's are needed in some counties; contact N5BPU if interested. Traffic: AE5L 234, W4AZJ 102, WB5IGF 32, W5UAU 28, KA5DFT 8, W5RXU 8.

LOUISIANA: SM, John Meyer, N5JM — SEC: WA4MUW. PIO: KO5R. ACC: K5DPG. SGL: KD5SL. In the biggest voting turnout in years at the BRARC, the 1984 officers are WD5ELJ, pres.; K5PGW, v.p.; KA5NGO, secy.; N5EGA, treas.; W5OVV K5RGI W5ISS W5KYC KB5AQ WB5CIQ, board mbrs. You can pass a good time in Lafayette on Marhc 10 & 11 at the Holidome on Hwy 167 South when the Acadiana group puts on their hamfest. You can count on fun, fellowship and fantastic area food; talk-in on .22/.82 or contact chmn KE5SZ for info. The CLARC's *Brass Key* monthly newsletter is a fine example of ham journalism; contact KB5CX for a copy and ideas on how to "spruce up" yours. Mark your calendar for the following hamfests: B.R. May 5 & 6; Alex. June 16 & 17; Shrev. in Aug.; N.O. in Oct. The DDXA says a certain Miss. rptr is louder than the Laccadives. Fire has put NM N5BFV QRT so W5TVW will sub for him.

Net	Freq. (kHz)	Time	Mgr
LTN	3910	Dy 6:30 P.M.	N5ANH
LAN	3615	Dy 7 & 10 P.M.	N5BFV
LSN	3703	Dy 7:30 P.M.	WA5ANV
LEN	3910	M 8 P.M.	KA5PFB
CCTN	146.01/61	M-F 6:45 P.M.	GNOARC

Traffic: KA5HDT 217, W5GHP 131, WB5NCM 98, WA5TQA 91, WB5LBR 55, W5TVW 48, N5BFV 46, K5WOD 36, N5ANH 27.

MISSISSIPPI: SM, Tom Hammack, W4WLF — ASM: KW5T.

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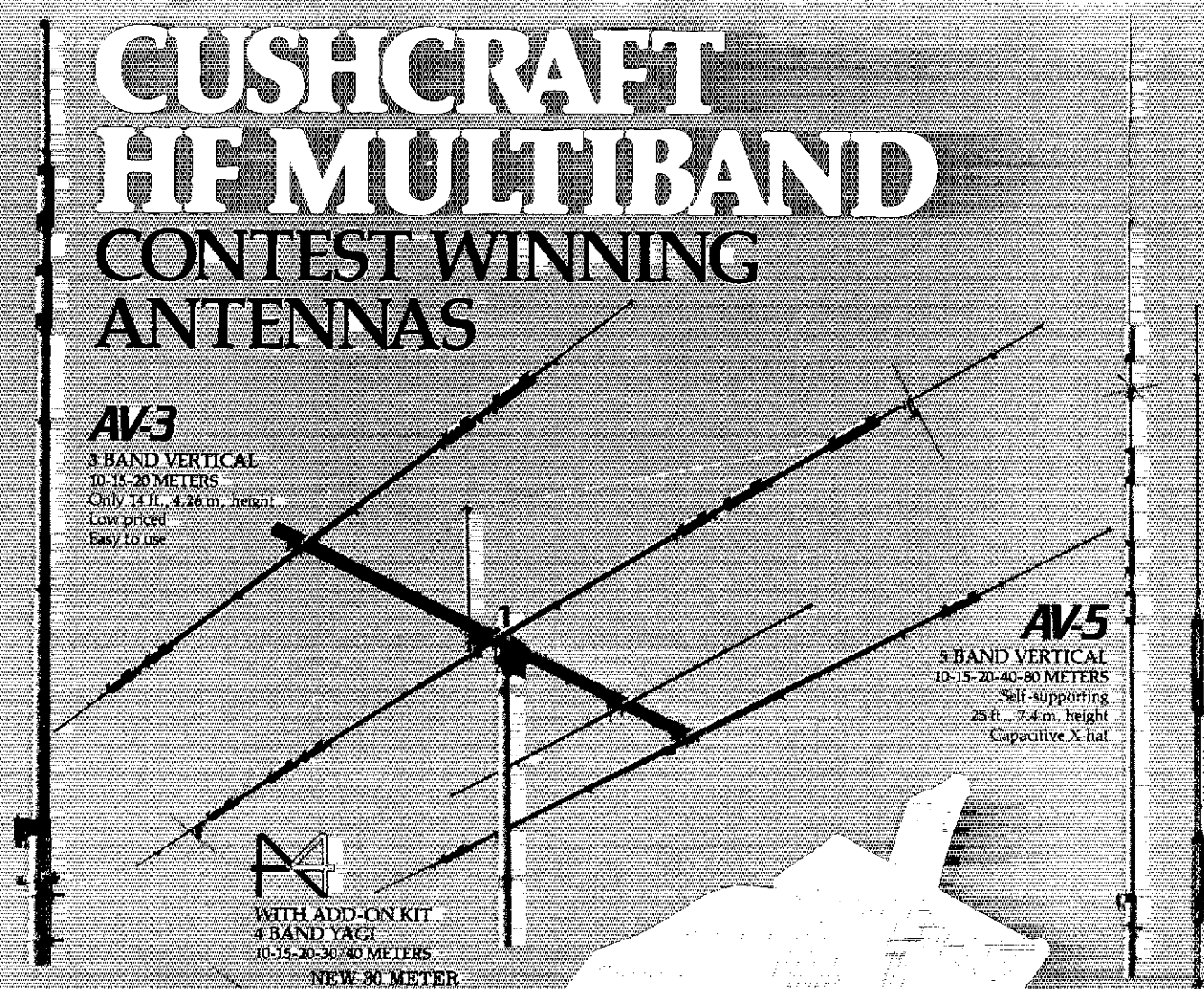

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A4
Broadband, excellent gain and f/b ratio, 2 kw power rating, direct 50 Ω feed, boom 18 ft., 5.48 m., longest element 32 ft., 9.7m., weight 37 lbs., 16.8 kg., turn radius 18 ft., 5.48 m., mast dia. 1¼" to 2in., 3.18 to 5.08 cm., material 6063-T832 seamless aluminum.

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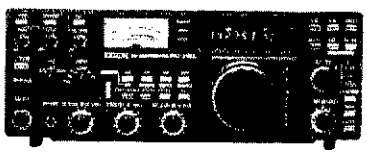

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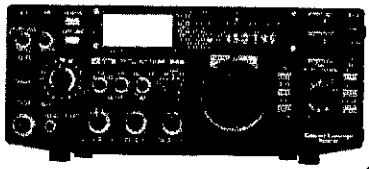

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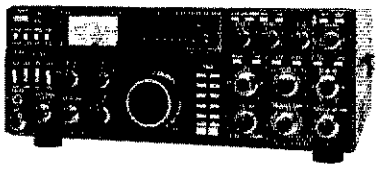

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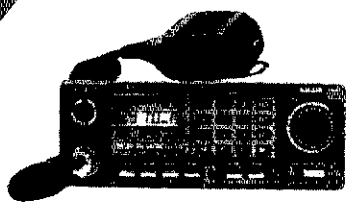

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SEC: N5DDV. STM: KB5W. PIO: ND5M. Freq. Coord.: NF5Q. Everyone is looking forward to another fine hamfest in Jackson. The Capital City state ARRL convention will be on April 14-15. See you there. Contact NA5Y fo rinfo. KA5IAT has his WAC; congrats. Mississippi ARRL Info Net meets at 7:15 CST Tuesday. All amateurs are welcome to talk on their ARRL Leadership Officials.

Net	Sess.	QNI	QTC	Freq.	Time/CST
GCSBN	31	815	8	3925	1830
MMN	31	577	9	3935	0630
MSBN	31	2695	148	3987.5	1745
MTN	31	130	62	3665	1845
MSN	22	90	6	3733	1900 M-F

Traffic: N5AMK 1209, KB5W 1201, K5OAF 489, KT5Z 175, N5DDV 46, W5LSG 38, WD5JXT 14.

TENNESSEE: SM, John C. Brown, NO4Q — ASM/ACC: WA4GLS. OO/RFI: W9FZW. PIO: WK4V. SEC: WA4GZQ. SGL: WA4GZZ. STM: NG4J. TC: W4HHK. It is indeed good to hear of the clubs working to increase the amateur ranks in Tennessee. One worthy of mentioning is in Dickson. One of their ranks got his General ticket and the very first piece of formal traffic was of a train wreck. Congrats go out to N4JII for his efforts to pass the emergency traffic. The continued support to public service events by the amateur community is great. Thanks go out to the RACK, for their support to rowing races, horse trials diabetis walk-a-thon. Especially the aid rendered by a member of the crew (a respiratory therapist) to a walker who started choking. The STM and SEC are in the process of renewing the traffic net and emergency coordinator appointments. Better get your name in the pot if you wish to continue your appointments. The other staff officers are continuing to bring up their rosters of specialists. If you have an area that you would like to assist, just complete a Form CD-187 and send it to the manager of that field of responsibility. The CW Honor Roll shows W4DDK WV4E K9IMI/4 and NG4J for the TSN. The assistant net manager for the TSN KA4BSG is holding the fort till the regular net manager completes QTH and shack mods and returns to the air. The section was represented well on the RN5 and DRN5 nets. Not 100%, but close. TPN sess. 90, QNI 4206, QTC 165; CW net sess. 19, QNI 65, QTC 11; VHF sess. 97; QNI 2352; QTC 637. Good work by all. Keep a cool head with the weather doing a job on the bands bringing in all the QRM and associated problems. Traffic: NG4J 337, W9FZW 234, K4WWQ 181, W4DDK 144, WD4GYT 135, K4WOP 83, KA4BSG 59, W4TYV 55, W4MRD 42, WV4E 30, WB4YPO 28, NN4S 26, KE4LS 25, NM4W 19, W4PFP 18, WB4TDB 16, KA4UVR 15, K4UMW 14, WA4HKU 10, W4EWR 8, NY4N 8, W4PSN 8, N4JII 4.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Sloan, KA4GFU — SEC: WA4JAV. STM: KA4BCM. OO: N4GD. BM: WA4AGH. PIO: K4TAJ. ACC: W4OYI.

MKPN	3959	1330Z	KA4SAA	1213	266
KTN	3959	0000Z	KA4SKV	1137	182
KYN	3600	0100Z	WD4IYI	173	78

KY QSO Party, Mar 17 & 18. Contact WM4N for details. HAMFESTS: Glasgow-Feb 25; Elizabethtown-Mar 24; Paducah-Apr 8. New Novice — KB4IGJ, Murray. CW net operators need in Lex, Lvi, Bowling Gn, Hopkinsville and most other areas of the state. Please send address of Novices to STM. Clubs can help out here. Submit any KY news to STM for this column. Traffic: WA4JTE 580, KA4SAA 217, WD4BSC 150, WD4IYI 145, WD4RWV 108, KA4BCM 95, K4MHL 86, KB4QZ 80, WB4LLF 66, W4WQV 56, WA4EBN 55, KA4SKV 49, KA4GFU 42, NW4A 40, WA4AVV 35, KA4MTX 23, WA4YPQ 23, WD4PBF 18, W4PKX 15, WD4CJQ 14, WD4IXS 14, KA4YIV 14, K4HOE 11, WA4NOG 11, WB4APC 10, N4GD 10, WA4JAV 8, WA4AGH 8, WK4D 8, KA4GBZ 8, N4HZT 7, WD4IYH 3, W4TPB 2, WB4ECB 1.

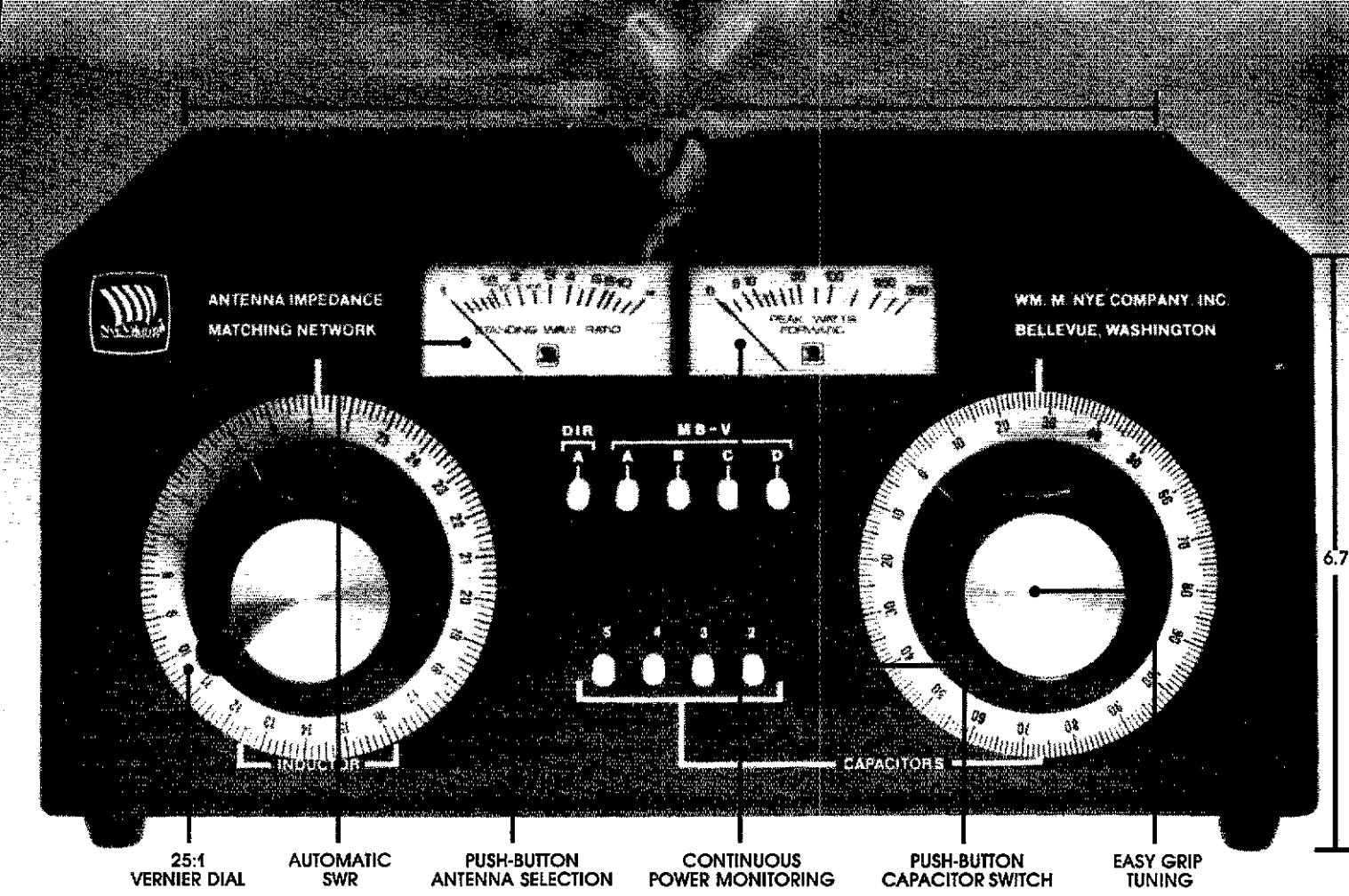
MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. ACC: K8SB. PIO: KC8K. SGL: N8CNY. TC: WB8BGY. BM: KZ8V.

Net	Freq.	Time/Day	QNI	Tfc	Sess.
MITN*	3953	1900 Dy	740	491	31
MACS*	3953	1100 Dy**	718	414	31
QMN*	3663	1800 Dy**	1410	390	92
UPN*	3922	1700 Dy	830	148	35
GLETN	3932	2100 Dy	731	91	31
MNN*	3722	1730 Dy**	261	91	61
WSSBN	3935	1900 Dy	806	42	31
TASYL	3922	1900 M	3	1	1
VHF NETS	14 Reports		1263	65	79

*NTS Nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn, 1300. ARES net Sn. 3932, 1730. Traffic Workshop, Sn. 3953, 1600. ARRL Info net Sn. 3953, 1500. 3932 is MI HF emer freq. Silent Keys, with deep regret: W8FYX KA8FGT W8EIR. Thanks to WD8CSZ for accepting the post of EC for Marquette Co. This fills a gap that has been with us for quite a while. Many thanks also to N8AYV WA8PST and KB8PW, all retiring ECs as of Dec. 31. Make note that the ARRL State Convention will be in Livonia this year, sponsored by the Livonia ARC. Details should be in the mail soon for all members. It will be the first time in many years for this event to be held on the eastern side of the state. I have high hopes for its being well attended. From the preliminary material I have seen, it promises to be one of the best ever. Along with the usual meetings and forums, there will be seminars in computers, space communications, packet radio, RTTY, ATV, etc. LARC's experience with their annual hosting of one of the largest hamfests around would seem to assure the quality of this year's convention. The year 1983 was a good one for MI amateurs. Good progress was shown in the start-up of the new ARRL Field Organization programs. A modest membership growth is noted. We held the line in major public service work, and we certainly contributed our share to the defeat of the infamous and now peacefully resting "no-code" docket. It is especially pleasing to note the influx of young people into the MI scene; we are certainly doing our part in reducing the average age of the overall amateur population! BPL: KA8CPS W8UE. Traffic: KA8CPS 903, W8UE 570, W8QHB 499, K8EQO 322, WD8RHU 225, WA8DHB 217, WD8LRT 217, KB8GT 164, KA8OWN 158, K8KQJ 156, W8CUP 131, WD8MJB 119, KA8NCR 119, K8GXV 118, WB8MTD 118, WB8YDZ 111, AF8V 104, N8BNC 80, N8DSW 78, WD8OUO 75, WB8TTA 75, WD8EIB 64, WB8SYA 64, N8EBG 60, W8VIZ 50, K8ZJU 50, W8IHX 48, W8SCW 48, WB8SIW 47, W8YIQ 43, W8JXJ 42, K8UPE 41, WB8WKQ 41, KA8JCL 38, K8OCP 35, N8BBY 34, WD8ICM 32, N8EBN 26, WB8YRY 20, N8CNY 19, KA8MBK 19, N8EOI 18, W8URM 17, KA8PQH 16, KI8Q 15, KV8U 14, W8YZ 13, WB8BEZ 12, KT8G 11, W8LDS 11, W8VWY 7, WB8YWA 6, WB8HSN 3. KA8SSU.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: KB8MU.

Net	QNI	QTC	Sess.	Time(local)	Freq.
BN	386	330	61	6:45/10 P.M.	3.577



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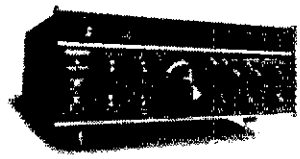

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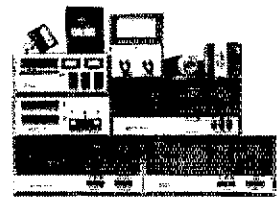

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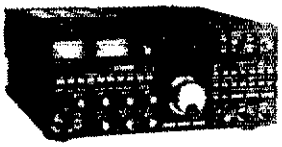

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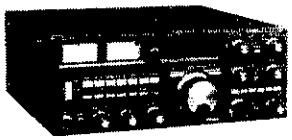

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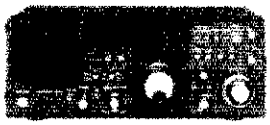

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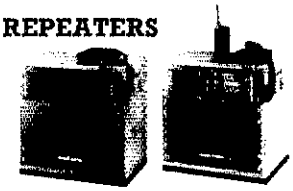

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ONN	89	45	30	6:30 P.M.	3.708
OSN	267	144	31	6:10 P.M.	3.577
OSSBN	2876	1939	93	10:30 A.M. 4:15 & 6:45 P.M.	3.9725
OSSN	109	85	25	6:45 A.M.	3.577
O6MN	725	23	31	9 P.M.	50.160

Congrats and thanks to all the amteaeurs who helped with the public service activities during December's severe weather. I know that although Ohio's weather was less severe than in other areas, our concerns were justified. December was another heavy traffic month handled well by our traffic nets. Congrats to the eight BPL qualifiers in our Section. I hope that the FCC's recent action on the "No-Code" docket will help prove there is no such thing as an issue "cast in stone," as I've too often heard. Regardless of the merits or demerits of Docket 83-28, I think we have seen no governmental bureau or jurisdiction is immune to an aroused, vocal and articulate populace. We did it before with the so-called "Plain Language Rewrite," you'll remember. I know there's a lesson in this somewhere for all of us. I'm going to miss the *Buckeye Burr*, the Buckeye Belles' newsletters, as edited by WD8IKC who has finally bent under the burden of preparing mucho pages each month or so. Actually, she is going country-wide as editor of *YL Harmonics*, so once again Ohio's loss is the country's gain as we add more literary talent to the national scene. I'm certain that the Belles, considering the talent represented in its membership, will continue to entertain me and all the others on the newsletter mailing list. Best to you, Doris, and thanks for all the good reading you've given us. And those of you who are blessed with proper mail service will have this as my last nudge towards Cincinnati on Feb. 25 & 26 to enjoy the Cincinnati ARRL Ohio State Convention, guarenteed to be bigger and better than ever! As I often say, don't miss it! Club elections: Westpart Radiops — AF8C, pres.; WD8BJL, v.p.; WD8AJF, secy.; W8IMF, treas. Findlay RC treas. — NA8W, pres.; WB8EYJ, v.p.; N8EYQ, secy.; AK8H, treas. CARA KA8IIC, pres.; K8HRR, v.p.; KA8PTT, secy.; NE8Q, treas. Oh-Ky-In WD4OFJ, pres.; K8DHK, v.p.; K8THT, treas.; WD8JAJ, rec. secy.; KD8KU, corr. secy. TSRAC — WD8DDE, pres.; W8VIF, v.p.; K8AN, secy.; KC8IG, treas. Appt. to EC Harrison Co. KD8AV. Upgrades to Extra: NE8B KD8KH KF8Z. Congrats to all of these very involved amateurs!

Local Nets	QNI	QTC	Sess.
ALERT	55	5	4
BRTN	262	199	31
LCNWO	239	94	27
MASER	86	2	4
Medina Co.	287	82	30
NEON	139	38	27
NCTW	28	36	14
RARA	58	3	4
TATN	301	429	31
TSRAC	1061	81	44
VWCEN	46	2	4

Traffic: K8NCV 842, W8PMJ 707, K8JDI 620, WD8MIO 612, WB8KWD 578, K8OZ 535, WD8KFN 508, W8QZK 502, W8BO 440, WB8DMF 376, WB8UBR 373, KA8CGF 299, WA8HGH 292, KA8ICB 247, N8DGY 226, KF8J 220, WA8SSI 212, WB4MRL 210, W8SKP 195, KA8IAF 181, N8CW 168, KV8Q 168, NE8X 163, WA8GMT 158, N8AUH 155, WB8QHV 155, AB8P 130, WA8HED 115, WD8ODV 111, N8EVC 105, WB8JGW 102, WD9HDZ 101, K8TVG 95, W8CXM 89, N8AKS 86, WB8MEK 84, K8DHD 78, N8EES 75, WB8SIQ 75, WD8RGP 71, WD8KBW 68, W8EK 62, N8FCQ 60, WA8QYJ 59, WB8HHZ 55, K8JE 55, K8AN 50, K8CKY 45, AE8L 38, KA8GGZ 36, W8MVE 36, WB8VOA 36, K3RC 35, WB8NHV 32, WB8SRC 32, N8AEH 31, W8BHL 31, WD8OYK 30, WB8SGL 29, KA8GMF 24, WB8FWF 22, N8CJS 20, K8VOY 19, K8NJQ 18, W8RG 18, WD8RGS 17, K8WLF 13, WD8AYH 12, N8CGM 12, WA8DYX 12, WD8DOS 9, WD8CSP 8, WD8EKI 7, K8CMR 6, K8LQM 6, W8OQL 5, N8AJU 4, W8LZE 3, WB8QHU 2. (Nov.) W8UPD 46, KA8ICB 43, WA8DYX 12, K8LQM 3.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — SEC: AK2E. STM: WB2MCO. ACC & SC: N2BFG. BM: WB2EAG. SGL: KB2HQ. Club news: AARA has new officers: WB2PUH, pres.; KA2HTU, v.p.; KA2PHD, secy.; KY2I, treas.; W2XM KB2CR, directors; N2CJH WD2AJS KA2SOL, new members. SARA had speaker from National Weather Service in January and reports Silent Key W2NMF. WARA had WA2MOE give presentation on Jarvis DXpedition in Jan. WECA had speakers showing what is the latest in new ham equipment. Net Reports: AESN sess. 4, QNI 66, QSP 3; ATEN sess. 4, QNI 13; ESS sess. 30, QNI 418, QSP 112; EPN sess. 31, QNI 179, QSP 212; CDN sess. 31, QNI 696, QSP 162; NYPON sess. 31, QNI 766, QSP 672; NYS/M sess. 31, QNI 353, QSP 281, NYS/E sess. 31, QNI 497, QSP 394; NYS/L sess. 31, QNI 410, QSP 443; SND sess. 31, QNI 275, QSP 81; Schen. Co. ARES sess. 4, QNI 52, QSP 81; Schen. Co. ARES sess. 4, QNI 52, QSP 4. A few positions are still open on the ENY staff. Contact me if you are interested. N2BFG put out an excellent newsletter to all affiliated clubs in January. We have a volunteer to edit an ENY newsletter. Now we need help with photo-offset and mailing. Any volunteers?? BPL: WB2EAG WB2MCO WA2YBM. PSHR: WB2MCO WB2EAG K2ZM W2PKY WB2VUK WB2ZCM W2BIW KC2TF K2ZVI WB2OHR KA2OPG AK2E. Traffic: WB2EAG 941, WB2MCO 589, KC2TF 428, W2PKY 318, K2ZM 287, WA2JBO 154, W2BIW 149, WB2ZCM 143, WA2YBM 135, N2EKS 124, WB2VUK 101, K2ZVI 95, WA8MAZ 69, AK2E 57, AA2Y 52, KA2OPG 50, N2AWI 38, WB2OHR 29, WB2SON 28, W2SWA 26, N2BFG 24, KV2U 20, K2HNW 2. (Nov.) K2HNW 12.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2SUB. STM: K2GCE. ACC: WB2IAP. OO/RFI: NB2T. TC W2JUP. PIO: W2IYX.

NLI CW*	3630	1900/2200	N2AKZ
NLIPN	3928	1815	KS2G
NCVHF	6.145/745	1930 M-F	K2MT
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
ESS	3590	1800	W2WSS
NYS/M	3677	1000	WB2EAG
NYS	3677	1900/2200	N2APB
NYS	7077	1000 M-S	WB2EAG

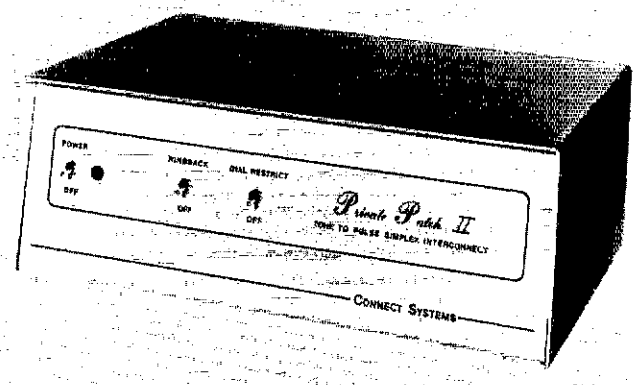
* Denotes section net; all times are local; please try and help out by checking in whenever possible. Plan now to attend the ARRL National Convention, July 20-22 at the New York Statler. Dr. Owen Garriott will be the guest speaker at the banquet, see the advertisements in *QST* for ticket information. Please try to help out with the 1984 Special Olympics that will be held at Eisenhower Park, East Meadow June 16-30. Plans are being made to operate a "Special Events" station. Officers for LIMARC for 1984 are: K2LJH, pres.; WA2FBQ, v.p.; WA2KXE, secy.; WB2MAS, treas. Officers for Gt. South Bay ARC are:

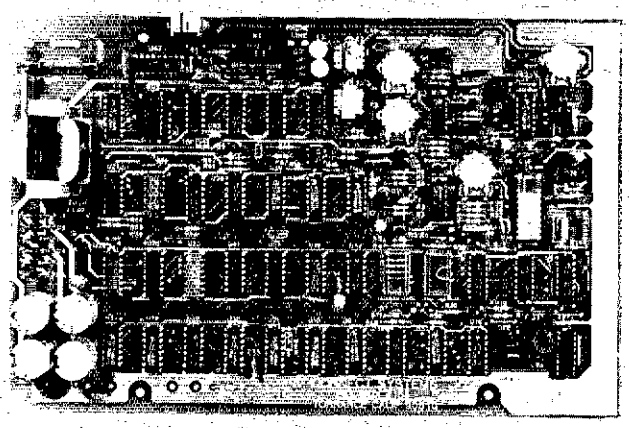
PRIVATE PATCH II

THE ULTIMATE SIMPLEX AUTOPATCH

PRIVATE PATCH II is for the discriminating amateur who demands the finest in simplex autopatch performance, features and quality. Our digitally processed VOX and simplex loop create a level of communications quality which is not even closely rivaled. *Please . . . do not confuse our technique with sampling!!* **PRIVATE PATCH II** has the following major advantages over sampling type autopatches:

- Compatible with every known transceiver—yes, synthesized and relay switched types included.
- No transceiver modifications are ever required!
- Connects only to MIC and external speaker jack—no internal connections to your transceiver required.
- Natural push to talk operation—no need to pause—you may talk the instant the button is pressed.
- Much greater range—noise on your weak mobile signal causes no performance degradation. (Noise sampled autopatches fail to operate when your signal becomes noisy.)
- **Private Patch II** offers natural "take-turns" style of communications in the manner you are used to. There are no annoying sampling kerchunks and missing syllables punched out of every other word.
- In addition to superb simplex operation, **Private Patch II** will operate through *any* repeater from your base location. Yes, *any* repeater! Tone encoding equipment and repeater modifications are not required.





STANDARD FEATURES

- CW identification—ID ROM chip included.
- Single chip XTAL controlled tone decoder.
- Tone to pulse—compatibility with all telephone systems—eliminates critical tone adjustments in the mobile—no wrong numbers, ever! Can be strapped for straight tone dialing.
- Speed dialer compatible—can consume up to 15 digits per second.
- Sophisticated toll restrict logic—user programmable restrict digits.
- Five digit access code—59,049 user programmable code combinations! (Their three digit code beginning with * has less than 196 combinations.)
- Ringback (reverse patch)—alerts you with CW ID.
- Busy channel ringback inhibit—will not send CW ID alert if channel is in use — defeatable.
- Three/six minute "time-out" timer—resettable from the mobile—four CW ID warnings during final minute.
- Control interrupt timer—assures reliable and positive control.
- Self contained 115VAC supply—230V 50/60 Hz available at slight additional cost.
- Modular phone jack—and seven foot cord.
- 14 day return privilege—when ordered factory direct.
- One year factory warranty.

OPTION: FCC registered coupler.
Inquire about commercial and half duplex models.

OUR QUALITY GLASS BOARD, SUPERB ENGINEERING AND EXCELLENT COMPONENTS BLEND TOGETHER TO PRODUCE THE FINEST AMATEUR AUTOPATCH AVAILABLE.

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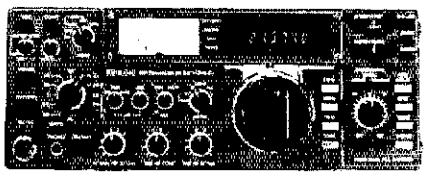


HF Transceivers — Regular — SALE

IC-740 9-band 200w PEP Xcvr w/mic $1099.00 **949.95**

plus **FREE** PS-740 internal power supply &

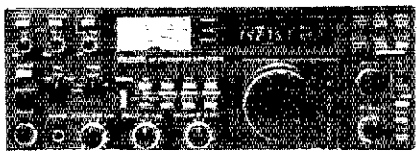
$50 Factory Rebate - until gone!

