March 1983 $2.50

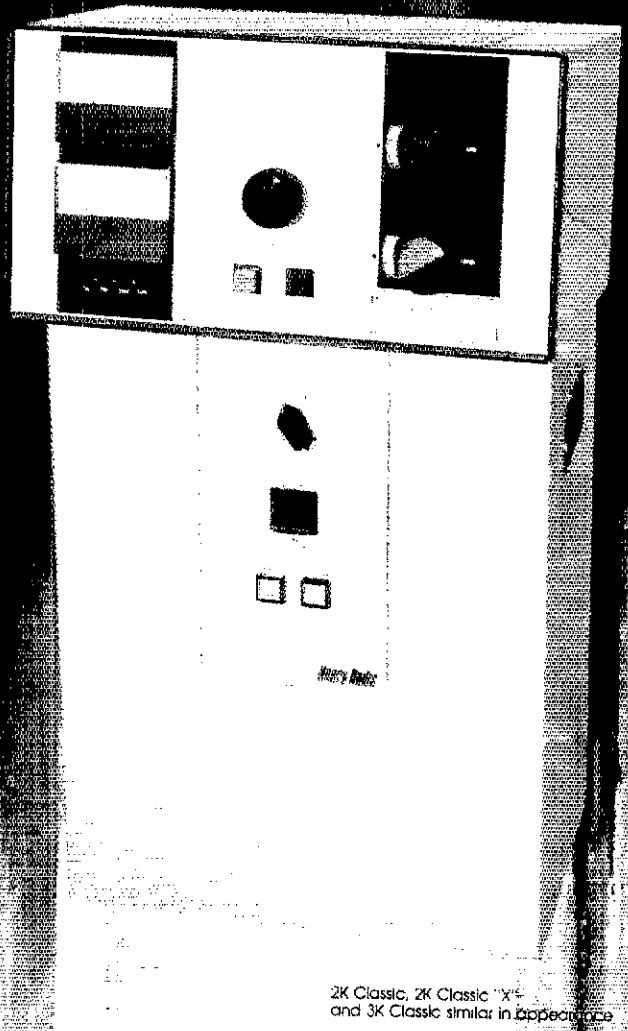
QST

devoted entirely to Amateur Radio

Antennas — every ham's fancy

ANNÉE MONDIALE DES COMMUNICATIONS
WORLD COMMUNICATIONS YEAR
AÑO MUNDIAL DE LAS COMUNICACIONES
1983

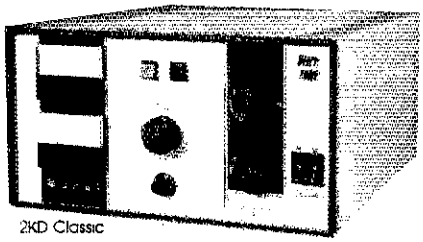
The world's broadest line of linears now boasts... four new amplifiers



2K Classic, 2K Classic "X" and 3K Classic similar in appearance

Now you have a choice of ten superb amplifiers spanning the spectrum from 3.5 MHz to 450 MHz. The most dazzling display of value and performance the amateur world has ever known.

Here they are! Treat yourself to the kind of amplifier you have always dreamed of owning.



2KD Classic

HF amplifiers..80 through 15 meters (10 meters included on export models)

The 1KD-5...1200 watt desk model $695

New!

The 2KD CLASSIC..2000 watt desk model. We challenge you to find a better desk model for even a thousand dollars more. $980

The 2K CLASSIC The latest and best version of the console that made the name "2-K" famous around the world. $1295

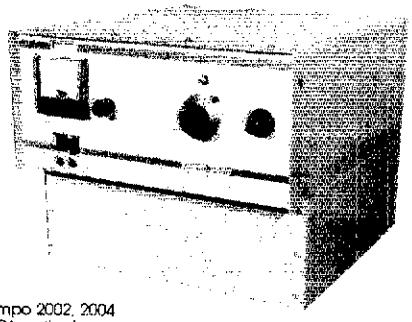
New!

The 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. $1790

The 3K CLASSIC uses the superb Eimac 8877 tube. More than 13 db gain. We believe the 3K to be the finest amateur linear available anywhere. $2695.

The 3K CLASSIC "X" version available for export and military customers only. $2895

The 4K ULTRA A general coverage, general purpose amplifier for commercial, military, scientific and export customers. Not for sale to amateurs in the U.S.A. $4500



Tempo 2002, 2004
2006 similar in appearance

For VHF and UHF:

The TEMPO 2002 for 144-148 mHz. The 2000 watt workhorse of the 2 meter band. $1095

New!

The new TEMPO 2004 offers 2000 watts input at 440 mHz. Few amateurs have ever seen an amplifier capable of full powered UHF. $1295

New!

The TEMPO 2006. The same reliable design for 50-54 mHz. (For export only) $1095

All three models: 2002, 2004 and 2006 are also available on frequencies outside the amateur bands and are part of a unique line of high power commercial, industrial and scientific amplifiers and transmitters for communications, plasma-generation; nuclear magnetic resonance, heating and other special applications. Let us know what your requirements are. We're here to help both in the U.S.A. and throughout the world.

54 YEARS OF SERVICE

Henry Radio

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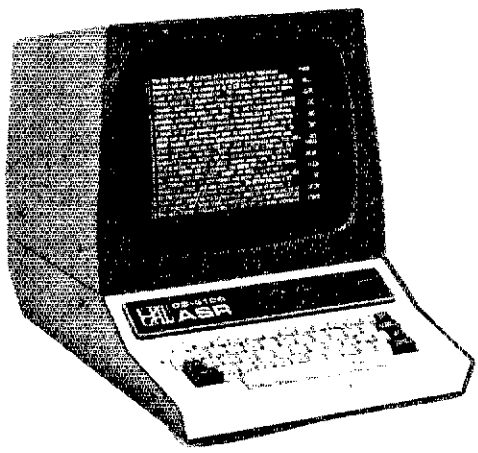
For all states except California.
Calif. residents please call collect on our regular numbers.

MESSAGE PROCESSOR TERMINAL



MPT3100

Message processing is now available for radio communications systems. The MPT3100 is a complete up-date of the popular HAL DS3100 RTTY terminal, adding the ability to store RTTY messages, edit them, and retransmit them singly or in preset groups. ALL of the previous features of the DS3100 and MSO3100 are retained and new mailbox commands are included. The editor may be used with any file that is stored. The MPT3100 includes ASR (Auto Send-Receive), MSO (Message Storage Option - "mailbox"), and TRO (Traffic Relay Option) modes. The MPT3100 is a new software package that works in ANY DS3100 with MSO3100 circuit board. Some of the features of the MPT3100 are:

NEW FEATURES OF MPT3100:

- Automatic storage of all received text in files separated by the standard "NNNN" terminator (TRO-REC mode)
- Full editing capability of all files stored by mailbox (MSO) or by TRO storage
- Editor allows insertion or deletion of text in any part of a stored message - 15 keyboard edit commands
- Editor may be used even while receiving, transmitting, or storing messages - even when MSO mailbox is in use
- Files may be renamed, created in the editor, cut into smaller files, and deleted with keyboard commands
- Message files may be transmitted singly or in batches
- Transmitted messages may be serial-numbered automatically
- The full format requirements for NAV MAR COR MARS NTP-8(A) are supported
- New TRO commands include: RXON, RXOFF, DIR, SEND, STOP, RESUME, RESTART, EDIT, CUT, CREATE, QUIT, RENAME, DELETE
- On-screen status indicators show: TRO mode; bytes of memory remaining; file names being recorded, transmitted, and edited
- MSO mailbox .SDIR directory command revised to shorten time required for transmission
- New .DIR [filematch] and .SDIR [filematch] mailbox commands give listing of only file names that include [filematch]
- Programmable "header ID" for each mailbox transmission

MSO Mailbox Features:

- Programmable MSO call-up command
- Mailbox may be controlled by external station to store message files, read files, delete files, and list the file directory
- DS3100 operator may perform all MSO operations on the keyboard without transmitting
- Mailbox transmissions include user-prompting and automatic CW and RTTY indentification
- HELP messages are provided to assist the new user in operation of the mailbox
- All mailbox messages stored may also be edited, renamed, and transmitted using TRO commands
- MSO commands are: .DELETE, .DIR, .DIR [filematch], .ENDFILE, .FILEHELP, .HELP, .KY1ON/OFF, .KY2ON/OFF, .PRINTON/OFF, .QBF, .READ, .RYS, .SDIR, .SDIR [filematch], .WRITE

DS3100ASR Terminal Features:

- Send and receive ASCII, Baudot, Morse codes
- ASCII or Baudot at 45, 50, 57, 74, 100, 110, 134, 150, 300, 600, 1200, 2400, 4800, and 9600 baud; full or half duplex
- Morse code at 1 to 175 wpm
- Full length 72 character line / 24 line screen display.
- 50 line pre-type on-screen transmit buffer
- True "ASR" operation - pretype transmit text while receiving
- 150 line receive display buffer
- MSO 3100 adds 32K bytes of additional storage
- 12 inch, P31 green display built-in
- Control functions are clearly marked on keytop
- On-screen status indicators with real-time indication
- Upper-lower case ASCII with ALL control codes
- Current loop or RS232 RTTY input/output
- Positive and negative Morse key outputs
- ASCII printer output prints Baudot, Morse, or ASCII text
- Operates on 105-130 / 210-250 VAC 50-400 Hz power

WHEN OUR CUSTOMERS TALK, WE LISTEN—and we have been listening. Rather than making a proven product obsolete—a product that is well known and respected for its reliability and capabilities—HAL has completely rewritten the software of the DS3100 to offer the features that our communications customers have been asking for. A full year in the preparation, these are features that could only be designed by people who know and operate RTTY. Best of all, ANY DS3100 can be modified at the factory to include the MPT3100! In marked comparison to other radio equipment that is made obsolete by new models every 6 to 12 months, the DS3100 lives on—a full 4 years after its announcement.

HAL COMMUNICATIONS CORP.
BOX 365
URBANA, ILLINOIS 61801

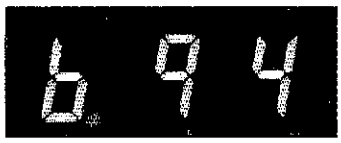
If you are really serious about your RTTY, look to HAL, your REAL RTTY company.

Please write for even more details about the MPT3100 Message Processor Terminal. Call your dealer or HAL for prices and how to get a new MPT3100 or to arrange for modification of your present DS3100.

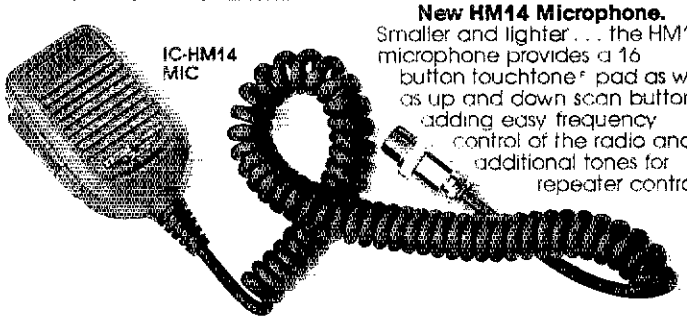
ICOM IC-25A

More Features Per Square Inch!

The smallest 2 meter FM mobile on the market (only 2"H x 5½"W x 7"D) is now even easier to read and use with a green LED readout and a compact touchtone*/scanning microphone.



New Green LED. Easier to read in bright sunlight, and not glaring at night, the IC-25A's new readout provides good visibility under all conditions.

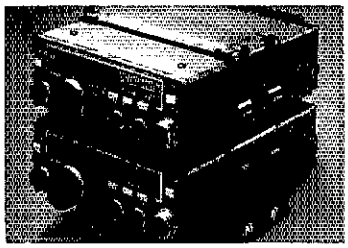


5 Memories. Instant access to most frequencies. VFO A information is transferred to the selected memory by pushing the write button.

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

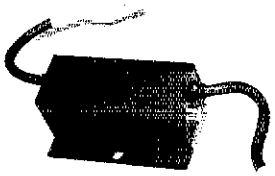
NOR/REV Capability. Use of this button in the duplex mode, allows one touch monitoring of the repeater input frequency. If simplex operation is possible you will know instantly.

New HM14 Microphone. Smaller and lighter . . . the HM14 microphone provides a 16 button touchtone* pad as well as up and down scan buttons, adding easy frequency control of the radio and additional tones for repeater control.



The Most Compact FM Mobiles on the Market. Fits in the smallest of places. Stacking, matching Mobile Mounts for complete mobile communications for your car. This allows the 25 watt IC-25A and its matching UHF companion, the 10 watt IC-45A, to mount in one convenient package.

Scanning. Pushing the S/S button initiates the scan circuitry. With the mode switch in a memory position the unit will scan all 5 memories plus the 2 VFO frequencies. With the mode switch in a VFO position, the unit will scan the entire band or the portion of the band defined by memories 1 and 2. Full band scan or program band scan is selected from the front panel and internally switched scanning choices of adjustable delay period after a carrier is received then resume scan, or resume on carrier drop, are standard.



IC-BU1

Memory Backup. When the optional IC-BU1 backup power unit is installed on the back of the IC-25A or IC-45A, memory will be maintained while transferring the unit from power source to power source. If the unit is not removed from power, it will maintain memory even when turned off with or without the IC-BU1.

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**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

March 1983 *Volume LXVII Number 3*

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CONTENTS

OUR COVER
Up early one morning, Associate Technical Editor K1TD came across this lovely sunrise over the W1AW antenna farm. Your antennas may or may not be as photogenic, but they're certainly worth paying attention to, especially at this time of year. The articles beginning on pages 16, 33, 36 and 38 provide some timely reading.

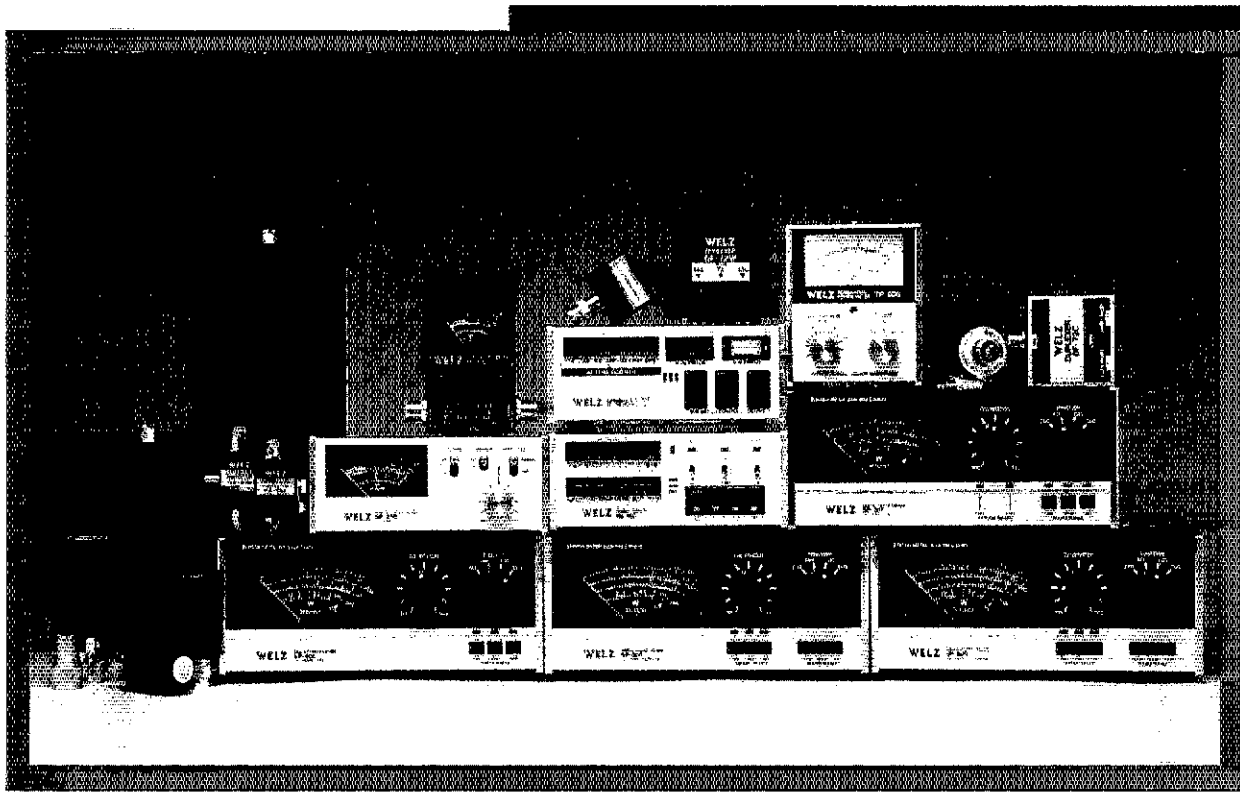
TECHNICAL

BEGINNER'S BENCH

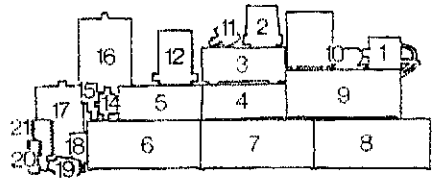
NEWS AND FEATURES

OPERATING

DEPARTMENTS



INTRODUCING



The WELZ Family of Communications Accessories

Come to the WELZ for Station Accessories. WELZ Co., Ltd., is the source for top quality, superior performing, affordable products to compliment the mainstay radio equipment in your station. Increase the versatility of your station with WELZ Wide-Z Sensor™ power and V.S.W.R. meters, precision 50 ohm terminations with bandwidth to 1300MHz, EMP surge protectors, termination wattmeters and more. The unique features and solid performance of WELZ products make you more comfortable getting maximum performance from your station. The products in the photo and listed below are just some of the WELZ family of products. Send QSL for full catalog and **see us at the Dayton Hamvention, 1983.**