PS-740 Internal power supply	$159.00	149.95
*EX-241 Marker unit	20.00	
*EX-242 FM unit	39.00	
*EX-243 Electronic keyer unit	50.00	
*FL-45 500 Hz CW filter (1st IF)	59.50	
*FL-54 270 Hz CW filter (1st IF)	47.50	
*FL-52A 500 Hz CW filter (2nd IF)	96.50	89.95
*FL-53A 250 Hz CW filter (2nd IF)	96.50	89.95
*FL-44A SSB filter (2nd IF)	159.00	144.95
SM-5 8-pin electret desk microphone	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-12 Mobile mount	19.50	

**Options also for IC-745 below.*

IC-730 8-band 200w PEP Xcvr w/mic	$829.00	599.95
FL-30 SSB filter (passband tuning)	59.50	
FL-44/A SSB filter (2nd IF)	159.00	144.95
FL-45 500 Hz CW filter	59.50	
EX-195 Marker unit	39.00	
EX-202 LDA interface; 730/2KL/AH-1	27.50	
EX-203 150 Hz CW audio filter	39.00	
EX-205 Transverter switching unit	29.00	
SM-5 8-pin electret desk mic	39.00	
HM-10 Scanning mobile microphone	39.50	
MB-5 Mobile mount	19.50	
IC-720A 9-band Xcvr/.1-30 MHz Rcvr	$1349.00	899.95
FL-32 500 Hz CW filter	59.50	
FL-34 5.2 KHz AM filter	49.50	
SM-5 Desk microphone	39.00	
MB-5 Mobile mount	19.50	
IC-745 9-band Xcvr/.1-30 MHz Rcvr	$999.00	899.95
PS-35 Internal power supply	160.00	144.95
CF5-455K5 2.8 KHz wide SSB filter	TBA	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

See IC-740 list above for other options (*)



IC-751 9-band Xcvr/.1-30 MHz Rcvr	$1399.00	1229
PS-35 Internal power supply	160.00	144.95
FL-52A 500 Hz CW filter	96.50	89.95
FL-53A 250 Hz CW filter	96.50	89.95
FL-33 AM filter	31.50	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	
RC-10 External frequency controller	35.00	
CR-64 High stability reference xtal	56.00	

Options: 720/730/740/745/751	Regular	SALE
PS-15 20A power supply	$149.00	134.95
EX-144 Adaptor for CF-1/PS-15	6.50	
CF-1 Cooling fan for PS-15	45.00	
PS-20 20A switching ps w/speaker	229.00	199.95
CC-1 Adapt. cable; HF radio/PS-20	10.00	

ICOM

Options - continued	Regular	SALE
CF-1 Cooling fan for PS-20	45.00	
EX-310 Voice synthesizer for IC-751	39.95	
SP-3 External speaker	49.50	
Speaker/Phone patch - specify radio	139.00	129.95
BC-10A Memory back-up	8.50	
EX-2 Relay box with marker	34.00	
AT-100 100w 8-band automatic ant tuner	349.00	314.95
AT-500 500w 9-band automatic ant tuner	449.00	399.95
MT-100 Manual antenna tuner	249.00	224.95
AH-1 5-band mobile ant w/tuner	289.00	259.95
PS-30 20A systems power supply	259.95	233.95
GC-4 World clock	99.95	94.95
HF linear amplifier	Regular	SALE
IC-2KL 160-15m/WARC solid state linear	1795.00	1299

VHF/UHF base multi-modes

IC-251A* 2m FM/SSB/CW xcvr	$749.00	549.95

***$50 Factory Rebate** - until gone!

IC-551D 80w 6m Xcvr	$699.00	599.95
PS-20 20A switching ps w/speaker	229.00	199.95
EX-106 FM adaptor	125.00	112.95
BC-10A Memory back-up	8.50	
SM-2 Electret desk microphone	39.00	
IC-271H 100w 2m FM/SSB/CW Xcvr	TBA	
PS-35 Internal power supply	160.00	144.95
IC-271A 25w 2m FM/SSB/CW Xcvr	699.00	629.95
AG-20 2m preamp	56.95	
IC-471A 10w 430-450 SSB/CW/FM Xcvr	799.00	719.95
PS-25 Internal power supply	99.00	89.95
EX-310 Voice synthesizer	39.95	
HM-12 Hand microphone	39.50	
SM-6 Desk microphone	39.00	

VHF/UHF mobile multi-modes

IC-290H 25w 2m SSB/FM Xcvr, TTP mic	549.00	489.95
IC-560 10w 6m SSB/FM/CW Xcvr	489.00	439.95
IC-490A 10w 430-440 SSB/FM/CW xcvr	649.00	579.95
VHF/UHF/1.2 GHz FM	Regular	SALE
IC-22U 10w 2m FM non-digital Xcvr	299.00	249.95
EX-199 Remote frequency selector	35.00	
IC-25A 25w, 2m, grn leds, up-dn-TTP mic	359.00	319.95
IC-25H as above, but 45 Watts (Special!)	389.00	339.95
BU-1H Memory back-up	38.50	

Limited Offer! **Get a FREE BU-1H Memory back-up with your purchase of an IC-25H.**

IC-27A 25w 2m mobile Xcvr	TBA	
IC-45A 10w 440 FM Xcvr, TTP mic	399.00	359.95
AG-1 15 db 440 preamp	89.00	79.95
EX-270 CTCSS encoder	39.00	
BU-1 Memory back-up	38.50	
RP-3010 10w 440 MHz FM repeater	999.00	899.95
IC-120 1w 1.2 GHz FM Xcvr	499.00	449.95
RP-1210 10w 1.2 GHz FM repeater	TBA	
Cabinet for RP-1210 or RP-3010	249.00	

VHF/UHF portables

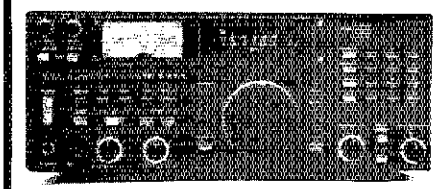
	Regular	SALE
IC-505 3/10w 6m port. SSB/CW Xcvr	$449.00	399.95
BP-10 Internal nicad battery pack	79.50	
BC-15 AC charger	12.50	
EX-248 FM unit	49.50	
LC-10 Leather case	34.95	
IC-402 432 MHz portable SSB xcvr	389.00	299.95
SP-4 Remote speaker for portables	24.95	
IC-3PS Power supply for portables	95.00	89.95

Hand-held transceivers:

Deluxe models	Regular	SALE
IC-02A for 2 meters	$ 319.00	289.95
IC-02AT w/DTMF	349.00	314.95
IC-04A for 440 MHz	TBA	
IC-04AT w/DTMF	TBA	
Standard models	**Regular**	**SALE**
IC-2A for 2 meters	239.50	214.95
IC-2AT with TTP	269.50	219.95
IC-3A for 220 MHz	269.95	234.95
IC-3AT with TTP	299.95	239.95
IC-4A for 440 MHz	269.95	234.95
IC-4AT with TTP	299.95	239.95

Accessories for all Hand-helds	Regular
BC-25U Extra wall charger	$ 10.00
BC-30 Drop-in rapid charger	69.00
BP-2* 425ma 7.2v 1w long life battery	39.50
BP-3 Extra 250ma 8.4v 1.5w battery	29.50
BP-4 Alkaline battery case	12.50
BP-5* 425ma 10.8v 2.3w high power battery	49.50
**BC-30 required to charge BP-2/5*	
CP-1 Cigarette lighter plug charger (BP-3)	9.50
DC-1 DC operation module	17.50
LC-2A Leather case without TTP cut-out	34.95
LC-2AT Leather case with TTP cut-out	34.95
HM-9 Speaker/microphone	34.50
HS-10/HS-10SB Boom mic headset/switchbox	39.00
CA-2 Telescoping 2m antenna	10.00
CA-3 Extra 220 flexible antenna	9.12
CA-4 Extra 440 flexible antenna	9.12
CA-5 5/8-wave telescoping 2m antenna	18.95
ML-1 2m 2.3w/10w amplifier	SALE 79.95
ML-25 2m 20w amplifier	SALE 179.95
3A-TTN 16-button TTP front; 2A/3A/4A	39.50
CommSpec SS-32M 32-tone encoder	29.95

M-12 12 ch marine hand-held ..... SPECIAL 269.95



Shortwave receivers	Regular	SALE
R-71A 100 Khz-30 Mhz digital receiver	$799.00	699.95
R-70 100 Khz-30 Mhz digital receiver	749.00	599.95
EX-257 FM unit	38.00	
IC-7072 Transceive interface, 720A	112.50	
FL-44/A SSB filter (2nd IF)	159.00	144.95
FL-63 250 Hz CW filter (1st IF)	48.50	
SP-3 External speaker	9.95	
EX-299 (CK-70) 12v DC option	9.95	
MB-12 Mobile mount	19.50	

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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.

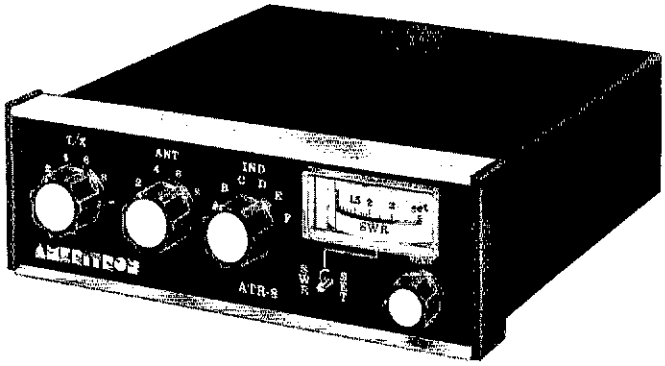
ATR-8 Antenna Tuner

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"

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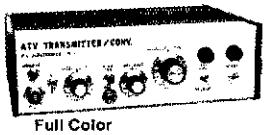

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TVC-4 70CM ATV DOWNCONVERTER Tunes 420-450 MHZ to CH3. Has TVC-2 and AC supply in cabinet ..... **$89** ppd. **TVC-2** Wired & Tested Board, Req. 12VDC ..... **$49** Delivered

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We are a full line supplier of ATV gear. Over 20 years in ATV. We have modules for the builder, complete units for the operators, antennas, repeaters, cameras, linears, and special affects.
SEE CH. 14 1983 ARRL HANDBOOK.

WB2COO, pres.; KA2RGI, v.p.; N2EOB, secy.; WA2AWE, treas. WA2UWF was presented with a plaque by the Heart Assn. in appreciation for the assistance given by the amateurs in the Cyclathon. KA2JMA needs daytime help for the "Ham Radio on the Road" program, visiting schools and such. If you can help or want more info please contact KA2JMA or WA2UWF at 516-732-1031. 1984 will be the 54th consecutive year of membership in the ARRL for W2DBQ; congrats. Officers for Larkfield ARC are: WB2ZIT WB2QCR WB2QEL, trustees; W2INJ, secy.; WB2YFJ, treas. NYLIPN welcomes KC2YZ and KA2PNR to the ranks of traffic handlers. N2AKZ is looking for stations to fill the net control slots int he NLI CW net. Training is cheerfully provided to anybody interested in nets and their operations. WB2YXB is now an OBS; more info on his sked as it becomes available. Traffic: W2AHV 464, N2AKZ 458, W2GKZ 290, K2MT 147, W2DBQ 128, KS2G 30, KA2NMA 20.

NORTHERN NEW JERSEY: SM, Robert Neukomm, KB2WI — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC/AG2R N2BNB WB2RMJ WB2ANK WB2IQJ KY2D N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	3695	1000 Dy	31	228	168
NJPN	3950	1800 Dy	34	445	285
NJSN	3735	1830 Dy 0900 Sn	31	—	—
NJN/E	3695	1900 Dy	31	343	261
NJN/L	3695	2200 Dy	31	280	201
TCETN	147.255	1930 Dy	30	82	75
OBTTN	147.12	2000 Dy	31	132	104
NJVN	49/49	2230 Dy	36	319	117
NJRTTY	147.51	Autostart			

Tri-County RA News: October '84 is TCRA's 50th anniversary with a big party planned under the direction of W2IHA. W2FJG is recovering from by-pass surgery. W2IIN a SK. Upgrades: W2GO W2OLV and W2PIX to Extra. Ramapo Mountain ARC reports training classes now being held for Novice and Technician at our Lady of Perpetual Help School, Room 107, Franklin Ave., Oakland, Wednesday evenings 1900 local time. The following have passed their Novice exams and are awaiting their tickets: Arnold Bottari, Bob Bottiglierie and Danny Pluck. Barbara Skold has passed the theory portion and is awaiting her code exam. BARA NEWS: KB2WI was elected into the Radio Club of America. The following are new club officers: KC2EV, pres.; NB2F, v.p.; W2CQR, treas.; Bernice Shoobs, secty. KA2ORK was guest speaker at the annual dinner with N2BOT as organizer and MC. The Garden State ARC has a new masthead and name for its monthly newsletter. It's known as the *Propagator*. WB2FWD addressed the members concerning troubleshooting local power lines for interference to amateur equipment. Traffic: N2XJ 547, W2VY 506, KB2HM 381, AG2R 315, KB2WI 232, WB2KLF 210, KA2IOW 183, W2XD 144, N2EOV 92, K2VX 88, WB2GHN 87, WB2RMJ 86, W2RRX 74, N2ERN 51, N2DZZ 48, WB2ANK 65, K2SE 46, KD2BE 43, W2UH 26, W2KB 18, KC2YG 15, W2CVW 12, W2CC 10, W2ODV 1. (Nov.) W2CVW 4. (Oct.) W2CVW 6. (Sept.) W2CVW 2. (July) W2CVW 12. (June) W2CVW 2. (May) W2CVW 2.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. ACC: WBØQAM. SGL: AKØQ. TC: KØDAS. PIO: KBØZP. BM: KØIIR. I will accept nominations for the "Iowa ARRL Amateur of the Year" award until April 1; send your nominations to me now for the ham who typifies the stature of the Iowa ham. Congrats to "Wapsi Valley ARC" and "Megahertz Manor Maniacs" for being the ARRL 100% clubs. New officers for the 3900 club are WØCON KNØO WØFZO WØKHF WDØFOY. 3900 membership now totals 751; they meet each Sunday at 9 A.M. New officers for NIARC are KCØCC WØQDB WDØFWB and the IA-ILL Club officers are WBØBHF KAØEIW and KØIWA. The Ft. Madison club already planning Field Day; good idea. NØEEN now Extra; KAØLSL now General. Congrats to WDØFOY KAØY WØSWB for working W5LFL. KØWKT and WØFO are the only ECs reporting 100% during 1983. Special event stn being planned for Ft. Dodge. Start planning RAGBRAII. All nets doing well; ICN is planning to extend weekends. WDØFWB achieved BPL. PSHR to WDØFWB WØZTP NØOR. KEEP UP THE FINE WORK; SPRING IS ALMOST HERE!!!

Net	Freq.	UTC	Dys	QTC	QNI	Sess.
TLCN	3560	0030/0400	Dy	425	320	62
75M Phone	3970	1830/2330	M-S	2013	319	54
ICN	3713	0100	M-F	130	64	19

Traffic: WDØFWB 688, WAØAUX 402, KØCY 259, WØSS 253, KØGP 234, NØCWW 180, W4JL 131, WØYLS 129, KCØXL 123, WBØJFF 114, KAØJQG 93, WDØGVY 92, KAØADF 83, KAØX/AEØR 75, NCØR 57, KQØI 55, WØZTP 55, WBØAVW 33, KCØSC 31, KBØOZ 24, WØBW 23, KDØBG 22, NØEPG 13, KØWKT 7.

KANSAS: SM, Robert M. Summers, KØBXF — SEC: WØKL. STM: WØOYH. SGL: NØBLD. TC: KØEZ. BM: KØJDD. ACC: KØBXF. A brand new repeater at WØTQ Concordia with increased coverage, still on 146.13/73. WØMYM now serving as NCS on the ACARA ttc net Wed nites 9 P.M. Hutch/Wichita rptr 146.22/82. Following the ttc net is the on the air mtg of the QCWA, Sunflower Chapter. WØKL reporting ARES standing still at 910 mbrs. Several instances of severe weather in KS the past month but no emergencies — communication-wise that is. Traffic and service net reports; KSBN QNI 1359, QTC 237; KPN QNI 416, QTC 67, mgr both nets KAØCUF. Note: KAØCUF will be resigning effective Feb. 1 and the new net manager of both KSBN and KPN will be WØFRC from Clay Center. KWN QNI 1041, QTC 764; morning session KMWN 715/624. CSTN (the ol' KS PO Net) QNI 2474, QTC 261. Many tnx to WAØOMB up there in Nebr for acting as Net Mgr. All the hams in Kansas really appreciate the help he gives us. We also offer our sympathy to him on the loss of his Mrs. recently. CSTN had a big year: QNI 23710, QTC 1727; QKS QNI 321, TC 112; QKS-SS QNI 49, QTC 16. Last but not least congrats to Mr. Traffic of KS WØFRC for a year-end total of 4976. Traffic: WØFRC 830, WBØZEN 276, WØAM 249, KSØU 198, WØFDJ 143, WØCHY 132, WAØLBB 131, KØBXF 74, ACØE 65, WØKL 44, WØCHJ 38, WØQMT 37, KDØJM 32, WØMYM 19, KØGSC 15, NØBDG 14, WØPB 11, KAØE 9, WAØOWH 8, KØKD 1. (Nov.) WØHI 220, WØKL 14, KAØE 5.

MISSOURI: SM, Ben Smith, KØPCK — The Heart of America ARC Amateur of the year co-award was presented to club members WAØVYF and WAØNXD, with KØUAA receiving honorable mention. KT5Y and I attended the December meeting of Northeast MO ARC to present the ARRL Affiliated Club Charter. We hope many more clubs will receive their Affiliated Club Charter in 1984. If you need information on ARRL Affiliated Club recognition, contact KT5Y. Clubs reporting their 1984 club officers to me were: Hannibal Amateur ARC — NØBPA, pres.; NDØI, v.p.; WØRTY, secy.; WDØCQC, treas.; KKØP, club trustee.

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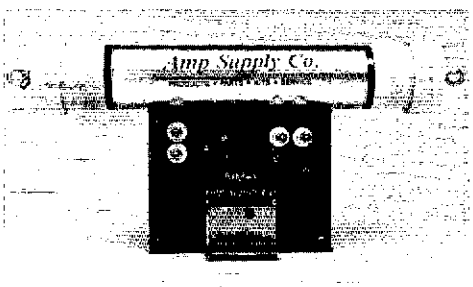
The LA-1000A is a portable kilowatt now covering 160-15 meters. Typical drive requirement is 100 watts PEP yielding 1200 watts PEP SSB 700 watts CW. The compact linear uses four 6MJ6 tubes, has a tuned input and QSK built in and comes in an attractive gray-on-gray finish.

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*

NEW **LA-1000NT**
No Tuneup Version $489.50*



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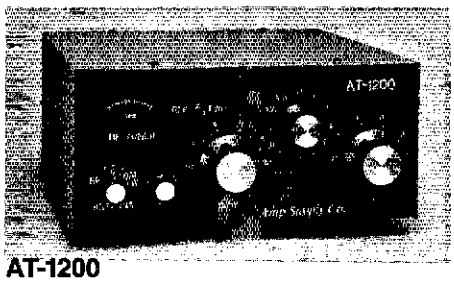
Major Antenna break through!

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, rombic, random wire or loop antennas
- weatherproof
- 2 year warranty

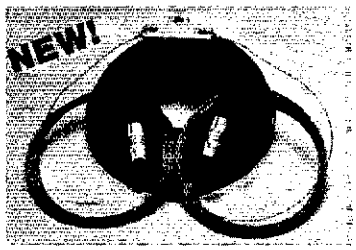
AIM-1 ..... $129.50*
with 130' antenna wire and insulators $139.50*
Stranded Ant. Wire .08 ft.



AT-1200

The AT-1200 antenna tuner is the perfect companion for the LA-1000A or any amplifier running up to 1200 watts input. It covers 1.8 to 30 MHz, has an antenna selector switch for 3 coax positions and 1 long wire or balanced feedline, and a built in SWR bridge and meter.

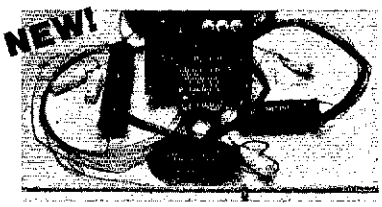
AT-1200 ..... $179.50*



Original ALL BAND DOUBLET

The return of an old time favorite. This is the 160-10 meter wire antenna that has been held in high regard for years. The AMP SUPPLY "ALL BAND DOUBLET" features a strong heavy duty center insulator and is completely assembled ready to pull up into the air. This doublet is center fed with 100 feet of 470 ohm balanced transmission line and the antenna is 130 feet long. Purchase the AMP SUPPLY "BL-1500" 9:1 transformer and tune this antenna with your favorite antenna tuner on any band 1.8-30 MHz.

All Band Doublet $39.50*
BL-1500 9:1, 5KW Pep Balun $24.50*



SAS-1 Sloper Antenna System

Another FIRST from AMP SUPPLY. The SAS-1 sloper matching and decoupling transformer. Simplify bolt the SAS-1 weather-proof box to the top of your tower, hook up the 50 ohm coax feed line and a 1/4 wave piece of antenna wire and you're ready to go. The SAS-1 takes all the pains out of sloper antenna systems. The SAS-1 covers 1.8-10.5 MHz., and handles 5KW PEP. Purchase the SAS-1 matching box separately or you may want the complete system ready to go on 160, 80, 40 and 30 meters. We offer a complete sloper system covering 160-30 meters complete with all elements, ground rod, insulators, nylon rope and ground radials. The sloper antenna covering all these bands is only 60 feet long. The sloper antenna is also available separately. Transform your entire tower into a dynamite low frequency antenna system with the SAS-1 sloper system.

SAS-1
Sloper Matching Network $49.50*
SA-4 Sloper Antenna
160, 80, 40 and 30 Mtrs $44.50*
SAS-1 and SA-4
Deluxe Sloper System $99.50*

* *

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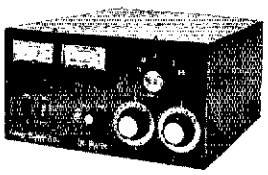

LK500ZA 2.5 KW AMPLIFIER

The all new Amp Supply LK-500ZA 2.5 KW Input Amplifier is the right amplifier, with the right features at the right price. The LK-500ZA is available in kit form or completely assembled and covers 160-15 meters. Two Eimac 3-500Z triodes in grounded grid are featured with a dual cooling system, one for the power supply and the other cooling the 3-500's. There's only one 2.5 KW amplifier with a pair of 3-500Z tubes in the world that sells for under $800.

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- 2.5 KW SSB PEP Input: 1500 Output
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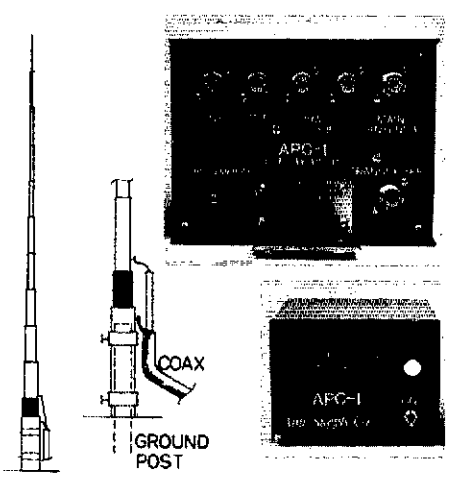
- 1 KW SSTV, RTTY Input: 600 Output
- QSK Full Break-in CW
- 9" H x 15" W x 15" D
- 117/234 AC 50/60 Hz

LK-500ZA
Wired and Tested $799.50*
1500 Watt Output
All Mode with Hipersil Transformer .. $999.50



AEX-1, APC-1

The AEX-1 is a 33' self-supporting vertical full 1/4 wave on 40 meters (or any band). It is constructed of adjustable seamless aluminum, and will handle 4 KW.

The APC-1 is a two piece phasing control for verticals, dipoles or loops. The outside switching box and the indoor control system combine to eliminate all phasing guess work.

AEX-1 ..... $79.50*
APC-1 ..... $99.50*
APC-1 + 3 AEX-1 antennas .. $299.50*
This combination provides complete 360 degree rotation.
80 Meter Add-on $24.50*

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Northeast MO ARC — KCØGC, pres.; WØYRL, v.p.; KAØKFS, activities director; KØHKN, parliamentarian. Elected 1984 club directors for the PHD were: KAØAVI WØDCI NØDPB WBØJVQ WAØKUH W5NI WBØOCW WBØROQ WAØSOK and KØZZH. It is with regret to report the following Silent Keys: WBØPZP WDØFTQ WBØYLB KØVSM WBØSEU WBØHYW WBØQPU NØDHU NØAQZ. NØAQZ was president-elect of the Ozark ARS for 1984. WBØRHK received an OES Field Appointment. During the year of 1983 it was great to hear of more stations from Missouri involved in net activity from local nets, section nets to NTS. KØSI and I both appreciate all the cooperation from all the net managers turning in their monthly net reports and the individuals for their station reports and PSHR reports at the end of the month. Although we made many Field Appointments in 1983 I am sure a lot more stations could qualify for these appointments. Contact me for information on Field Appointments. Congrats to the Missouri clubs OBP-1 ARC of St. Louis and St. Louis ARC for being 100% ARRL. Section and local nets reporting:

Net	QNI	QTC	Freq.	Time Day	Mgr.
MON	334	251	3585	7 & 9:45 P.M. Dy	KØSI
MOSSB	896	219	3963	6 P.M. Dy	KT5Y
MEOW	590	64	3963	5:30 P.M. Dy	KØDSQ
HBN	472	37	7280	12:05 P.M. M-F	KØDSQ
RRARN	298	10	146.79	8 P.M. Dy	KAØBKR
PHD	121	9	146.43	9 P.M. M	WAØKUH
STLAN	193	6	146.91	8 P.M. M	NØBKH
CPRN	65	5	145.43	8 P.M. W	WBØLRF
IFN	15	1	147.23	8 P.M. M	WØKNF
LOZRN	112	0	147.03	9 P.M. F	WØRTL
CMEN	57	0	146.76	9 P.M. W	KØPCK
SARN	40	0	147.03	9 P.M. T	WØENW
JCAN	34	0	147.00	8 P.M. W	KCØSF
LOZCW	30	0	28104.7	8 P.M. T	WØRTL

Traffic: WØBMA 554, AIØO 406, KØPCK 362, KØSI 295, KT5Y 219, KØBM 158, WAØYJX 141, NDØN 109, KGØL 74, NEØA 63, WØOUD 56, K2ONP 43, KØDSQ 38, WAØKUH 23, WBØHOP 13, WØNUT 10.

NEBRASKA: SM, Reynolds Davis, KØGND — We have a new Novice CW net starting on March 1. Encourage Novices to join the fun at 0200Z near 3737 kHz. The 1984 Midwest Division convention is the last weekend of March in Kearney; a super program is planned with something for everyone! Congrats to WAØVPY, the new President of the 260-member Lincoln club. Traffic totals for 1983 show KØDKM with 1505! Thank you! Other highs are WØKK/994, WBØTED/892, KØGND/471, KAØBCB 457. In order to count, only formal written & numbered traffic must be reported to me in CD-210 format. Post card size report forms are available from KØGND or KAØBCB. See you all in Kearney! 73. Traffic: WBØTED 304, KØDKM 263, WØKK 248, KØGND 77, KAØBCB 38, KØIXY 25, KAØBWM 23, NØDGM 22, WAØBOK 10, WAØKGD 8, WAØOQX 8, KAØELI 7, WDØBQG 6, WDØEGK 5.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC. OO/RFI: KA1ML. ACC: N1AZF. TC: W1HAD. SGL: K1AH. BM: KS1F.

Net	Freq.	Time/Local	QTC	QNI	NM
CN	3640	1900/2200	314	274	K1EIR
CPN	3965	1800/1000 Sn.	176	295	KA1BHT
NVTN	28/88	2130	—	—	WA1EMI
WCN	78/18	2030	235	405	WB1GXZ
RTN	13/73	2100	101	313	K1UQE

Upgrades: Extra — KA1HGH KA1JPC WB1COB; Gen — KA1CFM. New OBS — KB1BJ. SARC's repeater now located on 145.29. Call change — KA1EXB/KB1LG. Congrats to: N1AMR for achieving the rank of Eagle Scout; to KI1N & N1BYR on their new harmonic; to MARS members N1AD & WB1ARF, recipients of plaques for outstanding service to their club. A welcome to the section extended to WB8TDA & KBKA. SMAG to have a 10-meter FM repeater in operation shortly. The CARA-sponsored Connecticut QSO Party will be held March 31/April 1; contact N2EFA for details. New FARA officers: K1NGL, pres.; K3ZJJ, v.p.; KE1A, secy.; KA1GGT, treas.; N1CBM, act. Remember to support your local repeater. K3ZJJ now operating VHF-ATV & RTTY. KA1ECL is looking for communications assistance for the Danbury Tri-Centenial Celebration to be held in September. KA1ML now instructing an Amateur Radio class for gifted students in the Meriden Public Schools. K1LHO has started a Fire Fund to assist the Meriden Fire Department to purchase fire detectors/smoke alarms for the community. The Volunteer Examination Program is on the way. Amateurs wishing to become involved in the most worthwhile project are encouraged to contact Hq. Congrats to CARA's W1QI on placing in the top ten in the recent VHF Contest. The next Division Cabinet Meeting will be held March 17th in Nashua, NH. ARRL members wishing to provide input to their respective Section Managers are encouraged to do so. KA1KPG is now a Silent Key. G4BEN recently operating portable W1 while on holiday from the UK. Traffic: WB1GXZ 716, W1EFW 617, WB9IHH 228, KA1GWE 191, W1XX 140, WA1HFE 128, KA1BHT 125, KA1EGE 123, W1BDN 85, K1AQE 83, KA1XG 81. WA1WOG 54, KA1KD 42, K3ZJJ 28, WB1ESJ 27, W1DPR 25, KA1JXX 21.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: KA1GBS. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. OO/RFI & BM WA4STO. TC: SEC: KA1IU. PIO WA1IDA. SGL: K1BCN.

Net	Mgr	Freq.	Time(toc)/Dy	QNI	QTC
EMRI	WA1LPM	3.658	1900/2200/Dy	454	600
EMRIPN	KA1GBS	3.959	1730/Dy	319	416
EM2MN	N1BNI	23/63	2000/Dy	407	256
NEEPN	K1BZD	3.945	0830/Sn	74	37
HHTN	KA1MII	04/64	2230/Dy	613	516
EMRISS	N1BHH	3.715	2030/Dy	142	82
CI2MN	N1BYS	045/645	1930/Dy	200	100

Why is it that we seem to overlook all of the good work people do until they are no longer with us. The passing of W4KFC and locally AJ1I and I'm sure others bring this painfully to mind. We should find ways to thank those who quietly do so much for Amateur Radio in general and hams in particular. ACC N1AZE held another council of EMass clubs meeting in Dec. Where plans were made to get a project underway for the group. Sixteen clubs were represented. Was yours? All clubs are invited to participate. North Shore RA has seen to it that we have had Amateur Radio Week in Massachusetts for the past few years, and our thanks go out for a job well done. Middlesex Club held its annual Xmas pizza party at the Chateau in Waltham. Colonial Wireless member N1BDA is on the Concord Cable TV Committee. Sturdy memorial members are taking advantage of the affiliated club outgoing QSL service to save some money on their QSLing. Wellesley club gave a demo to over 50 Wellesley boy rangers and their dads. A general discussion and a live on-the-air demonstration were given. We need more youth and this is an excellent way to do it. WA1IGL gave a talk on the latest telephone equipment at the Framingham club. Billerica club had an interesting talk by K1OX on his huge contest station. Greater Lawrence club had its annual Xmas party. K1UGM and N1CSI gave a talk on their use of ham radio on their 34-ft sailboat. 1200 club repeater on 72/12 has new feature of ringing the security guard in response to 911 tones on the repeater. Traffic: KA1GBS 1852, W1TKZ 743, KA1EXJ 584, N1BGW 578, KA1EPO 363, WA1NPO 338, N1AJJ 336, KA1BBU 266, K1OGF 228, WA1DXT 184, W1CE 181, N1BYS 175, K1CB 157, K1BZD 141, KA1AMR 114, KI1I 109, N1BQG 102, WA1FNM 54, W1XA 36, W1MJ 35, WA1FCD 34, K9HI 33, K1ABO 27, W1QLL 24, K1UR 22, WB3FOC 16, K1LCQ 12, W1ZHC 6. (Nov.) KE1U 11.