1 & 2 — Duplexers (**DF-72C & DF-72W** shown) WELZ produces a series of these "little black boxes" to permit operation on any two of several bands from HF thru 449MHz. $23-50.00 depending on model. **3** — **LX-10F** AC Power Meter, line filter and switch box for organizing your shack and taking the trash off of the AC Mains. $82.00. **4** — **RS-120** Non Interruptable Power Supply with battery charger terminals and 10 amp capacity, when used with auxiliary battery. $210.00. **5** — **SP-250** most economical 1.8-50MHz, 2KW Wattmeter & V.S.W.R. Meter is perfect for your hamshack. Has <-0.06db insertion and 3 watt sensitivity. $75.00. **6** — **SP-400** VHF-UHF 130-500MHz inline type Wattmeter. Very good accuracy (10%) has 5/20/150 watt scales. Has "N" type connectors. $108.00. **7** — **SP-300** HF-VHF/UHF Three Sensor Wattmeter up to 1KW HF- 200W VHF/UHF. Three power levels, 10% accuracy and excellent sensitivity. $150.00. **8** — **SP-600** our best Three "Wide-Z" Sensor 2KW Power Meter for HF-VHF-UHF sensor 1 is 1.6-60MHz at 2KW, sensor 2 is 1.6-150MHz at 200W, sensor 3 is 130-500MHz at 200 watts. These three sensors allow monitoring of exciter drive and amplifier input V.S.W.R., amplifier output and antenna V.S.W.R. and power and V.S.W.R. on the VHF/UHF station at the touch of a finger without changing cables or "slugs." $157.00. **9** — **SP-200** the single element 1KW but 2 antennas for HF operation 1.8-160MHz Wide-Z Sensor great performance, style for the hamshack. $107.00. **10** — **TP-20G** 50MHz to 1300MHz Termination Power Meter compact fast acting 5-7% wattmeter is ideal for up to 15 watt units. $210.00. **11** — **TP-05X** 50-500MHz Handheld performance meter. Built in BNC connector fits on most handhelds. Tells if TX is up to specs. $21.00. **12** — **SP-10X** 1.8-150MHz Pocket Size unit for convenient field or shack use. Handles up to 200 watts, 10% accuracy. $37.00. **14 & 15** — **CA-35A & CA-23N** Coaxial EMP Surge Protectors contain the latest changable chip technology for surge protection. Handle 300 watts up to 500MHz with low insertion loss. 35A-$22.00, 23N-$26.00. **16** — **CT-300** 1KW Wide Band Oil less Aircooled Dummy DC-250MHz handles 1KW for 3 min. and 300 watts continuous. $68.00. **17** — **CT-150** 400W Wide Bank Oil less Aircooled Dummy DC-250MHz has gold plated SO-239. Less than 1.1:1 up to 250MHz. $46.00. **18** — **CT-15N** 15 watt DC-500 MHz Dummy Load gold plated type "N" connector. 50 watt peak power (3 min). V.S.W.R. < 1.1:1. $21.00. **19** — **CT-15A** 15 Watt DC-500MHz Dummy Load, the work horse around any shack. 50 watts peak (3 min). V.S.W.R. < 1.2:1. $12.00. **20 & 21** — **CT-03N & CT-20G** DC-1300MHz Dummy Loads CT-03N 3 watts, low V.S.W.R. < 1.1:1 at 1.3GHz (03N) — $47.00 (20G) — $123.00

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Ringo Ranger II

Simply the best

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

Quick easy assembly and installation

Mount anywhere with compact dimensions and neat appearance

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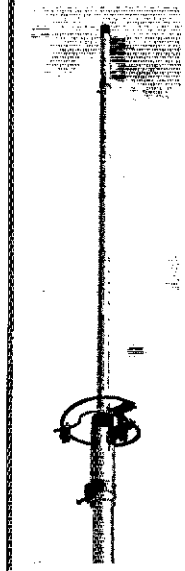
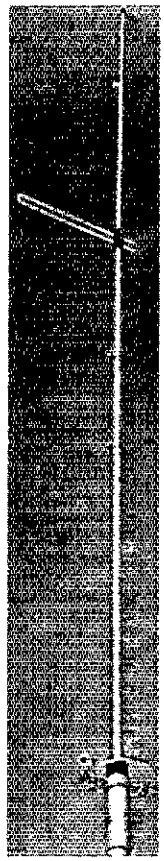
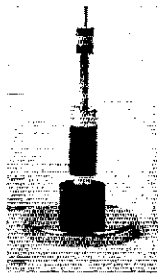
Complete FM band coverage

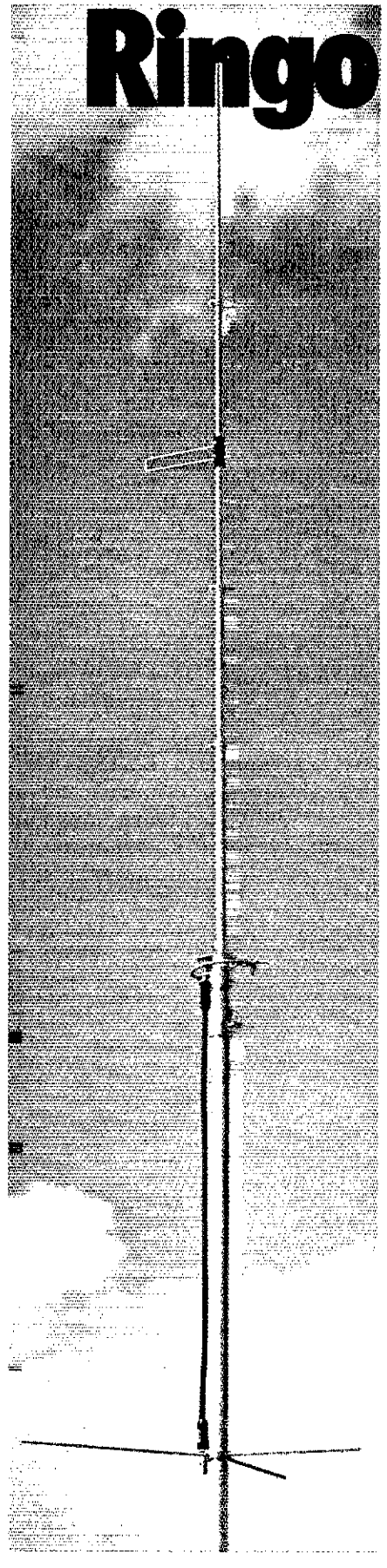
One year warranty

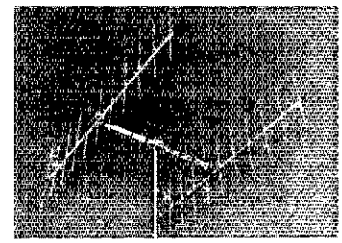
Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft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

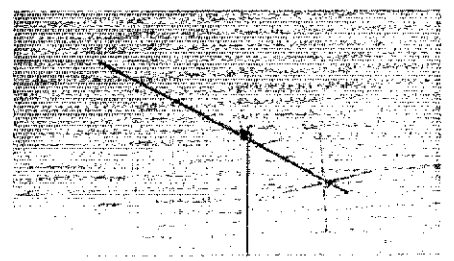












RINGO RANGER II

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

RINGO RANGER

ARX-2	134-164 MHz

RINGO

AR-6	50-54 MHz
AR-2	135-175 MHz
AR-10	28-29.7 MHz
AR-220	220-225 MHz
AR-450	440-460 MHz

MOBILE ANTENNAS

AMS-147	144-148 MHz	Magnetic Mount
ATS-147	144-148 MHz	Trunk Lip Mount
AMS-220	220-225 MHz	Magnetic Mount
ATS-220	220-225 MHz	Trunk Lip Mount

YAGIS

A147-4	145.5-148 MHz	4 Element
A147-11	145.5-148 MHz	11 Element
A147-22	145.5-148 MHz	22 Element
214-FB	145.5-148 MHz	14 Element
A220-7	220-225 MHz	7 Element
A449-6	440-450 MHz	6 Element
A449-11	440-450 MHz	11 Element

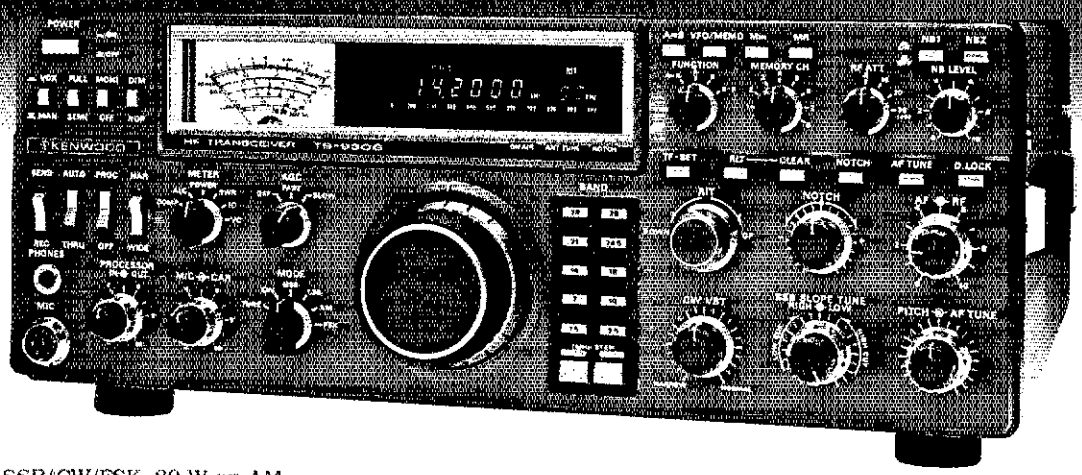
CROSS YAGI

FOR CW/SSB and FM

A147-20T 144-146 MHz Horizontal
145.5-148 MHz Vertical

cushcraft CORPORATION

THE ANTENNA COMPANY
48 Perimeter Road, P.O. Box 4680
Manchester, NH 03108



TS-930S

"DX-traordinary"... superior dynamic range, auto. antenna tuner, QSK, dual NB, 2 VFO's, general coverage receiver.

A superlative, high-performance, all solid-state HF transceiver, that covers all Amateur HF bands, and incorporates a 150 kHz to 30 MHz general coverage receiver having an excellent dynamic range.

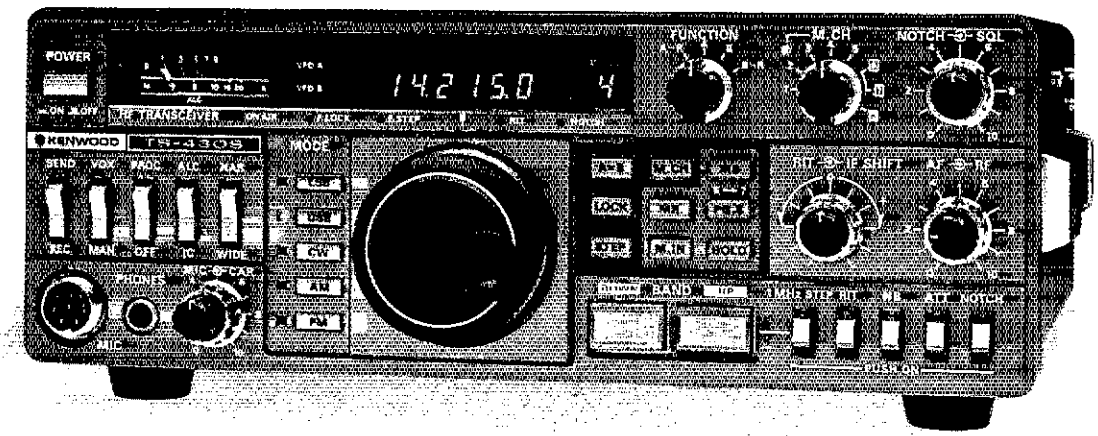
TS-930S FEATURES:

- 160-10 Meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC, on SSB, CW, FSK, and AM. UP conversion digital PLL circuit.
- Excellent receiver dynamic range. Typical two-tone dynamic range, 100 dB (20 meters, 50-kHz spacing, 500 Hz CW bandwidth).
- All solid-state 28 volt operated final amplifier. Lowest IM distortion. Power input 250 W on SSB/CW/FSK, 80 W on AM. SWR/ Power meter.
- Available with AT-930 automatic antenna tuner built-in, or as an option. Covers 80-10 meters, including WARC bands.
- CW full break-in. CMOS logic IC, plus reed relay. Switchable to semi break-in.
- Dual digital VFO's, 10-Hz steps, includes band information.
- Eight memory channels. Stores frequency and band data. Internal battery memory back-up, est. 1 yr. life. (Battery not Kenwood supplied.)
- Dual mode noise blanker. NB-1, with threshold control, for "pulse" noise. NB-2 for "woodpecker."
- SSB IF slope tuning, allows independent adjustment of the low and/or high frequency slopes of the IF passband.
- CW VBT and pitch control. VBT tunes out interfering signals. CW pitch control shifts IF pass-band and beat frequency. "Narrow-Wide" filter switch.
- Tuneable, peak-type audio filter for CW.
- AC power supply built-in.
- Fluorescent tube digital display (100 Hz resolution, modifiable to 10 Hz) with digitalized sub-scale, in 20-kHz steps.
- RF speech processor.
- One year limited warranty.
- SSB monitor circuit.

Optional Accessories:

- AT-930 Auto. 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 grade TCXO.
- MC-60A deluxe desk microphone, 8-pin, with pre-amplifier, UP/DOWN switches.

NEW



TS-430S

"Digital DX-terity"... General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch, COMPACT!

Combines compact styling with state-of-the-art circuit design and performance.

TS-430S FEATURES:

- 160-10 meters, with 150 kHz-30 MHz general coverage receiver. Covers all Amateur frequencies, plus WARC. UP-conversion digital PLL circuit.
- USB, LSB, CW, AM, and FM (optional) all mode.
- Compact lightweight design. Only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm); only 14.3 lbs. (6.5 kg.).
- Superior receiver dynamic range with Dyna-Mix high sensitivity direct mixing system.
- 10-Hz step dual digital VFO's. Operate independently, include band and mode information. Dial torque adjustable. Step switch for 10-Hz or 100-Hz steps. A=B switch shifts "B" VFO to "A" VFO frequency and mode, or vice versa. VFO LOCK switch. RIT for VFO or memory. UP/DOWN manual scan with optional UP/DOWN microphone.
- Eight memories store frequency, mode, and band data. 8th memory stores RX/TX frequencies independently.
- Lithium battery memory back-up. (Est. 5 yr. life.)
- Memory Scan.
- Programmable automatic band scan width.
- IF shift circuit for minimum QRM.
- Tuneable notch filter, built-in.
- Narrow-wide filter selection on SSB, CW, AM (filter optional).
- Speech processor, built-in.
- All solid state. Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Operates on 12 VDC or on 120 VAC, or 220/240 VAC with optional PS-430 AC power supply.
- Fluorescent tube digital display indicates frequency to 100 Hz (10 Hz modifiable).
- All-mode squelch circuit, built-in.
- Built-in noise blanker.
- RF attenuator (20 dB).
- VOX circuit, plus semi break-in with side-tone.

Optional accessories.

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m, incl. WARC.
- AT-230 base antenna tuner, 160-10 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-60A deluxe desk microphone, UP/DOWN switch.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

TR-9130

All mode (FM/SSB/CW) 25 watts, plus...!!!

The TR-9130 is a powerful, yet compact, 25 watt FM/USB/LSB/CW transceiver. Available with a 16-key autopatch UP/DOWN microphone (MC-46), or a basic UP/DOWN microphone.

TR-9130 FEATURES:

- 25 Watts RF output on all modes, (FM/SSB/CW).
- FM/USB/LSB/CW all mode. Selectable tuning steps of 100-Hz, 1-kHz, 5-kHz, 10-kHz.
- Six memories. On FM, memories 1-5 for simplex or ±600 kHz offset, using OFFSET switch. Memory 6 for non-standard offset. All six memories may be simplex, any mode.
- Memory scan.
- Internal battery memory back-up, using 9 V Ni-Cd battery, (not KENWOOD supplied). Memories are retained approx. 24 hours, adequate for the typical move from base to mobile. External back-up terminal on the rear.
- Automatic band scan.
- Dual digital VFO's.
- Transmit frequency tuning for OSCAR operations.
- Squelch circuit for FM/SSB/CW.
- Repeater reverse switch.
- Tone switch.
- CW semi break-in; sidetone.
- Compact size and lightweight.
- Covers 143.9 to 148.9999 MHz.
- High performance noise blanker.
- HI/LOW power switch. 25 or 5 watts on FM or CW.
- RF gain control. • RIT circuit.

Optional accessories:

- KPS-7A AC power supply.
- PS-20 AC power supply (TR-9500 only).
- BO-9A system base with memory back-up supply.
- SP-120 external speaker.
- TK-1 AC adapter for memory back-up.

TR-9500

70 CM SSB/CW/FM transceiver

- Covers 430-440 MHz, in steps of 100-Hz, 1-kHz, 5-kHz, 25-kHz or 1-MHz.
- CW-FM Hi—10 W, Low—1 W. SSB 10 W.
- Automatic band/memory scan. Search of selected 10-kHz segments on SSB/CW.
- 6 memory channels.

TR-7730

Dyna-"mite"... miniaturized, 5 memories, memory/band scan.

The TR-7730 is an incredibly compact, reasonably priced, 25 watt, 2 meter FM mobile transceiver, with five memories, memory scan, automatic band scan, plus other convenient operating features. It is available with a 16-key autopatch UP/DOWN microphone, (MC-46), or with a basic UP/DOWN microphone.

TR-7730 FEATURES:

- Dimensions: 5-3/4 W x 2 H x 7-3/4 D, inches. Weighs 3.3 lbs.
- Extended frequency coverage, 143.900-148.995 MHz, in 5 or 10-kHz steps.
- 25 watts RF output power, with HI/LOW power switch.
- Five memories. Simplex or repeater operation, with transmit offset switch. The 5th memory stores receive and transmit frequencies independently, for non-standard splits. Memory back-up terminal on rear panel.
- Memory scan, plus automatic band scan. Locks on busy channel, resumes when signals disappear, or when scan switch is pressed. Scan HOLD or PTT switch on microphone cancels scan.
- UP/DOWN manual scan on microphone, either version.
- Four digit LED frequency display.
- S/RF bar meter. LED indicators for BUSY, ON-AIR, REPEATER operation.
- Tone switch for internal tone encoder (not Kenwood supplied).
- Offset switch ±600 kHz, or simplex. Fifth memory for non-standard offset.

Optional Accessories:

- MC-46 16-key autopatch UP/DOWN microphone.
- SP-40 Compact mobile speaker.
- KPS-7A Fixed station power supply.

TR-8400

Synthesized 70-cm FM mobile rig

- Covers 440-450 MHz, in 25-kHz steps, with two VFOs.
- Transmit offset switch for ±5 MHz. Non-standard offset uses fifth memory.
- HI/LOW power switch selects 10 or 1 watt RF output.
- Similar to TR-7730 in other features, including five memories, memory scan, automatic band scan, UP/DOWN manual scan, four digit display, S/RF bar meter, LED indicators, tone switch, and same optional accessories.
- Basic UP/DOWN microphone supplied with unit.

KENWOOD

TRIO-KENWOOD COMMUNICATIONS
1111 West Walnut, Compton, California 90220

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Section Communications Managers/Section Managers of the ARRL

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

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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us..."

The American Radio Relay League, Inc., is a noncommercial association of radio amateurs, bonded for the promotion of interest in Amateur Radio communication and experimentation, for the relaying of messages by radio, for the advancement of the radio art and of the public welfare, for the representation of the radio amateur in legislative matters, and for the maintenance of fraternalism and a high standard of conduct.

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

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

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

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

The FCC No-Code Proposal: Ready or Not, Here It Comes

The latest FCC proposal to create a codeless class of Amateur Radio license is now "on the street." The Notice of Proposed Rulemaking in Docket 83-28, approved by the Commissioners at their January 20 meeting and released February 1, proposes two alternatives. One would drop the code requirement from the existing Technician license (without affecting present licensees' privileges), while the other, called the Experimenter license, would require a more difficult written examination similar in concept, but somewhat less demanding, than the Canadian Digital Amateur Class Certificate. Neither would confer operating privileges below 30 MHz; the precise limitations above that frequency are open to discussion. The full text of the FCC NPRM begins on page 49 of this issue; we urge you to study it carefully.

The initial reaction of many amateurs to the announcement of the FCC action was one of shock and indignation. The League had requested an 18-month deferral of the proposal, citing the importance of getting the volunteer examination program off to a smooth start. The request was denied, with the somewhat misleading explanation that the amateur community itself had requested the new volunteer exam system; the fact is that, in trimming amateur exams from its budget, the Commission left no alternative.

The FCC argues that "there are intelligent, disciplined persons who can make a valuable contribution to the Amateur Radio Service without proficiency in Morse Telegraphy," and cites the case of young people having a primary interest in computers. Another such source, says the Commission, is handicapped people. Some amateurs agree with the Commission's rationale, and see a codeless amateur license as a way of bolstering activity at the higher frequencies. Opponents, who at this point are far more numerous, argue that the Morse code has never been an obstacle to motivated young people. Similarly, many handicapped amateurs have been outspoken in defense of their wish for equal treatment, with concessions sought only in the manner in which they may demonstrate their Morse code skills.

Clearly, the FCC understands that the amateur community has long opposed a codeless class of amateur license. Why, then, its insistence on pushing such an unpopular idea? There are at least two theories.

The FCC proposal is regarded by some as part of a continuing effort to "solve" the CB problem, by offering a palatable alternative to those CBers who chafe under (or ignore) 27-MHz restrictions but resist learning the code. This is seen as a futile effort, likely to succeed only in expanding the problem to a new part of the spectrum and another radio service — ours.

On the other hand, the Commission has expressed the desire to attract more young people to Amateur Radio. Nearly everyone endorses this objective, but it is seen as a difficult and complex problem for which a codeless license is no panacea. Amateur Radio is not everyone's cup of tea; those who are interested in computers may not necessarily be attracted to Amateur Radio, although the integration of computer technology into Amateur Radio communications activities now underway can be expected to bring in additional numbers of young people without *any* changes in the licensing structure.

If the FCC realizes amateurs are opposed, but is intent on proceeding anyway, how much good will it do to file comments? Plenty! An important question needs to be answered: Is the Commission correct in its perception that there are hordes of otherwise well-qualified individuals waiting for the opening of this new entryway to Amateur Radio, or is this group neither as numerous nor as well-qualified as the FCC thinks? One way this question will be answered is through the comments filed with FCC by members of the general public, all of whom, amateurs or not, are eligible to comment — a powerful argument for filing!

The Commission perceives a codeless license as an entry-level license, from which new amateurs will progress as they discover the range of activities and pursuits available to other licensees. If this is valid, should not the newcomer be exposed in some way to the code at the point of entry, and perhaps be expected at least to be able to recognize Morse characters? This is but one of the dimensions that deserves to be explored in comments; you will find others suggested in the FCC Notice itself.

Form letters, petitions and one-sentence "I'm opposed to (or support) a no-code license" will not be nearly as persuasive as well-reasoned arguments. Even if you're opposed, you may wish to give the Commission some idea of the features a codeless license should have to be less objectionable to you. The introduction on page 49 explains the mechanics of filing comments with FCC by the deadline of April 29.

Finally, make no mistake about this: The no-code license — good or bad — is *not* an ARRL proposal, nor has it been endorsed by the League. The latest statement of policy was adopted by the Board of Directors at its March 1982 meeting, ". . . strongly opposing the issuance by FCC of any amateur license with no requirement for a knowledge of the Morse Code." If you want the League position to be something different, it's important to tell your Director before the Board Meeting on April 21!

— *Vic Clark, W4KFC, and David Sumner, K1ZZ*

League Lines...

What are your feelings on a new amateur license class not requiring any demonstrated ability to send and receive the international Morse code? The FCC is proposing such a license. For the text of this proposal and information on how to file your comments with the FCC, turn to page 49.

A third-party agreement is now in effect between the United States and St. Vincent (J8). St. Vincent includes the Grenadine Islands, and there may be some confusion regarding Grenada. There is no third-party agreement between the U.S. and Grenada.

The FCC will soon authorize the use of the AMTOR digital teleprinter code by radio amateurs in the amateur hf bands (3-30 MHz). Acting on a petition submitted by the League, the Commission ruled that AMTOR is sufficiently standard worldwide to be considered "plain language" and therefore permitted under international treaty. AMTOR is an improved, error-free RTTY system which automatically slows down transmission and reception of data under marginal and fading hf propagation conditions. The rules (see this issue, page 63) will go into effect upon publication in the Federal Register. We will pass along the effective date via W1AW. Further details will appear in next month's "Happenings." A complete description of AMTOR appears in June 1981 QST.

Do you own a so-called "touch controlled" device that is causing RFI? Hq. has received several isolated reports of interference to the a-m broadcast and 80-m and 160-m amateur bands from "touch controlled" lamps. The RFI is described as a "strong buzzing interference so great that it ruined several bands." If you are experiencing interference from similar devices, send details of the problem to the RFI Task Force, ARRL Hq.

The federal judge in the case Goumas v. City of Cerritos (California) has dismissed the complaint filed by George Goumas, N6AWF, and others against this city because of its restrictive antenna ordinance. The attorney in the case, Fred Lawson, K6JAN, has filed for an immediate appeal to the U.S. Court of Appeals for the 9th Circuit. We will keep you informed of further developments.

The FCC has proposed to create a new Private Radio Communications Service at 900 MHz to satisfy "a documented public need for direct, affordable mobile communications." The proposed new service would be allocated spectrum at 898-902 and 937-941 MHz, making 133 frequency pairs available. According to the Commission, the new service would not have individual licenses, but repeater stations would be licensed. The proposal would not affect the present Citizens Band (CB) Radio Service. The docket number is General Docket 83-26, and more information is available from the FCC at (202) 632-4964.

The VHF/UHF Century Club Awards program announced in January QST has taken off like a rocket. Applications are now available from Hq. Maps will be available soon. Volunteers are needed to act as local check points for verifying QSLs and applications. For more information, contact ARRL Communications Manager John Lindholm, W1XX, at Hq.

The Club and Training Department at ARRL Hq. is looking for an assistant training manager. Solid writing ability and an Advanced class amateur license are essential. Contact Steve Pink, KF1Y, at Hq. for details.

The complete W1AW winter operating schedule appears in October QST, page 67. A W1AW schedule is also available on request from Hq. for a self-addressed, stamped envelope. For the times and dates of Code Proficiency Runs, see the Contest Corral section of this QST. The W1AW summer schedule will appear in the April issue.

QST contributing editors (those who write QST columns but don't work at Hq.) are always happy to hear your comments and suggestions. They'll get your message quicker if you send it to their home address listed at the bottom of the page the column appears on, not Hq. If you'd like a quick reply, please enclose an s.a.s.e.

The Jet Propulsion Laboratory Amateur Radio Club has received a 90-day extension of a temporary waiver from the FCC, permitting it to retransmit, on Amateur Radio frequencies, radio communications from the Space Shuttle Columbia. The next flight is scheduled for mid-April.

Make Mine Modular: Easy-to-Build Receiving Converter and Test Equipment for 435 MHz

The amateur experimenter is not dead! Get in on the uhf excitement. Easily found parts yield high performance on a low budget.

By John C. Reed,* W6IOJ

A lot of interesting activities take place in the 70-cm band. I am particularly interested in the amateur satellite program. To operate OSCAR 8, Mode J, I needed a receiving converter for 435 MHz. I decided to build one.

There are two potentially discouraging hurdles to get over in a project of this kind. The first is where to buy the parts. I was able to put together a relatively high-performance converter using parts purchased mostly from Radio Shack. A mail order parts emporium carried the few remaining items that were not in my "junk box."[1]

The second potential discouragement is where to find the uhf test equipment for troubleshooting and alignment. Highly sophisticated equipment is not needed; you can construct the test equipment you need. This article will show you how.

I built my first 435-MHz converter on a 6-inch-square pc board.[2] It worked, but there were a number of compromising limitations. I also found it difficult to make changes. What to do? Start over and forget about the shape and size — make it easy to work with. The final version had three separate assemblies: oscillator, mixer and preamplifier. This new arrangement resulted in simple assemblies that are stable without shields — an important convenience during checkout and alignment.

Oscillator

This module is mounted on a 5 × 4-1/4 inch double-sided pc board (Figs. 1 and 2). The layout deliberately places the input and output circuits for each stage on opposite sides of the pc board. Isolation provided by this method allows stability without additional shielding. I use no-etch circuit boards. Construction is easy and the results are good.

I chose a 29.5-MHz-and-up converter i-f. Oscillator output at 405.5 MHz is the eighth harmonic of the 50.7-MHz crystal. Three criteria guided the design process. I wanted a simple circuit that had plenty of spurious-free output.

Circuit simplicity dictated the use of an FET for Q1. The piston-trimmer and feedthrough capacitors were purchased from Meshna. The 24-pF capacitor in the source lead of Q1 is actually two 47-pF, disc-ceramic capacitors in series. Being satisfied with their performance, I chose to use disc-ceramic capacitors throughout the project.

A simple pi network provides coupling between Q1 and Q2. The 100-pF capacitor should be mounted as close as possible to the base of Q2 to prevent spurious oscillations. Reasonable Q is maintained in the 202.7-MHz tuned circuit through the use of link coupling. Spurious signals at this point are at least 40 dB below the desired signal.

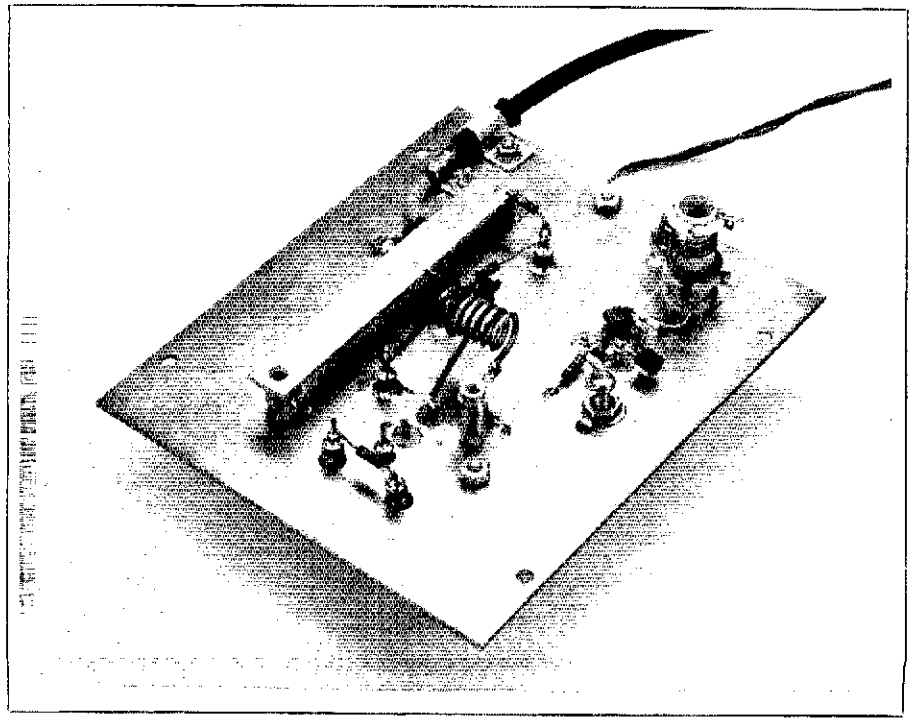

Fig. 1 — Photograph of the local-oscillator module.

[1]Notes appear on page 15.

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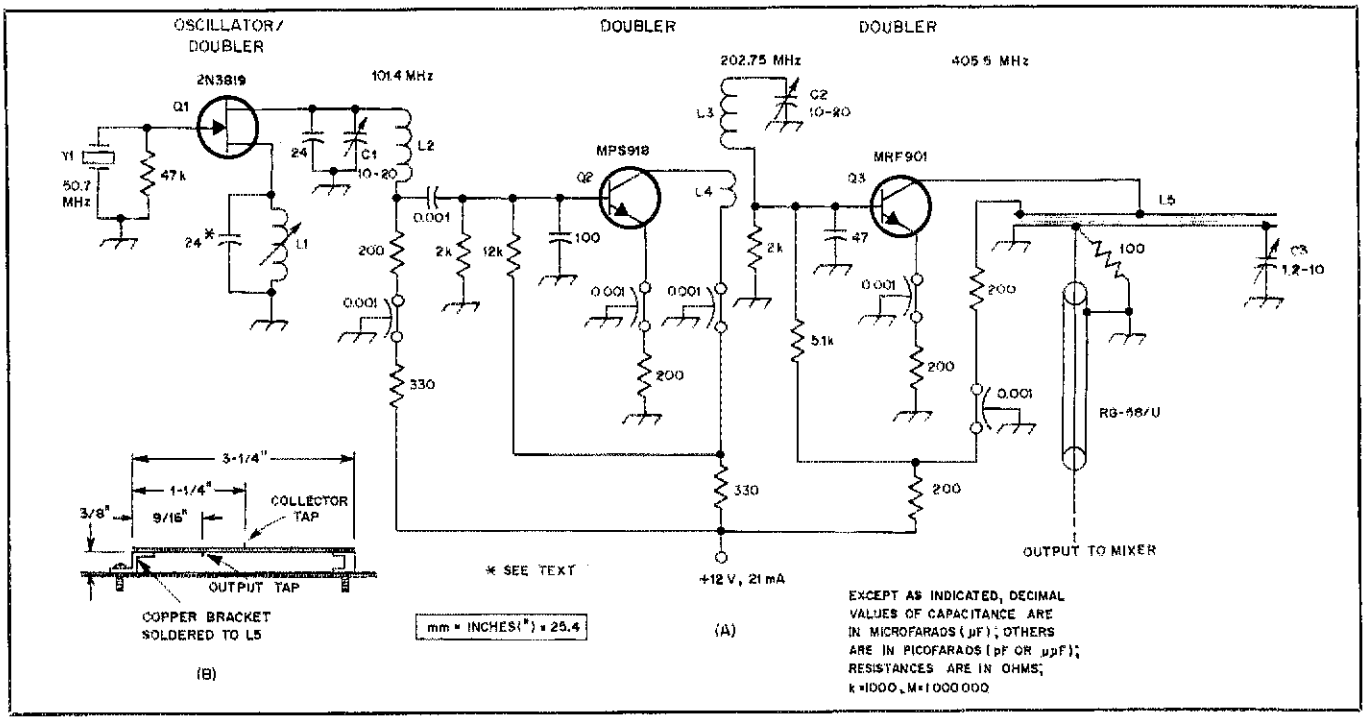


Fig. 2 — Schematic diagram of the local oscillator is shown at A; a detail drawing of L5 is at B. All resistors are 1/4 W; fixed-value capacitors are disc ceramic. Feed-through capacitors are from Meshna, part no. H-30.