MAINE: Sm, Cliff Laverty, W1WRG — STM: AK1W. SEC: KL7IJG/1. BM: W1JTH. OO/RFI: W1KX. PIO: KA1TJ. ACC: KB1JF. SGL: K1NIT. TC: KQ1L. W1KX has appointed two new Official Observers, KA1TJ and KB1JF. WB1CBP, a Novice, handled 177 pieces of traffic during Dec. Bulletin stns are very active. Hams under the direction of W1HTG handled comms for NE Spec Olympics on Sugarloaf Mt.

Net	Sess.	Checkins	Traffic	Mgr.
SGN	27	1080	420	KTGUP
PTN	61	556	356	AC1G/KA1AVU
CMEN	9	227	35	W1WCI
MPSN	4	64	12	KL7IJG
RACES	4	39	5	W1RWG
AEN	4	60	3	WA1YNZ

PSHR: AK1W WB1GLH WA2YNZ W1RWG KL7IJG N1BJW. Traffic: AK1W 656, W1ISO 195, WB1CBP 177, WB1GLH 153, KA1TJ 138, KL7IJG 137, N1BJW 124, N1BLZ 119, KA1KFC 106, W1KX 105, W1RWG 95, W1BMX 92, W1JTH 85, W1WGI 51, W1OTQ 47, W1NV 35, WA1YNZ 33, W1VEH 32, K1NIT 28, W1BME 25, W1AHM 23, KB1JF 19, KA1ENL 17, KA1ENM 9, KA1FTL 9, N1AZH 8, K1BEA 7, K1PV 6.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: Open. EC reports received from W1FYR N1ACB & K1OIQ. Heard working DX on 80: W1JY W1TN KM1H. Space shuttle W5LFL tape lists NH's KS1S & WA1PSI for QSO. KA1JOC & N1CWB now Advanced. K1ACL & WA1PEL have new Icom 751s. Contact WA1WNM for details on the "Worked All New England" award. W1AM recuperating after auto accident. K1ACL worked UK1PAA on 80. News short this month. Traffic: KK1E 539, W1TN 294, N1CPX 255, N1NH 250, K1IM 172, W1GUX 140, N1AKS 134, K1PQV 121, K1OSM 111, WA1YZN 111, AK1E 93, W1MHX 91, W1CUE 80, W1ALE 71, K6UXO 59, KA1GOZ 48, WB1CFP 39, N1ALM 26, W1VTP 26, K1OIQ 22, N1BEW 22, KA1HKB 20, KA1JA 19, KA1HPO 17, W1FYR 14, KS1S 14, W1OKU 8, KA1IIP 6, KA1HRH 4, KA1QF 4, KU1D 2, KA1IXA 2.

RHODE ISLAND: SM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. TC: AB1D. NM: WA1OSL RIEM2MTN. ACC: N1BEE. SGL: K1DA. Upgrade: KA1KML to General. RIEM2MTN reports: 21 sessions, 138 QNI, 63 QTC. Rhode Island Section Nets

Bristol Co. ARES Net	146.40 MHz	Mon	0030Z
Kent Co. ARES Net	146.35 rpt	Mon	0100Z
Prov Co. ARES Net	147.51 MHz	Fri	0030Z
RI ARES Net	146.70 rpt	Thu	0030Z
EMRI Net	3658 kHz	Dy	0000Z
EMRI Phone Net	3958 kHz	Dy	2230Z
EMRI Slow Speed Net	3715 kHz	Dy	0130Z
Newport Co. Emer	147.36 rpt	Sn	1215Z
Wash. Co. ARES Net	147.165 rpt	Thu	0130Z

Traffic: W1EOF 1264, KA1KML 383, WA1CRY 96, WA1CSO 54, KA1FPP 35, KA1EHR 10. (Nov.) N1RI 17.

VERMONT: SM, Reed Garfield, WB1ABQ — STM: N1ARI. SEC: W1RNA. BM: AE1T. SGL: W1KRV. ACC: KA1AKI. Hope Santa was good to you all and brought lots of new ham/computer "toys." Vt. traffic handlers did an excellent job with the holiday traffic load. All traffic ops (and DXers, contesters) please get reports to me for my files and activity report. Please get all reports and news items to me by 5th of the month. Nets: VTN (NTS) 31/185/90; VSBN 31/571/189; VFMTN 31/431/101; GMN 27/426/28; CVFMN 4/31/4. Traffic: AE1T 214, KD1R 130, N1ARI 124, W1KRV 114, N1COB 86, WB1ABQ 65, W1OAK 41, K1IK 5.

WESTERN MASSACHUSETTS: SM, Don Haney, KA1T — All of WMA extends great appreciation to outgoing SM W1JP for his leadership and dedication for the past 2 years. Welcome to new appointees K1PUG as NM WMN, WA1DNB as NM WMFN, and WB1GLX as EC Hampden Co. DXers watch for KA1FP from VU2SNM thru mid-March and WB1ABF W1JP K1IJV & K1IJU from Nevis starting with phone DX Test. W1PUO having sked with KA1KVS/TI9 on Cocos. CMARA having good turnouts with 48-plus 34 scouts at recent meeting. Enjoyed recent visit to HCARA meeting and hope to visit other clubs soon. K1UN/R on 224.5 from Princeton getting into six states. K9ES/R 145.27 antenna now at 400 ft. WB1EYL cross-country skied up Mt. Greylock for K1FFK/R maintenance. December traffic was large again. PSHR: KA1T W1PUO, WB1HIH K1JHC W1JRA. Traffic: KA1T 864, W1PUO 424, W1JRA 239, W1UD 234, WA1YYW 155, W1KK 89, WB1HIH 65, K1JHC 62, W1JP 43, KB1W 38, K1IJV 37, WA1DNB 28, W1SJV 26, WA1OPN 24, W1ZPB 19, K1PUG 15, WB1HKN 8.

NORTHWESTERN DIVISION

ALASKA: SM, David W. Stevens, KL7EB — STM: KL7T. SEC: KL7QS. SGL: KL7LO. OO/RFI: AL7FL. Congrats to AL7W for contacting W6LFL/Columbia. Anchorage ARC has a VEC board and is gearing up for the Volunteer Examiner Program, supplementing the FCC's four-time-a-year testing. The AARC address is AARC, POB 1987, Anchorage 99510-1987. Congrats also goes to KL7FD for coordinating the amateurs' involvement in the 1984 Iditarod Dog Team Race from Anchorage to Nome. Traffic: KL7JFT 353, KL7VY 261, KL7LA 218, AL7FJ 110, AL7FL 68.

IDAHO: SM, Dennis Hall, KK7X — Congrats to K7AF, new FARM net manager, and to WB7VAO, Northwest Traffic Net manager. Congrats also to W7JMH, new section SEC. Subscriptions are invited for the *Idaho Newsletter*. A donation of $3 to ISRA, 1920 N. Phillippi Ct., Boise 83706. K7RT has been appointed region comm. manager for Region 5 AF MARS. Would appreciate information on upgrades, elections, appts, etc. Let's all think spring! 73, Dennis.

Net	Freq.	Time	Sess.	QNI	QTC
IMN	3635	7 P.M. M-F	22	194	140
ICD	3990	7:10 A.M.	22	829	59
FARM	3935	6 P.M. Dy	—	—	—
NWTN/N. Idaho	146.98	6:30 P.M. Dy	27	471	24

Traffic: W7GHT 580, KA7GQP 156, K7TM 12.

MONTANA: SM, Les Belyea, N7AIK — 1984 club officers are for: Great Falls AREA ARC KC7OA, pres.; WB7WBW, v.p.; WA7HYH, secy.; KC7BQ, treas. Gallatin ARC N7CFF,

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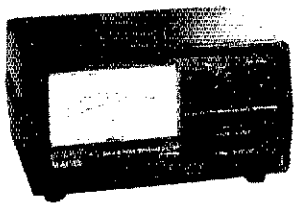

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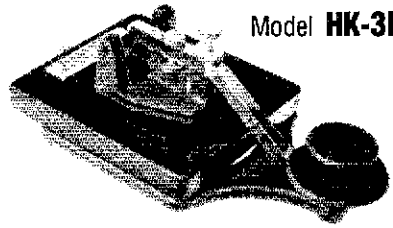

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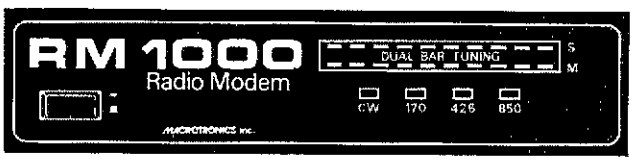

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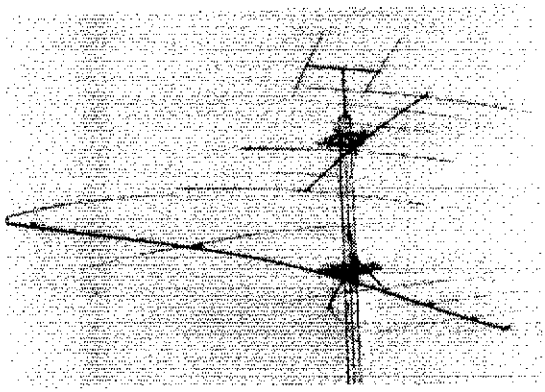

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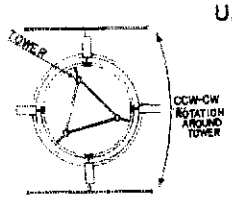

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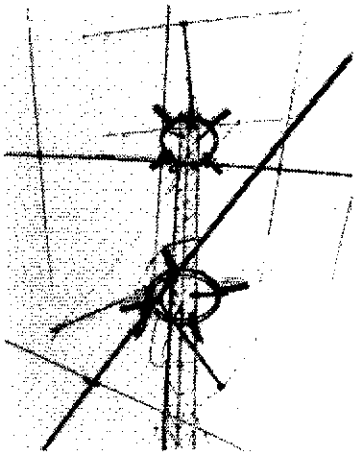

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pres.; KJ7C, v.p.; W7OZH, secy/treas. Capital City ARC KA7MAI, pres.; K7EGM, v.p.; N7FFM, secy/treas. Good luck to all. The Lower Yellowstone ARC and WA7GVT has a unique way for getting new ARRL members: $5 off with the club footing the bill. FB. FCC exams for upgrading will be held in Helena in mid-April. KA7M KB7BJ and KB7Q are up and running on OSCAR 10 mode B with very good results. WB7QZE of Glendive has been chosen as Dawson County's outstanding farmer for 1983. Airline pilot K7WOC and family spent the holidays in the Bozeman area. WA7GQO (our PIO) has relocated to Billings, working for Y-93 FM. DX note: W7LR KØPP and KE7X worked AZ5ZA in the South Orkney Islands on 160 meters.

Net	Sess.	QNI	QTC	Mgr
BSN	12	229	20	WB7UTJ
MTN	29	1497	213	KB7SE
IMN	22	194	140	K7RX

Traffic: KF7R 152, K7EFA 141, WB7TNH 126, K7AF 115, N7AIK 55.

OREGON: SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. Upgrades: KA7RKW (Novice); KA7OFP (General); W7AGO KA7NPN (Adv). W7VSE made BPL as usual, but had two new BPLs to present this month to KN7B and AL7W. WB7VWX won OTVARC's "Rusty Key Nite". KA7GHR had a confirmed contact with W5LFL, Columbia. KZ7T is the new DEC for the Portland metropolitan area. OTVARC officers are W7LJN, pres.; WA7CZA, v.p.; N7CZY, secy; N7DCQ, treas. Hearty Congrats to the whole group.K7WWR has been very busy getting settled into his new marriage and new home so had to step down from his post in ARRG and W7CLU assumed his spot. Thanks for all the hard work over the years with ARRG. Oregon Weather Net is in the final stages of organization. Weather info will be collected on the ARES nets at 8:30 A.M. and 5:15 P.M. daily from all over the state. Speaking of weather, winter storms in December, particularly in the northern parts of the state gave lots and lots of practice for our emergency communications systems. W5LFL, Spaceship Columbia, was loud and clear in most Oregon areas although metro Portland area had lots disrupting interference from well-meaning and not so well-meaning amateurs. OSN report QNI 555, QTC 786 in 62 sessions. Traffic: W7VSE 1182, KN7B 944, AL7W 579, KX7W 430, W7ZB 243, N7FAP 156, WB7OEX 139, W7KYC 133, KX7T 126, N7BGW 65. KA7AID 56, W7LNE 9, W7LT 3.

WASHINGTON: SM, Joe Winter, WA4RWK — STM: K7GXZ. SEC: W6IIH. PIO/SGL: W7CKZ. ACC: K7RS. OO/RFI Coord.: KB7WC. BM: KD7G. TC: K7UU.

Net	Freq.	Time(Z)	QNI	QTC	Sess.
WARTS	3970	0200	2731	278	31
WSN	3590	0245/0545	331	222	62
PSTS	145.33	0130/0630	213	202	61
NTN	3970	2000	1101	74	31
EWTN	146.04	0130/0630	84	70	62
NWSSB	3945	0230	555	50	31

This rpt. ends a good 1983 & we can look forward to a greater 1984. Many of us will be wrkg DX, attaining DXCC, handlg tfc, contesting, rag chewing, bldg, etc. Comms with computers (RTTY) will boom. There are many good things to do! The public service area depends greatly on us and we need lots of help to keep up. I urge you to see your ARES EC or club officer handlg this activity. I am concerned abt telephone interference. The sale of cheap phones by many mfrs and the break-up of the ATT could increase the prob. Advise OO/RFI Coord. KB7WC if you are affected. ACC K7RS rpts a new affiliated club for '83 is the Evergreen ARS in Port Townsend. A warm welcome! The Lower Col. ARA & Key Beepers of Sedro Wooley High School achieved SSC status. Key Beepers is the only high sch. club to do this in the USA. Clark Co. ARC & the Radio Club of Tac. applications are in the mill. The Radio Club of Tac. is the 1st & only club (that I know) that has started the HROTR (Ham Radio on the Road) program. I urge all clubs to get involved in this essential activity to bring the young people into Amateur Radio. GO FOR IT! Congrats to Skagit ARC on rcvg 100% ARRL membership cert. We need more of these! Thirty seven mbrs of King Co. ARES worked during a 27-hr. emergency when 100 mph winds damaged Enumclaw. They provided emergency comms to local authorities & ARC. They radioed damage & hazardous conditions, coordinated evacuation center, dispatched generators to dairy farms, and canvassed mobile home park for evacueees. P.C. ARES dispatched one mbr with a 10 kw generator from the Radio Club of Tacoma. Congrats to all for a great job. PIO W7CKZ, SEC W6IIH & I (SM) spoke to the Olympia ARS on the new ARRL Field Org. OARS mbrs will assist at the Olympic Marathon 5-12. It will be carried live on ABC-TV. Walla Walla Swapfest is 3-25. Now is the time to recognized the '84 club officers WWDXC K7UU, pres.; KB7WD, v.p.; WA7RVA, secy.; W7NG, treas. BEARS K6DQW, pres.; WB7DFR, v.p.; AJ7M, secy.; WB7DNS, treas. Clark CARC KA7HND, pres.; N7ANP, v.p.; KA7PSZ, secy.; WB7VBK, treas. Chehalis YARS KA7JPK, pres.; W7DHZ, v.p.; WB7DQB, 2nd v.p.; KA7PQB, 3rd v.p.; N7EXJ, secy.; W7GYB, treas. Issaquah ARC N7CFO, pres.; WB7VAS, v.p.; KA7QBV, secy/treas. Let's give these officers & also the trustees our thanks & support. Traffic: W7DZX 1178, WB7WOW 1023, KD7ME 710, KR7L 707, W7LG 349, K7GXZ 272, N7ANE 252, KD7MW 114, N7DDP 105, K7AJT 65, WA7BDD 60, KR7F 60, K7CTP 56, W7IEU 51, N7AFY 50, W7GB 50, W7LUP 46, W7APS 31, KD7G 18, KA7INX 14.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN. SEC: W6LKE. STM made BPL. Contra Costa Co. ARES/RACES members participated with the sheriff's dept. in a New Year's Eve program (which lasted until 0500!) to transport over 100 persons who should not have been driving. They were: KA6BSN WA6HAM WA6AEO N6DRT NI6A WA6ZFZ KD6DY WA6JSO KA6NJO WBØYRD KA6SFT KA6OLK K6MFV WB6AED WB6POM WA6OCZ N6EEQ KB6UY KE6RV KA6QGV WB6EZI KE6IK N6IGN WB6JDO. LARK's Novice class had 10 who passed their tests, and six who are almost ready to try their skills. Members KA6OOJ & KA6OOK set sail soon on their 39-foot ketch for a year's stay in KH6-land. Livermore RACES members N6HPO W6BNG W6SOT W6GDM KG6AI KB6ALZ WA6SDA KA6OOK KA6OOJ & W6PYO provided comms for the Livermore Marathon. HARC net meets each Wed at 1900 on K6EAG/R, 145.13 out/144.53 in. EBARC new officers are N6DIG, pres.; K6AGD, 1st v.p.; KA6WAG, 2nd v.p.; KF6PD, 3rd v.p.; KF6IU, treas.; WD6FRP, secy.; WB6DOB, trustee. MDARC new officers are K6MFV, pres.; WA6DQN, v.p.; W6CPO, secy/treas.; W6ZHY, EC; KA6LSL, director. Traffic: NI6A 842, W6VOM 287, WB6DOB 237, K6APW 185, K6AGD 97, WB6UZX 46, NV6T 20.

NEVADA: SM, Leonard M. Norman, W7PBV — SEC: WB5VDV. STM: W7BS. KG7FM now NF7J. K7HRW reports DXing on 80 meters K7ZOK received good publicity for

Amateur Radio on Las Vegas TV while attempting to work W5LFL/space mobile. WADG is sponsoring Advanced and Extra Class classes. We need more station activity reports on what has been done and who did it, can't use what is planned to be done, though. HI. WA7ESM hamming it up in an Airstream Trailer. KA7EUA NCS needs more stations checking in on the 3992 weather net 0800 Monday thru Friday. Boulder City Radio Amateurs meet Saturday mornings for coffee. Las Vegas Radio Amateurs meet every other Tuesday at the 76 Truck Stop for dinner. Traffic: WB5PTO/7 136, W7BS 126, W7MRN 26, W7PBV 6, WB5VDV/7 4.

PACIFIC: SM: Army Curtis, AH6P — STM: KH6HIJ. SEC: KH6B. ACC: KH6BZF. BM: KH6W. PIO: KH6IJ. Aloha and hafa adai to all of the Pacific. Hawaii West ARS (Kona) new officers are KH6CCL, pres.; WH6AWZ, v.p.; WH6AWV, secy/treas. Big Island ARC new officers are KH6WT, pres.; KH6AFS, v.p.; WH6AXL, secy.; W6ORS treas. Congrats to all. Hawaii West ARS has voted to affiliate with the League. Welcome! WH6ARF just upgraded from Novice to General and is burning up the bands enjoying his new privileges. We now have many volunteer examiners signed up and anxiously waiting the new program to begin. We could use more, especially on Oahu. If you are an Amateur Extra and would like to help, please contact me. Traffic: KH6B 220, KH6RQ 78, KH6S 53, KH6JJP 34, KH6HIJ 27, KH6H 17.

SACRAMENTO VALLEY: SM, Ron Menet, N6AUB — STM: KY6Q. SEC: WA6ZUD. SGL: WB5WFG. OO/RFI: WB6TNC. This month greet Marty Brett, WB6TNC, who joined our section cabinet in January as OO/RFI Coordinator. He will be organizing our section OO team. If interested, contact him directly. New club officers: Amador Co. — WA6WIY, pres.; KB6AFF, v.p.; Nevada Co. — KF6JM, pres.; WB6BSN, v.p.; UPGRADES: KB6BMZ NOVICE TO EXTRA in one step! Also, N6HCH and W6IEW to Extra. New Techs: KB6AFE KB6AFF N6JNF KA6ZYJ. Congrats all. Is your club receiving our monthly club bulletin? If not, please let me know. Perhaps it's because it is not affiliated with the League. If so, you're missing a lot of vital information. Please make certain I am on your club's mailing list for your newsletters. It's now time to begin planning all of those summer projects to improve your station or club repeater. Fair weather is just ahead. Traffic: WA6WJZ 152, N6CVF 91, KY6Q 41, WA6ZUD 21, N6AUB 15, WB6SRQ 8. (Nov.) N6EPG 1.

SAN FRANCISCO: SM, Bob Smith, NA6T — STM: K6TP. The traffic handlers did it again, SEVEN people handled almost 2K in traffic in Dec. Ukiah ARC is off and running with its NOVICE class, with their normal monthly meeting 1st Monday. New OBS in Ukiah area is WA6WTT. X-Mas Breakfast for VOMARC was "emergency" fashion because of the power failure in Sonoma. HARC is looking for any historical info on the club. Contact KA6SSY — CBA if you have anything. Humboldt Co. RACES/ARES received 9 VHF radios to be used in their program, tnx to Cal Dept. Water Res. New pres. of ACS is WA6POR, with an able body of directors and volunteers. REDXA combined scores for CQWW rpted to be in excess of 3.2 meg. Good work! SFRC has involved NOVICES in their local 10-meter net — here's how — after ssb the net control listens down split on 28,150 kHz. Good idea, maybe other local groups will give this a try? SFRC NOVICE classes start 2-16 at 7 P.M. in basement of SF Youth Guidance Center (EOS room). Did anyone get a good recording of the STS-9 two-way? I have had many inquiries as to the availability of the two-way audio. Let me know if you can help. I am still looking for an EC for SF Co. Are you interested in ARES/RACES in the SF Co. area. Let me know if you are interested in the appt. See you next month de NA6T. Traffic: W6IPL 571, W6RNL 526, K6TP 219, WB6RTE 49, KK1A/6 6. (Nov.) W6NL 364, W6IPL 345, W6RNL 147, K6TP 117, K6TWJ 97, WB6RTE 31.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. TC: WA6EXV. Appts. renewed: STM N6AWH; OES N6CDD. New officers of Sierra ARC are WA6KZV, pres.; KA6NWC, 1st v.p.; WA6QYR, 2nd v.p.; WA6ARA, secy.; N6BVP, treas. The club meets the second Monday of each month in Ridgecrest. W6RKX N6HYU N6HWO and N6GCK are Advanced, KB6CCI KB6CCV KB6CCJ and KA6UPI are General, KA6UYY KA6TIO and KA6HED are Tech. KA6HED is N6JQL. WB6ZHX is N6GWR. KA6IPL is NW6G. KA6QVW is NW6K. KA6QPB has a TR-2500. Be sure to check the expiration date on your license. A number of valley amateurs have let their licenses expire. In order to get information about your club printed here before the event takes place, I must have the information at least 2 months in advance. Make your traffic handling a part of the record; send me your monthly message count. The Fresno Hamfest is May 18-20 at the Tropicana Lodge in Fresno. Attend and make this one the best hamfest ever. The 1984 Pacific Division Convention will be Labor Day weekend in Santa Clara. Traffic: N6AWH 115, W6DPD 55, K6PMG 34, WA6YAB 18, W6SX 10, K9YBM 10. (Nov.) K6PMG 8.

SANTA CLARA VALLEY: SM, Rod Stafford, KB6ZV — SEC: KA6R. STM: W6PHT. PIO: WB6BPU. ACC: W6MKM. The Naval Postgraduate School ARC in Monterey held a special operating event that coincided with the 1984 Crosby Golf Tournament. W6SZN W6OAT & W6TPH are looking forward to their upcoming March DXpedition to Clipperton Is. WB6YRS KA6R & AE6M are teaching the spring Novice, Tech/Gen & Adv/Extra classes for SCCARA. WD6CZY is the new SCCARA pres for 1984. He has some good plans for the year including a concerted effort for Field Day. The club will operate from Mt. Madonna Park. WB6GFJ just put up new antenna on 2 mtrs & UHF for more satellite work. W6KH has worked 72 countries thru the satellites. OSCAR-10 activity has really taken off in the section in the last few months with regulars AA6G W6MSF WB6ETD W6PGR & WB6GFJ being very active. W6PHT made her first computer CW contact on the HF bands. WB6OQS members provided communications for the Cerebral Palsy Walk. Those participating included: WB6s SFC KHP AHC FEL, KA6s YMD SQD POL AOV, W6s KYF QZE HCM, WA2IBM, N6IYT, KD6VO & KB6ZV. The Coastside ARC newsletter *Pacifica Communicator* had an excellent article in Jan. 84 issue comparing the HyGain Explorer 14 and KLM KT34 antennas. KB6VT has built and used both so he has first hand experience with both antennas. WA6AFT is a member of the City of Pacifica Emergency Disaster Committee. KB6ZV gave a talk to the Lockheed ARC on the new Volunteer Examiner procedures. N6BWX gave an outstanding presentation on computer CW-RTTY operation to the Santa Clara Valley RS. Section Mgr. club visits during December: SPARK, CCRC, Naval Postgrad, ARC, NPEC, West Valley ARA & S.C. Valley Rptr Soc. Traffic: W6YBV 893, N6GKE 441, W6PRI 390, W6KZJ 197, W6PHT 151, W6RFF 46, W6OIl 32. (Nov.) N6GKE 212.

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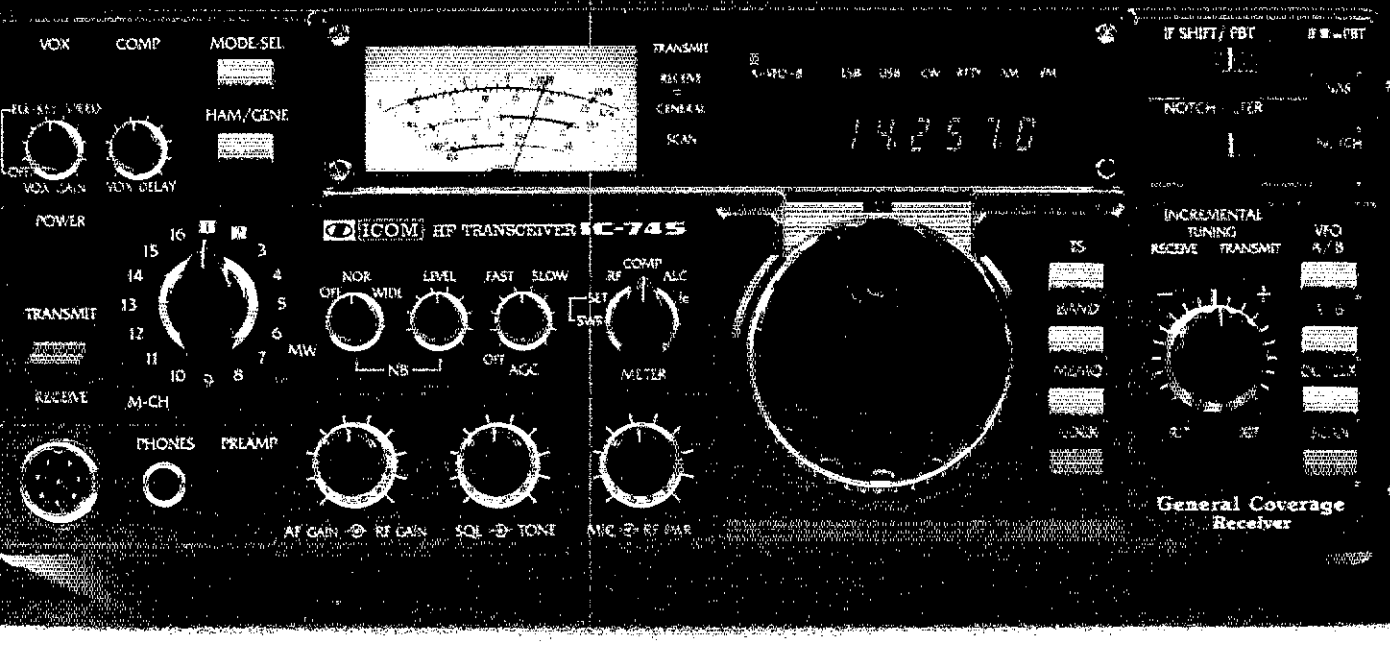

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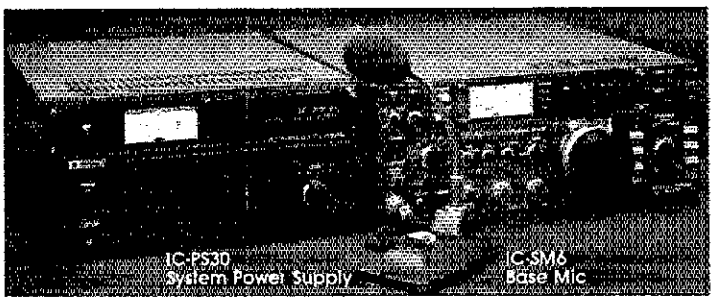

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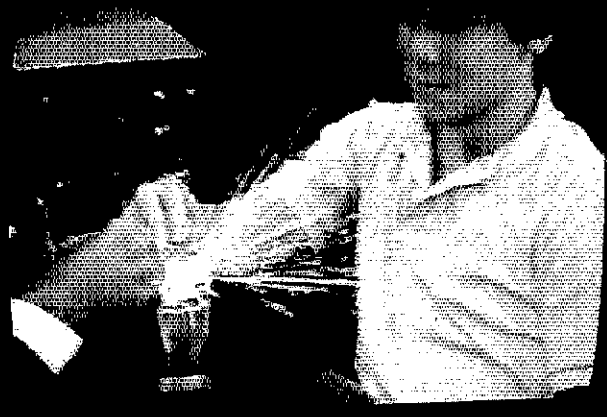

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ROANOKE DIVISION

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — November 28 gave each of us the opportunity to do something exciting concerning our hobby. For 10 days, W5LFL streaked through the skies and talked to hams around the world. It is impossible for me to describe the emotion I felt when his voice broke my squelch calling earth stations. Most of us looked upon the STS-9 mission the way I described it above, trying to be one of the few to make two-way contact with the first amateur in space. Others had the foresight to see that this event would give them the opportunity to publicize the exciting aspects of Amateur Radio. SC hams went into schools, before Scout groups, took their message to TV and had numerous articles published in newspapers. Congrats to all that helped in bringing this event before the public and especially to KA4UIY for going the extra mile to publicize our exciting hobby. Traffic: K4WJR 764, K4ZN 295, W4FMZ 291, W4NTO 181, W4ANK 162, W0IKT 82, WD4FJP 61, K4ZB 59, WD4UDK 59, KA4AUR 47, WA4MIY 37, WD4PLB 27, KA4LRM 23, WA4JWS 12, W4DRF 8.

WEST VIRGINIA: SM, Karl S.Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. Rpt Coord.: WD4KHL. K8WV was guest speaker at KARC installation dinner on Jan. 6. KU8R is new pres. of KARC. KB8DA has assisted with intermod problems in the Hunt. area. K8JQ is active on 8RN and EAN. KZ8Q made BPL in Dec. There are now 493 ARES members in WV.