C1, C2 — 20-pF piston trimmer (Meshna SP-109).
C3 — 10-pF piston trimmer (Meshna SP-109A).
L1 — 0.327 to 0.587 μH (Miller 40A477CB1).
L2 — 5 turns of no. 14 wire, 3/4 in. long and 1/4 in. in diameter.
L3 — 7 turns of no. 14 wire, 3/4 in. long and 1/4 in. in diameter.
L4 — 2 turns of no. 22 hook-up wire, 1/4 in. in diameter.
L5 — 3-1/4 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. Q3 collector tap 1-1/4 in. from cold end. Output tap 9/16 in. from cold end.
Q1 — Radio Shack 276-2035.
Q2 — Radio Shack 276-2011.
Q3 — Radio Shack 276-4055.
Y1 — Third-overtone crystal (International Crystal Mfg. Co., no. 031081).

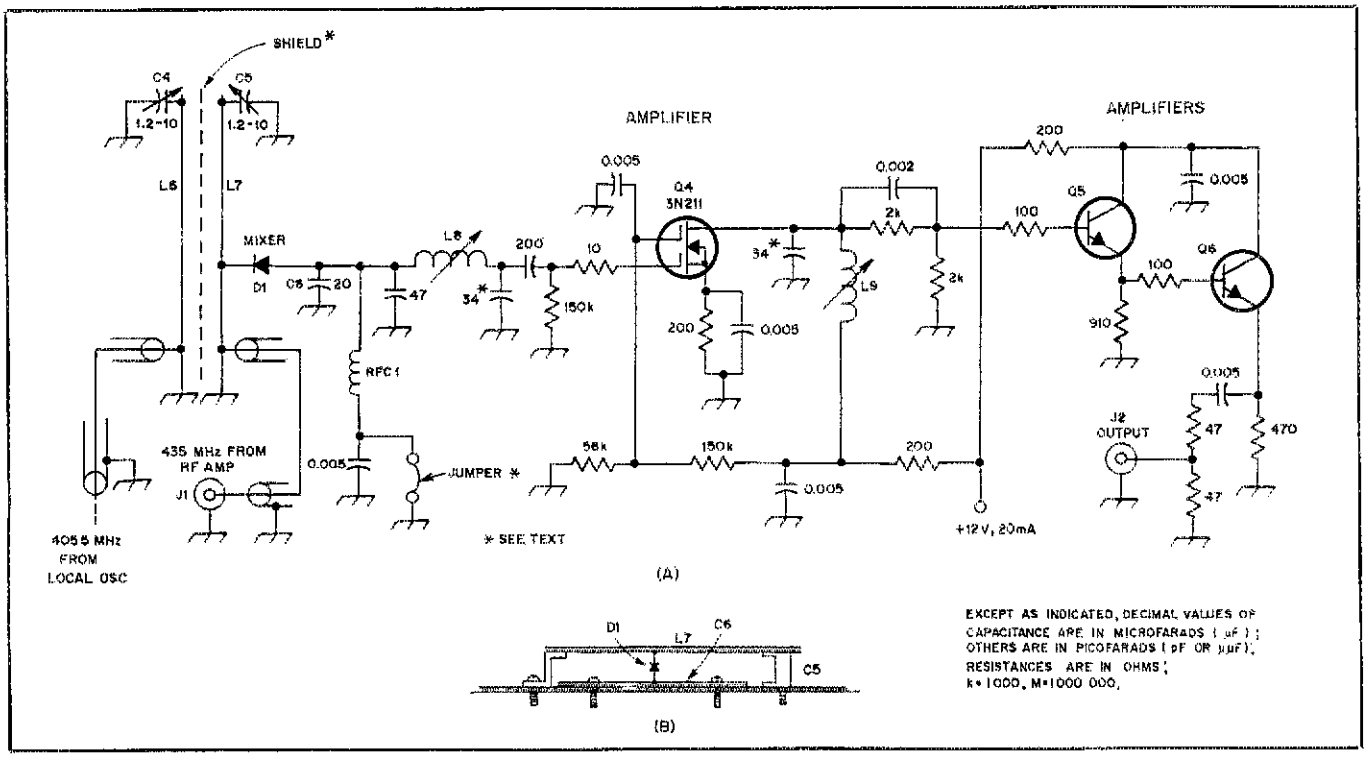


Fig. 3 — Schematic diagram of the mixer is shown at A; a detail drawing of L7 and C6 is at B. All resistors are 1/4 W; fixed-value capacitors are disc ceramic.

C4, C5 — 10-pF piston trimmer.
C6 — 2-1/2 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. See text.
D1 — Schottky diode (Radio Shack 276-1124).
J1, J2 — UG-1094 BNC chassis connector (Radio Shack 278-105).
L6, L7 — 3-1/4 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. L6 input tap 3/4 in. from cold end. L7 input tap 3/8 in. from cold end. D1 tap 1-1/4 in. from cold end.
L8, L9 — 0.63 to 1.02 μH (Miller 40A827CB1).
Q5, Q6 — Radio Shack 276-2033.
RFC1 — 42 turns of no. 34 wire wound on a 10-kΩ, 1-W resistor.

I have had some difficulties with the Radio Shack 276-2011 bipolar transistor (Q2). I bought eight of them and two were inoperable. Of the remaining six, only one had the lead connections listed on the package. I have never experienced this problem with other Radio Shack semiconductors.

As with Q2, mount the 47-pF capacitor as close to the base of Q3 as possible. A strip-line circuit, resonant at 405.5 MHz, is coupled to the collector of Q3. The collector tap position on the strip line was determined experimentally for best signal purity consistent with reasonable output.

All converter strip lines are made from double-sided glass-epoxy pc board. The necessary dc isolation is obtained by using both sides of the board. Compatibility with the piston-trimmer capacitors led to the choice of 3/8-inch-wide strip line, spaced 3/8 inch away from the pc mounting board. The strip lines, at their "cold" ends, are fastened to the mounting board by means of copper brackets (Fig. 2B).

Output is approximately four times that required by the mixer; it appears to be relatively free from spurious energy. Tuning the output strip line either plus or minus 50.7 MHz produces no perceptible output.

Mixer

I tried several active mixers using commonly available FETs. Rated to perform above 500 MHz, the devices did show considerable gain. However, noise-figure performance was better using a Schottky diode. It is a bit more difficult to make a single-ended diode mixer circuit perform optimally. Nevertheless, adjusting for optimum noise figure is not a formidable task when the local oscillator is clean and you have a gated noise source.

Two strip lines, mounted with their centers 7/8 inch apart, are used in the input of the mixer circuit (Figs. 3 and 4). Owing to the high oscillator output there should be very light coupling between L6 and L7. Coupling is controlled by an L-shaped shield of solid, light-gauge aluminum. A pair of screws through the foot of the shield mounts and holds it centered between the strip lines. I adjusted the shield dimensions for about 1 to 2 mA of mixer current. Mixer current can be read by substituting a milliammeter for the jumper from RFC 1 to ground.

Mounting details for C6 are shown in Fig. 3B. The capacitor is formed by the two sides of a piece of double-sided pc board. Be sure to remove copper from around the mounting-screw heads. That will prevent short-circuiting the capacitor.

A pi network is used to obtain an impedance match between the mixer diode and the low-noise MOSFET, Q4. The 34-pF capacitors at the input and output of Q4 are actually each a pair of series-connected 68-pF disc-ceramic units.

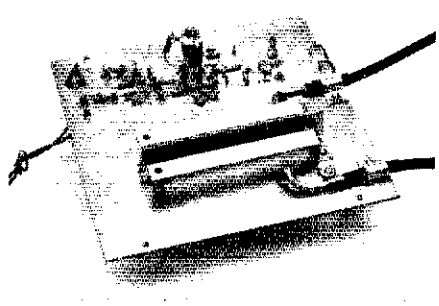


Fig. 4 — Photograph of the mixer module.

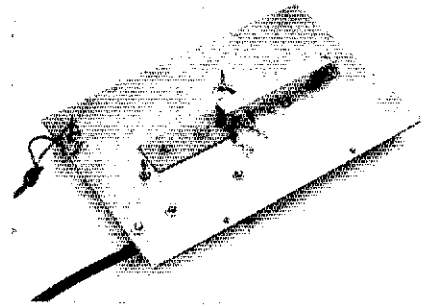


Fig. 5 — Photograph of the rf-amplifier module.

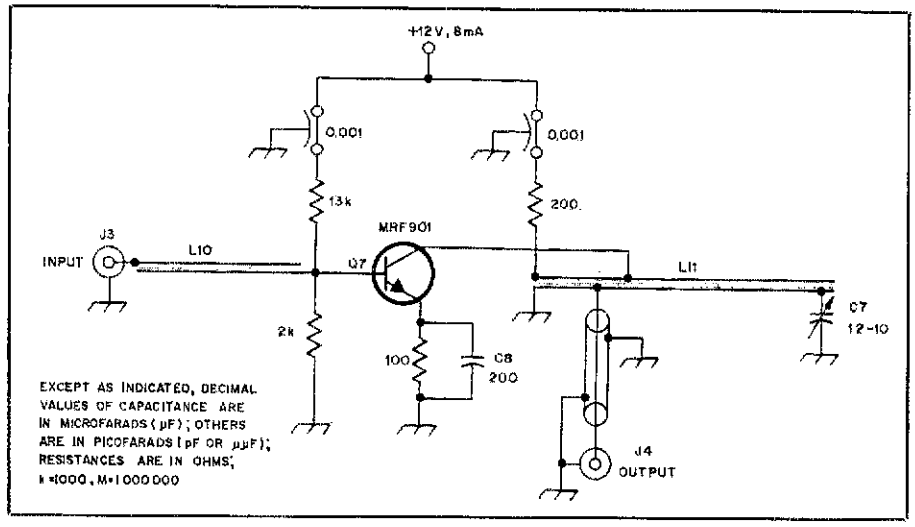


Fig. 6 — Schematic diagram of the rf amplifier. All resistors are 1/4 W; fixed-value capacitors are disc ceramic unless otherwise specified. Radio Shack part numbers are in parentheses.

C7 — 10-pF piston trimmer.
C8 — 1-3/4 × 3/4-in. pc board insulated from mounting board by Saran Wrap®. See text.
J3, J4 — UG-1094 BNC chassis connector (278-105).
L10 — 2-3/4 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. Bias resistor tap is 1/2 inch from transistor end.
L11 — 3 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. Collector tap 7/8 in. from cold end. Output tap 1/2 in. from cold end.
Q7 — (276-2044).

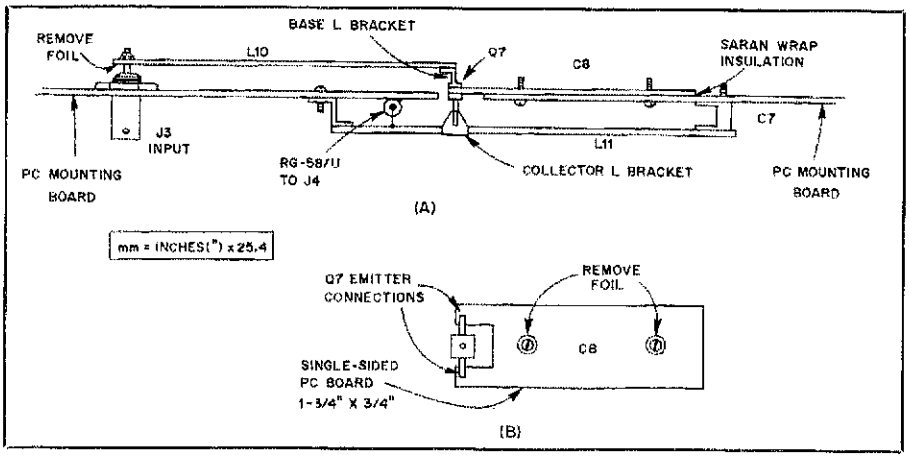


Fig. 7 — Rf amplifier module assembly detail is shown at A; details of C8 are at B.

Post-amplifier gain (approximately 40 dB) is much more than is usually required for the application. Emitter followers Q5 and Q6 were chosen for low output impedance, simplicity and stability.

The module is mounted on a 5-1/2 × 5-1/2 inch double-sided pc board. Input and output circuits are mounted on

opposite sides of the board to provide isolation.

Preamplifier

It would be nice to use a GaAs FET preamplifier. However, the readily available and inexpensive MRF901, with a rated noise figure of approximately 1.5 dB and a gain of 20 dB at 450 MHz, is not a poor compromise. The transistor is a consistent and stable performer.

The preamplifier is mounted on a 6 × 4-1/2 inch double-sided pc board (Fig. 5). A broadband strip-line circuit is used for input coupling (Fig. 6). Double-sided pc board provides dc isolation between the antenna and the transistor base circuit. A special emitter-bypass capacitor is made from pc-board material insulated with Saran Wrap® (Fig. 7). Saran Wrap is a soft material, and exceptional care must be taken to ensure that the mating surfaces are smooth; soldering must be done before assembly. I have experienced no problems with the material after final assembly.

The position of the collector tap on the output strip line was determined experimentally. It was set for a near-maximum-gain condition, consistent with a reasonable Q. The output circuit is sharp enough to provide substantial rejection of the 376-MHz image.

Mode-J Filter

Energy from the 145-MHz uplink transmitter may overload or "desense" the preamplifier. A strip-line filter has proved effective in preventing this (Figs. 8 and 9). L12 and L13 are spaced 1/2 inch on centers. Insertion loss of the filter is slight, being barely perceptible with a noise generator and oscilloscope. Checks were made with the filter in and out of the line.

Test Equipment

You don't need a digital ohmmeter to check continuity — a battery and lamp or buzzer will do the job. Having a lab full of uhf test equipment is nice, but a few relatively simple devices will add little to the complexity of this project. Those devices, properly used, will virtually ensure successful performance.

Lecher Wires

How would you measure frequency in the uhf range? Would you try to borrow a uhf frequency counter? (You probably don't own one — they are expensive!) Lecher wires have been around almost as long as radio communication. They can be used to determine frequency with a fair degree of accuracy; they are also simple, inexpensive and easy to use. When the end-effect factor has been calculated while using a known frequency, further measurements can be made with 1% accuracy.

Simple Lecher wires are shown in Fig. 10. A one-turn loop is mounted permanently at the shorted end; a sliding short can be moved freely along the wires. Resonance of the Lecher wires is indicated by a null in the reading on the external VTVM. Using the known frequency output from the oscillator module, I was able to calculate end effect using the formula:

$$\ell \text{ (inches)} = \frac{5904}{f(\text{MHz})} \times \text{end effect} \qquad \text{(Eq. 1)}$$

The result, 0.96, was substituted into the formula, which was then used to calibrate the frequency scale opposite the sliding short.

Before the Lecher wires were calibrated, I used them to great advantage during the development of the oscillator. One time I was able to detect, and consequently eliminate, an 800-MHz spurious oscillation. Another time, I discovered that the final doubler stage was actually acting as a tripler. After retuning, it functioned properly. Later, when the Lecher wires had been calibrated, they were used to calibrate the uhf test oscillator.

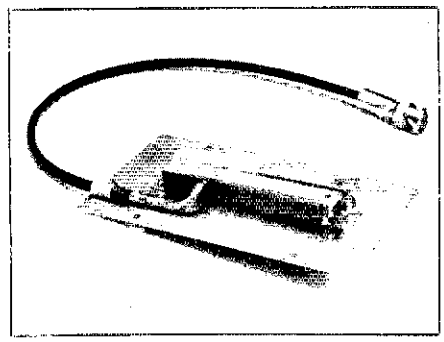


Fig. 8 — Photograph of the Mode-J filter.

Uhf Test Oscillator

I had two goals for the test oscillator design: It should have a wide frequency range and no major output level variations. The simple circuit shown in Fig. 11 is the result. The output frequency is varied through two ranges. With C12 set at maximum capacity, C11 tunes the oscillator from 340 to 420 MHz; with C12 at minimum, C11 tunes from 410 to 510 MHz. An L network output attenuator was chosen to minimize output variations as a function of frequency. An additional 20 dB of attenuation is used at J9.

A polystyrene block supports the

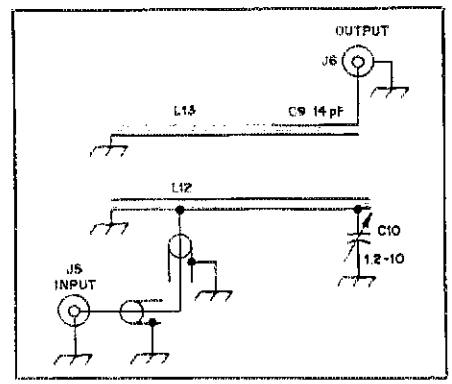


Fig. 9 — Schematic diagram of the Mode-J filter.
C9 — 14-pF pc-board capacitor (formed by removing 1-1/2 in. of foil from the top side, cold end of L13).
C10 — 10-pF piston trimmer.
J5, J6 — UG-1094 BNC chassis connector.
L12 — 3-1/4 × 3/8-in. glass-epoxy pc board. Input tap 7/8 in. from cold end.
L13 — 3-1/4 × 3/8 × 1/16-in. double-sided glass-epoxy pc board.

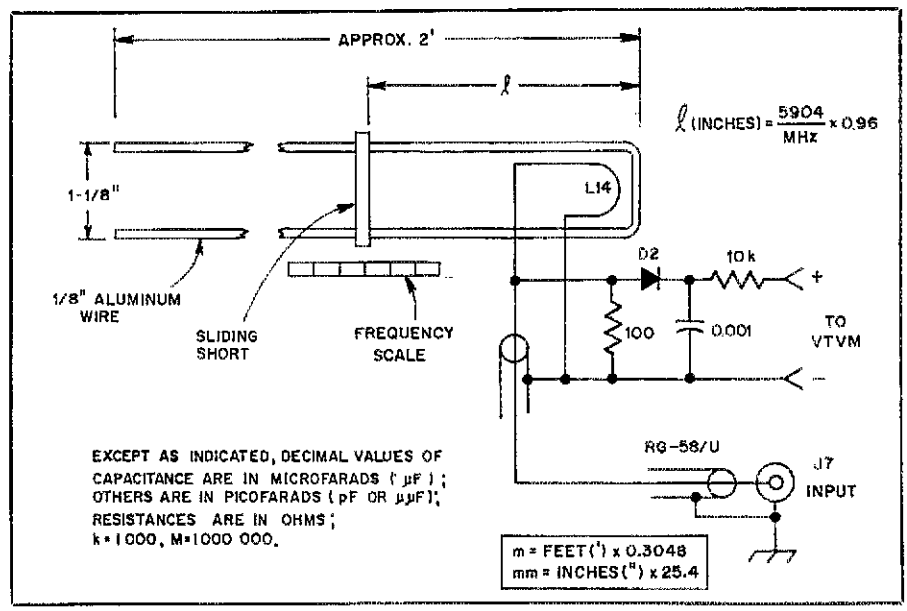


Fig. 10 — Diagram of the Lecher wires.
D2 — Schottky diode (Radio Shack 276-1124).
J7 — UG-1094 BNC chassis connector.
L14 — Single-turn loop of no. 14 wire, 1 × 9/16 in.

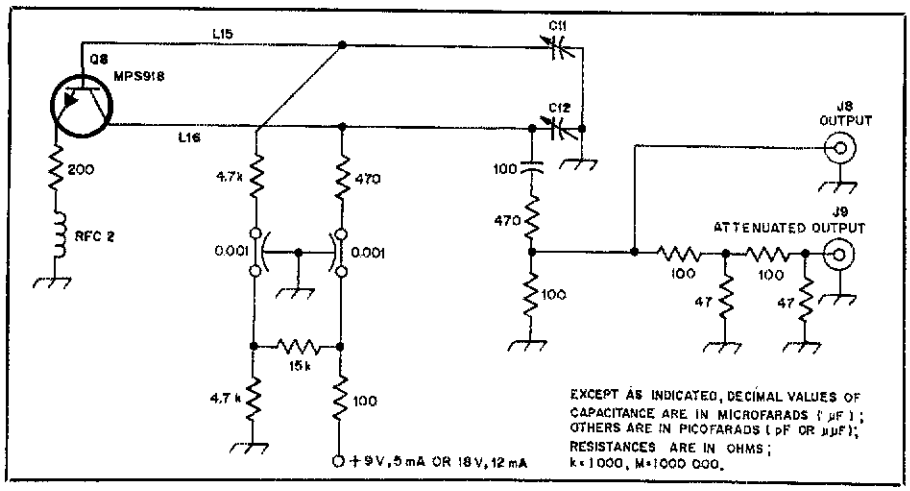


Fig. 11 — Schematic diagram of the uhf test oscillator. All resistors are 1/4 W; fixed-value capacitors are disc ceramic.

C11, C12 — 9-pF subminiature variable (Johnson 9M11 or equiv.).
J8, J9 — UG-1094 BNC chassis connector.
L15, L16 — No. 14 copper wire 5-3/4 in. long, tapped 2 in. from the hot (C) end.
Q8 — Radio Shack 276-2011.
RFC2 — 15 turns of no. 28 wire wound 3/4 in. long on a 1/4-in.-diameter plastic form.

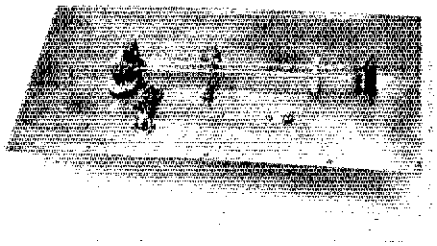


Fig. 12 — Photograph of the uhf test oscillator.

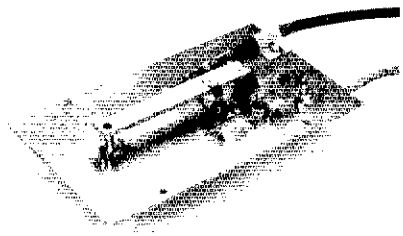


Fig. 13 — Photograph of the gated noise generator.

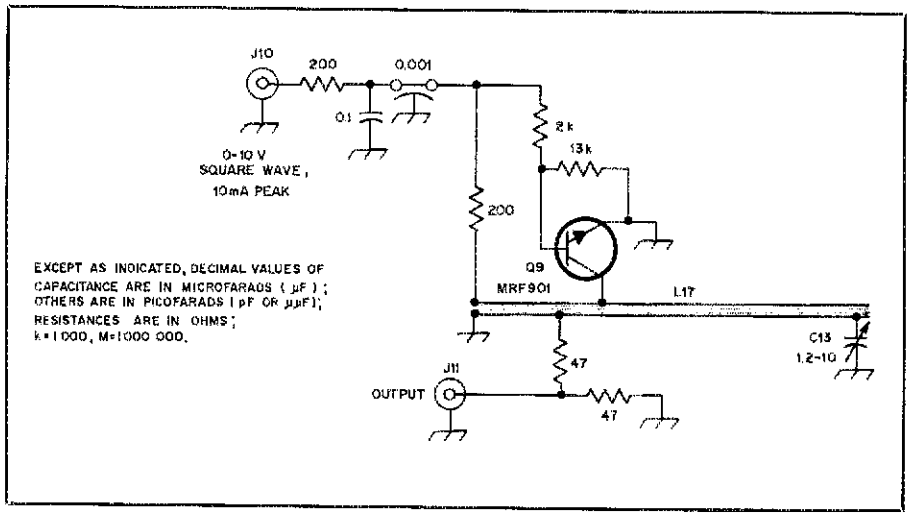


Fig. 14 — Schematic diagram of the gated noise generator. All resistors are 1/4 W.

C13 — 10-pF piston trimmer.
J10 — Phono connector, single-hole mount.
J11 — UG-1094 BNC chassis connector.
L17 — 3 × 3/8 × 1/16-in. double-sided glass-epoxy pc board. Collector tap 7/8 in. from cold end. Output tap 1/2 in. from cold end.
Q9 — Radio Shack 276-2044.

"cold" (transistor) end of L15 and L16; spacing between them is 5/16 inch. They are both spaced 3/8 inch above the pc mounting board (Fig. 12).

Frequency stability is poor, particularly as a function of input voltage. This makes the signal unsuitable for tests using a narrow-bandwidth receiver at the i-f. It can be easily used to check the converter if you add a diode detector at the mixer module output.

I used the test oscillator for two major purposes. First, it proved helpful in checking initial strip-line resonance. When the oscillator output is coupled into a strip line, several volts of rf will be present when the line is tuned to resonance. Rf voltage can be measured by means of an rf probe that uses a Schottky detector diode. Some loading will result from connecting the probe to the strip line; this can be minimized by moving the probe toward the cold end.

A second use of the oscillator was as a large-signal source for converter testing. This allowed me to check for spurious responses that might result from stray resonances or faulty local-oscillator injection. In addition, I was able to get an idea of converter image response. Owing to the lack of frequency stability, however, use of a narrow-band i-f was not possible. A simple diode detector at the mixer-module output works just fine.

Noise Source

Since the 1979 edition, *The Radio Amateur's Handbook* has contained a description of a gated noise source and the procedure for using it.[3] Although the procedure section is fine, I found that the output level was low at 435 MHz. The circuit shown in Figs. 13 and 14 overcomes that problem. Noise output is sufficient to permit using a 50-ohm terminating network to ensure proper loading. A strip-line tuned circuit limits noise output to the 70-cm region; this helps prevent tune-up on the image frequency. Noise output is a function of input voltage. I use an ancient square-wave generator to supply up to 10 peak volts of square-wave drive.

Final Comments

Perhaps you are now a little more inclined to try building a uhf converter — I hope so! Building your own gear and test equipment (and getting it to perform properly) is indeed a satisfying achievement. It is also great experience for hams who want to learn more about uhf.

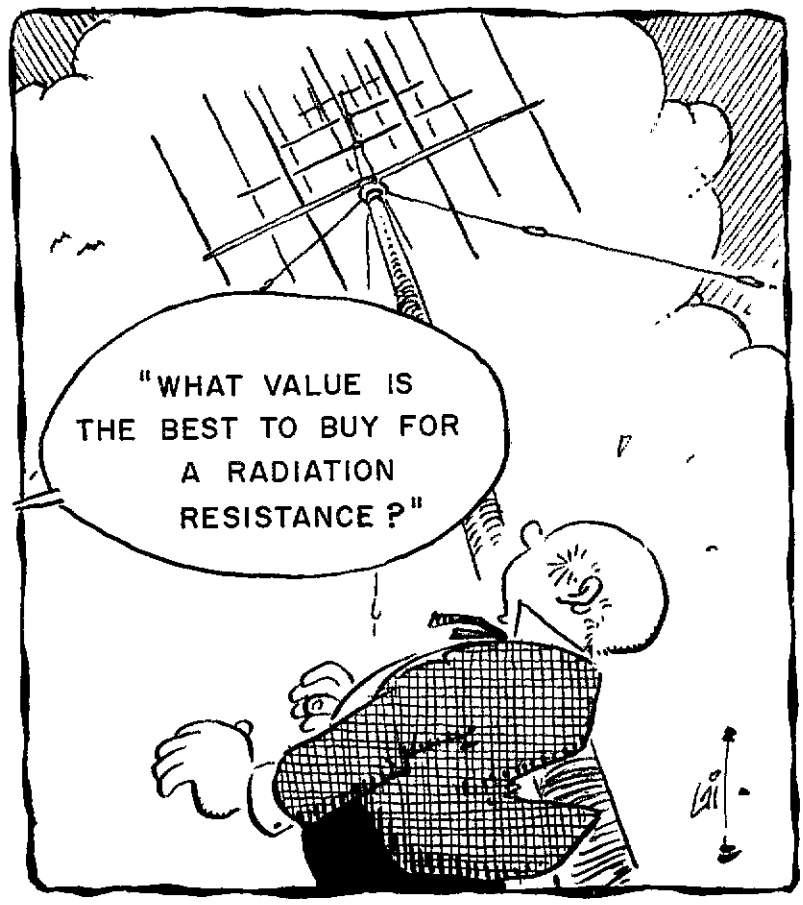
My desire was to operate OSCAR 8, Mode J. The converter has performed in a respectable manner for me on Mode J. I have enjoyed QSOs with hams as far away as New England and as close as Los Angeles. My next plans for the converter are to use it in conjunction with the Phase III satellite on Mode L. See you there?

Notes

[1]John J. Meshna Jr., Inc., P.O. Box 62, E. Lynn, MA 01904.
[2]mm = in. × 25.4.
[3]*The Radio Amateur's Handbook* (Newington: ARRL, Inc.), Chapter 16.

BEGINNER'S BENCH

A Simple Approach to Antenna Impedances



Every active amateur owns at least one antenna. And every antenna has a property we call impedance. You can't see it and you can't feel it, but it's there.

By Jerry Hall,* K1TD

In July 1977 *QST*, we introduced two fictitious characters, Gus and Jack.[1] Gus was the seasoned amateur, the fellow who had tutored several folks into Amateur Radio and helped them progress to the higher classes of license. Jack was the new Novice who lived down the street from Gus. In 1977 Gus was helping Jack learn some of the theory he'd need for the General class exam. Well, he passed that exam with flying colors, and has since gone on to obtain his Amateur Extra ticket.

But enough about Jack. Our scenario now opens with Gus and Donna working on an antenna in Donna's backyard. Donna is a young housewife who had just received her Novice ticket a few days before. She has already made a few 80-meter contacts with a wire dipole antenna, but is itching to work some DX (foreign countries). Donna's OM bought her a new 15-meter beam, and she accepted Gus's offer of assistance in getting it up. (Her OM knows *nothing* about these things, she told Gus.) The installation is going smoothly, with Gus and Donna simply following the manufacturer's instruction sheet for the assembly of the array. But Donna wants to understand all the technical information in the instruction sheet and the brochures that accompanied the antenna. Let's listen as they converse.

"Gus," Donna is saying, "will my SWR curve be exactly like this curve here?" She was referring to the printed instruction sheet for the antenna they were assembling. Donna already knew that SWR stood for standing-wave ratio.

"Well," Gus began his careful reply. "That curve is typical for this antenna. We'll measure the SWR across the band later and see what we get, but it should be close to what they show there."

"You mean it won't be exactly the same," Donna inferred from Gus's reply. "Will that mean there's something wrong with my antenna, like maybe we didn't put it together right?"

"Oh, no, nothing like that," Gus was quick to say. "What I mean is that the impedance of any antenna will depend a lot on where it is installed. Its height above ground and being near other objects will have the greatest effect on the impedance."

"Yes, but what does that have to do with the SWR curve," Donna asked.

"Well, no two antenna installations are exactly alike. The impedances for your antenna may be a little different from

[1] J. Hall, "A Simple Approach to Complex Circuits," *QST*, July 1977, p. 35.

*Associate Technical Editor

those at the factory when they measured the SWR, even though the antennas are identical. And that could change the SWR curve a little bit," Gus explained.

"I guess I don't really know what impedance is," Donna confided. "How do different impedances change the SWR curve?"

Radiation Resistance

"Oh," exclaimed Gus, realizing he hadn't answered Donna's question as clearly as he could have. "Forget about impedance for a little bit, and let's talk about resistance. You remember what resistance is, don't you?"

"Yes," Donna answered, "resistance is something in a circuit that limits the flow of electric current." "That's right," said Gus. "When you're talking about an ordinary circuit, that kind of resistance consumes power, and it produces heat in the process. The consumed power can be calculated from the equation

$$P = I^2R \qquad \text{(Eq. 1)}$$

where

P = power in watts
I = current in amperes
R = resistance in ohms

An antenna also has resistance, but . . ."

Donna interrupted, "But won't that resistance be *really* low? For my 80-meter dipole there's nothing but copper wire. And for this beam antenna it's all aluminum tubing. That can't have very much resistance, can it?"

"That's true," Gus agreed. "But the kind of resistance I'm talking about is called the *radiation resistance* of the antenna. It isn't a real resistor. In fact, you can't even measure the value of the radiation resistance with an ohmmeter."

"I don't understand," said Donna. "How can you have a resistance that you can't even measure?"

"Oh, you *can* measure it," Gus remarked, "but it takes a special kind of measuring instrument." [See the article by Priedigkeit elsewhere in this issue. — Ed.] "I just said you can't measure it with an ohmmeter. That's because it isn't the same as an ordinary resistor. Let's say you key your transmitter with your antenna connected. And let's say that 100 watts of power is delivered to the antenna terminals through the transmission line. What happens to that 100 watts?"

"Well, I guess it gets radiated," was Donna's reply.

"Yes, that's right. Most of it does get radiated, and that's the useful part of the energy. But current flows in the wire or tubing, and a small part of that energy is converted to heat. This happens because of the resistance you were thinking about. The heating losses are usually called ohmic losses, and the same old I^2R equation applies (Eq. 1, above). In the case of these heat losses the resistance is real; it's the resistance of the copper or aluminum conductors. But in the case of the power being radiated from the antenna, the resistance is only assumed to exist. Its value is the one that would consume the power being radiated by the antenna."

"Oh," said Donna, "what value is the best to buy for a radiation resistance?"

"You can't just go out and buy a value of radiation resistance to your liking," Gus explained. "Each different type of antenna has its own radiation resistance, and that value depends on the fundamental design of the antenna. For example, a half-wave dipole that is far away from the earth and any other objects would have a radiation resistance of about 73 ohms. We call this its free-space resistance. This resistance can go either up or down from that value when you put the dipole close to other objects or at a practical height above the ground. Are you with me so far, Donna?"

"I think so," she stated. "What about other antennas? What kind of radiation resistance will this 15-meter antenna have?"

"Good question," Gus commented. "This is a 3-element parasitic beam. It has one driven element and two parasitic elements. The driven element is like a dipole."