WVN	3567	7:00	194	130	30
WVFN	3900	6:00	690	189	31
WVMD	7235	11:45 A	726	107	31
WVNN	3730	6:15	95	14	29
Hillbilly	14290	Noon Sn	116	16	4
KARC 2M	28/88	8:30 Sn	75	0	4

Traffic: KZ8Q 552, W8JWX 162, WA3NUI 155, W8LYV 150, N8EMQ 146, N8AJC 137, WA8KCJ 64, W8HZA 52, K8KT 45, K8QEW 39, W8FZP 35, W8CAL 16, NC8G 12, K8JQ 8, KQ8R 6, WD8DHC 4.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ0J — SEC: WB0FWB. STM: WD0AIT. OO/RFI: NC0F. ACC: WB0DUV. PIO: WB0HNQ. SGL: KE0M. TC: KQ0P. BM: W0MDT. This month's news is important not only to Colo., but also to the Div. First, our heartiest congrats to KA3GXH/0 of Colo. Springs. She went to the FCC as a Novice and walked out as an Extra Class. She is only 11 years old. All of the leadership, along with ARRL Pres., W0BWJ & Div. Dir. K0PGM went to the Springs to congratulate her in person. A very efficient EC program has been designed by SEC WB0FQB. It will enhance & improve our capabilities to be prepared in the event of emergencies, within the state. Congrats WB0FQB. Put March 18 on the calendar for the 3rd annual ARA Hamfest. It is going to be a good one and will be at the Nat'l Guard Armory in Aurora. The Rky Mtn Div Convention is May 25-27 at the Holidome. Many dealers/mfrs will be here. So will many prizes, programs & activities for all. The banquet is limited on attendance, so please get registrations in as soon as possible. A letter or call to me will get you the info. This will be an all time great one for Colorado. 73, KQ0J. Nets: CWN QNI 153, QTC 146, time 661, 30 sess.; CWXN QNI 2771, QTC 3420, time 2790, 31 sess.; HNN QNI 1944, QTC 404, Inf 414, time 1942, 31 sess.; COLB QNI 854, QTC 104, Inf. 152, time 1294, 30 sess. Traffic: WA0HJZ 3251, N0BQP 866, W0FPT 552, K0JAN 543, W0ACH 486, WD0BSZ 426, KA0DMR 423, N0CXI 323, KB0Z 258, WD0AUN 177, WD0AIT 176, W0EJD 166, W0NFW 79, W0LQ 55, W5HRS 37, N0CYR 2. (Nov.) WD0BSZ 173.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: KB5XD. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3683 at 1930 local and handled 897 msgs with 370 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3.939 at 0100 UTC and handled 1204 msgs with 115 stations in. New Mexico Breakfast Club meets daily on 3.939 at 0630 local and handled 1161 msgs with 145 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 10 msgs with 333 checkins. Caravan Club 2-Mtr Net 66/06 handled 9 msgs with 132 checkins. Sorry to report the passing of W5REZ. W5CXY NCS on new 06 morning net. W5VTL new pres. of Los Alamos Club. W5MCH participated n a ship rescue in the So. Pacific. Traffic: ND5T 738, W5UH 475, W5DAD 346, W5JOV 323, N5SJ 263.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: W0OGH. PIO & ACC: KC7QJ. OO/RFI: Vacant. The 1984 RKY MTN Division Convention will be held in Denver, May 25-27, at Holiday Inn at I-70 & Chambers Road. Contact KQ0J for info. KC7QY moved out of the section and would like to thank him for the fine job as OO/RFI & TC. The OO/RFI position is vacant and the PIO & ACC will be vacant in the near future as KC7QJ leaves the section. Any volunteers?? Thanks to W7PT for fine job as net control on WPEN. WCN — 22 sessions with 862 QNI & 32 QTC. WJN — 26 sessions with 866 QNI & 5 QTC. Traffic: WB7NHR 506, W7HLA 91, KC7KC 12.

SOUTHEASTERN DIVISION

ALABAMA: SM, Joseph E. Smith, Jr., WA4RNP — SEC: N4DMA. STM: N4JAW. SGL: KA4WVU. PIO: WO4W. BM: KF4VV. The new officers of the Mobile club are: W4YXO, pres.; N4AAM, v.p.; W2TVM, secy.; WU4M, treas. And in Montgomery the Capital City ARS has these new officers: NR4A, pres.; KA4WZD, v.p.; KB4GGO, secy.; KA4RTX, treas. I am looking for an amateur who can encourage others to share their technical achievements with the rest of us through the pages of *QST* and at club meetings and hamfests. He/she should also promote technical advances and experimentation at VHF and UHF with specialized modes and be able to give talks at club meetings and

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Santec's smarter handhelds help the user by providing widest frequency coverage for MARS and CAP operations as well as amateur radio. Any value of offset on 10 KHz steps can be set and stored in any memory location, thus requiring only one memory per transceive frequency pair. Single stroke memory recall of all 10 memories and the required offset means no more switch flipping when repeater frequencies are changed. Because lower power output from the transmitter helps the user to get longer service times on each battery charge, Santec provides three switchable power levels from the full power level of 4 watts plus down to a midrange of around one watt and a battery conserving 100mw. The Santec user gets plenty of helpful information from the complete display on the large size LCD frequency display using six digits plus the offset direction and memory number. Mode of scan, PLL lock and the receiver and transmitter indicator are all usable at the same time without any extra effort. All the neat features you expect plus a good, solid performing transceiver section with excellent sensitivity and high quality audio make Santec your best choice for a handheld transceiver.

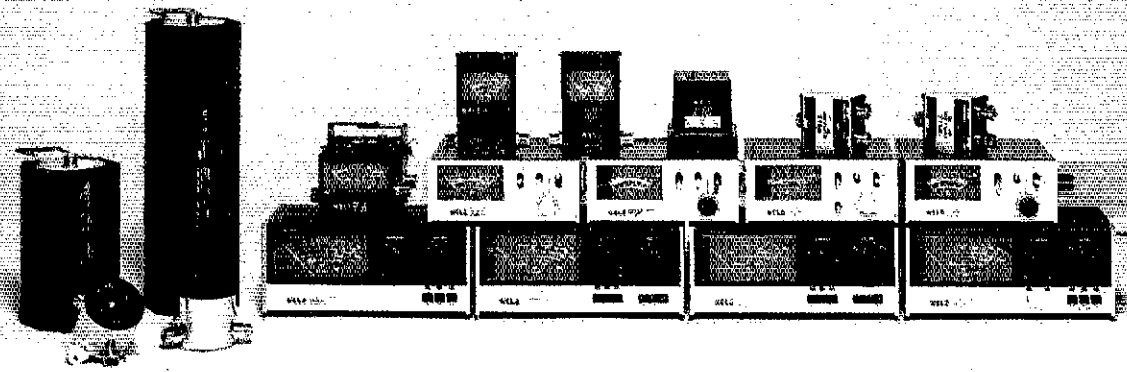
For specifications and a full catalog of Encomm, Inc. products send us a QSL. Specifications subject to change without notice or obligation. Information in this ad does not constitute warranty.

WELZ CORP.

SUPERIOR ACCESSORIES

THE WELZ CORPORATION LINE OF STATION ACCESSORIES

WELZ specializes in WATTS. Measuring Watts and switching Watts, radiating Watts and dissipating Watts is what the WELZ line of winners is all about. Welz is the source for top quality, superior performing, affordable products to compliment your mainframe radio equipment from any source. Increase the versatility of your measuring capability with WELZ WIDE-Z Sensor (TM) power and V.S.W.R. meters, precision 50 ohm terminations. Conserve your coax dollars with the dual band Diamond Antennas for 144/430-440 MHz for base and mobile applications. Welz dual band duplexers let you feed two antennas on two different bands with one feed line with no switching or two transmitters onto one dual band antenna simultaneously. WELZ has wattmeters and V.S.W.R. bridges from 200 mW to 2000 Watts from 500 kHz to 500 MHz frequency range. When you need to measure in RF Watts WELZ has a winner for you. The full line of Wattmeters encompasses many different models, some of which are shown in this family portrait. In addition to both in-line and terminating type wattmeters the WELZ line of Winners includes several high quality dummy loads for testing and tuning plus applications requiring precision 50 Ohm terminations. Frequency ranges of the WELZ loads are typically wider than similarly priced items from other sources. WELZ has winners in the economy circle also. The performance value of the economy line of Wattmeters from WELZ is really superior. The instruments from WELZ are extremely well built and very easy to view. The portable units such as the SP-10x and the SP-380 provide reliable service in the field as well as in the fixed station. Send QSL type card for complete catalog of WELZ products.



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KDK

FM MOBILE TRANSCEIVERS

- Liquid Crystal Display with soft orange lighting for direct sunlight viewing plus night viewing.
- Repeater Offsets (+, −, S) Stored in memory along with the frequency information.
- WIDE frequency coverage for MARS and CAP capability (142-149.995 MHz)
- New chrome front with soft pearl gray cabinet for today's auto decor.
- Memories with valid data scanned, blanks are skipped.
- Repeater reverse switch for monitoring repeater's input frequency.

2m 25W Mobile Maxpack

ing Soon
MHz—FM-6033
440 MHz—FM-7033
220 MHz—FM-4033

The KDK FM-2033 represents a significant advance in user convenience and simplicity of operation for the user. The KDK '33' series provides excellent readability in any lighting condition for the operating frequency and the memory channel in use. Warm orange background LCD displays improve readability by providing easy-on-the-eyes contrast.

Simplicity of operation has always been the mark of the KDK design team and the FM-2033 is no exception. From the single knob frequency and memory selection to the automatic recall from memory of the desired repeater offset, the FM-2033 provides relaxed, comfortable mobile operation.

Once the 10 memory frequencies have been selected, a single knob is all that is required for operation on the standard simplex or repeater channels. Using the audible beep as the end-of-memory marker allows setting to a particular channel without even looking at the radio.

In the scan mode, scanning for a busy memory or pre-programmed band scan keeps you up to date on the happenings in the area. Very busy frequencies can be skipped by using the up key on the TM-2 microphone. If a full 10 memories are not used, the unused ones can be marked for scan skip so that no time is wasted checking them.

The FM-2033 provides a clean 25 watt output signal across 142-149.995 MHz to operate in balance with most repeaters and provide quieting for simplex operations. MARS (Navy too!) and CAP frequencies are also accommodated even with their unusual repeater splits.

You want convenience, reliability and easy operation for your mobile station and a tough-to-beat dollar value, right? Then check out the FM-2033 at your local dealer TODAY or send QSL for specifications. We think you will want one for yourself.

Specifications are nominal and are subject to change. All KDK transceivers meet or exceed FCC regulations regarding spurious emissions.

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AMPLIFIERS • PREAMPS • COUPLERS

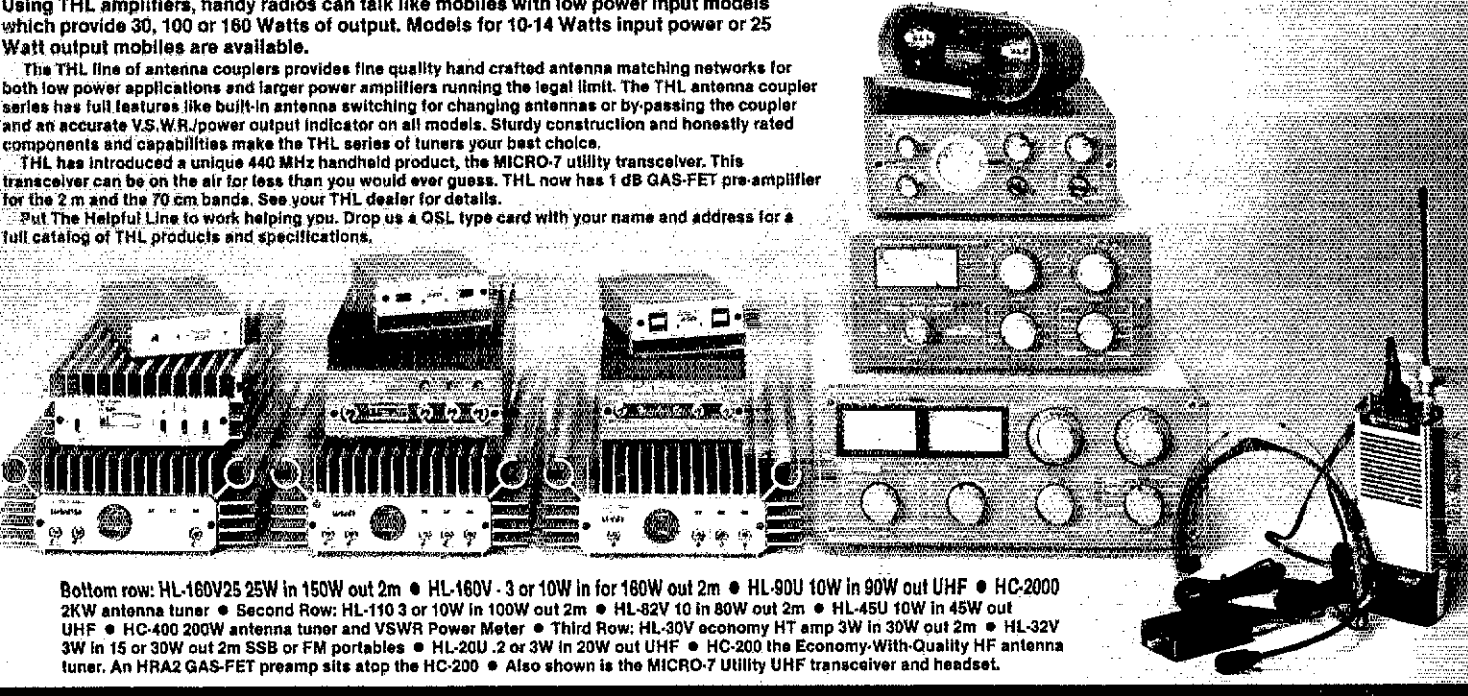
The helpful line of handsome products.

The THL line of amplifiers, pre-amps, antenna couplers and transceivers provides a broad line of solutions to help solve life's problems of needing "just a little more." Whatever it might be, look to THL helpful products to aid in solving the problem. THL can make your signal stronger, your receiving better and can make your HF transmitter happier with the match to the antenna. THL amplifies to a level of 160 Watts on VHF and 90 Watts on UHF. Using THL amplifiers, handy radios can talk like mobiles with low power input models which provide 30, 100 or 160 Watts of output. Models for 10-14 Watts input power or 25 Watt output mobiles are available.

The THL line of antenna couplers provides fine quality hand crafted antenna matching networks for both low power applications and larger power amplifiers running the legal limit. The THL antenna coupler series has full features like built-in antenna switching for changing antennas or by-passing the coupler and an accurate V.S.W.R./power output indicator on all models. Sturdy construction and honestly rated components and capabilities make the THL series of tuners your best choice.

THL has introduced a unique 440 MHz handheld product, the MICRO-7 utility transceiver. This transceiver can be on the air for less than you would ever guess. THL now has 1 dB GAS-FET pre-amplifier for the 2 m and the 70 cm bands. See your THL dealer for details.

Put The Helpful Line to work helping you. Drop us a QSL type card with your name and address for a full catalog of THL products and specifications.



Bottom row: HL-160V25 25W in 150W out 2m ● HL-160V - 3 or 10W in for 160W out 2m ● HL-90U 10W in 90W out UHF ● HC-2000 2KW antenna tuner ● Second Row: HL-110 3 or 10W in 100W out 2m ● HL-82V 10 in 80W out 2m ● HL-45U 10W in 45W out UHF ● HC-400 200W antenna tuner and VSWR Power Meter ● Third Row: HL-30V economy HT amp 3W in 30W out 2m ● HL-32V 3W in 15 or 30W out 2m SSB or FM portables ● HL-20U .2 or 3W in 20W out UHF ● HC-200 the Economy-With-Quality HF antenna tuner. An HRA2 GAS-FET preamp sits atop the HC-200 ● Also shown is the MICRO-7 Utility UHF transceiver and headset.

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hamfests. This is a section-level position entitled Technical Coordinator, so if you qualify drop me a line. This is the start of "tornado" season so keep your batteries hot and ready. CAND with 2983 messages in 33 sessions; rep 100% by NW4X W4CKS and WX4I. DRN5 with 1733 messages, 62 sessions; was rep 97% by WA4JDH W4CKS KC4GS WX4I NW4X WB4IXA W4IBU and W4WJF. RN5 passed 1341 messages for the month. PSHR: WX4I WA4JDH WA4LXP W4CKS WA4RNP. BPL: WA4JDH WX4I. Vry 73, Joe. Traffic: WA4JDH 1501, WX4I 523, NW4X 190, WB4IXA 129, W4CKS 124, WA4LXP 68, K4AOZ 43, WA4RNP 35, N4JAW 30, WD4DHI 16, KB4PGN 13, WB4TVY 10, W4DGH 6, W4WJF 6.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4ABY. STM: K4VHC. ACC: WA4ABY. BM: W4BIA. PIO: WA4PNY. OO/RFI: K4VHC. SGL: W4BTZ. TC: K4UDR. GSSBN had to move to 6:30 local time owing to poor propagation at the later hour. Columbus ARC's annual hamfest starts the season on Mar 31 & Apr 1. Same place as in the past. Savannah ARC qualified as the 3rd SSC in the section. Congrats. Colquitt Co. HRS elected WD4A, pres.; KB4DAY, v.p.; AA4P, secy/treas. Savannah ARC 1984 officers are: KK5M, pres.; KE4OE, v.p.; KF4BA, secy.; KA4CQY, treas.; WD4AFY, act. mgr.; W4KGP trustee. To have a truly efficient Amateur Radio Emergency System in the Georgia section we still need Emergency Coordinators in some of the isolated areas in the state. Even a small group can do wonders in time of need. If U desire to become an EC please contact our very capable SEC, WB4ABY, or me. The 1st stateside station KA2ORK contacted during the Grenada crisis was our own W4BKK of Dublin. His long distance calls started the ball rolling. Tnx for a job well done. From the calls & letters I've received since the TI — 99 computers fell into the hands of so many hams we're needing info on how to use it on the bands. If any of U have programs, info on adaptability, etc., make yourselves known. Contact me so that we can have some of this duplicated & put into the hands of those needing help. With Spring just around the corner we're hoping that the usual bad WX is behind us. Other than some record breaking low temperatures we have been lucky so far. Traffic: WB4RUJ 210, W4WXA 203, W4PIM 197, N9ECB 196, N4BIM 170, WB4NTW 113, K4VHC 75, K4EV 57, N4UZ 37, W4BIA 19, W4HON 18, K4JNL 18, K4BAI 16.

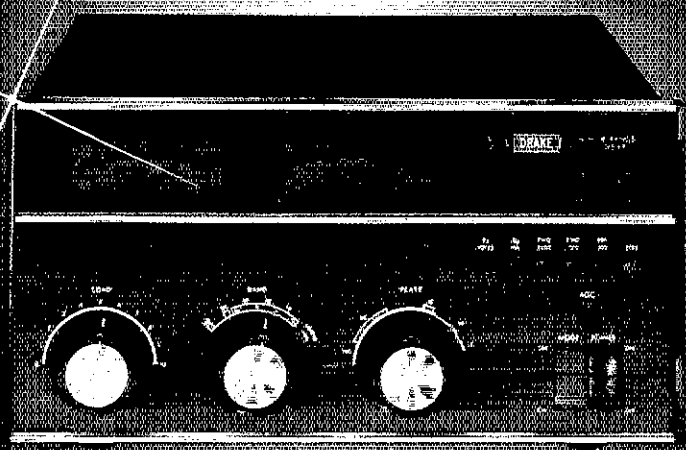
SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. TC: KI4T. BM: WA4EIC. ACC: AA4WJ. PIO: W4WYR. SGL: KC4N. With the huge effort everyone expended on getting out the Christmas traffic there does not seem to be the usual amount of net news this month. K4SCL said he received a new IC471A for Christmas to use as an uplink to OSCAR 10. In addition to 30 contacts in 10 countries he reports that he worked W2MTA on OSCAR 10 Terrestrial Traffic Net, frequency 145.888. WA4EIC, our hardworking section Bulletin Manager, reported that there were 93 bulletins received and 157 sent for a total of 250. The Official Bulletin Stations reporting were: WA4EIC 95; WD4KBW 41; W4DL 62; AA4BN 10; NW4R 12; N4IMI 12; KA4AMC 5; W4ESH 7; K4IEK 6. Our bulletin coverage in the section is excellent; if there is any area that needs an OBS for local net bulletins just send a radiogram to WA4EIC with your recommendation. W4LLA handled 37 phone patches in addition to his formal traffic. STM K4ZK will be taking a world trip from Feb. 23 until mid-April. RN5 mgr KB5W reported that 1341 messages were handled in December and that Florida was represented 100 percent during the month. DCAN mgr W5KLV reported QTC 923 with VE3BSY from Southern Florida active as a Florida rep. W2HAE wrote that he has had a long hospital stay; he fell 14 feet while trimming a tree, and developed further complications in addition to an existing cardiac condition. Hope everything is cleared up by the time you read this. Official Observers reporting were W4SME and N2WX. KF4RL gave a talk to the Tamarac RC. He spoke about the Southeast Florida Traffic Net and traffic handling. BPLs this month were earned by W3CUL W3VR K4ZK K4EUK WA4PFK VE3BSY WD4KBW KE4O and WA4HXU. Qualifying for PSHR were: K4SCL WA4PFK K4ZK KA4GUS NW4R KY4U WB4WYG WD4AWN WD4KBW WA4EIC W4SME KA4FZI K7LCA WB4AID KA4BBA/T. 73 de WA4PFK. Traffic: W3CUL 4211, W3VR 939, K4ZK 836, K4EUK 770, WA4PFK 618, VE3BSY 604, WD4KBW 537, WA4EIC 439, K4IA 386, K4SCL 383, KE4O 382, KY4U 325, KA4GUS 313, W4NFK 309, WB4WYG 286, NW4R 277, WD4CHO 251, W4DL 244, AA4BN 243, WB2NVJ 243, K2RUE 240, WD4AWN 230, WA4HXU 229, W1NJM 203, W4YCL 194, W8BZY 184, NC4H 165, KA4FZI 157, W4SME 157, W4LLA 150, KA4KSQ 144, NF4O 117, KF4RL 110, WB4AID 109, KF4JA 93, N4KB 91, WD9AEP 76, W4PKP 74, W3TLV 70, KA4NXF 69, K4JLL 60, W4DVO 51, WA4TWD 49, W1DLP 45, K4JI 45, KA4YHS 44, W3IJR 40, K5IHH 31, WB4GCK 31, K7LCA 28, KA4BBA 27, KA4KDD 27, WA4GYR 26, KA4RWV 24, KA9AKY 23, WB4GJH 22, K4FQU 22, WB4GJH 22, K3NMR 18, N2WX 18, KM4Y 18, KA4TTS 16, N4CMW 14, W4MFD 14, W4MPV 12, WB2OUK 12, AF3S 11, N4FNY 10, KF4AL 9, WK4F 8, K4IRT 7, WV4F 6, WT4F 5, KA4SIH 5, WB8SNT 5, W4UIO 5, K4VSN 4, NX4X 4, WD4RCC 3, KA4YHE 3, KB4AQO 2, KA4GDU 2, WB4HYB 2, K4OVC 2, WD4PPA 2. (Nov.) W8BZY 65, NX4X 19, WB4GJH 9, K9ALX 6, K2DPD 5, WA3BAA 4, W9FPO 3, WB4LPX 2, WA3AZZ 2, WD4PPA 1, KA4USU 1, KA4UIO 1, N8EL 1, WR4J 1. (Oct.) W8BZY 12.

WEST INDIES: SM, Gregoria Nieves, KP4EW — West Indies Net Slow (WINS) daily 7 P.M. (2300 UTC) on 3.710 MHz. West Indies Net Central (WINC) daily 6:30 P.M. (2230 UTC) 146.94 MHz. Plans are being made for a contest probably for the month of July, organized by NP4X and NP4Z. They have given the name already "Puerto Rico World Wide Contest." The rules for this contest that includes certificates and other details were presented at their meeting of January 4 to the Board of Directors of the Puerto Rico ARC, who will be the sponsor. When finally approved, the rules will appear in *QST* some time before. Good luck to both the organizers and the club in this event. WP4BEF reports the following totals for WINC: QND 370, QTC 41, QNI 537. KP4DJ reports the following totals for WINS: QND 463, QTC 47, QNI 128, 31 sessions. Traffic: KP4DJ 109, NP4FQ 53.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J.Holzer, N7EH — STM: W7*EP*, NMs: WA7FDN WA7KQE. December brought a wide variety of activities to the section. The month started off with many of the section attempting to contact W5LFL in the Columbia Space Shuttle. N7WS and W7FF report being among those that W5LFL reported contacting. The TRA reports the following participated in the Canyon Ranch Fitness Fun comm. exercise: WB7CGQ WØYOY KA7FRY WB7TLR WB7TWM N7EKT K7CO N7CLC W8BID KA7FTZ KBØIW KD7D N7CL WA7FDN AF7M K7KYW KC7AQ WAØNNC. The Superstition ARC is planning a special event station commemorating Lost Dutchman Days as

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 optimium 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. •

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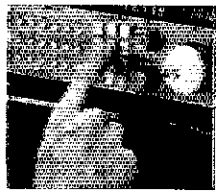
Circle 288 on reader service card.



The Bearcat® DX1000 makes tuning in London as easy as dialing a phone.

Direct access keyboard tuning brings a new level of simplicity to shortwave radio. With the *Bearcat® DX 1000*, dialing in the BBC in London is as easy as dialing a telephone. And you can switch from the BBC to Peruvian Huayno music from Radio Andina instantly. Without bandswitching.

Featuring the innovative microprocessor digital technology made famous by *Bearcat* scanner radios, the *DX 1000* covers 10 kHz to 30 MHz continuously, with PLL synthesized accuracy. But as easy as it is to tune, it has all the features even the most sophisticated "DXer" could want. 10 memory channels let you store favorite stations for instant recall—or for faster "band-scanning" during key openings.

The digital display measures frequencies to 1 kHz, or at the touch of a button, doubles as a two time zone, 24-hour digital quartz clock. A built-in timer wakes you to your favorite shortwave station. Or, it can be programmed to activate peripheral equipment like a tape recorder to record up to ten different broadcasts—any frequency, any mode—while you are asleep or at work.

The *DX 1000* also includes independent selectivity selection to help you separate high-powered stations on adjacent frequencies. Plus a noise blanking system that stops Russian pulse radar interference.

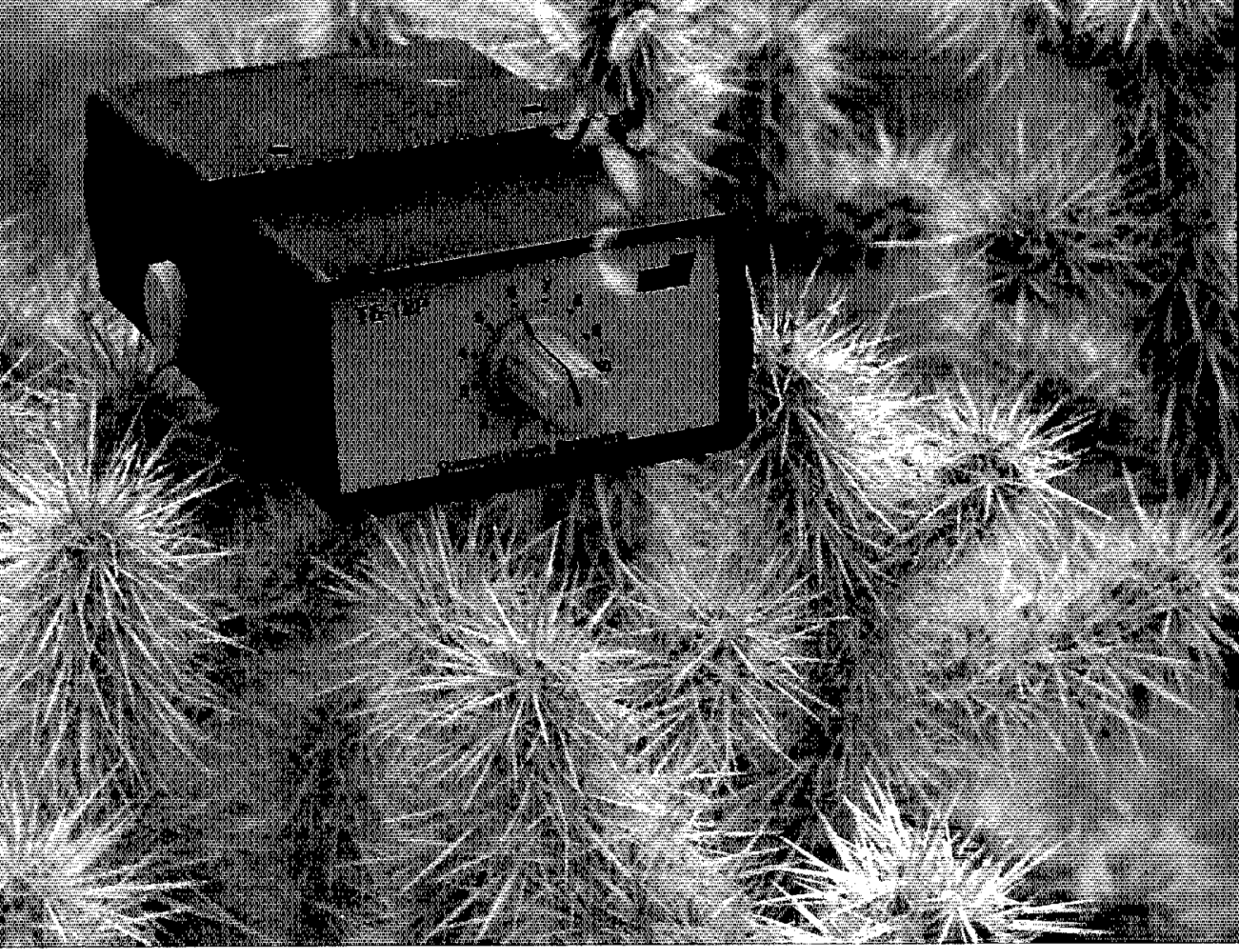
There's never been an easier way to hear what the world has to say. With the *Bearcat DX 1000* shortwave radio, you have direct access to the world.

For the name of your nearest retailer dial toll-free... 1-800-SCANNER.

Frequency Range: 10 kHz to 30 MHz continuously **Tuning:** Direct keyboard entry, selectable 3 or 24 kHz per revolution knob tuning, or manual step tuning in selectable 1-99 kHz steps **Sensitivity:** 1.0 μV AM, 0.5 μV CW/SSB/FM, 1.6-30 MHz. **Image and IF Rejection:** 70 dB or more. **Memory:** 10 frequency capacity. **Frequency Stability:** Better than 100 Hz after warm-up. **Modes:** AM/LSB/USB/CW/FM. **AGC:** Selectable Fast/Slow release times **Filter Bandwidths:** 2.7 kHz, 6 kHz and 12 kHz. **Filter Selection Independent of Mode.**

Bearcat® DX 1000
shortwave radio.

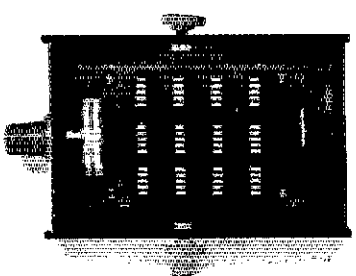
Direct Access To The World.



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 2Z	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, ±.1 Hz maximum −40°C to +85°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	1336	1650	1900	2200	2450
1500	852	1477	1700	1950	2250	2500
2175	941	1633	1750	2000	2300	2550
2805			1800	2100	2350	

- Frequency accuracy, ±1 Hz maximum −40°C to +85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

$89.95

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well as providing comm. for the parade as well. N7ECE is requesting all clubs to send him a copy of their monthly bulletin; by the way N7ECE is the section Affiliated Club Coordinator. It was reported that Santa Claus was observed operating over the Tucson 22/82 repeater? Many thanks to the many stations involved in handling the many holiday season messages that entered and left the section. A BPL cert. was issued to KB7FE. Also PSHR this month goes to KB7FE W7EP and KO7V. Cactus Net: QNI 822, QTC 262. ATEN: QNI 1059, QTC 202. Traffic: KB7FE 1060, K6LL 219, W7EP 200, KO7V 174, W7LVB 90, WA6ZVN 88, KA7JNU 65, K7RDH 44, WA7KQE 41, N7CQY 32, W7KXE 32, KA7HEV 15, K7POF 12, K7NMQ 4, WA7NXL 3.

LOS ANGELES: SM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. ACC: NI6D. The Olympics will tax LAX this next year with many events widely separated. LA City police and the LA Co. Sheriff will be using many hams in security communications roles. Amateurs desiring to participate should contact N6UK or WA6LAU for details. ARES activities during the holiday season were great with many local parades. One of the bigger parades is the HOLLYWOOD Christmas Parade which the NORTH WEST District ARES worked directly with the LAPD and the Hollywood Chamber of Commerce. TORRA is the new name for the Tournament of Roses Radio Associates which provides the communications for the world famous Rose Parade in Pasadena on New Year's Day. Communicators are drawn from many clubs in the area, and the new organization, consisting of those hams who have volunteered to work during the Parade will meet twice a year. New officers for the San Fernando Valley ARC are N6CPP, pres.; KF6JG, E.V.P.; KA6FNJ, M.V.P.; WA6MRY, P.V.P.; N6GLO, T.V.P.; N6EOL, secy.; WD6FWZ, treas. Two members of the Rancho Palos Verdes ARC were elected to the City Council. They were WD6GBG and K6KSY. It looks like antenna restrictive laws may be lessened in that community. Very large traffic group this month; the holiday traffic was very heavy and the bands very poor. Thanks for the big job well done gang. Wishing you all a Happy New Year even if you see this too late. N6DZQ has overcome some TVI lately and all it took was a high pass filter to the TV set. Traffic: K6YBV 888, K6UYK 834, AD7G 556, W6INH 427, KT6D 214, WA6OCM 161, AD0A 154, KA6LAW 33, N6DZQ 29, W6NKE 12, K6CL 2.

ORANGE: SM, Sandra Heyn, WA6WZN — SEC: W6UBQ. STM: WA6QCA. ACC: KA6NLY. BM: W6DXL. OO/RFI Coord: N6PE. PIO: NS6W. SGL: N6HIQ. TC: AA6DD. DECs (by counties): WB6JBI (Orange); W6LKN (Riverside; K6GGS (San Bernardino); WB6YZY (Inyo). NMs: AI6E (CW); WA6QCA (FM); KA6HJK (RTTY); W6CPB (SSB); WA6WZO (ASCII). New PIAs: WB6RVM (Anaheim ARA); KV6F (Barstow ARC); KA6IYM (Buena Park ARC); NR6P (Coachella Valley ARC); KD6GX (Lee de Forest RC); KR6U (McDonnel Douglas ARC); N6DQU (Morongo Basin ARC); WA6GPF (OC Comm Club-RACES); WB6IXN (OCARC); WA6IEX (SCATS); WA6OPS (St. Jude Hosp. & Rehab Ctr ARA); KA6OMZ & N6ISW (West Coast ARC); W6YBI (SCAR Computer Club); KA6SOP (Western ARA). New 1984 officers — West Coast ARC KA6OMZ, pres.; KA6NOR, v.p.; KA6RRR, secy.; WD6BIC, treas. Morongo Basin ARC W6IF, pres.; NN6J, v.p.; KA6EMS, secy.; KF6UO, treas. Buena Park ARC KF6NQ, pres.; N6CAC, v.p.; KA6QWZ, secy.; W6TO, treas. LA Area Council ARC NF6D, chairman.; KF6NC, vice chairman; XYL of W6LPJ, secy/treas. Anaheim ARA K6KNC, pres.; KD6DA, v.p.; NM6X, secy.; WA6WVJ, treas. Yucaipa Valley ARC KA6DAU, pres.; KA6VLG, v.p.; KA6NCG, secy.; K6JQL, treas. So CA ATV Club WB6VVV, pres.; WB7AJC, v.p.; W6KVC, secy/treas. ARA Long Beach AK6Y, pres.; W6PGM, v.p.; KA6UMX, secy.; W6UPL, treas. IDEC WB6CFY, pres.; KF6LG, v.p.; VE2BLR, secy. Victor Valley ARC K5EDS, pres.; KA5IKU v.p.; WA6YBG, secy.; KB6BLD, treas. Downey ARC NM6M, pres.; KF6NC, v.p.; KA6SLS, secy. Congrats to OBS N6BVU on being appointed to the ARRL VHF Repeater Advisory Committee; he is currently secy of TASMA and v.p. of 220 SMA. EC N6BAW received thanks from CHP for organizing 2nd annual "SAVE A LIFE NET" New Years Eve. Many hospital children talked to Santa Claus thru Amateur Radio thanks to KW6T KA6TMQ N6CYV WA6OPS and many others. Many section hams promoted Amateur Radio with W5LFL's space flight including Morongo Basin ARC pres N6DQU who showed ARRL "Amateur Radio Newest Frontier" to 18 organizations! BPL: KA6BNW AI6E N6GIW. PSHR: AI6E WB6QBZ KA6BNW W6NTN N6GIW WA6QCA KA6HJK.

Net	Freq.	Time	QNI	QTC	NM
SCN/1(20+)	3598	7 P.M.	368	605	AI6E
SCN/2(13-)	3598	8:15	218	148	AI6E
SCN/V(FM)	146.645	9 P.M.	546	858	WA6QCA
RTTY/VHF	145.12	10 A.M.	486	185	KA6HJK

Traffic: KA6BNW 533, AI6E 507, N6GIW 506, WB6QBZ 454, KA6HJK 356, WA6QCA 236, N6GOT 188, W6RE 187, K6GGS 176, W6NTN 174, K6ZCE 55, N6FRW 35, W6PNS 32, KA6HMS 8. (Nov.) W6NTN 187.

SAN DIEGO: SM, Arthur R. Smith, W6INI — TC: N6NR. BM: WA6HJJ. STM: N6GW. SEC: W6INI. PIO: WA6CUP. ACC: WA6COE. If you are active in handling written message traffic, you may be eligible for appointment to Official Relay Station (ORS). Contact N6GW (222-5575) for info. 220 Club meets 2nd Monday at Sierra Mesa Rec Cen, 9020 Village Glen, San Diego. Contact W6INI (273-1120) for details. North County Tfc Net handled 307 msgs in 30 sessions. South Bay ARS meets first Thursday at Norman Park Rec Cen, 270 "F" St, Chula Vista. Call WD6CSS (424-5785) for info. Orange Co. Swap Meet is held on second Sunday at Orange Coast College, Fairview St. (off I-405). Talk in 147.51 and 147.09(+), Catalina rptr. ARES holds monthly breakfast/meeting on second Saturday at Normal Heights United Methodist Church, 4650 Mansfield. Bkfst 0800—0845, meeting 0900. All welcome. ARRL affiliated clubs are reminded that renewing ARRL membership thru the club will benefit the club's treasury. Traffic: KT6A 1034, KU6D 657, W6HJJ 350, KM6I 303, KB6AI 126, KF6TF 54, N6AT 40, N6GW 21, WA6IIK 5. (Nov.) KT6A 684, N6AT 31.

SANTA BARBARA: SM, Ernest L. Kapphahm, WB6HJW — Only thing to report this month is that no one reported. If you or your club wants your activities mentioned, please drop me a line. There is no "Big Brother" in the section to report on your activities if you don't. N6BEA is new Satellite ARC pres. N6FOU is appointed section net manager. Your Affiliated Club Coordinator (ACC), W6ZZN, is devoting many hours to benefit clubs in the section. If you would like info, contact W6ZZN. FCC Report & Order sustains $6000 fine levied against Sonic Cable in Arroyo Grande for interference to Amateur Radio operators. ARES status in the section is great but other aspects of ham radio are important, too. Please let us know what you are doing to further Amateur Radio.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: NI5V. SEC: W5GPO. STM: W5VMP. PIO: N5FDL. BM: W5QXK. SGL: W5UXP. OO/RFI: WB5JBP. TC: WB5IIR. New officers: Dallas ARC KC5YB, pres.; WB5JBP, v.p.; N5FTJ, secy.; N5CBD, treas. Panhandle ARC WB5MDJ, pres.; KA5MTE, v.p.; KA5OLK, secy.; KD5IA, treas. KCARC (Abilene) N2BVJ, pres.; N5COT, v.p.; KA5RQH, secy.; Martnell Miller, treas. WB5ULA retakes helm as EC for Johnson Co. Thanks! Stormcom '84 in Dallas was a huge success, with everything bigger and better this year. Now is the time to get all emergency equipment checked out for the tornado season. Our section emergency freqs are: 7290 (day), 3961 (night) and 3697 (CW). These will be the initial calling freqs. for emergency operations in this section. PSHR: KA5AZK N5BT KD5FR KC5NN KB5UL N5DKW N5EZM. Traffic: W5TI 454, KA5AZK 402, KB5UL 385, N5BT 254, W9OYL 198, KC5NN 132, KD5FR 115, KA5QWN 76, N5DKW 76, K5SOR 69, WB4HML 63, NI5V 53, AE5I 46, W5ERT 33, KA5QYV 9.

OKLAHOMA: SM, Art Roberts, W1GOM — ASM: KB5EK. SEC: W5ZTN. STM: KV5X. ACC: K5CAY. TC: W5QMJ. BM: W5AS. SGL: W5NZS. Greetings to the OK section from your ASM, KB5EK. SM W1GOM and XYL are in Arizona. Time to review spring wx communication plans. See if you can assist your DECs who are KB5XI NW, W5VXU SW, K5ENA NE, N5FM Okla City area. OK is represented regularly on W. Gulf Director's Net by WA5OUV WA5KBJ and W5REC. Enid ARC presented W5LFL with a plaque at a luncheon held in his honor. W5REC also presented a certificate of appreciation to WA7UIB and his "super station" from W5EDZ. KC5OU has a number of new Novices tested. KD5OE doing a super job as assistant manager of the Southwest Traffic Net. OK represented 100% on DRN5 by WB5EAY KD5OE K5OIP K5RZS W5FW WB5ELG KV5X and NG5G. BPL: KB5XI K5CXP KB5EK. PSHR: K5CXP KV5X WA5OUV KB5EK. Traffic: K5CXP 345, KV5X 332, KB5XI 293, W5RB 280, W5AS 238, KB5EK 228, W5REC 223, WB5ELG 176, KC5OU 159, NG5G 152, KI5P 137, WA5OUV 126, W5VXU 126, WD5IFB 74, W5FW 73, WA5ZOO 68, N0IN 54, NG5O 53, WD5JCE 46, W5SUG 38, W5VLW 33, KD5GB 27, W5VHP 24, W5VOR 24, WA5OGC 23, K5ENA 16, K5CAY 10. (Nov.) WD5IFB 189.

SOUTHERN TEXAS: SM, Art Ross, W5KR — SEC: WA5RVT. ASM: N5TC. STM: K5QEW. BPL: WB5YDD N5DFO W5CTZ W5TFB W5KLV (all with more than 600 msgs), plus KA5DQP with 114 originations plus deliveries. ARRL bulletins receive wide dissemination in STX from OBS W5KLV (21 bltns, 23 satellite bltns, 4 propagation fcsts, 5 DX bltns, 1 CRRL bltn given 87 readings on 8 nets), OBS N5DFO (38 bltns given 52 readings on 8 nets), and COBS WB5FCO who covers Austin like a blanket. CAND mgr W5KLV reports STX stations represented 100% in Dec by KH6SU WD5BQR W5SHN N5DFO KE5EC N5EFG W5KLV KD5KQ and WB5YDD. ORS N5FN busy chasing DX and upgrading the club repeater N5FN/R with new rcvr, new xmtr, and new feedline. RN5 mgr KB5W reports Texas represented 100% in Dec. OO K5VRF has TRS80-II on RTTY receiving and broadcasting ARRL bltns; monitored STS-9 on his earth station. DRN5 mgr WB5YDD reports STX represented 100% by KH6SU W5KLV WB5EPA WB5FQU W5CTZ N5DFO W5URN KS5V KD5KQ K5WOB N5AMH WD5BQR and WB5YDD. From *AARC-OVER*, Austin ARC: W5EQD donated equipment to Austin ARC, including 2-mtr transcvr utility power supply and other items; some will be used at club station in Red Cross bldg near airport, rest will be auctioned at spring swapfest to benefit club treasury; KA5OJK is new editor for *AARC-OVER*; WD5JCB reports 4 students passed Novice exam and new classes for Novice and General will start in spring; KC5LD helping teach Novice class at Texas School for the Blind. Brazos Valley ARC reports Novice class going well with 12 students ranging in age from 12 to "over 21." Traffic: WB5YDD 762, N5DFO 688, W5CTZ 578, W5TFB 612, W5KLV 610, K5GM 295, KB5NX 271, KS5V 244, KA5DQP 230, WB5EPA 206, N5TC 179, WB5MMI 87, WB5FQU 57, W5BGE 52, W5KR 48, K5OWK 48, WD5GKH 47, AK5M 40, WA2VJL 38, KK8L 5. (Nov.) K5GM 112.

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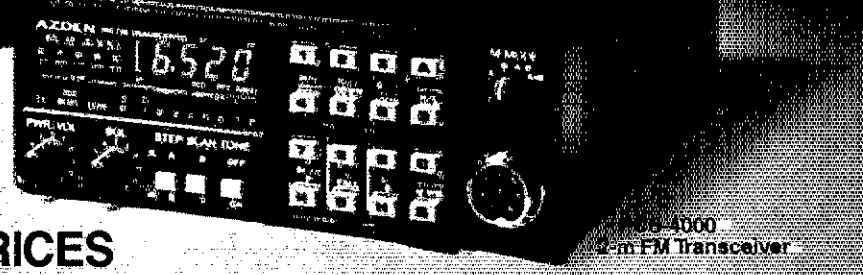

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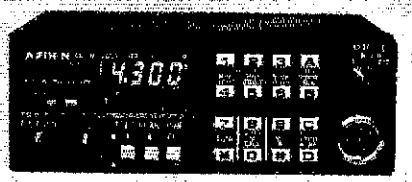

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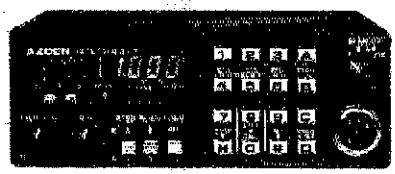

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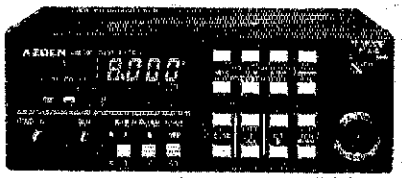

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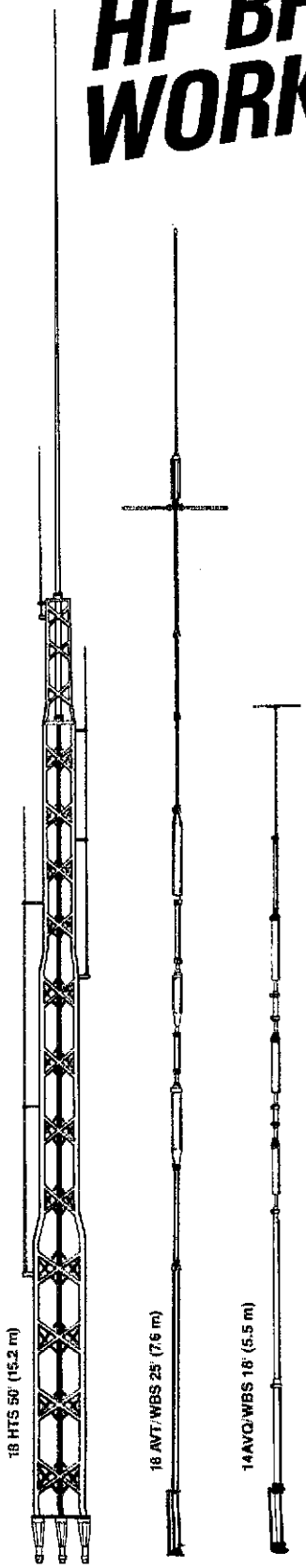

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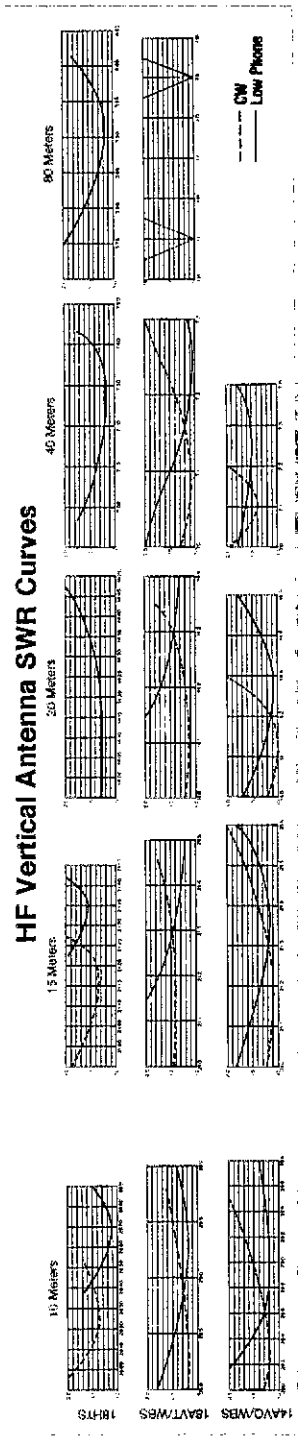

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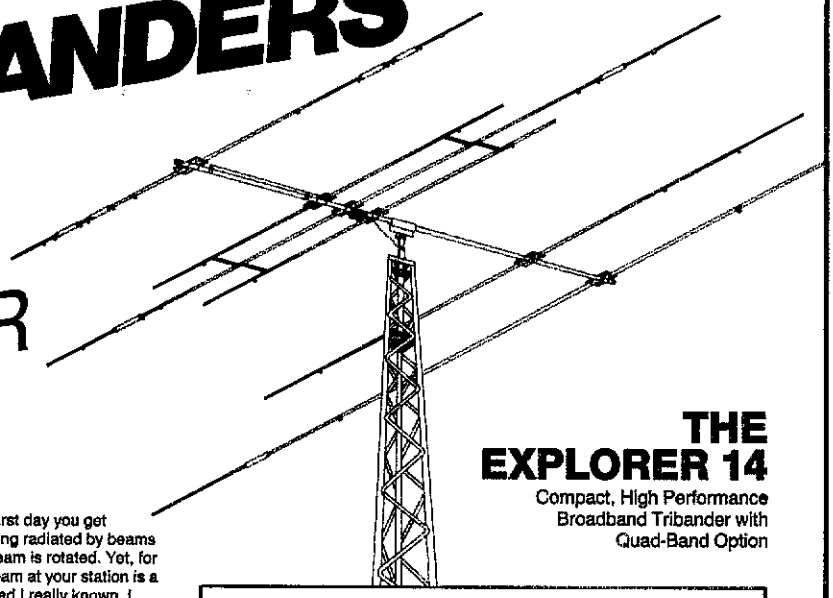
hy-gain®

BROADBANDERS

MAXIMIZE THE POTENTIAL OF YOUR HAM GEAR



There is nothing like a beam!

You hear about the importance of the antenna system from the first day you get involved in amateur radio. You hear the big signals on the air being radiated by beams and you hear those same signals virtually disappear when the beam is rotated. Yet, for whatever the reason, getting on the air for the first time with a beam at your station is a down-right exhilarating experience. The universal reaction is "Had I really known, I would have installed a beam years ago".

The gain of a beam multiplies the effective radiated power of your transmitter just like an amplifier. More importantly, it amplifies the signal from the station being beamed. Off the sides and back of the antenna, the effective radiated power of those kilowatts on/near your frequency are reduced to manageable QRP levels.

A well-designed beam is by far the best performance buy you can make and it doesn't use any electricity. Further, if you buy a good one, it will last longer than some of the electronics gear in your shack. In terms of cost per hour of enjoyment, a beam antenna is among the least expensive major station components.

As sunspot cycle 21 winds down over the next few years the priority for a good beam shifts from "great to have" to "essential!" To maximize your station capability on the high bands choose one of these super broadband arrays.

THE EXPLORER 14

The same compact size as the well-known TH3Mk3 it replaces. The driven element uses an open sleeve dipole which is a concept that we call PARA-SLEEVE (Patent Pending). The para-sleeve design achieves the broadband performance objective. The forward gain and front to back ratio is very impressive, especially when compared with other antenna designs in the same size class. 43 lbs. (19.5 kg) of superb performance on a 14 ft. (4.3 m) boom. Turning radius 17 ft. (5.3 m) and 7.5 sq. ft. (.69 m²) of surface area. The EX 14 is the ideal choice where space is limited. Great for roof mount or on smaller towers. Optional QK7-10 kit adds your choice of either 30 or 40 meters to the driven element.

FIVE ELEMENT THUNDERBIRD TH5Mk2

Broadbanding is achieved with our unique dual driven element system. Five elements on the 19 foot boom (5.8 m), with four active elements on each of the three bands. 72 lbs. (32 kg) of rugged antenna with 7.4 sq. ft. (.68 m²) of surface area. Turning radius is a manageable 18.4 ft. (5.6 m).

SEVEN ELEMENT THUNDERBIRD TH7DX

This is a broadband successor to the legendary TH6DXX. Five active elements on 10 meters and four elements on both 15-20 meters. The TH7DX represents the ultimate in high-performance arrays whether you're comparing other large tribander's or stacked monobander's. 76 lbs. (35 kg) with a surface area of 9.4 sq. ft. (.87 m), a 24 ft. (7.3 m) boom and a turning radius of 20 ft. (6.1 m). If you own a TH6DXX, a conversion kit is available which includes the second driven element, the completely new matching system, a full set of stainless steel hardware, and of course, step by step instructions. After conversion, your TH6DXX is a TH7DX, exactly.

FEATURES COMMON TO EX 14, TH5Mk2, and TH7DX:

- Separate Hy-Q traps for each frequency. Factory assembled and individually resonated to insure uniform performance.
- Handles maximum legal power with a respectable margin of safety.
- Unique broadband beta match assures efficient energy transfer and places the entire antenna structure at dc ground.
- BN 86 balun supplied as standard.
- Top quality stainless steel hardware supplied at no added cost.
- Super strong, taper swaged 6063-T832 thick-wall aluminum tubing used throughout.
- Unique Hy-Gain die cast aluminum boom to mast bracket. Accepts mast diameters up to 2½" (63 mm).
- Twist and slip proof die formed heavy gauge aluminum element to boom brackets.
- All tubing deburred and cleaned for ease of assembly.
- Only one set of dimensions for complete coverage of all three bands below 2:1 SWR.
- Designed to survive winds of 100 mph (160 km/hr).

THE EXPLORER 14

Compact, High Performance Broadband Tribander with Quad-Band Option

The value of a Directional Antenna was one of my early "discoveries". Over the years, I have built or bought numerous Quads and Yagis. I have never been so impressed as I am with my TH7DX. I enjoy QRP but now have a problem convincing folks that I am only running 5 watts! The TH7DX is a superb antenna, both from a performance and a structural point of view.

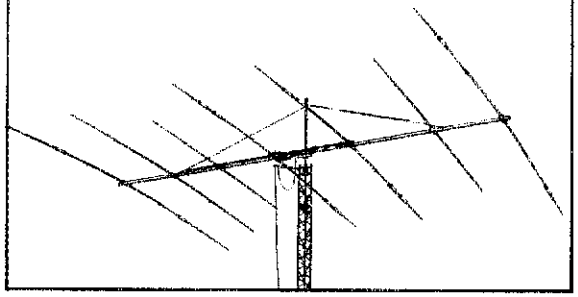
Congratulations!

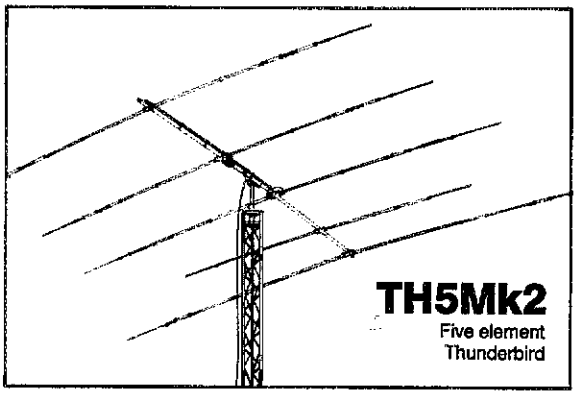
Jack Falker
W8KR

(W8KR has worked all countries but two!)

TH7DX

Seven element Thunderbird





TH5Mk2

Five element Thunderbird

TELEX® hy-gain®

TELEX COMMUNICATIONS, INC.

9600 Aldrich Ave. So., Minneapolis, MN 55420 U.S.A.
Europe: Le Bonaparte—Office 711, Centre Affaires Paris-Nord, 93153 Le Blanc-Mesnil, France.

"DX-traordinary."

Superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

TS-930S

The TS-930S is a superlative, high performance, all-solid state, HF transceiver keyed to the exacting requirements of the DX and contest operator. It covers all Amateur bands from 160 through 10 meters, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.
Among its other important features are, SSB slope tuning, CW VBT, IF notch filter, CW pitch control, dual digital VFO's, CW full break-in, automatic antenna tuner, and a higher voltage operated solid state final amplifier. It is available with or without the AT-930 automatic antenna tuner built-in.

TS-930S FEATURES:

- **160-10 Meters, with 150 kHz-30 MHz general coverage receiver.**
  Covers all Amateur frequencies from 160-10 meters, including new WARC bands, on SSB, CW, FSK, and AM. Features 150 kHz-30 MHz general coverage receiver. Separate Amateur band access keys allow speedy band selection. UP/DOWN bandswitch in 1-MHz steps. A new, innovative, quadruple "UP" conversion, digital PLL synthesized circuit provides superior frequency accuracy and stability, plus greatly enhanced selectivity.
- **Excellent receiver dynamic range.**
  Receiver two-tone dynamic range, 100 dB typical (20 meters, 50-kHz spacing, 500 Hz CW bandwidth, at sensitivity of 0.25 μv, S/N 10 dB), provides the ultimate in rejection of IM distortion.
- **All solid state, 28 volt operated final amplifier.**
  The final amplifier operates on 28 VDC for lowest IM distortion. Power input rated at 250 W on SSB, CW, and FSK, and at 80 W on AM. Final amplifier protection circuits with cooling fan, SWR/Power meter built-in.
- **CW full break-in.**
  CW full break-in circuit uses CMOS logic IC plus reed relay for smooth, quiet operation. Switchable to semi-break-in.
- **Automatic antenna tuner, built-in.**
  Covers Amateur bands 80-10 meters, including the new WARC bands. Tuning range automatically pre-selected with band selection to minimize tuning time. "AUTO-THRU" switch on front panel.
- **Dual digital VFO's.**
  10-Hz step dual digital VFO's include band information. Each VFO tunes continuously from band to band. A large, heavy, flywheel type knob is used for improved tuning ease. T.F. Set switch allows fast transmit frequency setting for split-frequency operations. A=B switch for equalizing one VFO frequency to the other. VFO "Lock" switch provided. RIT control for ±9.9 kHz.
- **Eight memory channels.**
  Stores both frequency and band information. VFO-MEMO switch allows use of each memory as an independent VFO, (the original memory frequency can be recalled at will), or as a fixed frequency. Internal Battery memory back-up, estimated 1 year life. (Batteries not Kenwood supplied).
- **Dual mode noise blanker ("pulse" or "woodpecker").**
  NB-1, with threshold control, for pulse-type noise. NB-2 for longer duration "woodpecker" type noise.
- **SSB IF slope tuning.**
  Allows independent adjustment of the low and/or high frequency slope of the IF passband, for best interference rejection. HIGH/LOW cut control rotation not affected by selecting USB or LSB modes.
- **CW VBT and pitch controls.**
  CW Variable Bandwidth Tuning control tunes out interfering signals. CW pitch controls shifts IF passband and simultaneously changes the pitch of the beat frequency. A "Narrow/Wide" filter selector switch is provided.
- **IF notch filter.**
  100 kHz IF notch circuit gives deep, sharp, notch, better than -40 dB.
- **Audio filter built-in.**
  Tuneable, peak-type audio filter for CW.
- **AC power supply built-in.**
  120, 220, or 240 VAC, switch selected (operates on AC only).
- **Fluorescent tube digital display.**
  Six digit readout to 100 Hz (10 Hz modifiable), plus digitalized sub-scale with 20-kHz steps. Separate two digit indication of RIT frequency shift. In CW mode, display indicates the actual carrier frequency of received as well as transmitted signals.
- **RF speech processor.**
  RF clipper type processor provides higher average "talk-power," improved intelligibility
- **One year limited warranty on parts and labor.**

Other features:

- SSB monitor circuit, 3 step RF attenuator, VOX, and 100-kHz marker.

Optional accessories:

- AT-930 automatic antenna tuner.
- SP-930 external speaker with selectable audio filters.
- YG-455C-1 (500 Hz) or YG-455CN-1 (250 Hz plug-in CW filters for 455-kHz IF.
- YK-88C-1 (500 Hz) CW plug-in filter for 8.83-MHz IF.
- YK-88A-1 (6 kHz) AM plug-in filter for 8.83-MHz IF.
- SO-1 commercial stability TCXO (temperature compensated crystal oscillator). Requires modifications.
- MC-60A deluxe desk microphone with UP/DOWN switch, pre-amplifier, 8-pin plug
- TL-922A linear amplifier (not for CW QSK)
- SM-220 station monitor (not for pan-adapt
- 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.

"Comm-packed."

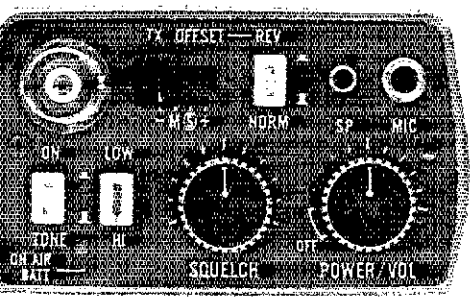
BIG performance... small size... smaller price!!!

TR-2500

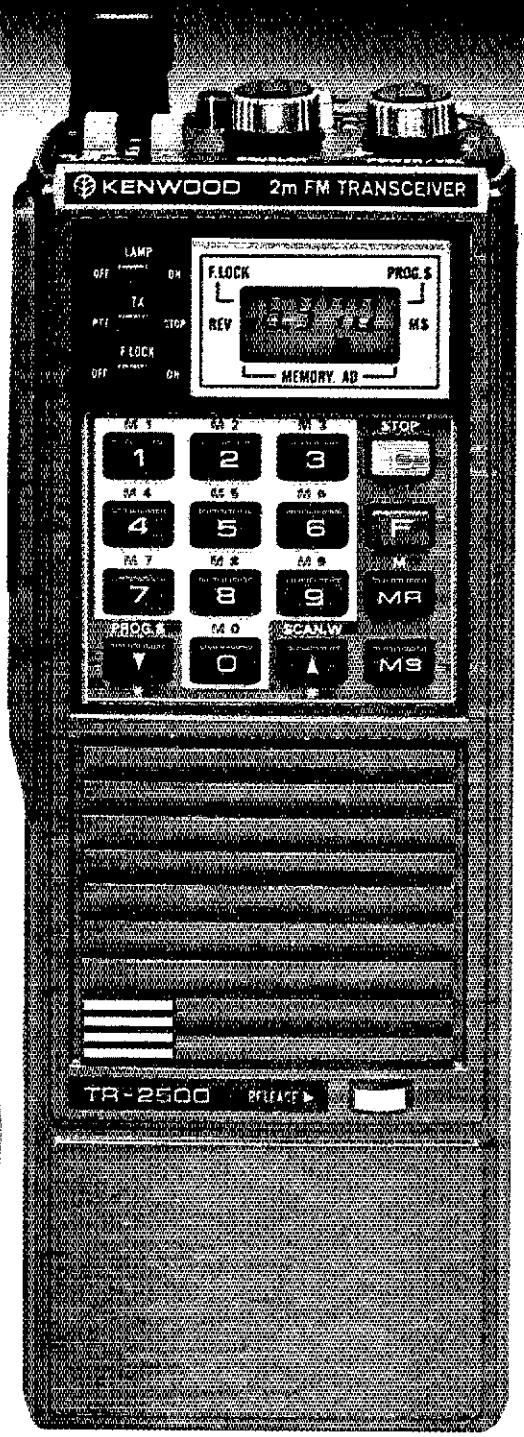
The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

TR-2500 FEATURES:

- **Extremely compact size and light weight**
  Measures 66 (2-5/8) W x 168 (6-5/8) H x 40 (1-5/8) D, mm (inches). Weighs 540 grams (1.2 lbs) with Ni-Cd pack.
- **LCD digital frequency readout**
  Shows frequencies and memory channels, four "Arrow" indicators.
- **Ten channel memory**
  Nine memories for simplex or ±600 kHz offset. "M0" memory for non-standard split frequency repeaters.
- **Lithium battery memory back-up**
  (Estimated 5 year life.) Maintains memory when Ni-Cd pack is fully discharged or removed.