"Oh," chimed in Donna, "then will the free-space radiation resistance of my beam be 73 ohms?"

"No, it'll be much lower. That's because of the presence of the two parasitic elements. It'll probably be something like 20 to 30 ohms."

"Well, then, shouldn't we use something besides this 50-ohm coax to feed the beam?" Donna asked.

"No, we're okay on that. The manufacturer has included this matching arrangement to transform the low resistance up to 50 ohms, so you *can* feed it with 50-ohm line," Gus explained. "This kind of matching arrangement is called a beta match. Another popular type is a gamma match. But I won't go into matching arrangements just now. Maybe we can talk about them later."

"Okay," replied Donna. "A little bit ago you said a *half-wave* dipole had a radiation resistance of 73 ohms. What if it's not a half wave? Will the radiation resistance be different?"

"Aha!" Gus exclaimed. "You're thinking the resistance might change with antenna length, and you're right. If the dipole were made shorter, its radiation resistance would go to lower values. And if it were made longer, the resistance would go higher, up to a point. Now tell me, Donna, what happens to the radiation resistance if we have a fixed length for an antenna, but we use it for different frequencies, like your 80-meter dipole? You use that for several different frequencies in the Novice band, you know."

"Well," Donna mused, "the antenna is a half-wavelength long for 80 meters, so I guess if it were in free space it'd be 73 ohms for all the Novice frequencies. Is that right?"

"Not quite," was Gus's reply. "The antenna is really a half-wavelength long at *just one* frequency. As you move up or down from that frequency, the antenna is not an electrical half wave any more. So its radiation resistance changes as you move in frequency."

"Oh, I see!" Donna exclaimed. "That's why my SWR reading changes when I change frequency."

Antenna Reactance

"Partly true," said Gus. "But across the 80-meter Novice band the radiation resistance won't change very much — only a few ohms. And that by itself won't have much effect on your SWR. But remember, I mentioned the antenna is really a half-wavelength long at just one frequency. At that frequency the antenna is said to be resonant. And resonance means there is no reactance present. You remember what reactance is, don't you Donna?"

"Doesn't reactance come from circuit elements that don't consume any power?"

"Exactly right. And remember, Donna, only resistances can absorb power. Or in the case of the radiation resistance, you might say it can radiate power. You know what kind of circuit elements have reactance, don't you?"

"Oh, sure," Donna replied, "inductors and capacitors. And now I'll bet you're going to tell me that an antenna can have reactance, even though there aren't any inductors or capacitors there."

Gus exclaimed, "You took the words right out of my mouth! With a half-wave dipole, you get inductive reactance as you go above the resonant frequency. And you get capacitive reactance when you go below. It's exactly the same as a tuned circuit. At circuit resonance there is no reactance, and as you depart from resonance, you get either inductive or capacitive reactance, depending on which way you changed the frequency."

"I see," Donna said gleefully. "A little while ago you said the radiation resistance didn't change much over the band, and you said the change wouldn't have much effect on the SWR. Then it must be the reactance that makes the SWR go up when I change frequency."

"Exactly right," Gus confirmed. "How about if we take a short break from putting this antenna together, and I have you do some simple calculations on paper? You're very close to having a good understanding of antenna impedance."

"Good idea," Donna thought aloud.

Antenna Impedance

Inside, Donna fixed cool drinks to sip while she and Gus talked. "You know,

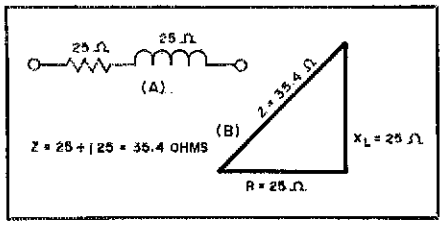


Fig. 1 — Electrical circuit and diagram representing an impedance of 25 + j25 ohms. The lower-case j is a shorthand notation indicating that the ohmic values cannot be added directly. The plus sign with the j indicates inductive reactance.

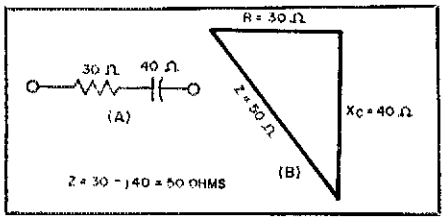


Fig. 2 — Electrical circuit and diagram representing an impedance of 30 − j40 ohms. The minus sign with the j indicates capacitive reactance.

Donna, an impedance is nothing more than what you get from a circuit that has both resistance and reactance in it. And as I've indicated, an antenna behaves just like a circuit." Gus explained further, "You've heard me talk about antenna impedance. Such an impedance is made up of some resistance and some reactance. The resistance and the reactance are both measured in ohms. What if we had an antenna with 25 ohms of radiation resistance and 25 ohms of inductive reactance? Can you tell me what the total antenna impedance would be?"

"I think it'd be 50 ohms," was the reply, "25 plus 25."

"Nope, sorry." Gus corrected, "It's more like 35 ohms."

"How'd you get that number?" Donna asked sharply.

"That's why I wanted to sit down with pencil and paper, so I could show you," said Gus. He drew the circuit shown in Fig. 1A, talking as he was drawing. "This circuit represents the impedance I was talking about." Then he drew the triangle shown in Fig. 1B. "And here's how we diagram that impedance. This horizontal line represents the resistance, R, 25 ohms. And this vertical line represents the inductive reactance, X_L. That's also 25 ohms for this example. It's customary to draw the inductive reactance line upward from the base line or resistance line, and to draw a capacitive reactance line downward from the base line. Now, the hypotenuse of the triangle represents the total impedance, and we represent that with the letter Z."

Recognizing the solution from earlier school days, Donna said, "Oh, yes, we can use the equation

$$Z = \sqrt{R^2 + X^2} \qquad \text{(Eq. 2)}$$

where

Z = total impedance
R = resistance (radiation resistance of the antenna)
X = reactance (may be inductive or capacitive)

and we get 35.4 ohms." Donna had used her household electronic calculator to figure the answer.

"Good," said Gus. "Here's how we indicate that same impedance without having to draw the triangle. It's a more convenient way when you are writing about impedances." At the bottom of the drawing he wrote, "Z = 25 + j25 = 35.4 ohms," as shown in Fig. 1. "That little letter j is a shorthand way of saying that you cannot add the resistive ohms and the reactive ohms directly. You have to use the process you went through (Eq. 2). Sometimes that is called vector addition."

Offering another example, Gus said, "How about if we had 30 ohms of resistance and 40 ohms of capacitive reactance? Draw the equivalent circuit and diagram the impedance for me. And tell me the impedance value." Donna drew the information shown in Fig. 2, and calculated the impedance to be 50 ohms.

"Exactly right," Gus said proudly. "I think you've got this antenna impedance business down pat."

Standing Waves and Standing-Wave Ratios

"Well I'm not sure," said Donna. "I still don't understand exactly how the SWR curve depends on the impedance."

"Okay," said Gus. "One important thing to remember is that the reactive part of the impedance does not absorb any power. Or in the case of an antenna, it does not radiate any power. But it can prevent some of the available power from being transferred to the resistance. The power that isn't radiated is then reflected back down the transmission line, and that's what creates a standing wave."

"If the antenna had no reactance, then you'd have no standing wave?" Donna asked. "And just what is a standing wave?"

"Well, let me answer your questions in the reverse order," Gus said as he began drawing what appears in Fig. 3. "A standing wave is developed on the transmission line any time you have power reflected from the antenna. The forward power and the reflected power waves are traveling in different directions along the line. If the line is long enough, at some points in the line the voltages in the two waves will be in phase with each other. At these points the voltages will add, and the total rf voltage there will be greater than the voltage from either power wave alone. And at some other points on the line the two waves will be 180° out of phase with each other. At these points the voltages will tend to cancel each other, and the total rf voltage will be less than from either power wave alone, as I've shown in this drawing."

He continued, "Now this wavy line represents the voltages that are developed at all the points along the mismatched transmission line. A lot of amateurs forget that at every point along the line the rf voltage will go through zero at some instant in time. You see, the rf voltage at any point on the transmission line is a sine wave. It's just that the amplitude of the sine wave is higher at some points than it is at others. And this is what that wavy line represents, nothing more than a plot of the rf voltage at all points along the line. That wavy line also represents the standing wave, which is merely the resultant of the forward power wave and the reflected power waves."

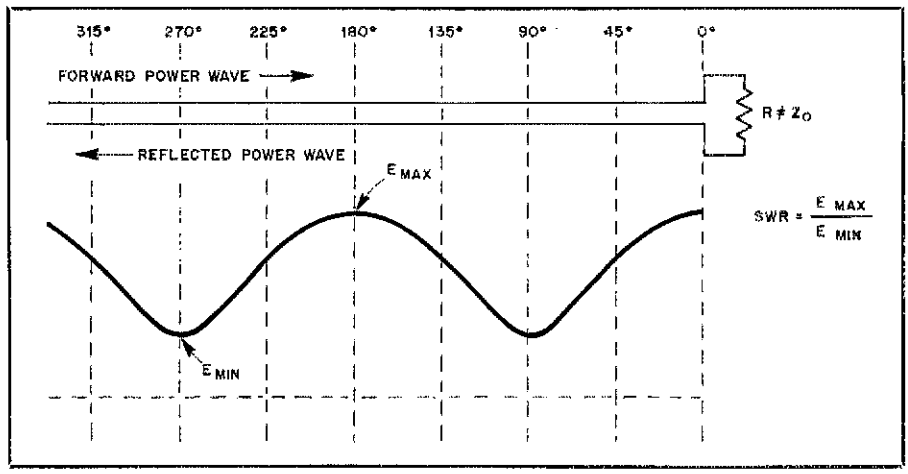


Fig. 3 — Voltage standing wave along a mismatched line, resulting from components of the forward power wave and the reflected power wave combining in various phase relationships at different points on the line. The power waves travel along the line, while the standing wave is stationary. The positions of the maxima and minima depend on the value of the load components with respect to the line impedance, but there will always be an electrical quarter wavelength of line between a maximum and a minimum.

"Then how does that tie in with standing-wave ratio?" Donna asked.

"Simple. By definition, the standing-wave ratio, or the SWR, is the ratio of the maximum voltage to the minimum voltage in the standing wave." Gus indicated this information on his sketch, also shown in Fig. 3.

$$SWR = \frac{E_{MAX}}{E_{MIN}} \qquad \text{(Eq. 3)}$$

where
SWR = standing-wave ratio
E_{MAX} = maximum amplitude in the standing wave
E_{MIN} = minimum amplitude in the standing wave

"Now to answer your first question, it's not always true that you have no standing wave when you have no reactance. No standing wave means you have no reflected power. A line operating under these conditions is sometimes called a flat line, because the wavy line showing the voltage along the line now becomes flat. And of course the SWR is 1:1, because the ratio of maximum to minimum voltage along the line is 1."

"That's easy to understand," said Donna.

Gus continued, "But you can still have a mismatched line without having reactance at the load. Say you have an antenna that has a radiation resistance of 100 ohms but no reactance. And say you feed it with 50 ohm-line. The line is not matched, so there would be some reflected power."

SWR vs. Antenna Impedance

"What would the SWR be if you did feed a 100-ohm antenna with 50-ohm line?" Donna asked.

"If you have a load that is resonant or purely resistive, it's easy to figure the SWR. Just divide the line impedance into the load resistance, or vice versa, whichever gives a number bigger than 1. In equation form, you can write it this way.

$$SWR = Z_0/R \text{ or} \qquad \text{(Eq. 4)}$$

$$SWR = R/Z_0 \qquad \text{(Eq. 5)}$$

where
SWR = standing-wave ratio
Z_0 = characteristic impedance of transmission line
R = load resistance (load must be purely resistive)

Use the equation that gives an answer greater than 1," Gus continued. "So your SWR would be 2:1. You get this by dividing 100 by 50. You'd also have a 2:1 SWR if you fed a 25-ohm resistive load with 50-ohm line."

"I see. And if you had an antenna with an impedance of 50 ohms and fed it with a 50-ohm line, your SWR would be 1:1. That figures, since 50 divided by 50 equals 1."

"Be careful," Gus cautioned. "That's true only if the load is purely resistive. You know, a lot of amateurs talk about *antenna impedance* when they really mean radiation resistance — or maybe radiation resistance plus loss resistance. That's what you just did. The word *impedance* sort of implies that there is some reactance present. See this example I gave you," Gus said as he pulled out the information shown in Fig. 2. "This impedance is made up of 30 ohms resistance and 40 ohms reactance. Yet the total impedance is exactly 50 ohms. But that'll look a lot different to a 50-ohm line than a 50-ohm resistance will."

"How much different? What would the SWR be?"

Gus had to do some brain searching to come up with an answer to that one, for it involved a set of equations he didn't use often. Finally he said, "Okay, here's how you can calculate it.

$$SWR = \frac{A + B}{A - B} \qquad \text{(Eq. 6)}$$

where
$A = \sqrt{(R + Z_0)^2 + X^2}$
$B = \sqrt{(R - Z_0)^2 + X^2}$
R = resistance at load, ohms
Z_0 = characteristic impedance of feed line
X = reactance at load, ohms

"In this case, R equals 30 and X equals 40," Gus went on. Borrowing Donna's calculator, he said, "Okay, A is going to equal the square root of 30 + 50 or 80 squared plus 40 squared. That's the square root of 8000, which is 89.44. And B equals the square root of 30 − 50 or negative 20 squared plus 40 squared. That's the square root of a positive 400 plus 1600 or the square root of 2000, which is 44.72. Okay, A plus B is 134.16, and A − B is 44.72, so the SWR is 134.16/44.72, or 3.0 to 1. Donna, would you believe a 50-ohm *impedance* on the end of a 50-ohm line could give you a 3:1 SWR?

"No, I wouldn't have. Did you figure that right?" she asked, rechecking Gus's calculations. Coming up with the same answer, she exclaimed, "But I do now. It's still hard to believe, though."

"Well, we'd better get back to work on that antenna so we can get it done before dark," Gus said.

"Gus," Donna said, "I'm glad you came over to help me with this antenna. I guess almost anybody can put the parts together, but you explained it so well that I feel I really understand it. Thanks." Together they walked out the back door to the waiting hardware and tools.

Strays

Past Hudson Division Director Stan Zak, K2SJO (right), presents a plaque to *Time* senior writer Ed Magnuson, W2IJB, honoring him for his story (May 3, 1982) about the DXpedition to Navassa Island. An avid DXer himself, Ed participated in the DXpedition.

Francis C. Leonard, W2NPT, of Fairlawn, New Jersey, proudly displays the plaques he received after being named 1982 Elmer of the Year by the Northern New Jersey Chapter of the QCWA. The larger plaque will rotate annually, but the other will grace W2NPT's shack permanently. *(tnx N2XJ)*

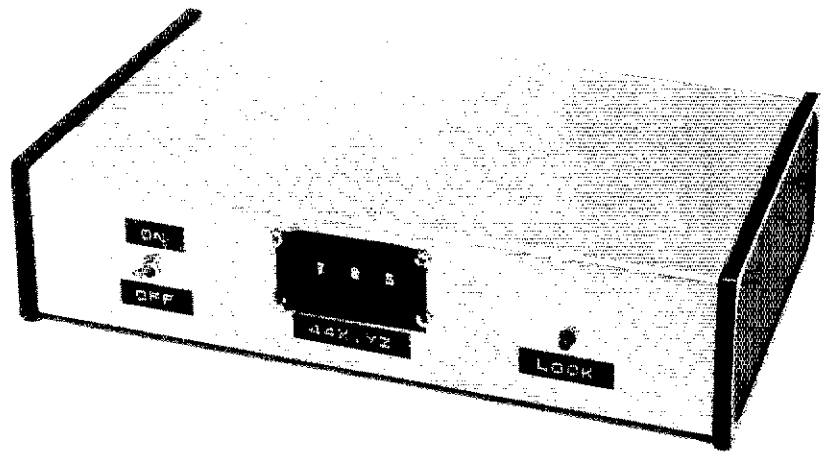
Next Month in QST

Now that the FCC has unveiled its no-code license proposal (see pages 9 and 49, this issue), it's time to digest the next piece of news from Washington: volunteers will be able to give code and theory exams. Details will appear in April *QST*, as will:

- news about a new League book explaining the ins and outs of the FCC Rules, Part 97, and
- two items of interest to microwave enthusiasts — a discussion of 10-GHz Gunnplexer theory and operation, and details on how to build a 1296-MHz slug tuner from easily obtainable parts.

Modifying a CB-Board Synthesizer for Amateur Use

If you've ever needed a synthesizer for a receiver or transmitter but weren't up to building a circuit with 10 to 20 ICs (and then trying to make it work), this is for you!



By J. Robert Witmer,* W3RW

The widely available Hy-Gain CB transceiver board can be adapted to provide synthesized frequency control of a receiver or transmitter.[1, 2, 3] Included here are some guidelines to follow when performing the conversion, along with some suggested applications. The modifications involved are simple. One elective (more complex) step provides for a high synthesizer-signal output level. This involves modifying the CB board to connect the output that is normally fed to the receiver section to the on-board transmitter predriver and driver stages for amplification.

The CB-board synthesizer section can be modified to provide a 35- to 41-MHz output range of frequencies by changing the PLL mixer oscillator crystal and retuning the VCO coil. The version I'm using with the higher drive-level modification supplies approximately 1.8 V of rf output to a 50-ohm load from 35 to 35.7 MHz. It has a very clean output waveform. Harmonics are about 45 dB down from peak fundamental output, and the close-in spurious signals are at least 60 dB down. Measured residual fm noise deviation is 0.003 kHz, which is not noticeable even after multiplication.[4]

Basic Synthesizer Operation

The unmodified CB-board synthesizer output-frequency range is approximately 37 to 38 MHz in 10-kHz steps. This output is used as high-side local oscillator (LO) injection for the receiver section (10.695-MHz i-f), and is mixed with a 10.695-MHz crystal-oscillator signal to obtain the required 26.9- to 27.4-MHz CB transmitter output frequencies. See Fig. 1. The described modification will ignore the 10.695-MHz oscillator and transmitter mixer functions and will concentrate on the 37- to 38-MHz synthesizer.

Applications Steps

The following steps will help you to modify the synthesizer for your purposes. Refer to Table 1 and Figs. 2 and 3. Details of my first conversion work, a 443- to 450-MHz synthesizer for a modified surplus fm receiver, are included as a guide. The required calculations are shown in equation form.

1) *Frequency Range.* Establish the frequency range you wish to cover. I required reception of frequencies between 443 to 449.95 MHz (Table 1, column 1).

2) *Determine The Equipment Heterodyning Scheme.* What is the multiplication factor of the multiplier string and of the first multiplier stage? It's also necessary (in the case of receiver applica-

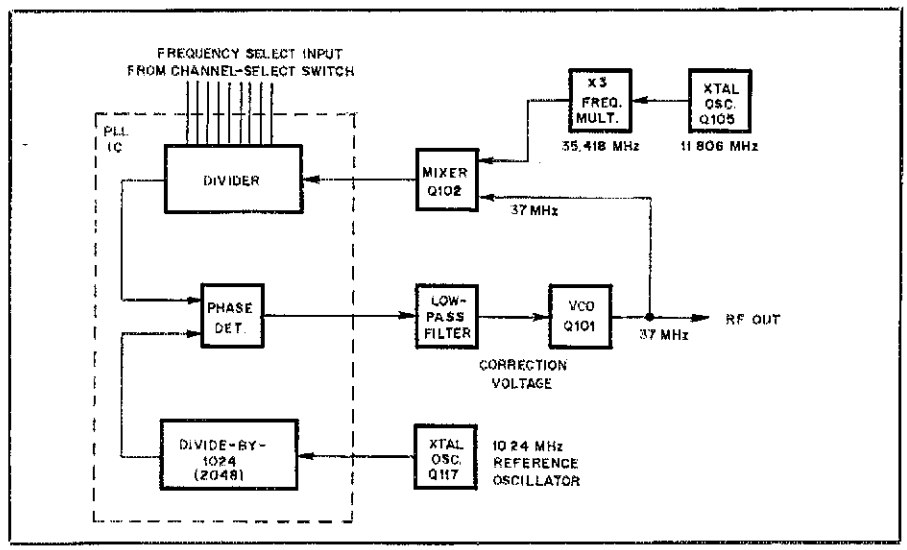


Fig. 1 — Block diagram of the Hy-Gain PLL synthesizer.

[1]Notes appear on page 24.
*79 Blaine Ave., Leola, PA 17540.

Table 1

Key Parameters For Various PLL Synthesizer Applications

1	2	3	4	5 Ⓐ	6 Ⓑ	7 Ⓒ	8	9 Ⓓ	10 Ⓔ	11 Ⓕ	12
443-449.95 receive (21.4-MHz i-f)	52.7-53.568	50	8/12	35.1333-35.7125	4.166	8.5333	139	256-395	1.0666-1.64383	11.3555 (34.0666)	2048
443-449.95 transmit	12.3055-12.4986	50	36/12	36.9166-37.495	4.166	8.5333	139	256-395	1.0666-1.64383	11.950 (35.850)	2048
222-224.98 receive (10.7-MHz i-f)	52.825-53.57	40	4/6	35.2166-35.7133	6.666	6.8266	75	256-331	1.7066-2.2066	12.3077 (36.9233)	1024
222-224.98 transmit	18.5-18.748	40	12/6	37.0-37.4966	6.666	6.8266	75	256-331	1.7066-2.2066	11.7644 (35.2933)	1024
222-224.98 receive (10.7 MHz i-f)	58.825-53.570	20	4/6	35.2166-35.7133	3.333	6.8266	150	256-406	0.85333-1.35333	11.4544 (34.3633)	2048
222-224.98 transmit	18.5-53.57	20	12/6	37.0-37.4966	3.333	6.8266	150	256-406	0.85333-1.35333	12.0488 (36.1466)	2048
26.965-27.405 (original configuration)	—	10	1	37.66-38.10	10.0	10.24	40	224-268	2.240-2.680	11.806 (35.418)	1024

Notes

Circled letters refer to corresponding letters in Fig. 2

1 — Application and frequency range (MHz)
2 — Original crystal frequency range (MHz)
3 — Channel spacing (kHz)
4 — Multiplication factor, old/new
5 — Synthesizer VCO range (MHz)
6 — Reference frequency (kHz)
7 — Reference oscillator crystal frequency (MHz)
8 — Number of channels
9 — Divide-by-N range
10 — Divide-by-N input frequency range (MHz)
11 — PLL oscillator crystal frequency (MHz)
12 — Divide-by-N number

tions) to know the i-f and whether upper- or lower-side LO injection is used. This can usually be obtained from the equipment schematic diagram or operating manual (Table 1, column 4).

As shown in Fig. 3A, my surplus 450-MHz receiver used a frequency multiplication factor of eight. The first stage of the multiplier string was a frequency doubler with output in the 106-MHz range. The i-f is 21.4 MHz with low-side LO injection.

3) *Channel Spacing.* Decide what sort of channel spacing you require. At 450 MHz, I felt that 50-kHz channel spacing was adequate (Table 1, column 3).

4) *Crystal-Range To Synthesizer-Range Conversion.* If you're performing this modification to use the synthesizer with an existing piece of equipment, find the original crystal frequency operating range of the unit and determine the needed synthesizer output frequency range. Calculate the input frequency range necessary for your desired band coverage. As shown in Fig. 3A, my fm receiver used a crystal frequency operating range of 52.7 to 53.56 MHz. Since the synthesizer output is about 35 to 40 MHz, I decided to use the first multiplier stage of the surplus receiver (which normally operated as a doubler) as a tripler. Therefore, I needed a 105.4- to 107.1375-MHz output from this first multiplier stage or a synthesizer output frequency range of 35.1333 to 35.7125 MHz. Thus, the new multiplication factor is 12. See Table 1, columns 2, 4 and 5, and Fig. 3B. More information concerning the selection of synthesizer operating frequencies is available.[5, 6]

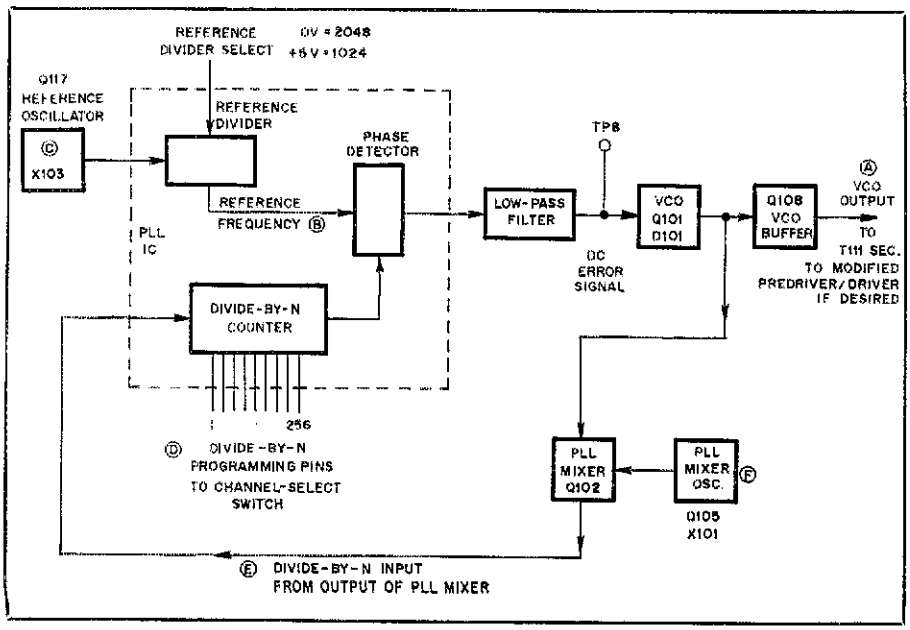


Fig. 2 — Block diagram of the Hy-Gain CB-board PLL synthesizer. Key parameters are shown in circled letters that correspond to those of Table 1.

5) *PLL Reference and Reference-Oscillator Crystal Frequencies.* The PLL reference frequency is equal to the selected channel spacing divided by the required frequency multiplication factor of the receiver or transmitter. In my application:

$$\frac{50\text{ kHz}}{12} = 4.166666\text{ kHz} \qquad \text{(Eq. 1)}$$

The MC145109 (IC101) on my CB board has selectable reference-divide ratios of 1024 or 2048 (pin 4 high or low, respectively). The reference-divide ratio of the CB board is 1024, but it can be modified easily to obtain a divide ratio of 2048. To determine the reference-oscillator crystal frequency, multiply the reference frequency of Eq. 1 by the two reference-divider ratios (1024 and 2048). Thus:

$$4.166666\text{ kHz} \times 1024 = 4.26666\text{ MHz} \qquad \text{(Eq. 2)}$$

$$4.166666\text{ kHz} \times 2048 = 8.53333\text{ MHz} \qquad \text{(Eq. 3)}$$

Since 8.5333 MHz is closer to the original reference crystal frequency of 10.24 MHz, I chose it and modified the PLL board wiring to use the 2048 divide ratio (ground pin 4 of IC101). See Table 1, columns 6 and 7.

6) *Number of Channels.* This is determined by dividing the frequency range (Table 1, column 1) by channel spacing (Table 1, column 3). In my case:

$$449.95\text{ MHz} - 443\text{ MHz} = 6.95\text{ MHz} \qquad \text{(Eq. 4)}$$

$$\frac{6.95\text{ MHz}}{50\text{ kHz}} = 139\text{ channels} \qquad \text{(Eq. 5)}$$

7) *PLL IC Divide-By-N Range.* The unmodified CB-board synthesizer has a divide-by-N range of 224 to 268 with the

divide-by-32, -64 and -128 select pins wired to V_{CC}. I freed these pins and made them available for divide-by-N programming.

At this point, the divide-by-N selection can be anything from 2 to 511. But the important factor to consider is that the maximum input frequency to the PLL divide-by-N input is 4 MHz. The highest frequency that will be applied to the PLL divide-by-N input may be determined by multiplying the highest divide-by-N number by the reference frequency. To simplify things, I wired the divide-by-256 pin to V_{CC}. This provides a divide-by-N range of 256 to 511 or a maximum of 255 channels to be selected by the use of eight spst switches connected to the 1 through 128 divide-by-N programming pins of the PLL IC. Since I needed only 139 channels for my receiver, the divide-by-N range is 256 to 395 (Table 1, column 9).

8) *Divide-By-N Input Frequency Range.* As mentioned earlier, this is found by multiplying the divide-by-N range (step 7) by the reference frequency (step 5). For my receiver, this is

$$256 \times 4.166\ \text{kHz} = 1.0667\ \text{MHz} \quad \text{(Eq. 6)}$$

$$395 \times 4.166\ \text{kHz} = 1.6458\ \text{MHz} \quad \text{(Eq. 7)}$$

See Table 1, column 10.

9) *PLL Oscillator Crystal Frequency.* The new PLL oscillator crystal frequency can be calculated by subtracting the low-end divide-by-N frequency found in step 8 from the corresponding low-end VCO output frequency, and dividing by three. In my case:

$$\frac{35.1333\ \text{MHz} - 1.0667\ \text{MHz}}{3}$$

$$= 11.3555\ \text{MHz} \quad \text{(Eq. 8)}$$

See Table 1, column 11.

Upon completion of these steps, you're ready to order your crystals and start the physical modifications of the CB board. My crystal oscillator circuits have 39-pF capacitors in series with the crystals, so I used a 32-pF load capacitance factor when I ordered new parallel resonant crystals.

CB-Board Modifications and Alignment

Before starting modifications, check to see that the PLL circuit is basically the same as that described (see Fig. 4). I've used Hy-Gain 75A080 boards that I purchased from Poly-Paks several years ago. CB units manufactured by Kraco, Lafayette, Midland and Pierce-Simpson use the basic Hy-Gain design. Avoid the remote-PLL boards (such as the Hy-Gain 750096).

Get the original synthesizer section working. One advantage of the CB-board synthesizer approach is that if the board requires troubleshooting, there usually is a service manual available to aid you. You don't usually have this type of help with home-made synthesizers.

Crystal Installation

Refer to Figs. 4 and 5. Remove the offset oscillator crystal (X102), the PLL reference oscillator crystal (X101) and C126. Install the new PLL crystal at X101. With power applied to the board, measure the reference oscillator frequency at pin 3 of the PLL IC. If you wish, you may add a trimmer capacitor to fine-tune the oscillator. PLL oscillator operation can be checked by loosely coupling a frequency counter to the PLL mixer transistor base (Q102) or to the emitter of Q105 through a 5-pF capacitor.

VCO Alignment

Connect a high-impedance voltmeter to pin 6 of the PLL IC and program the syn-

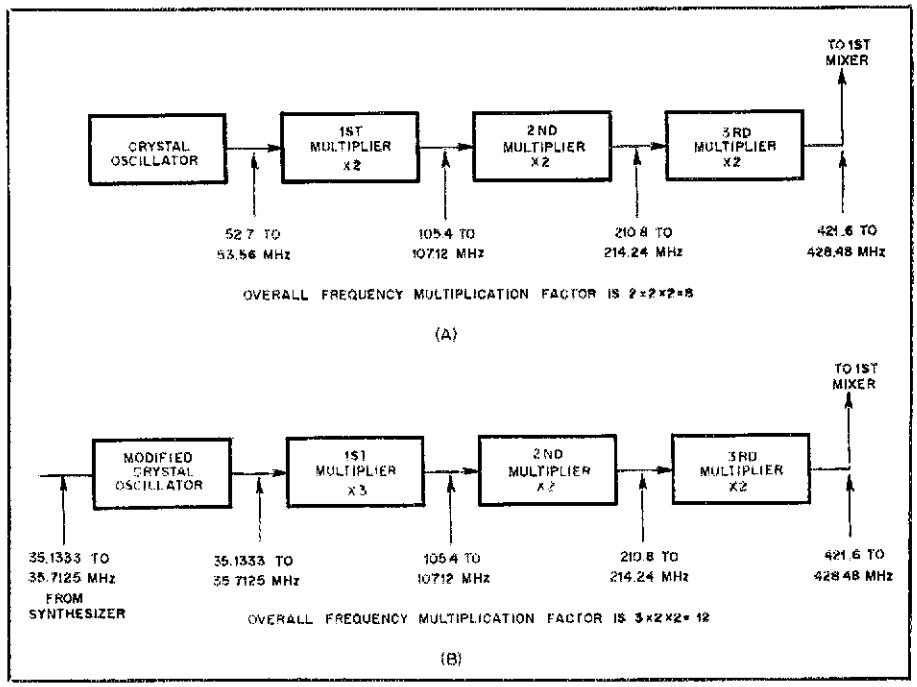


Fig. 3 — Block diagram of the original multiplier chain of the author's surplus fm receiver is shown at A. At B, the modified chain used with the synthesizer.

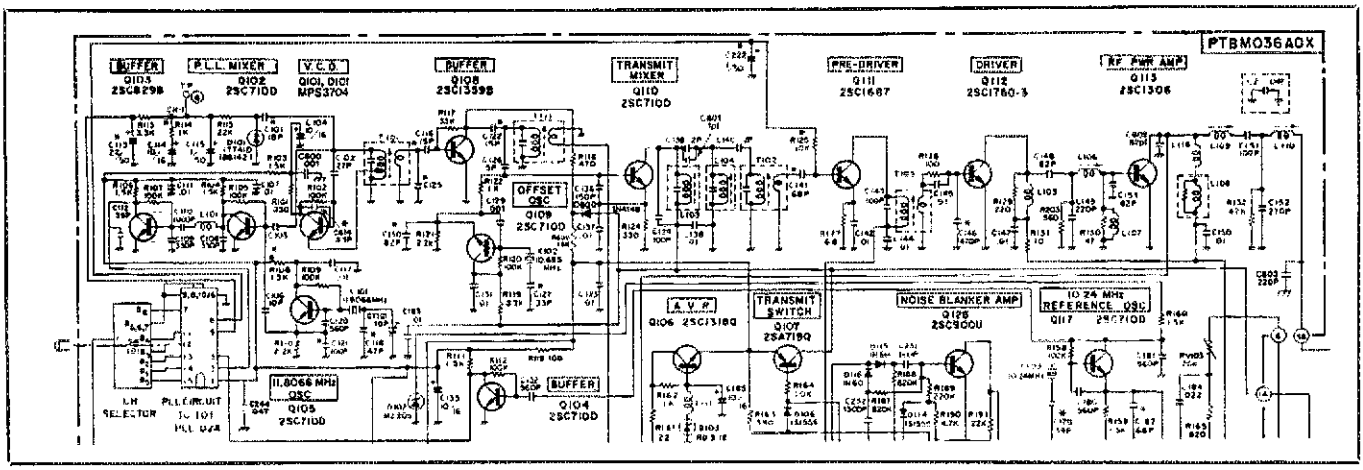


Fig. 4 — Partial schematic diagram of the CB board prior to modifications.