- **HI/LOW power selection**
  2.5 watts or 300 mw.
- **Memory scan**
  Scans only channels in which frequency data is stored.
- **Programmable automatic band scan**
  Upper and lower frequency limits and scan steps of 5-kHz and larger.
- **UP/DOWN manual scan**
- **Built-in tuneable sub-tone encoder**
  Tuneable (variable resistor) to desired CTCSS tone.
- **Built-in 16-key autopatch encoder**
- **"SLIDE-LOC" battery pack**
- **Repeater reverse switch**
- **Keyboard frequency selection**
- **Extended frequency coverage**
  Covers 143.900 to 148.995 MHz in 5-kHz steps.
- **Optional power source**
  Using optional MS-1 mobile or ST-2 AC charger/power supply, radio may be operated while charging. (Automatic drop-in connections.)



Actual size

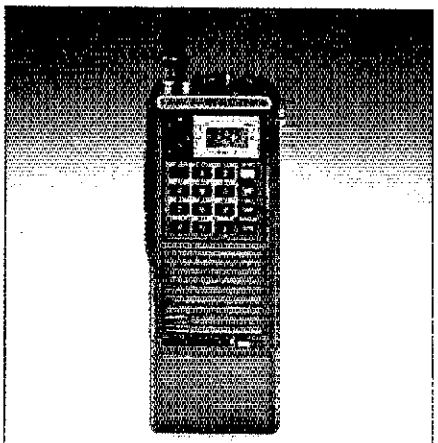
- **High impact plastic case**
- **Battery status indicator**
- **Two lock switches**
  Prevent accidental frequency change and accidental transmission.

Standard accessories include:

- Flexible antenna with BNC connector
- 400 mAH Ni-Cd battery pack
- AC charger

Optional accessories:

- ST-2 Base station power supply/charger (approx. 1 hr.)
- MS-1 13.8 VDC mobile stand/charger/power supply



TR-3500

70 CM FM Handheld

- 440-449.995 MHz in 5-kHz steps
- TX OFFSET switch keyboard programmable ±5 kHz to ±9.995 MHz
- 1.5 W/300 mW HI/LOW power switch
- Auto. squelch position on squelch control
- Tone switch for TU-35B optional programmable CTCSS encoder
- Other features include 10 memories, lithium battery memory back-up, programmable automatic band scan, memory scan, UP/DOWN manual scan, repeater reverse, 16-key autopatch, keyboard frequency selection, slide-lock battery.

- VB-2530 2-M 25 W RF power amp., w/cables, mtg. brkt. (TR-2500 only)
- TU-1 Programmable CTCSS encoder (TR-2500 only)
- TU-35B Programmable CTCSS encoder (mounts inside TR-3500 only)
- PB-25 Extra 400 mAH Ni-Cd battery
- PB-25H Heavy-duty 490 mAH Ni-Cd battery
- DC-25 13.8 VDC adapter.
- BT-1 Battery case for manganese/alkaline AA cells
- SMC-25 Speaker-microphone
- LH-2 Deluxe leather case
- BH-2A Belt hook
- RA-3 m 3/8λ telescoping antenna (for TR-2500).
- WS-1 Wrist strap
- EP-1 Earphone

More information on the TR-2500 and TR-3500 is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

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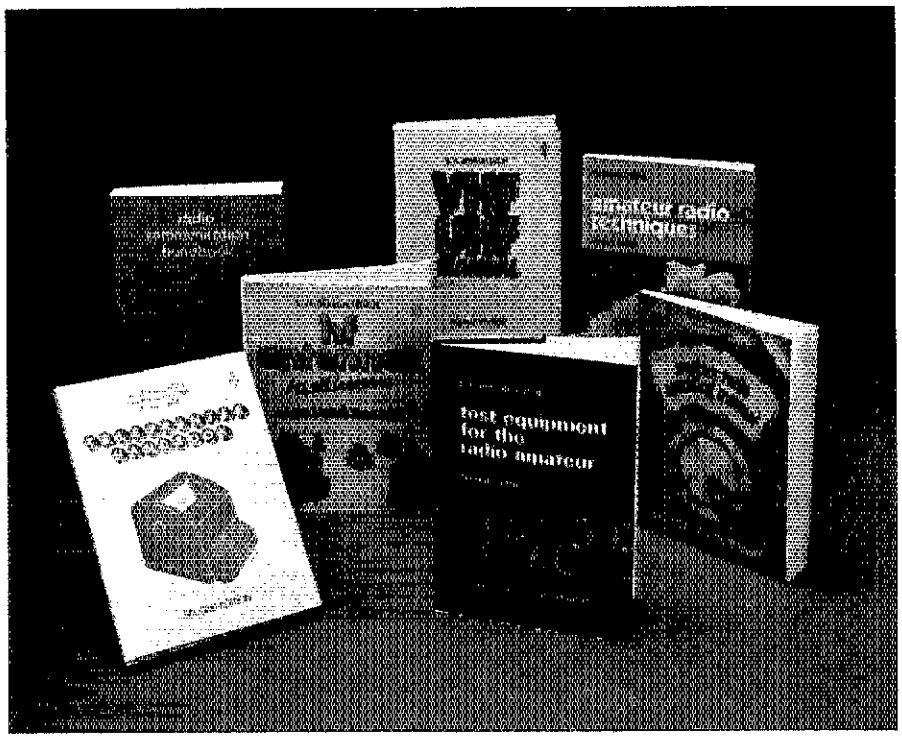
...pacesetter in amateur radio

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



PUBLICATIONS FROM THE RADIO SOCIETY OF GREAT BRITAIN

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, Bandwith; 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 machines, the *Teleprinter Handbook* also covers maintenance, repair and operation of Teletype Model 15, 19, 28, 32, 33, and 43 units. Also covers repertorators, 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.**

RSGB publications are available from:

THE AMERICAN RADIO RELAY LEAGUE, INC.

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NEWINGTON, CT 06111

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a weekend or holiday, the Ham-Ad deadline is the previous working day.

(5) No Ham-Ad may use more than 100 words. No advertiser may use more than two ads in one issue. A last name or call must appear in each ad. Mention of lotteries, prize drawings, games of chance, etc. is not permitted in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or characters of their products and services. Individual advertisers are not subject to scrutiny.

Clubs/Hamfests

QCWA Quarter Century Wireless Association is an international nonprofit organization founded in 1947. You are eligible for membership if licensed 25 or more years ago, and presently licensed. It is not necessary to have been licensed the entire 25 years. Members receive QCWA publications and participate in QCWA activities. Come grow with us! Write QCWA, Inc., 1409 Cooper Drive, Irving, TX 75061.

PROFESSIONAL CW operators, retired or active, commercial, military, gov't., police etc. invited to join Society of Wireless Pioneers — W7GAQ/6 Box 530, Santa Rosa CA 95402.

IMRA-International Mission Radio Association Helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont, NY 10538.

THE Veteran Wireless Operators Association, a non-profit organization of communications people founded in 1925, invites your inquiries and application for membership. Write VWOA, Ed. F. Pleuler, Jr., Secretary, 46 Murdock Street, Fords, NJ 08863.

JOIN the Old Timers Club, an international non-profit organization. If you operated a radio station, commercial, amateur or Armed Forces 40 or more years ago, and have an Amateur license at present you are eligible. Join the real pioneers of ham radio. Write O.O.T.C. Box AA, Mamaroneck, NY 10543 for details.

HAVE A-M capability? Join S.P.A.M. (Society for Promotion A-M) Membership is free. Write: F.A. Dunlap (S.P.A.M.), 14113 Stoneshire, Houston, TX 77060 (S.A.S.E. please).

W.A.R.A. Warren Ohio Hamfest Aug. 19, 1984 at Kent State University, Trumbull Campus.

ON MARCH 11, 1984 the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairground Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8 am. Table reservations: contact Aileen Scales, 3142 Market Place, Bloomington, IN 47401.

ON MARCH 11, 1984 the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8 am. Table reservations: contact Aileen Scales, 3142 Market Place, Bloomington, IN 47401.

FIND OUT what else you can hear on your general coverage transceiver or receiver. Complete information on major North American radio listening clubs. Send 25¢ and S.A.S.E. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier, CA 90601.

THE 15th annual B*A*S*H will be held on the Friday night of the Dayton Hamvention, April 27th, 1984, at the Convention Center, Main and Fifth Streets. Parking in adjacent City Garage. Admission is free to all. Sandwiches, snacks and C.O.D. bar available. Live entertainment for a super social evening. Don't miss it . . . Two exciting top awards, and many, many others. For further information, contact the Miami Valley F.M. Association, P.O. Box 263, Dayton, OH 45401.

MISSOURI STATE ARRL Convention April 7-8 1984. Details see March QST Ham Conventions.

ANNUAL FLEMINGTON, NJ Hamfest by Cherryville Repeater Association will be held Saturday April 7 at Hunterdon Central High School Field House on Route 31. Doors open at 8 AM, but breakfast will be served on site from 6:30 AM. Talk-in on 147.375, 147.015, 146.52, 224.12, 444.85. For further info or table reservations, call 201-788-4080 or write Bill Inkrote, K2NJ, RD10 Box 294, Quakertown-Croton Rd., Flemington, NJ 08822.

ATLANTA HAMFESTIVAL 1984! Sponsored by the Atlanta Radio Club. June 16th and 17th will be held at the Atlanta Civic Center. 70,000 square feet of air conditioned exhibitor space and over 800 outdoor flearmarket spaces will be available. Write: Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

ATLANTA HAMFESTIVAL 1984!! Flearmarket — $12.50/space in advance, $15 at the gate, both days. Hamfest registration — $5 in advance, $6 at the door. To be preregistered for the flearmarket or hamfest, we must receive your application and check by June 8th. Preregistration applications received after June 8th will be returned. Hours 8:00 AM to 5:00 PM on Saturday, 8:00 AM to 2:30 PM on Sunday. Talk-in on 3.975 MHz, 146.22/82 and 146.94 simplex. For preregistration or other information, write: Atlanta Radio Club, P.O. Box 77171, Atlanta, GA 30357.

QSL Cards/Rubber Stamps/Engraving

TRAVEL-PAK QSL Kit — Converts Post Cards, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

DON'T buy QSL cards until you see my free samples — or draw your own design. I specialize in custom cards. Send black and white sketch: wil give quote. Little Print Shop, Box 9848, Austin, TX 78766.

DISTINCTIVE QSL's — Largest selection, lowest prices, top quality photo and completely customized cards. Make your QSL's truly unique at the same cost as a standard card, and get a better return rate! Free samples, catalogue. Stamps appreciated. Stu, K2RPZ, Box 412, Rocky Point, NY 11778 516-744-6260.

FREE samples — stamp appreciated. Conner, 522 Notre Dame Ave., Chattanooga, TN 37412.

QSLs & rubber stamps. Top quality. QSL samples and stamp information 50c. Ebbert Graphics D-3, Box 70, Westerville, OH 43081.

WOODGRAINED QSLs. Beautifully printed. You have to see them. Write for free samples. Ham Graphics, Box 244Q, Camden, NY 13316.

QSL samples — 25¢ Samcards - 48 Monte Carlo Dr., Pittsburgh, PA 15239.

EMBROIDERED emblems, custom designed club pins, medallions, trophies, ribbons. Highest quality, fastest delivery, lowest prices anywhere. Free info: NDI, Box 6665 M, Marietta, GA 30065.

CADILLAC of QSLs — Completely different! Samples $1. (refundable) Mac's Shack, P.O. Box No. 43175, Seven Points, TX 75143.

QSLs — K0AAB collection, railroad employees and railfan's specials, front report styles. State your sample wants. 37¢ self addressed business size envelope required. Marv W0MGI, 2095 Prosperity Ave., St. Paul, MN 55109.

QSLs Samples 30c (stamps OK) Fred Leyden, W1NZJ, 454 Proctor Ave., Revere, MA 02151.

INTRODUCING: Beautiful natural full color photo QSL cards, made from your color negative or slide. From $285. for 3,000 cards minimum. Free samples, stamps appreciated. K2RPZ, Box 412, Dept. NC, Rocky Point, NY 11778 516-744-6260.

QSLS, Quality and fast service for 23 years. Include call for decal. Samples 50¢. Ray, K7HLR, Box 331, Clearfield, UT 84015.

QSLs by W6BA "customized" $19.75 per 1000. Star Route 2, Box 241, 29 Palms, CA 92277.

NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing and SWL's. Stamp appreciated.

RUBBER Stamps custom made to your satisfaction. Free literature. J. Glass, WB6ZTI, 14316 Cerecita Drive, East Whittier, CA 90604.

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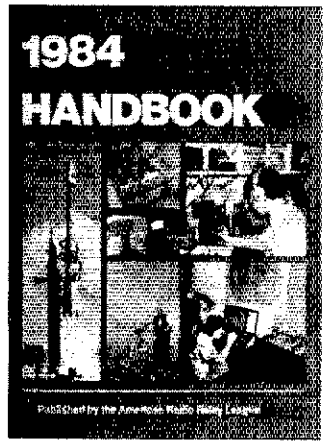

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The 1984 Edition of *The Radio Amateur's Handbook* carries on the tradition of the previous editions by presenting 640 pages of comprehensive information for the radio amateur, engineer, technician and student. Paper edition: **$12** in the U.S., **$13** in Canada, **$14.50** elsewhere. Cloth: **$17.75** in the U.S., **$20** elsewhere. In U.S. funds.

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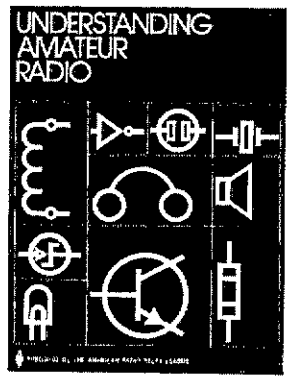

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HAMFESTS . . . We plan to be in Orlando and Charlotte in March. Drop by and say hello. Meanwhile, write for free samples. QSLs By W4MPY, 705 Audubon Circle, Belvedere, SC 29841.

General

LATITUDE and longitude Data Base for over 590 cities of the world, with Amateur Radio prefixes and time zone. Available in disk for TRS-80 mods, I, II, III and 8" SD CP/M. For $25. With free programs for file maintenance and calculation of bearing and distance. J.A. Demerutis, XE1IW. Ap. Postal 1-39, Guadalajara, Mexico.

ICOM IC-751, brand-new, Yen. 200,000. ($870. approxl.) Makoto Takano, JA8OBL/1, D13-4 Nagahori, Tokai, Ibaraki 319-11 JAPAN.

GERMAN AMATEUR asks for techn.-modification for Rec.R-392, and try to find tubes 2 6FZ6, 2 6C6 and AF-ampl. module assembly (trans.) DC8XA, Bruns, Stupfstr. 2, D-8 Munich 19, W. Germany.

CLEANING SHACK. S.A.S.E. for list of ham and computer items. Monty Hart, VE3TA, Box 359, Stroud, Ontario, CANADA L0L2MO.

CANADIANS! Tempo One transceiver, external VFO, Digital Frequency Display, P.S./speaker. $450. David Weiner VE2QV/3, 332 Homestead Crt., London, Ont. N6G 2E9.

CANADIANS, Squire-Sanders SS-1R receiver and SS-IV Video Bandscanner $300; MFJ Speech Compressor LSP-520BX-II $45; Vibroplex Original DeLuxe $50; General Radio 583-A Output Meter $10; Johnson Matchbox model 250-23-3 $125; Heath Antenna Impedance Meter $5; 829B $15. C. Gutman, 7526 Mountbatten Rd., Montreal, Que. H4W 1J9.

WANTED SB-221 VE7EJ Callbook QTH okay or 604-596-9839.

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WANTED: Early Hallicrafter "Skyriders" and "Super Skyriders" with "Silver" panels, "Skyrider Commercial," early transmitters — HT-1, HT-2, HT-8, etc., other Hallicrafter gear, parts, accessories, manuals. Chuck Dachis, WD5EOG, The Hallicrafter Collector, 4500 Russell, Austin TX 78745.

MOBILE Ignition Shielding gives more range, no noise. Literature. Estes Engineering, 930 Marine Dr., Port Angeles WA 98362.

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NEW

Most versatile RTTY/ASCII/AMTOR/CW interface cartridge available for VIC-20 and Commodore 64. Gives you more features, more performance, more value for your money than any other interface cartridge available.

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Same interface cartridge works for both VIC-20 and Commodore 64. Plugs into user's port.

Choose from wide variety of RTTY/ASCII/CW, even AMTOR software. You are not married to one on-board software package. Use MFJ, Kantronics, AEA plus most other software cartridge, tape or disk.

850 Hz and 170 Hz shifts on receive and transmit.

Has mark and space outputs for scope tuning.

Normal/Reverse switch eliminates retuning.

True dual channel mark and space active filters and automatic threshold correction gives good copy when one tone is obliterated by QRM or selective fading.

Easy, positive tuning with twin LED indicators.

Narrow 800 Hz active CW filter. Automatic PTT.

Exar 2206 sine generator for AFSK output.

Shielded XCVR AFSK/PTT interface cable provided. Plus or minus CW keyed output. FSK out.

Powered by computer (few mA.), no power adapter to buy or extra wire to dangle or pick up/radiate RFI.

Glass epoxy PCB. Aluminum enclosure, 4½x4½x1".

MFJ INTERFACE plus MFJ SOFTWARE CARTRIDGE

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Powerful MFJ software cartridge for VIC-20 (MFJ-1250, $49.95) and Commodore 64 (MFJ-1251,$49.95). Plugs into expansion port. Developed by MFJ.

Features RTTY/ASCII/CW send and receive, split screen display, type ahead buffer, message ports, status display, automatic CW speed tracking, parallel printer compatibility plus much more.

SUPER RTTY FILTER

MFJ-725
$39.95 NEW

Super RTTY filter greatly improves copy under crowded, fading and weak signal conditions. Improves **any** RTTY receiving system. 8 pole bandpass active filter for 170 Hz shift (2125/2295 Hz mark/space). 200 or 400 Hz bandwidths. Automatic noise limiter. Audio in, speaker out jacks. On/off/bypass switch. "ON" LED. 12 VDC or 110 VAC with optional AC adapter, MFJ-1312, $9.95. 3x4x1 inch aluminum cabinet.

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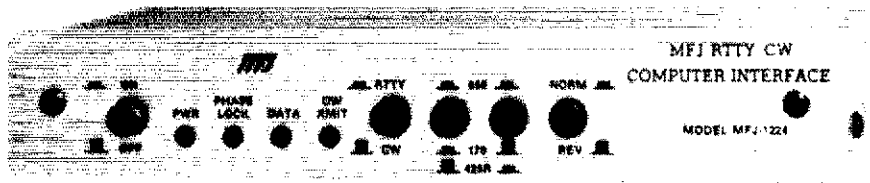
Lets you send and receive computerized RTTY/ASCII/AMTOR/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses MFJ, Kantronics software and most other RTTY/CW software.



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Software cartridge alone, $49.95. Order MFJ-1250/MFJ-1224 for VIC-20, MFJ-1251/MFJ-1224 for Commodore 64. Includes cable to interface MFJ-1224 to VIC-20 or C-64.
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New MFJ-1224 RTTY/ASCII/AMTOR/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/AMTOR/CW station for sending and receiving. Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most others.

Use MFJ (see MFJ-1250/1251 below) software for VIC-20, Commodore 64 and Kantronics for Apple, TRS-80C, Atari, TI-99 and most other software for RTTY/ASCII/AMTOR/CW.

Easy, positive tuning with twin LED indicators.

Copy any shift (170,425,850 Hz and all other shifts) and any speed (5-100 WPM RTTY/CW and up to 300 baud ASCII).

Copies on both mark and space, not mark only or space only, to improve copy under adverse conditions.

Sharp 8 pole 170 Hz shift/CW active filter gives good copy under crowded, fading and weak signal conditions. Automatic noise limiter suppress static crashes for better copy.

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Automatic tracking copies drifting signal.

Exar 2206 sine generator gives phase continuous AFSK tones. Standard 2125 Hz mark and 2295/2975 Hz space. Microphone line: AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying output. Plus and minus CW keying. CW transmit LED. External CW key jack.

Kantronics compatible socket.

Exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. Available TTL lines: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

Use Gaffo software with Apple, RAK with VIC-20, Clay Abrams with TRS-80C, N4EU with TRS-80 III, IV. Some computers with some software may require some external components.

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MFJ-1223, $29.95, RS-232 adapter for MFJ-1224.

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NEW

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4 pole 100 Hz bandwidth active filter. 800 Hz center frequency. 3 pole active lowpass post detection filter. Exclusive automatic tracking comparator.

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You can also use MFJ-1250 (VIC-20) or MFJ-1251 (C-64), $49.95 each, RTTY/ASCII/CW software cartridge. Or use Kantronics, AEA and others.

Also copy RTTY with single tone detection.

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MFJ-1225
$69.95

Use your personal computer and communications receiver to receive commercial, military and amateur RTTY/ASCII/AMTOR/CW traffic.

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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.
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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.

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Run up to 1.5 KW PEP **$229.95** (+$10) and match any feedline continuously from 1.8 to 30 MHz; coax, balanced line or random wire. Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected power. 2% meter movement. **6 position** antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines. 4:1 balun 250 pf 6 KV variable capacitors. 12 position inductors. Ceramic rotary switch. All metal black cabinet and panel gives RFI protection, rigid construction and sleek styling. Flip stand tilts tuner for easy viewing. 5 x 14 x 14 inches.

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$329.95 (+$10) **Meet "Versa Tuner V". It has all the features you asked for,** including the new smaller size to match new smaller rigs - only 10 3/4"W x 4 1/2"H x 14 7/8"D.

Matches coax, balanced lines, random wires — 1.8 to 30 MHz. 3 KW PEP- the power rating you won't outgrow (250 pf-6KV caps).

Roller inductor with a 3-digit turns counter plus a spinner knob for precise inductance control to get that SWR down to minimum every time.

Built-in 300 watt, 50 ohm dummy load, built-in 4:1 ferrite balun.

Built-in 2% meter reads SWR plus forward and reflected power in 2 ranges (200 and 2000 watts). Meter light requires 12 VDC. Optional AC adapter MFJ-1312 is available for $9.95.

6-position antenna switch (2 coax lines, through tuner or direct, random/balanced line or dummy load). SO-239 connectors, ceramic feed-throughs, binding post grounds.

Deluxe aluminum low-profile cabinet with sub-chassis for RFI protection, black finish, black front panel with raised letters, tilt bail.

MFJ-981, $239.95. 3 KW, 18 position switched dual inductor. SWR/Wattmeter. 4:1 balun.

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APPLE COMPUTER owners-announcing "The Logger". A very sophisticated, full-featured disk-based log book for ham radio opeators. "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.

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TRS-80 Model I/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.

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QUADS, db QUADS, 2, 3 & 4 elements, complete kits, fiberglass spreaders, components, wire. 3 first class stamps for complete brochure. db + Enterprises, Box 24, Pine Valley, NY 14872.

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SELL Teletype model 32ASR with 60 W.P.M. gears installed, ready for amateur use, all machines in excellent condition $125. Bob KL7HDY (907) 563-6209.

WANTED: mast, 40-foot crank-up, telescoping, self-supporting, in good operating condition. KB3ED, Fineman, 1839 Carwithan, Philadelphia, PA 19152, 215-342-1365.

NEW - Drake TR7-$1195; R7-$1195. IF filters installed — $49. Limited quantities. Organs and Electronics box 117 Lockport, Ill. 60441. Phone: 815-838-1580.

WANTED: Back issues QST 1915-1930. Send dates prices. Ken Gilbert, 8285 SW Brentwood St., Portland, OR 97225.

WANTED: RTTY Reinker Kits and spare felts for M15, M15, and Kleinschmidt. Bill Johnson, N5KR, 1808 Pomona, Las Cruces, NM 88001 505-522-2042.

FOR SALE: Mint condition Kenwood Twins, T-599D transmitter and R599D receiver E/W 2 and 6 meter converters. Complete with all cables and manuals. $400, cash and carry. WB3HNK, Palmyra, PA 17078.

HP-41CV $160; HP-41C + two memory modules $135; extended functions, time modules $60 each; HP-82143A printer/plotter $210. Free software. N7DH, 509-332-3978. Box 146, Pullman, WA 99163.

COLLINS S-Line/75A4 parts available at reasonable prices. Michael Bill WB9APC Box 362, Normal, IL 61761 309-874-2402.

HW 101 Owners! Put R.I.T. in your transceiver for under $10. Plans $5. K2PDJ, Box 201, Alexandria Bay, NY 13607.

COLLINS 30S-1 in mint condition with 3 extra 4CX1000A tubes + manual. Sacrifice $2,000. You ship. Jim, N4ITO 501-624-4935, 629 Prospect Avenue, Hot Springs, AR 71901.

COLLINS 312 B-4 round, very good, $165. Hallicrafters SX100, good condition, $120, both with book. AA6S Bill, 209-732-7163.

KENWOOD TS 820 w/digital display. Mint condx. Owner & Service Manuals. $475. AF2N 212-445-2799.

WANTED: Amateur equipment built from ARRL or Radio Handbooks, 1930s. Nagle, 12330 Lawyers, Hemdon, VA 22071.

HENRY 3K Classic, factory modified to X. Bird equipment, tilt-over tower S.A.S.E. for list. W1AGA.

TRITON II 481 solid state xcvr, 200 watts, with CW filter, perfect condx, $240. U-ship. W5HWP 512-358-4382.

GENERAL Coverage Receiver, Collins R390A/URR 0 to 30 MHz, rack mount, Excellent condition. $325. U-ship. W5HWP 512-358-4382.

WANTED: Back issues "Oscillator" Magazine published Gardena, Calif. early 1930s. Also other magazines prior early 1930s. Nagle, 12330 Lawyers, Herndon, VA 22071.

WANTED: old glass antenna insulators for collection. Good prices paid for ones I need. Jim Singleton K2IRO, 77 Cochrane St., Melrose, MA 02176.

U.S. NAVY Dept. Bureau of Ships Radio Frequency Oscillator Model O-275/SRT covers all bands from .3 MHz to 26 MHz. 500 Watt amplifier (also U.S. Navy Model AM-800/SRT no power supplies. Both units in mint condition. They are from an SRT 14,15,16 Radio Transmitting Set. $250 takes all (plus shipping). Call Mike WA2WCO at 914-452-5839 10 AM-2 PM.

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160/40 METER dipole. 115 ft. long, coax-fed, $45 postpaid. Tom Evans, W1JC, 113 Stratton Brook, Simsbury, CT 06070.

COLLINS WANTED: CT-2 cable trough for KWM-2, -2A, S-line. Also need the SC-301 antenna control console. This was designed to replace the blank front panel in the 516F-2. Need any original sales literature for early 30K-1 transmitter (circa 1948), no copies please. Contact AC1Y at ARRL Hq.

SOLAR ELECTRIC panels, components. $3 (or stamps) catalogs. Refundable with purchase. $10 photovoltaic manual and catalogs, non-refundable. SPECS Inc. P.O. 155 Montrose, CA 91020.

WANTED: Synchros, tubes, MS connectors. URA-17/CV-483; AM-2123A(V)/(U); SB-973; & anything Navy shipboard. P.O. 7057, Norfolk, VA 23509. 804-853-9146. Bill Williams.

WANTED: KENWOOD MARS-7000 adapter and SP-70 speakers. C.T. Huth; 130 Hunter St., Tiffin, OH 44883.

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FOR SALE: Two Xitek ABM-200 Data Converters. Translates between ASCII/Baudot, or Morse and ASCII/Baudot. $175 each. WB4RSL, 704-843-2185 ext. 242 weekdays. Waxhaw, NC 28173.

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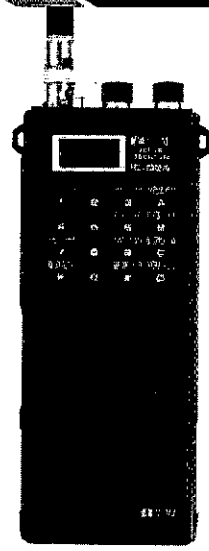

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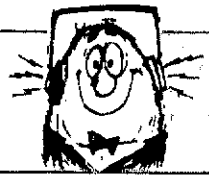

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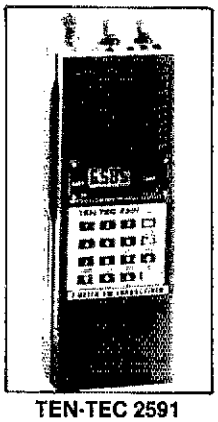

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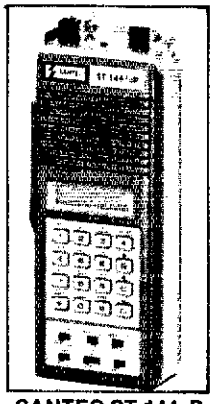

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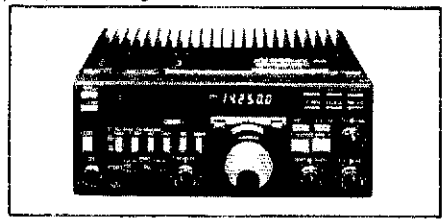

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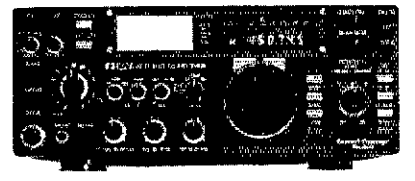

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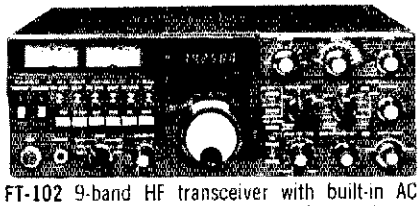

FT-102 9-band HF transceiver with built-in AC power supply, (3) 6146's in final, hand microphone
Regular $1149 - ***Special! $699.95***

FT-102 accessories:	Regular	SALE
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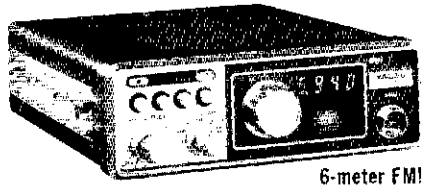

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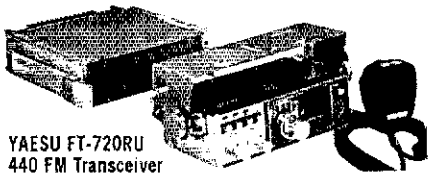
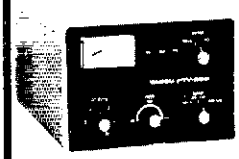


YAESU FT-720RU
440 FM Transceiver
10 watts, 440-449.975 MHz. Control head & detachable RF deck; remote or use optional 144 MHz 25 watt RF deck. 6"w × 2"h × 10"d. 13.8vdc. Microphone included.
Regular $449 - ***Closeout $299.95***

FT-720RU accessories:	Regular	Closout
702RVH 144 MHz 25 watt RF deck	$229.00	199.95
S-72 Switch box for (2) RF decks	85.00	69.95
E-72S 6½' remote control cable	35.00	29.95
E-72L 13' remote control cable	40.00	34.95



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2m Transverter
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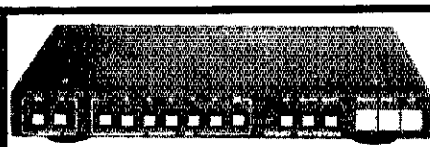
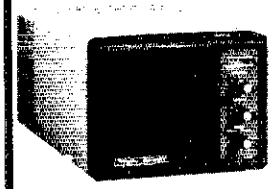


FV-707DM Digital VFO w/12 memories for FT-707
Regular $279 - ***Closeout $129.95***



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Speaker/Patch
Speaker & hybrid phone patch combination for the FT-901 transceiver.
Regular $76
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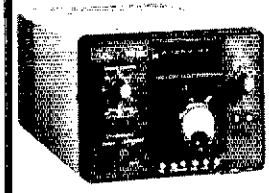

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Deluxe synthesized scanning VFO w/mem. for FT-901/902 & 101ZD.
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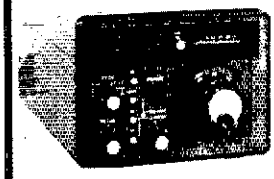
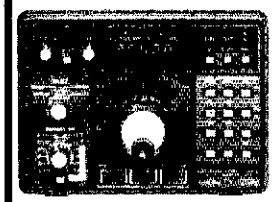


FV-101Z
External VFO for the FT-101Z/ZD, FT-901/902 series transceivers.
Regular $175
Closeout $129.95



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Synthesized scanning VFO w/mem. for FT-101ZD Mk-III only.
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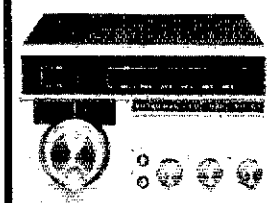
Regular $65
Closeout $45.00



FV-107
External VFO for the FT-107 HF transceiver.
Regular $150
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AC Power Supplies for FT-107M	Regular	Closout
FP-107 Internal power supply	$139.00	99.95
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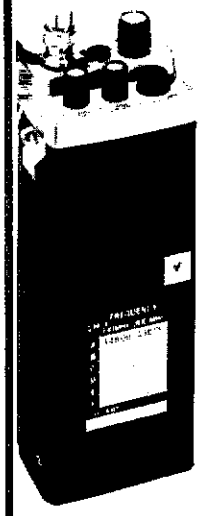

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COLLINS KWM-2, 516F-2, PM-2, CP-1, spare tubes-$550. K2JSO, 914-386-2882. RD#7 Bx 153, Middletown, NY 10940.

SELL YAESU FT-102 with SP-102 speaker $700, FT 208R $235, FRG-7 $150, MD-1 mic. $35, Ameritron linear amp. $400, MFJ-900 ant tuner $30. All equipment A1 condition. W6OWD eve. 415-728-7136.

GOING OUT Of Business Sale. Large savings on all components in stock. Stamp for flyer please. D & V Radio Parts, 12805 W. Sarle, Freeland, MI 48623.

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HAVE YOU an extra two meter rig you would like to donate to worthy cause? Wow, are we worthy. Contact WB2JKJ via Callbook to find out how you can help a great bunch of kids at Manhattan's Junior High School 22.

YAESU FT-901D with SP-901P, Shure mic, $675. FT-707 with FC-707, mobile bracket, $575. KG2I, 315-336-6555, evenings..

COLLINS CLASSICS: 75A4, KWS-1, SC-101; All for $600.00. QST — Hardcover, 1920 thru 1968. CQ — Hardcover, 1947 thru 1957, $200.00 or make offer. Pick-up only. W1KWA, 401-865-2102/401-434-0889.

NATIONAL and RME equipment from the 1920's and 1930's wanted. Also looking for early amateur transmitters. AD1E, Box 73, Kennebunk, ME 04043, 207-985-7243.

SALE: Kenwood TV-502S (2-meter transverter), $175; Autek active filter QF-1, $40; Teletype Model 15 (works, pick-up only), $40. Call Jay, KD2L, 201-254-5860.

FOR SALE: KLM 7.2/10-30 7LPA 8element log periodic on 42' boom. New in original factory sealed carton. Never opened, about 6 months old, shipped direct from KLM. Cost me $799 plus $60 shipping. Will sell for $590 including shipping USA. OR TRADE for mint Yaesu FT902DM. Paul, W1CKA, 203-582-4885.

QRP HW-8 with p.s., phones, factory alignment. $130. TS-130S with SSB filter, mobile bracket, MC-30s mike, $480 plus shipping. Both mint WA8UNK or 313-464-3525.

WANTED: KLM or FDK MultiU-11 UHF FM transceiver. Must be in mint condition, working, with shipping cartons and instructions. Contact Jerry, WB2KZX, 212-278-0897.

AUTOPATCH. Data Signal RAP-200 duplex patch with acoustic coupler and toll disconnect, $200. North Shore RF Technology 2m Cavaties, $100. KE7X, 406-586-2582.

YAESU FT-ONE. All options and modifications installed includes Yaesu desk and hand mikes, speaker patch. $1800 firm. Bill, KA3HTY, 215-295-6880.

WANTED: Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, McElroy, etc. Also ned Spark keys, Boston keys, large or unusual radiotelegraph keys, sideswipers, cooties, homebrew and foreign keys. K5RW, Neal McEwen, 1128 Midway, Richardson, TX 75081.

TI99/4A Code Practice Program. You select characters, speed $6.95. KA3LHD, 215-374-4433.

HANDBOOKS, 1930, 1941, 1942. Best offer. WB3KTH.

QST Library Sale: November 1963 thru current issue. Make me an offer. Herbert Novitsky, 8611 Montpelier Drive, Laurel, MD.

HW-32, Built-in preamp, spkr. $100. AA3X, 301-647-1992.

QST is available on a flexible disk from the Library of Congress, Division for the Blind and Handicapped, 1291 Taylor St., N.W., Washington, DC 20542.

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WANTED: Kenwood DG-5 & SP-520 speaker. N4JBL, 901-424-9729.

KENWOOD TS-130S, Huster antenna with 10, 15, 20, 40 resonators, $550. 316-438-2566, KDØJK.

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HEATHKITS: SB104A tranceiver $350, SB604 spkr/sup $100, SB634 console $70, SB301, 401 w/mike complete station $250, Hammarlund HQ110 rcvr. w/man. $75 (Estate W3HAB), Jim, W2IHK, 518-371-1930.

SWAN — 700CX Transceiver, 117XC PS, 510X Crystal oscillator, DD-76 digital freq counter. Like new. Write for details. Plus free extras. K4ZOX, 572 Park Ave., Birmingham, AL 35226, 205-822-0585.

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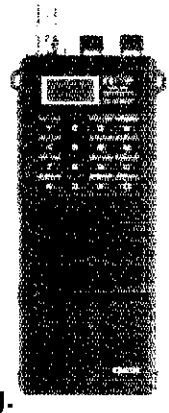

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WANTED: Grebe CR 18, coils, parts for same, A-P transmitting tube. W3HWT 329 Evergreen, North Wales, PA 19454.

DRAKE R4A, T4X, AC3, MS-4, $420. K2AM, 201-687-3518.

HEATH SB-200, $300, K2AM, 201-687-3518.

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DRAKE TR-7 (sn #7300) w/fan, 6 kHz, 1.8 kHz & 300 Hz filters. PS-7, RV-7, MS-7, 7077 & service manual. Cables, manuals & boxes. $1075 pick-up or $1130 shipped. WA2SON, 716-892-8889.

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FOR SALE: Hammarlund HQ-129-X speaker & microphone. Best offer. Ph. 516-944-9438, Carl E. Sundstrom.

FOR SALE: Kenwood TS-830S, excellent condition, $650. Midland 13-509 220 MHz FM mobile, crystals, nearly new, $100. Collins F455FA-21, 2.1 kHz mechanical filter, $45. Wanted: Transco "Y" relays. Mike Owen, W9IP/2, 21 Maple St., Canton, NY 13617.

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PROTECT your Bencher Key. Rigid Plexiglas cover $9.95. George Chambers, K0BEJ, 302 S. Glendale Ave., Coffeyville, KS 67337.

FOR SALE: New Cushcraft R3 halfwave vertical, $215, Tom, WA1RTD, 21 Bayberry, Acton, MA 01720, 617-263-2382.

KENWOD TS-830 S, with CW filter, mint condition, $640 No ship, KA8IHB, 419-678-4594.

DESPERATELY NEED manual EBC 144JR, WA2JNF, 212-941-8630.

COLLINS 30S-1, SN64; Icom 701, 701PS; Ten-Tec Omni-D/B, 500Hz filter, 243 VFO, 252 Supply; SASE for details on this and other gear for sale; W4AQL, Box 32705, Atlanta, 30332.

DRAKE WANTED: RV-6 or RV-4 remote VFO, MS-4 speaker, CC-1 converter console w/ 6 n 2 converters. Contact: K2AWA, P.O. Box 568, Boro Hall, Jamaica, NY 11424.

COIL-WINDING machine wanted. N6CMJ, 408-248-4805.

FASTRAK® 2005 Active Filter features 8-pole response and dc switching; make a cw filter with 80 Hertz bandwidth; 3.6 x 3.0 inch pcb and manual $9.95. Proham Electronics Inc., 34620 Lakeland Blvd., Eastlake, OH 44094.

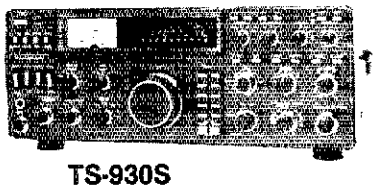
REPLACE RUSTED antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 507, 230 Woods Lane, Somerdale, NJ 08083.

LIKE NEW Wilson WR-1000 rotator. Will turn 26 sq. K7GEX, 20148 6th NE, Seattle, WA 98155, 206-364-3997.

ROHN TOWERS — Wholesale direct to users. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, and Hy-Gain. Hill Radio, P.O. Box 1405, 2503 G.E. Road, Bloomington, IL 61701-0887, 309-663-2141.

WANTED: Used Heath HR-1680 Receiver. State condition and price plus shipping charges. W0SZF, 211 East 4th, McCook, NE 69001.

TRIO-KENWOOD SALE!

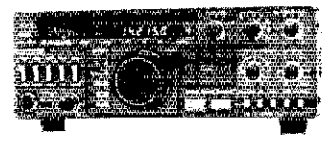


TS-930S

Top of the Line HF Transceiver
TS-930S w/Antenna Tuner List $1799
TS-930S w/o Antenna Tuner List $1599

- General Coverage Receiver
- Superior Dynamic Range
- All Solid State—28 VDC Final
- QSK CW
- Optional Automatic Antenna Tuner
- Dual VFO w/8 Memories
- Dual Mode Noise Blanker
- RF Speech Processor
- Built-In AC Power Supply
- MUCH, MUCH MORE

CALL FOR SPECIAL SALE PRICES!

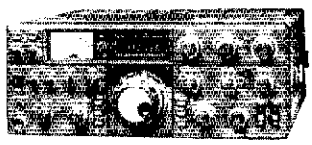


TS-430S

Most Advanced, Compact HF Transceiver List $899.95

- General Coverage Receiver
- USB/LSB/CW/AM/Optional FM
- 10Hz Dual Step Digital VFO
- Eight Memories w/Lithium Back-up
- Memory and Band Scan
- IF Shift—Notch Filter
- Speech Processor
- Narrow/Wide Filter Selection
- IF Shift
- Full Selection of Options Available

CALL FOR SPECIAL SALE PRICE!



TS-830S—TS-530S 160-10 Meter HF Transceivers

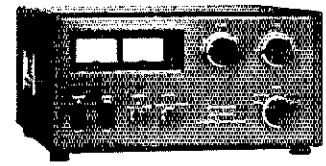
- All Solid State Except Driver and Final Amplifier
- Wide Dynamic Range
- Variable Bandwidth Tuning (TS-830)
- IF Shift
- RF Speech Processor
- Adjustable Noise Blanker
- Full Selection of Optional Crystal Filters
- Built-In AC Power Supply

TS-830-S List $949.95 TS-530S List $739.95
CALL FOR SPECIAL SALE PRICES!

TS-130SE Compact 80-10 Meter Transceiver

- All Solid State
- 100W Output
- IF Shift
- Speech Processor
- Noise Blanker
- Narrow SSB/CW Filter Option

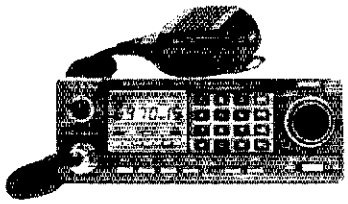
TS-130SE List $629.95
CALL FOR SPECIAL SALE PRICES!



TL-922A Linear Amplifier

- 160-15 Meters
- 2KW PEP Input Power
- Pair of Rugged 3-500Z Tubes Included
- Compatible with all Kenwood Transceivers and Many Others
- Built-In 110V-220 VAC Power Supply

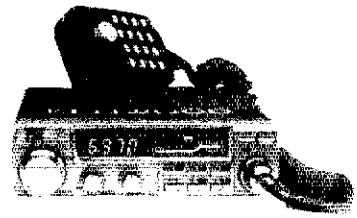
TL-922A List $1229.95
CALL FOR SPECIAL SALE PRICES!



TR-7950/7930

- Large LCD Readout
- 21 Multi-Function Memory
- Lithium Back-up
- 45 Watts (TR-7950) 25 Watts (TR-7930)
- Automatic Offset
- Built-In Encoder
- Memory or Band Scan
- MUCH, MUCH MORE!

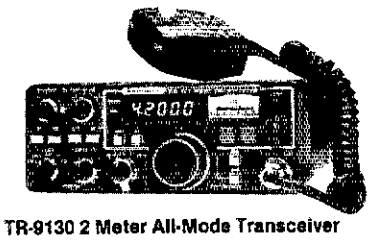
TR-7950 List $399.95 TR-7930 List $359.95
CALL FOR SPECIAL SALE PRICES!



TM-201A/TM-401A 2m/70cm FM Transceiver

- 25W Output (TM-201A) 12W Output (TM-401A)
- Ultra Compact
- Dual VFO—5 Memories
- GaAs FET Front End
- Tone Encoder/Mic
- Band/Memory Scan

TM-201A List $369.95 TM-401A List $399.95
CALL FOR SPECIAL SALE PRICES!



TR-9130 2 Meter All-Mode Transceiver

- 25W Output—All Modes
- Six Memories—with Battery Back-up
- Memory and Band Scan
- Dual VFO
- Hi-Lo Power Switch
- High Performance Noise Blanker

TR-9130 List $529.95
CALL FOR SPECIAL SALE PRICES

TR-2500 2.5W/300 mW (Switchable) 2 Meter Handheld Transceiver
Small Size— Small Price— Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-In Sub-tone Encoder
- Built-In 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES

TR-2500 Options:
ST-2 Base Charger **$89.95**
MS-1 Mobile Charger **$42.95**
VB-2530 25W Amplifier **$99.95**
BT-1 Battery Case **$11.95**
SMC-25 Speaker Mic **$34.95**
LH-2 Deluxe Leather Case **$37.95**
RA-3 Telescoping Antenna **$14.95**
BH-2A Belt Hook **$4.95**
PB-25H Heavy-Duty Battery Pack **$39.95**
DC-25 13.8VDC Power Adapter **$19.95**

All TR-2500 Accessories in Stock for Immediate Shipment!
TR-3500 Also in Stock at Sale Prices—Call!

List $599.95

TW-4000A Dual Bander
2m and 70cm FM in One Compact Package!

- Big LCD Readout
- 25W Output—Both Bands
- 10 Memories w/Scan and Back-up
- Dual VFO
- GaAs FET Front End
- 16 Key Up/Down Mic

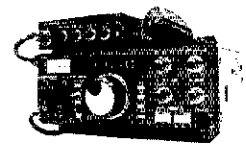
VS-1 Voice Synthesizer and Other Accessories in Stock—CALL FOR SPECIAL PRICES!

R-2000 Receiver
R-600—R-100S—R-2000 Receivers in Stock!
CALL FOR SPECIAL SALE PRICES—SAVE $$

TS-780 2m/70cm Dual Band—All Mode Transceiver

- Dual VFO
- 10W Output
- VOX
- Noise Blanker
- Band Scan
- 10 Memories
- Memory Scan
- AC Power Supply

TS-780 List $999.95
CALL FOR SPECIAL SALE PRICES!



TS-660 Quad Bander—All-Mode Transceiver
6m, 10m, 12m and 15m

- Dual VFO
- IF Shift
- 10W Output
- 5 Memories
- Noise Blanker
- VOX, Narrow Filters, AC Supply and Other Accessories Available

TS-660 List $699.95
CALL FOR SPECIAL SALE PRICES!

IMPORTANT—Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special KENWOOD Sale Prices and Save $$$!!

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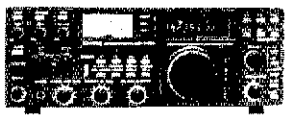
COMMUNICATIONS EQUIPMENT SALE!

ICOM



ICOM IC-751A . LIST PRICE $1399
CALL FOR SPECIAL SALE PRICE!

ICOM IC-745 LIST PRICE $999
CALL FOR SPECIAL SALE PRICE!

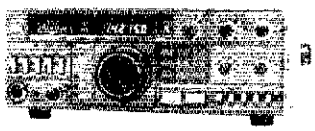
IC-02AT
NEW 2 METER
TOP OF THE LINE HT

- Digital LCD Readout
- Scanning
- Programmable PL Tones
- Optional 5W Battery
- S-meter Function
- 10 Memories
- Offset Storage
- Lithium Memory Backup
- 13.8VDC Operation!
- Sealed Case

SUGGESTED LIST PRICE $349
CALL FOR SALE PRICES!

KENWOOD

TS-930S LIST PRICE $1799
CALL FOR SPECIAL SALE PRICE!

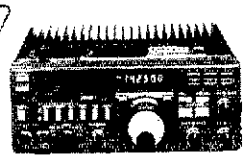


TS-430S LIST PRICE $899.95
CALL FOR SPECIAL SALE PRICE!

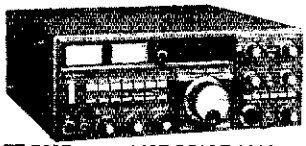
TR-2500 2.5W/300 mW
(Switchable) 2 Meter
Handheld Transceiver
Small Size— Small Price—
Big Performance!

- LCD Readout
- Ten Memories w/Lithium Back-up
- Band and Memory Scan
- Built-in Sub-tone Encoder
- Built-in 16 Key Autopatch Encoder
- Slide Lock Battery Pack

TR-2500 List Price $329.95
CALL FOR SPECIAL SALE PRICES



FT-757GX LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

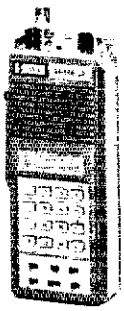


FT-726R LIST PRICE $829
CALL FOR SPECIAL SALE PRICE!

FT-208R 2M HT
List $319
FT-708R 440 MHz HT
List $319
• LCD Display
• 10 Memories

CALL FOR
SPECIAL PRICES!

SANTEC



NEW ST142μP
2M HT

- 3.5W/1W/0.1W
- 142-149.995 MHz
- LCD Display
- Programmable PL Option

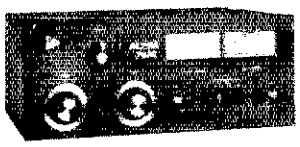
List $339.95
SALE $299!

ST144μP $259.95
ST222μP . . . . . CALL!
ST442μP . . . . . CALL!

SANTEC Accessories
SM3 Speaker Mic $34.95
ST-LC Leather Case $34.95
ST-500 NiCad Battery . . $29.95
ST-4QC Base Charger . . $69.95

FACTORY AUTHORIZED DEALER FOR ALL MAJOR AMATEUR LINES

ALPHA SALE!

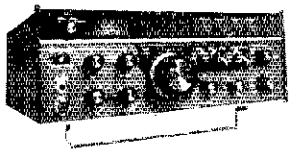


76PA $1699!

Model	List	Sale*
76A	$1985	CALL
76PA	$2395	CALL
76CA	$2695	CALL
374A	$2595	CALL
78	$3495	CALL

*Sale Prices Too Low To Print—
CALL & SAVE $$!

TEN-TEC SALE!



CORSAIR List $1169
Deluxe AC Supply List $199
Both Items—Yours for $1169!
All Ten-Tec Accessories in Stock for Fast Shipment!

TEN-TEC
New 2M HT
Full Featured!
List $319
Sale $279.95!

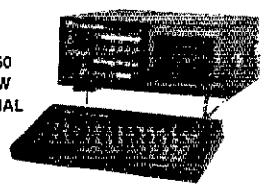
4229 2KW Tuner Kit $189.95!

HAL SALE!

NEW RTTY/CW COMPUTER INTERFACES

CRI-100 List $249 SALE $229.95!
CRI-200 List $299 SALE $269.95!

CWR6850
RTTY/CW
TERMINAL



List $999 SALE $749.95!

Other HAL Products On Sale

CWR6700	$439.95	DS3100ASR	$1699.95
CWR6750	$629.95	MPT3100	$2199.95
CT2100/KB2100	$749.95	RS2100	$289.95
CT2200/KB2100	$949.95	ST5000	$219.95
DSK3100	$1049.95	ST6000	$649.95
ARQ1000	$649.95	KG-12	$169.95

TOKYO HY-POWER LABS

HL-30V Reg. $69.95
SALE $59.95

HL-82V . $139.95	HL-90U . $329.95
HL-160V $289.95	HC-200 . . $89.95
HL-20U . . $99.95	HC-2000 $289.95

KDK FM2033

List $339 Sale $299

JANEL QSA5 PREAMP $39!

QSA-6	$41	432PL	$59
PB-30	$25	PB144	$25
PB-50	$25	PB220	$25

MIRAGE AMPLIFIER SALE!

B1016
$249

Model	Band	Pre-Amp	Input	Output	DC Pwr	Sale Price
A1015	6M	Yes	10W	150W	20A	$249
B23	2M	No	2W	30W	5A	$ 79
B215	2M	Yes	2W	150W	22A	$259
B108	2M	Yes	10W	80W	10A	$179
B1016	2M	Yes	10W	160W	20A	$249
B3015	2M	Yes	30W	150W	17A	$199
C22	220	No	2W	25W	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

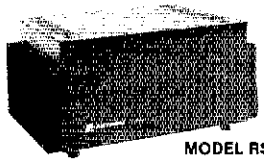
RC-1 Remote Control for Mirage Amplifiers $24
MP-1 and MP-2 Peak-Reading Wattmeter $99

ASTRON POWER SUPPLIES

Heavy Duty · High Quality · Rugged · Reliable

- Input Voltage 105-125 VAC Output 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

Model	Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229



MODEL RS-50A

CP-1 COMPUTER PATCH
List $239.95 SALE $189.95!

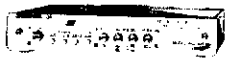
CP1-20	$219	CP1-64	$219
MP-20	$219	MP-64	$219
VIC-20 MBAText	$79	C-64 MBAText	$79

All AEA Keyers, Antennas & Accessories In Stock!

KANTRONICS

The Interface Reg. $169.95 Sale $129.95
The Interface II Reg. $269.95 Sale $239.95

Apple Amtor Soft/Hamtext	$39	VIC-20 Hamsoft	49
Vic-20 Amtor Soft	89	Hamtext VIC-20	99
Model 64 Amtor Soft	89	Hamtext Model-64	99
Apple Hamsoft	29	Atari Hamsoft	49
		TRS 80C Hamsoft	59



MFJ 1224 COMPUTER INTERFACE $89.95

202B Noise Bridge	$59.95
250 2KW Oil Load	$35.95
422 Keyer/Paddle	$89.95
901 300W Tuner	$59.95
941C 300 W Tuner	$89.95
989 Deluxe 2KW	$299.95

METRON
MA1000B
AMPLIFIER
Solid State
1KW Amplifier

- No Tuning
- 13.8 VDC Operation
- Remote Bandswitching
- Compact
- Heavy-Duty Construction

List Price $895 SALE PRICE $795.95!

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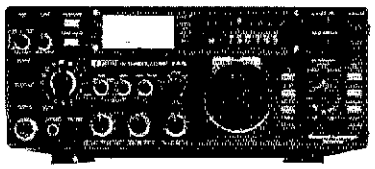
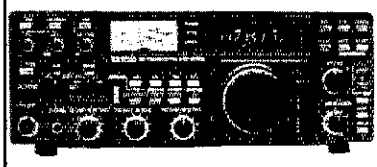
ICOM SALE! SALE! SALE!



IC-745
NEW GENERAL COVERAGE-ALL MODE
COMPACT HF TRANSCEIVER

- All Solid State
- SSB/CW/AM/RTTY
- FM Option
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $999—CALL FOR SPECIAL SALE PRICE!



IC-751-ICOMS' BEST!
NEW-HIGH PERFORMANCE-
SSB/CW/AM/RTTY/FM TRANSCEIVER-
GENERAL COVERAGE RECEIVER

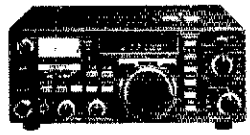
- All Solid State
- High Dynamic Range
- Full QSK Operation
- Receives .1 - 30MHz
- Dual VFO w/16 Memories
- 12VDC Operation or Optional Internal AC Supply
- 100% Duty Cycle
- Speech Compressor
- Lithium Memory Backup
- Adjustable Noise Blanker
- IF Shift/Passband Tuning

LIST PRICE $1399—CALL FOR SPECIAL SALE PRICE!

IC-2KL 500 WATT LINEAR AMPLIFIER

- 160-15mtr Coverage
- SSB/CW/RTTY Duty Cycle
- Auto Bandswitching
- IC-2KLPS Power Supply strapable 120V/240VAC Operation
- Broadband Tuning
- 500 Watts Output
- Full Final Protection

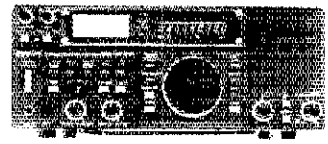
LIST PRICE $1795—CALL FOR SPECIAL SALE PRICE!



IC-730 COMPACT 80-10mtr SSB/CW/AM TRANSCEIVER

- All Solid State
- 100 Watt Output
- 12VDC Operation
- 80 - 10 Meters
- Dual VFO
- CW Filter Option

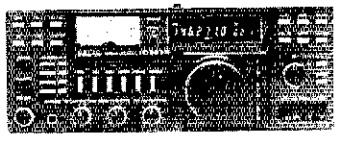
LIST PRICE $829—CALL FOR SPECIAL SALE PRICE!



R-70 HF GENERAL COVERAGE RECEIVER

- .1 - 30MHz Coverage
- Passband Tuning
- Notch Filter
- CW Filter
- SSB/CW/AM/RTTY
- FM Option
- Built-in 120VAC Supply or 12VDC Option

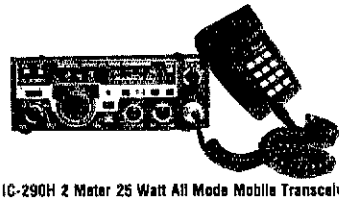
LIST PRICE $749—CALL FOR SPECIAL SALE PRICE!



IC-271A 2 Meter All Mode Base Transceiver
IC-471A 430-450MHz All Mode Base Transceiver

- SSB/CW/FM
- Dual VFO Tuning
- 32 Memories
- Programmable Sub-audible Tones
- 12VDC or Optional 120VAC Operation
- 25W Output - 2mtrs
- 10W Output - 430-450MHz
- Low Noise PLL Design

IC-271A List $699 IC-471A List $799
PLEASE CALL FOR YOUR SPECIAL PRICE!



IC-290H 2 Meter 25 Watt All Mode Mobile Transceiver
IC-490A 430-440MHz 10 Watt All Mode Mobile Transceiver
IC-560 6-meter 10 Watt All Mode Mobile Transceiver

- SSB/CW/FM
- Noise Blanker
- 12VDC Operation
- Dual VFO Tuning
- Memories

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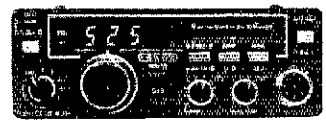

IC-25A/H 25/45W 2mtr FM MOBILE TRANSCEIVER
IC-45A 10W 440-450 MHz FM MOBILE TRANSCEIVER

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- Dual VFO Tuning
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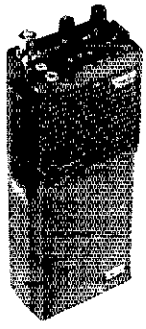

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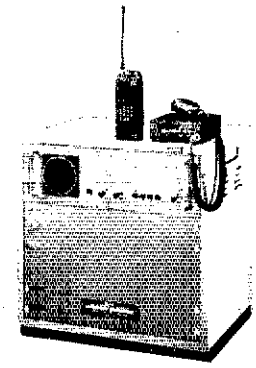

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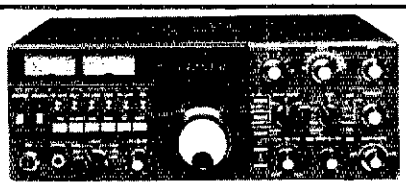

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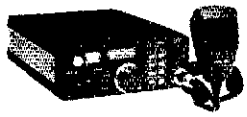

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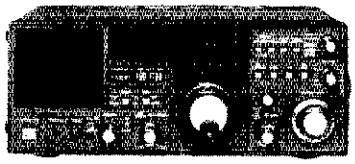

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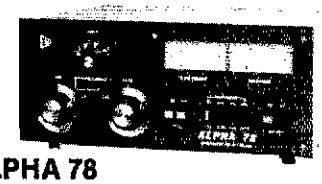
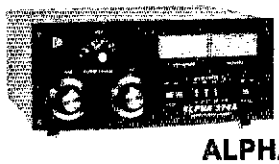


ALPHA 78



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78	$3495	*
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76A	$1985	*
76PA	$2395	*
76CA	$2695	*

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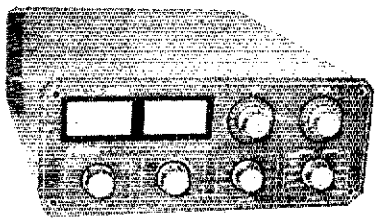

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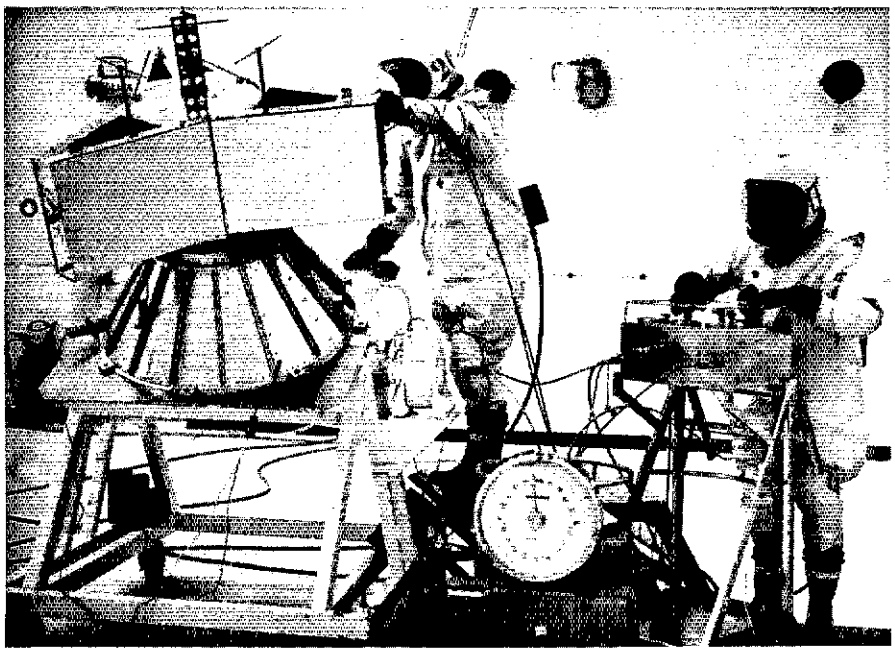

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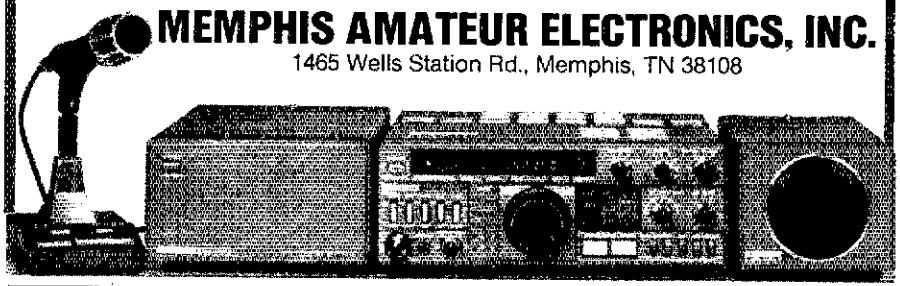

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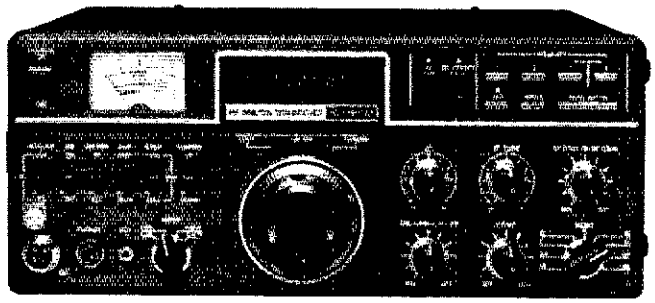

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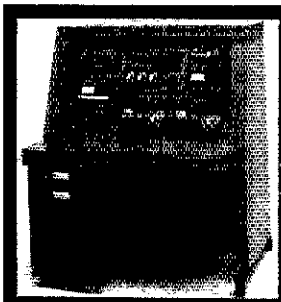

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IBM-PC RTTY. CompRtty is a comprehensive RTTY communications program for the IBM-PC. Features include: all standard ASCII and Baudot speeds, selectable parity, split screen display with status, hardcopy, diskcopy, keystring detect for autostart/stop, text file transfer, autologging, 12 programmable messages. Ideal for traffic handling. Requires 64K PC-DOX 1.1 or 96K PC-DOS 2.0, disk, IBM-compatable serial port and an RS-232C compatable TU. $50. David A. Rice, KC2HO, 7373 Jessica Dr., N. Syracuse, NY 13212.

JANEL 144CF 144-28 MHz converter $35. 4164 64K dynamic RAMS 8 for $45, 2016 2kx8 static RAMS 8 for $30. W2HG, CBA 716-225-6754.

COLLINS KWM-2, 516F-2, 312B-3 all round emblem and absolutely mint condition $600. Collins R388 receiver .5 to 30 MHz mint condition $500. W2GGS, 350 Ferris Rd., Schenectady, NY 12304, 518-374-6498.

WANTED: McIntosh and Marantz tube-type high fidelity equipment. KA6NNR, Box 71703, Los Angeles, CA 90071, 213-795-3397.

KENWOOD TS 520, $350. TR 7850, $260. Excellent condx. Grass Valley, CA, W6WYJ, 916-273-4167.

KENWOOD BS5 Pan Display for SM220 Scope purchased October 1983, half price $40. Pair Heath GD1114 intercoms never used $50. K4HT, 205-928-8609.

HEATH SB102 $300. Pro built A1 cond., examine and pickup. 203-434-8222. K1UQV.

COMPLETE Yaesu station: FT 902 DM and matching accessories, Robot 800 and PI-3 monitor. All mint $1975 or trade for computer, N6ETN, 415-752-8337.

SELL: Drake T4XB, R4B with cal. and NB, MS4, AC4, ElectroVoice 911 mike, and Ameco LPF. Best offer. KT8G, 102 Benjamin N.E., Grand Rapids, MI 49503, 616-454-5538.

FOR SALE or trade: 33 antique battery-operated radio tubes in original cartons. 53 metal glass tubes in original cartons. Send SASE, Robert Williams, Box 351, Selling, OK 73663, WDØBDN, 405-922-3518.

LINEAR PARTS: BW 850A Tank Circuit $25, 3KVA pole pig $20, 813's $5, 30A filament choke $8. SASE for list. KØEJ, 2565 Ada St., Pocatello, ID 83201.

KANTRONICS INTERFACE $100 and Atari Hamsoft $30. Both new. K7LJQ, 4220 Olympic Way, Salt Lake City, UT 84117. 801-278-8550.

BUY/SWAP: Tom Swift; Wireless/Radio Boys/Girls books. Charles King, Miner St., Middletown, CT 06457.

NATIONAL NC-57 works fine, $50 plus UPS; new 4-400A with chimney $55. Peter Buyaki, K5GV, 203 N. Cherry, Harrison, AR 72601.

HEATHKIT two-meter handheld radios Model VF-2031 plus TouchTone pad. Unassembled and unpackaged $125. each. Pat, N3NR, 814-899-2229.

TEN TEC, Omni-D, Series B, Remote VFO, speech processor, power supply $595. All mint, will ship. KX8W, 3355 Kettering, Saginaw, MI, 517-799-4577.

SELL: Poland Model R Microwave Rcvr. w/satellite & X band plug-ins $150. (pick up only) Want: battery box & manual for Wilson 1402SM H.T. Will pay to $300 for complete Tektronic 1L20/30/40. Charles King, Miner St., Middletown, CT 06457.

DIGITAL DISPLAYS for FT-101's, TS-520's and others. Write for information. Grand Systems, PO Box 3377, Blaine, WA 98230. 604-530-4551.

HEATHKIT HW-101 Transceiver (hardly used), mike, HP-23C pwr supply, HM-102 power meter, manuals $300. WB1AVK, 24 Colburn Dr., Sharon, MA 02067, 617-784-7890.

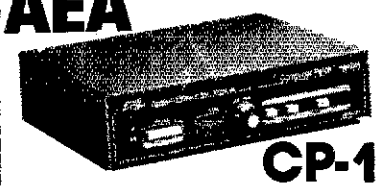
YAESU FT-202R Handie with YM-24 mike and HA201A amp, package $100; Johnson 4730 SSB converted to 10M, $85; Dentron W-2 Wattmeter/SWR, $50; Bearcat IV Scanner, $60; Panasonic RF-2200 Rcvr, $125. F. S. Eggert, N8AWK, PO Box 2154, Livonia, MI 48151.

COMMODORE Random Code Practice Programs. You select character speed and spacing speed basic program you select practice charactrs. For VIC-20 basic plus call signs Q-calls $6.95. For C-64 basic plus 300 words with call signs $9.95. Disc add $3. KA3LHD, 215-374-4433, 1024 Washington St., Reading, PA 19601.

SELL: Microcraft Keyboard — $110. Heath Mohican gen coverage rcvr. — $50. 10 meter CW converted CB — $40. QRP Transmatch — $25. 670 Keyer — $25. Bank checks. N9BPE.

KENWOOD TS-820S, CW and SSB filters, manuals, $550; SP-820 $45; VFO-820 $130; MC-50 $35. All mint. Separate, or all $675. U pay shipping WA8UNK, 313-464-3525 evenings.

AEA



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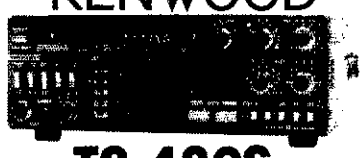

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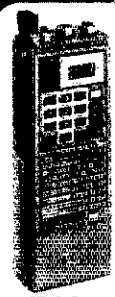

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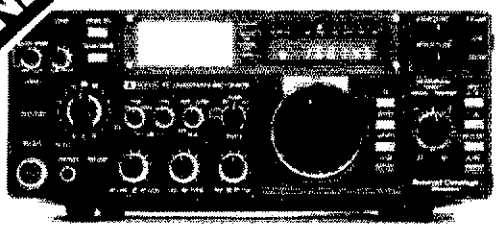

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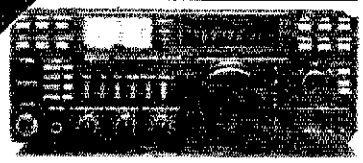

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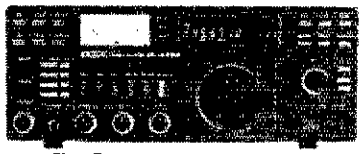

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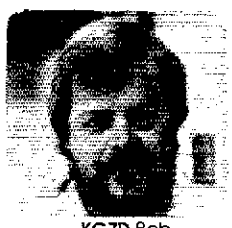

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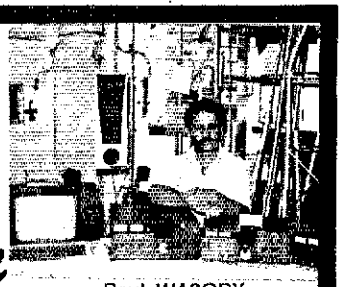

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ICOM 290H 25W multimode $420. HW-101 with p/s. Excellent Novice rig $260. Will ship. N2COP, 609-924-5070.

YAESU FT-101-ZD Mark III with CW filter, AC/DC ps. Mint condition. Excellent performance $525. Heathkit SB-220 carefully assembled. One of the best linear values. $475. QST Magazines 1960 through 1983 $65. KF7Z, 503-884-2046.

WANTED: MFJ-1224 Interface, RS232, H89A software. Zenith Trans-oceanic 7000 radio. Harris, W4BUZ, 1703 Verdun Dr., Rt. 11, Greensboro, NC 27410.

SB401, Xtal Pack, Magnum "6" RF Speech Processor $250; SB 301, CW & 8-pole SSB filters $150; SB 630 Console $80; 2.1 & 1.8 kHz 8-pole SSB filters for Heath SB-series $15 each. Complete station $450. All units mint. K8SLE, 616-983-4240.

YAESU 902DM with SP-901 phone patch/spkr. $850. Drake R-7A with AM filter and noise blanker $8 50. Both are in unused condition, manuals and original packaging included. Bob, KE6NT, 213-255-6177.

FOR SALE Or Exchange: Sencore VA48 TV/VCR Video Analyzer (Current Cost $1448). Factory up-dated and calibrated Dec. 6, 1983. Not used since service. (Send SASE for proof of factory service.) Includes manuals, test leads and also a AT218 RF-IF Attenuator. Will sell for $850 certified payment and UPS within 48 states. Will trade for good clean Xcvr and PS like Icom 730 and good clean 2M hand held. Roland, N6DEO, 760 Santo Tomas, Hemet, CA 92343. 714-658-8558.

WANTED: Military surplus radios, we need Collins 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131, or FM-622, RT-857/ARC-134 or Wilcox 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, APN-153, APN-155, APN-171, MRC-95, 718F-1/2, HF-105, Collins Antenna Couplers 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, CU-1239/ARC-105, 490D-1, Top dollar paid or trade for new Amateur gear, write or phone Bill Slep, 704-524-7519, Slep Electronics Co., Hwy. 441, Otto, NC 28763.

ESTATE SALE: Amprobe RS3, never used $45. Swan 500 w/AC $275. Swan 250 w/AC $225. Mk VI amp $300. 210 VFO $30. NS1 $30. Globe V10 VFO $30. W2FNT, 18 Hillcrest Ter., Linden, NJ 07036.

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SALE, HEATHKIT, SB-101 xcvr w/HP23/HP13/SBA100 $325, HD1250 solid state dipper $45. Daiwa CNA-2002 2kW automatic ant. tuner $250. Wilson 5Y36 Beam ant. w/40M $175. Transverters, MMT 432/28, 432/50 $225 ea. New sealed 4CX250B $60. QST's 1949 to 1984 $150. All as listed or best offer. K1HF, 274 S. Worcester St., Norton, MA 02766, 617-285-4600.

KENWOOD TS-820, DG-1 digital display, MC-50 mic $600, BS-8 $75, HP-33E $40. Want Palomar Noise Bridge. WA3WHR, 301-774-9131.

SALE: SB-101 with CW, SSB filters, HP 23A, SB600 speaker, spare finals. $235. N9TI, 312-526-7836.

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VIC-20: Complete Logger, Call, Name, QTH, Freq., Comments, etc. w/time. Fast. $5. KA1JRZ, Brian Kearney, 225 Cook Ave., Meriden, CT 06450.

TI-99/4A program cassetes: TI Basic Minimuf Propagation, TI Basic Send/Receive Code Practice, Extended Basic Send/Receive Code Practice, $12 each, postpaid; A. C. Buxton, W8NX, Ham Software Co., 2225 Woodpark Rd., Akron, OH 44313.

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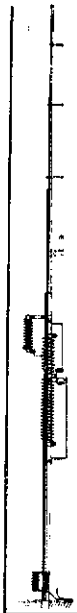

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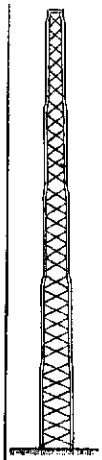

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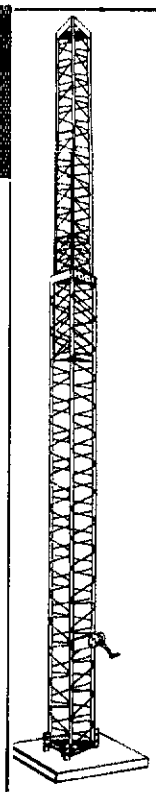
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
HDBX40	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXB8	429	30	459



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Cable Type	Imped.	10MHz	30MHz	150MHz	450MHz
RG-213/U	50	.6	.9	2.3	5.2
RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	6.0	12.5
½" Alum	50	.3	.5	1.2	2.2
½" Heliax	50	.2	.4	.9	1.6
⅞" Heliax	50	.1	.2	.5	.9

HARDLINE/HELIAX™

Lowest Loss for VHF/UHF!

- ½" Alum. w/poly Jacket . . . $.79/ft
- ½" LDF4-50 Andrew Heliax ™ . . . $1.49/ft
- ⅞" LDF5-50 Andrew Heliax ™ . . . $3.99/ft

select connectors below.

HARDLINE & HELIAX ™ CONNECTORS

Cable Type	UHF FML	UHF MALE	N FML	N MALE
½" Alum	$19	$19	$19	$25
½" Heliax ™	$22	$22	$22	$22
⅞" Heliax ™	$49	$49	$49	$49

AMPHENOL CONNECTORS

Silver PL259 . . . $1.25 Nickle PL259 . . . $.90
UG21B N Male . . $2.95 UG23D N Female . $2.95

ANTENNA WIRE & ACCESSORIES

12 Ga. Copperweld . $.12/ft 14 Ga. Copperweld $.10/ft
14 Ga. Stranded . . . $.10/ft 18 Ga. Copperweld ¼mi $30
450 Ohm H.D. Line . $.16/ft H.D. End Insulators . $2/ea
Van Gorden 1:1 Balun . . . $11
Van Gorden Center Insulator . . . $6

HUSTLER

4BTV 40-10 mtr Vert $89 5BTV 80-10 mtr Vert . $109
G6-144B 2-mtr Base $89 G7-144 2-mtr Base . $119
6BTV 80-10 mtr Vert $129

Mobile Resonators	10m	15m	20m	40m	75m
400W Standard	$12	$12	$15	$18	$22
2KW Super	$18	$20	$22	$26	$36

Bumper Mounts - Springs - Folding Masts in Stock!

CUSHCRAFT

MULTI-BAND HF ANTENNAS

A3 3-el Tribander . . $219 A4 4-el Tribander . . $289
R3 20/15/10mtr Vert $279 A743/A744 40mtr Kit . $75

HF MONO-BAND ANTENNAS

10-3CD . . . $ 95 10-4CD . . . $109
15-3CD . . . $119 15-4CD . . . $129
20-3CD . . . $199 20-4CD . . . $279
40-2CD . . . $289 D40 . . . $149

VHF/UHF BEAMS

A50-5 . . . $ 79 617B . . . $199
214B . . . $ 79 3219 . . . $ 95
220B . . . $ 95 424B . . . $ 79

OSCAR/TWIST ANTENNAS

A144-10T . . . $ 52 A144-20T . . . $ 75
A147-20T . . . $ 63 416TB . . . $ 59
A14TMB . . . $ 29 PS4 . . . $ 69

VHF/UHF FM ANTENNAS

A147-4 . . . $ 29 A147-11 . . . $ 49
214FB . . . $ 79 220FB . . . $219
A449-6 . . . $ 29 ARX2B . . . $ 39

HY-GAIN

Broadband 3-el Triband Beam Explorer-14, In Stock—$289

QK710 30/40 mtr. Add-On-Kit . . . $79.00
V2S 2-mtr Base Vertical . . . $39
TH5MK2S Broad Band 5-el Triband Beam . . . $389
TH7DXS 7-el Triband Beam . . . $439
TH3JRS 3-el Triband Beam . . . $179
TH2MK3S 2-el Triband Beam . . . $159
HY-QUAD 2-el Triband Quad . . . $299
402BAS 2-el 40-mtr Beam . . . $219
205BAS 5-el 20-mtr Beam . . . $329
155BAS 5-el 15-mtr Beam . . . $189
105BAS 5-el 10-mtr Beam . . . $129
204BAS 4-el 20-mtr Beam . . . $249
203BAS 3-el 20-mtr Beam . . . $149
153BAS 3-el 15-mtr Beam . . . $89
103BAS 3-el 10-mtr Beam . . . $69
DB1015BAS 3-el 10/15 mtr Beam . . . $179
64BS 4-el 6-mtr Beam . . . $59
66BS 6-el 6-mtr Beam . . . $119
18HTS 80-10 mtr Hy-Tower Vertical . . . $429
LC-160 160-mtr Coil Kit for 18HTS . . . $39
214 14-el 2-mtr Beam . . . $39
2BDQ 80/40 mtr Trap Dipole . . . $59
6BDQ 80-10 mtr Trap Dipole . . . $119
BN86 80-10 mtr KW Balun W/Coax Seal . . . $19

MOSLEY

CL-33 3-el Triband Beam . . . $279
TA-33 3-el Triband Beam . . . $249
TA-33JR 3-el Triband Beam . . . $189
TA40KR 40mtr Kit for TA33 . . . $119

Tri-Ex TOWERS SPECIAL PRICES! SAVE$$!

Model	Height Up	Down	Wind Load	List	Sale
W36	36.0 ft	20.5 ft	9.0 sq ft	$694	$579
WT51	51.0 ft	20.5 ft	9.0 sq ft	$1154	$999
LM354	54.0 ft	21.0 ft	16 sq ft	$2010	$1599
LM470D (Motorized)	70.0 ft	22.0 ft	16 sq ft	$4195	$2999
DX86 (Motorized)	86.0 ft	23.0 ft	25 sq ft	$6200	Call

ALPHA DELTA COMMUNICATIONS

Transi-Trap ™ Surge Protectors—In Stock Now!

- Model LT 200W UHF Type . . $19
- Model HT 2KW UHF Type . . $29
- Model LT/N 200W N Type . . $39
- Model HT/N 2KW N Type . . $44
- Model R-T 200W Deluxe . . . $29
- Model HV 2KW Deluxe $32

KLM

- K134A 4-el Broad Band Triband Beam . . . $339
- KT34XA 6-el Broad Band Triband Beam . . . $489
- 80m-1 80-mtr Rotatable Dipole . . . $469
- 40m-1 40-mtr Rotatable Dipole . . . $179
- 40m-2 2-el 40-mtr Beam . . . $309
- 40m-3 3-el 40-mtr Beam . . . $339
- 40m-4 4-el 40-mtr Beam . . . $649
- 20m-6 6-el 20-mtr Beam . . . $689
- 15m-6 6-el 15-mtr Beam . . . $439
- 10m-6 6-el 10-mtr Beam . . . $259
- 10-30-7LPA Log Periodic Beam . . . $639
- 2m-13LBA 13-el 2-mtr Beam . . . $79
- 2m-14C 14-el 2-mtr Satellite Antenna . . . $89
- 435-18C 435 MHz Satellite Antenna . . . $65
- 432-16LB 16-el 432 MHz Beam . . . $69

MINI-PRODUCTS HQ-1 only $159!

Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

- Alliance HD73 (10.7 sq ft rating) . . . $109
- Alliance U100 (for small beams & elevation) . . . $49
- Telex HAM 4 (15 sq ft rating) . . . $199
- Telex Tailtwister (20 sq ft rating) . . . $249
- Telex HDR300 Heavy Duty (25 sq ft rating) . . . $479
- Kenpro KR-500 Heavy duty elevation rotor . . . $189.00

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $37.50 25G $46.50 45G $107.50

Foldover Towers

Model	Height	Ant Load*	Price
FK2548	48 ft	15.4 sq ft	829
FK2558	58 ft	13.3 sq ft	$ 899
FK2568	68 ft	11.7 sq ft	$ 959
FK4544	44 ft	34.8 sq ft	$1159
FK4554	54 ft	29.1 sq ft	$1259
FK4564	64 ft	28.4 sq ft	$1359
25G Foldover Double Guy Kit			$199
45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

- 3/16" EHS Guywire (3990 lb rating) . . . $.13/ft
- 1/4" EHS Guywire (6000 lb rating) . . . $.16/ft
- 5/32" 7 × 7 Aircraft Cable (2700 lb rating) . . . $.12/ft
- 3/16" CCM Cable Clamp (3/16" or 5/32" Cable) . . . $.35
- 1/4" CCM Cable Clamp (1/4" Cable) . . . $.45
- 1/4" TH Thimble (fits all sizes) . . . $.30
- 3/8EE (3/8" Eye & Eye Turnbuckle) . . . $5.95
- 3/8"EJ (3/8" Eye & Jaw Turnbuckle) . . . $6.95
- 1/2"EE (1/2" Eye & Eye Turnbuckle) . . . $8.95
- 1/2"EJ (1/2" Eye & Jaw Turnbuckle) . . . $9.95
- 3/16" Preformed Guy Grip . . . $1.99
- 1/4" Preformed Guy Grip . . . $2.49
- 6" Diam - 4 ft Long Earth Screw Anchor . . . $12.95
- 500D Guy Insulator (5/32" or 3/16" Cable) . . . $1.39
- 502 Guy Insulator (1/4" Cable) . . . $2.49
- 5/8" Diam - 8 ft Copper Clad Ground Rod . . . $12.95

PHILLYSTRAN GUY CABLE

- HPTG2100 Guy Cable (2100 lb rating) . . . $.29/ft
- HPTG4000 Guy Cable (4000 lb rating) . . . $.43/ft
- HPTG6700 Guy Cable (6700 lb rating) . . . $.69/ft
- 9901LD Cable End (for 2100/4000 cable) . . . $6.95
- 9902LD Cable End (for 6700 cable) . . . $7.95
- Socketfast Potting Compound (does 5-8 ends) . . . $12.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

- HDT-3 3 ft Tripod . . . $19 HDT-5 5 ft Tripod . . . $29
- HDT-10 10 ft Tripod . . $49 HDT-15 15 ft Tripod . . $69

Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

1108 Summit Ave., Suite 4 / Plano, Texas 75074

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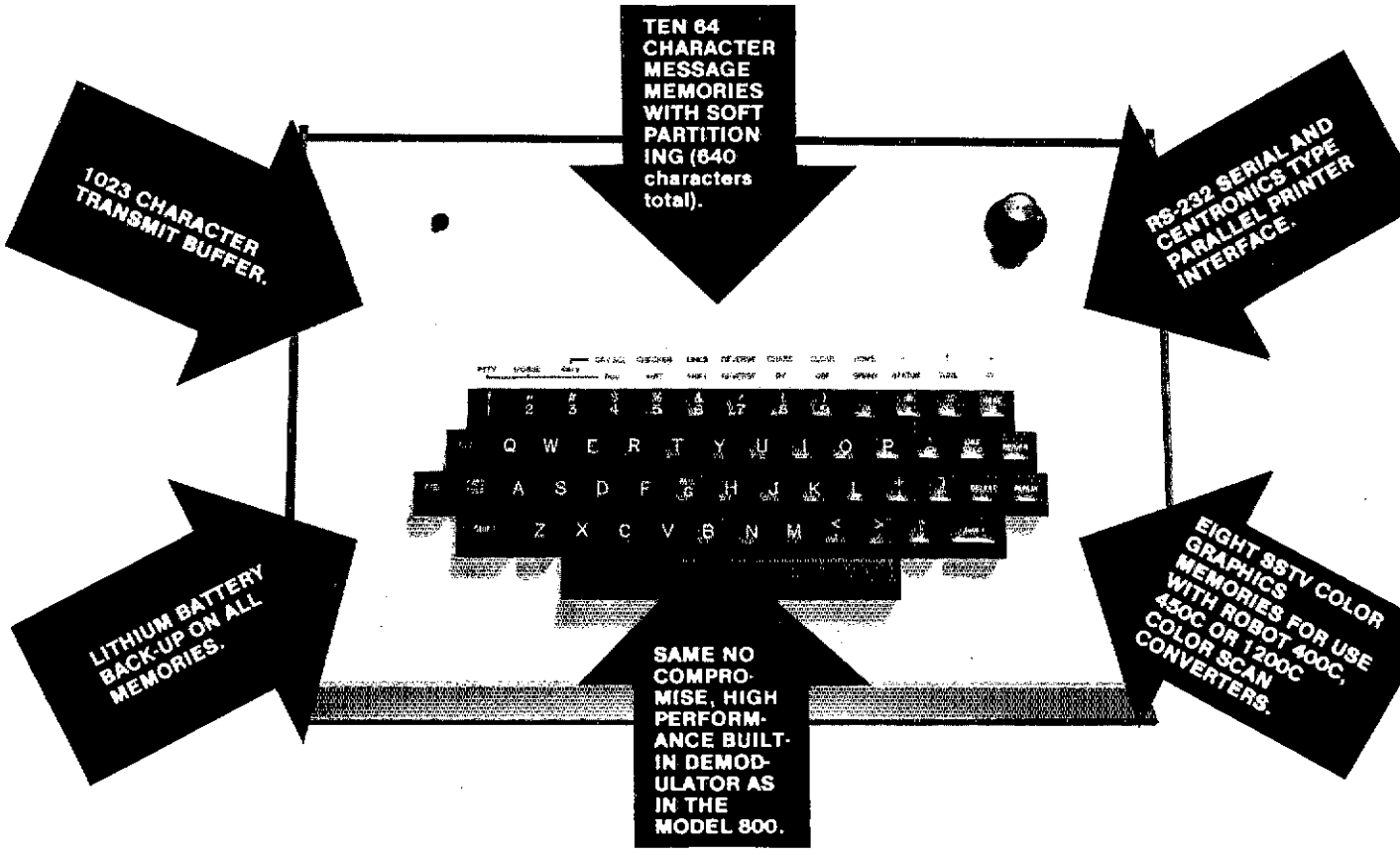
THE NEW ROBOT MODEL 800C SUPER TERMINAL!



The new Model 800C offers the same fine quality construction, high performance, and outstanding features as the popular Model 800, plus the many new operating features shown above. It is a complete specialty mode communications terminal offering unmatched ease of operation. The 800C is designed expressly for amateur radio and nothing else! By focusing our attention on this simple concept we are able to provide a product that works better, costs less and is easier to operate than systems that try to do "everything" and do nothing very well.

OUTSTANDING BUILT-IN DEMODULATOR

The Model 800C has the same high quality demodulator acclaimed by thousands of users of the Robot Model 800 in daily use world wide, with its ability to copy those weak signals that you usually give up on. The demodulator employs separate active two-tone discriminator filters for optimum demodulation of RTTY signals. It is available with the IARU standard "low tone" frequencies or "high tones" for use on VHF-FM.

BAUDOT/ASCII OPERATION

Split screen display. Autostart. Programmable WRU and SELCAL. On-screen status line and tuning indicator. Programmable narrow shift CW ID.

MORSE CODE OPERATION

Autotrack on receive. Side tone oscillator. Morse code traine On-screen speed indication.

SSTV OPERATION

Full color SSTV graphics capability when used with Robot's new color scan converters plus stand alone black and white SSTV graphics transmission. Eight color graphics memories available for CQ, QTH and special messages.*

ATTENTION ROBOT MODEL 800 OWNERS: All of the "new" features found in the Model 800C are available by adding the Model 800C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.

For complete information on all the Robot 800C's features wr for literature or visit your Robot dealer.

*The Model 800C does not receive SSTV pictures. A scan converter is necessary for this.

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ROBOT RESEARCH, INC.
7591 Convoy Court • San Diego, CA 92111 • (619) 279-943

World Leaders in SSTV, Phone Line TV and Image Processing Systems.

YAESU FT-726R TRIBANDER

NEW GALAXIES OF PERFORMANCE ON VHF AND UHF

FULL DUPLEX!!

TELLITES!! SCATTER!!

!!! 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

YAESU
The radio.

483

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YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

Watts to see...

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

TR-7950/7930

Outstanding features providing maximum ease of operation include a large, easy-to-read (direct sunlight or dark) LCD display, 21 multi-function memories, automatic offset, programmable priority channel, memory and band scans, built-in lithium battery memory back-up, built-in 16-key autopatch encoder, and a choice of a hefty 45 watts output (TR-7950), or 25 watts output (TR-7930).

TR-7950/TR-7930 FEATURES:

- **NEW, large, easy-to-read LCD digital display**
  Easy to read in direct sunlight or dark (back-lighted). Displays transmit/receive frequencies, memory channel, repeater offset, (+,S,–), sub-tone number (F-0, 1, 2, 3), tone, scan, and memory scan lock-out. Includes LED S/RF bar meter, and LED indicators for REVERSE, CENTER TUNING, PRIORITY, and ON AIR.
- **21 NEW, multi-function memory channels**
  Stores frequency, repeater offset, and optional sub-tone channels. Memories 1 through 15 for simplex or ± 600 kHz offset. Memory pairs 16/17, and 18/19 are paired for non-standard repeater offset. Memories "A" and "B" set upper and lower scan limits, or for simplex or ± 600 kHz offset. In MEMORY mode, a circle of light appears around the memory selector knob. When the memory selector knob is rotated in either direction to channel 1, an audible "beep" will sound.
- **Choice of 45 or 25 watts output**
  The TR-7950 provides a hefty 45 watts output, while the TR-7930 features a more modest 25 watts. A HI/LOW power switch allows power reduction to approx. 5 watts.
- **Long-life lithium battery memory back-up**
  Built-in lithium battery has an estimated 5 year life.
- **Automatic offset**
  The microprocessor is pre-programmed for simplex or ± 600 kHz offset, in accordance with the 2 meter band plan. "OS" key allows manual change in offset.
- **Programmable priority alert**
  The PRIORITY channel may be programmed in any of the 21 memories. With ALERT switch "ON," a dual "beep" sounds when a signal is present on the PRIORITY channel. An OPER switch allows an easy move to the PRIORITY channel.
- **Programmable memory scan lock-out**
  "LO" key for programming scan to skip selected memory channels, without erasing the memory.
- **Programmable band-scan width**
  The lower limit may be programmed into memory "A," and the upper limit into memory "B."
- **Center stop during band-scan, with indicator**
  Stops in center of channel during band-scan, with center tuning indicator.
- **Scan resume selectable**
  Scan stops on busy channel. Selectable automatic time resume-scan (approx. 5 sec., adjustable), or carrier operated resume-scan. A scan delay of approx. 1.5 seconds built-in.
- **Scan control using up/down microphone**
  Momentarily pressing UP or DOWN button on microphone tunes one step in the selected direction, on memory or on 5-kHz step tuning. Holding the button for about 2 seconds starts UP or DOWN automatic scan action. Scan start also possible using "SC" key on keyboard. Scan may be cancelled by momentarily pressing the PTT switch, or by pressing both UP/DOWN buttons simultaneously.
- **Programmable sub-tone channels**
  Optional TU-79 3 frequency sub-tone unit provides keyboard selectable sub-tone channels, which may be stored in memory.
- **Built-in 16-key autopatch, with monitor**
  The keyboard functions as a 16-key autopatch encoder during transmit. DTMF tones appear in the speaker output when a key is pressed during transmit.
- **Front panel keyboard control**
  Used for selecting frequency, offset, programming memories, controlling scan, and autopatch encode. Keyboard lighting is provided.
- **Extended frequency coverage**
  Covers 142.000-148.995 MHz, in 5-kHz steps.
- **Repeater reverse switch**
  Locking-type switch, with indicator.
- **"Beeper" amplified through speaker**
- **Compact, lightweight design**
- **Easy-to-install adjustable-angle mobile mounting bracket**

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.

More information on the TR-7950 and TR-7930 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.