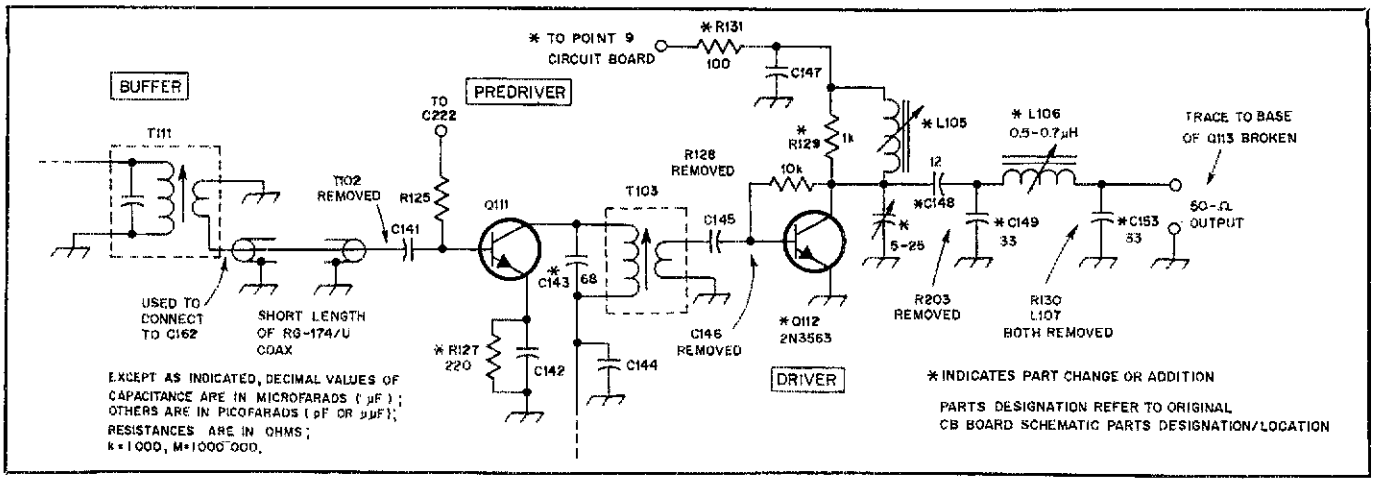


Fig. 5 — This schematic diagram shows the areas involved for the higher drive level modification.

thesizer divide-by-N for a synthesizer output frequency in the middle of the desired frequency range. If the voltmeter indicates approximately 5 V, the synthesizer is locked. If not, adjust T101 slowly until a lock is indicated by the presence of 5 V at pin 6. Once the synthesizer is locked, connect the meter to TP8 (R114) and adjust T101 so that a voltage range of about 1.5 to 4 (at the respective low and high ends of the synthesizer range) is obtained. Voltages below approximately 1 or above 4 may indicate the synthesizer is out of lock.

Reference Divider and Divide-By-N Programming Changes

If it's necessary, you should now change the PLL IC reference-divider programming. After this is completed, change the PLL divide-by-N programming input line wiring. Break the V_{CC} connections of pins 8, 9 and 10 and connect pin 7 to V_{CC}. Pins 8 through 15, inclusive, control the synthesizer frequency selection.

Final Touch-Up

You may want to recheck the VCO alignment using your intended frequency range. At this point, your synthesizer is complete except for coupling out the signal at a level sufficient to drive the oscillator or multiplier circuit of the particular receiver or transmitter. Synthesizer output can be obtained from the secondary of T111 (break the connection to C162). T111 should be then tuned for maximum output.

Higher Synthesizer Output Level

To raise the synthesizer output level, changes are needed in both the on-board transmitter predriver and driver stages. See Figs. 4 and 5 for before-and-after schematic diagrams.

PreDriver and Driver Changes

To change the predriver, connect a short piece of RG-174/U or similar 50-ohm coaxial cable from the secondary of T111 to the base circuit of predriver Q111. Remove T102 to make a connection point for the inner cable conductor. Replace the 100-pF capacitor across the primary of T103 with a 68-pF unit.

See Fig. 4 for driver changes. Carefully remove R128, R129, R130, R131, R203, C146, C148, C149, C153, L105, L106, L107 and Q112. Remove L109 and install it in place of L105. A 1-kΩ resistor is mounted where R129 was located. Install a 5- to 25-pF trimmer capacitor at the board location for C221 (Q112 collector). A 2N3563 is mounted at the Q112 location. Connect a 10-kΩ resistor from the base to the collector of Q112. At location C148, mount a 12-pF disc ceramic capacitor. Install a 100-ohm resistor from the junction of C147/R129 to the pad adjacent to connection point 32. Connect a wire from point 32 to point 9 (+12 V). Install 33-pF disc ceramic capacitors at locations C149 and C153. At location L106, mount a 0.5- to 0.7-µH coil or rf choke. Break the connection between the base of Q113 and the junction of L106 and C153. Connect the coaxial cable output lead across C153.

Tune-Up

You may find it helpful to preadjust the L105/C221 combination for resonance at the VCO frequency with a dip meter (GDO) prior to applying power to the board. When power is applied, adjust

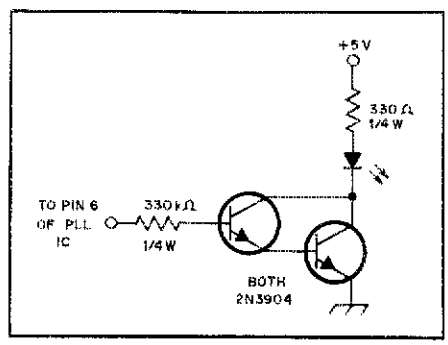
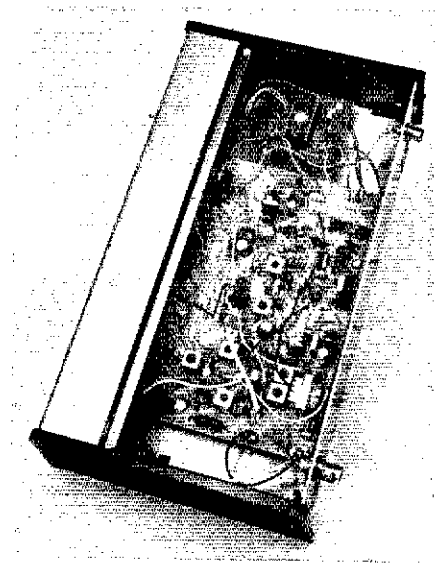


Fig. 6 — Schematic diagram of a simple PLL synthesizer lock indicator.



This photo and the title-page photo are pictures of the author's synthesizer mentioned in the text. BCD thumbwheel switches have been added to provide selection of various PLL IC divide ratios. The thumbwheel entries are sent to the PLL IC through a 2716 EPROM BCD-to-binary converter, which may be seen at the upper end of the enclosure.

T111, T103, L105, C221 and L106 (if you've used a variable inductor) for maximum rf output across C153. I used a VTVM equipped with an rf probe as a tuning indicator. You may also monitor the voltage drop across R131 or the CB-board power-supply output current. In the latter case, adjust T111 and T103 for maximum current drain. As mentioned earlier, I have obtained 1.8 V of rf output across a 50-ohm load from this synthesizer. This should be more than enough to drive most oscillator circuits. Exact interfacing instructions for this synthesizer and your receiver or transmitter are beyond the scope of this article, but notes 5 and 6 contain excellent discussions of this subject.

Limitations

Reference Frequency. The CB-board circuit was designed originally for a

10-kHz reference frequency using a 10.24-MHz crystal in the reference oscillator, and wide deviations from these figures may not work. However, I've successfully tried reference-oscillator crystal frequencies as low as 3.7 MHz with resulting reference frequencies as low as 1.8 kHz. I've also used a variety of reference crystals at frequencies of 5.05 and 6.317, and a 25.66-MHz overtone crystal operating on its fundamental. This would seem to indicate that the circuit is quite tolerant of a wide range of crystal and reference frequencies.

VCO Operating Frequency. The lowest frequency at which I've operated the VCO is 34 MHz. Most 10-meter conversion articles I've seen operate the VCO in the 40-MHz range, so there appears to be a wide spread of VCO frequency ranges available. The original frequency spread of the VCO was from 37.66 to 38.1 MHz, or a width of 0.44 MHz. I've operated it from 35.1333 to 35.71666 MHz (a 0.58-MHz spread) without any trouble. Wider ranges should be possible at higher VCO frequencies. To optimize the VCO tuning for maximum bandwidth, monitor the voltage at TP8 (R114) with a high-impedance voltmeter. The voltage should range from approximately 1.5 at the low lock frequency to about 4 V at the high lock frequency. T101 should be adjusted to center the voltage swing within this range as much as possible. When the PLL is out of lock, the voltage at TP8 is usually greater than 4 V and the voltage at pin 6 of the PLL IC is about 0 (about 5 V when locked). A simple PLL lock indicator is shown in Fig. 6.

Summary

The Hy-Gain CB-board PLL synthesizer circuit is quite versatile. This step-by-step modification and the examples shown should enable you (with a few calculations and some circuit changes) to convert the original CB synthesizer output to a range that can be useful in many applications. It also allows you to learn about the operation of a PLL synthesizer with a minimum investment if you just wish to experiment.

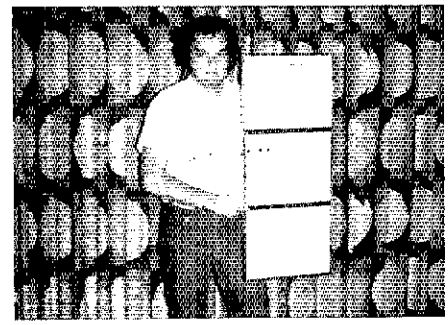
I'll be happy to try to answer any questions you have about the synthesizer modification. Please enclose a large s.a.s.e. with your inquiry.

Notes

[1]H. Knickerbocker, R. Stielau and A. Wise, "CB-To-10 FM — Best Conversion Yet?," *73*, Jan. 1980.
[2]B. Heil, "Experience 10-Meter FM Operation," *QST*, Aug. 1981.
[3]Boards are available from Poly-Paks, P.O. Box 942, South Lynnfield, MA 01940. Also, Surplus Electronics Corp., 7294 N.W. 54 St., Miami, FL 33166. Be certain to request the single-unit style board, not the remote microphone version.
[4]ARRL lab spectral analysis of the author's synthesizer showed the second harmonic to be about 53 dB below peak fundamental output.
[5]B. Fanning and G. Grantland, "800 Channel 2-Meter Synthesizer," *Ham Radio*, Jan. 1979.
[6]GLB Channelizer instruction manual, GLB Electronics, 1952 Clinton St., Buffalo, NY 14206.

Strays

An airwound coil of 2.5 mH resonates a 10-meter whip antenna for a trial in the experimental 1750-meter band. One watt of input to a transistor final amplifier produced enough signal for a 10-mile mobile-to-fixed-station signal. *(W6HDO photo)*



Bruce Balla, VE2QO, of Quebec, shows the spoils of his DXing: cw, phone and RTTY DXCC awards. The RTTY DXCC award is number 12 in the world and number 1 in Canada. *(VE2BBP photo)*

AMSAT NETS SCHEDULE

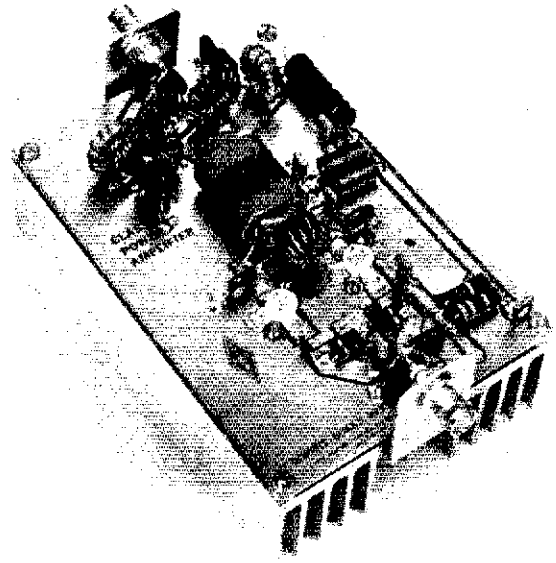
☐ The following AMSAT Nets meet regularly to disseminate information to newcomers and to keep regular satellite users in communication with one another:

Net Name	*Day/Time (UTC)*	*Frequency*	*Remarks*
HF Nets			
AMSAT Argentina	Sunday	3737	2100 Local Time
AMSAT Argentina	Sunday	14,277	2200 Local Time
AMSAT Asia/Pacific	Sunday 1100	14,305	
AMSAT Austria	Saturday 0900	7070	
AMSAT Australian	Sunday 1000	3680	During winter
AMSAT Australian	Sunday 1000	7064	During summer
AMSAT Canada			To be determined
AMSAT East Coast, U.S.	Wednesday 0200	3850	2100 EST Tuesday
AMSAT Espanol			Being rescheduled
AMSAT European	Saturday 1000	14,280	
AMSAT International	Sunday 1800	21,280	
AMSAT International	Sunday 1900	14,282	
AMSAT Mid-America	Wednesday 0300	3850	2100 CST Tuesday
New Zealand V.U.S.			Being rescheduled
AMSAT South Africa	Sunday 0900	7080	Lsb
AMSAT South Africa	Sunday 0900	14,280	
AMSAT South Pacific	Saturday 2200	28,878	
SESAT Southeast U.S.	Sunday 1300	7280	
AMSAT U.K.	Sunday	3780	1015 Local Time
AMSAT U.K.	Mon. & Wed.	3780	1900 Local Time
AMSAT West Coast, U.S.	Wednesday 0400	3850	2000 PST Tuesday
VHF Nets			
AMSAT Buenos Aires	Sunday	145.700	Fm
AMSAT Dallas/Ft. Worth	Wednesday	146.610	Fm 2000 Local Time
AMSAT Goddard	Wednesday 0200	146.835	2100 EST Tuesday
AMSAT London	Sunday	144.280	1930 Local Time
AMSAT Los Angeles	MTWThF	144.144	0730-0830 Local Time
AMSAT South Africa	Sunday 0900	145.650	Fm
AMSAT South Africa	Sunday 0900	145.725	Fm

A new "Satellite Basics" net is in the "talking and thinking" stage. Many requests to provide introductory-level material in an accessible format/frequency have been heard. Possibly, a new net will develop on 75 meters (3900-4000 kHz) or 40 meters to service newcomers. Several existing nets will be moving to Phase IIIB next summer, so other hf nets are now being looked at as "breeding grounds." Send your suggestions regarding AMSAT Nets to AMSAT Net Manager W8GQW, 1617 West McKaid Rd., Troy, OH 45373.

Go Class B or C with Power MOSFETs

The "solid-state tube" is here to stay! Power FETs offer similar performance to triode vacuum tubes, at comparable cost. Let's examine them in Class B and C amateur service.



By Doug DeMaw,* W1FB

How about a transistor that works well from 1.8 MHz to 175 MHz, delivers 30 W of output power, is virtually destruct-proof, has a gain of 15 to 18 dB and exhibits excellent two-tone IMD characteristics? The Motorola MRF138 and others of that power-FET family fit this general description. The new MRF series contains devices that will deliver as much as 100 W from a single unit (MRF150).[1, 2] Some of these transistors are in the same price class as a 6146B tube. Amplifier design is considerably less rigid when using power FETs than when power bipolar transistors (BPT) are employed.

This paper treats practical designs for 12- and 28-V power FETs. The amplifiers are highly efficient and provide a gain in excess of 20 dB. Information is given with regard to curing some of the problems that arise in power-FET design and operation — data that are kept a secret or ignored unintentionally by those who write application notes.

Power-FET Advantages

Immunity to damage from mismatching is a virtue of the power FET. It can withstand all load conditions at any phase angle without being damaged. This makes it unnecessary to include VSWR-protective circuits in one's amplifier. Thermal runaway, a specter that is ever-present with power BPTs, need not be a major concern with FETs. Also, the input capacitance (C_{GS}) and the output capacitance (C_{DS}) of the FET do not change with the operating frequency or drive level. This simplifies the design of fed-back power-FET amplifiers. The same is not true of BPTs. Still another advantage is the relatively flat gain characteristic of the power FET. The gain undergoes a gradual decline toward the f_T of the device, whereas the theoretical gain of a BPT is 6 dB per octave as the operating frequency is lowered. In other words, a specified power BPT might have a 10-dB gain at 14 MHz in a selected circuit, whereas the gain could increase to 28 dB at 1.8 MHz in the same circuit. This poses a threat to amplifier stability, especially at medium and low frequencies. To ensure a fairly constant gain bandwidth for a 2-30 MHz power BPT amplifier, it is necessary to include some form of R-C or R-C-L compensating network at the input port of the amplifier. This reduces the effective driving power as the operating frequency is lowered. Such is not the case with power-FET amplifiers; gain leveling is not needed.

Owing to the high impedance of FETs (1 megohm or greater at dc), design of the input circuit is uncomplicated. Shunt resistors can be used to establish the desired input impedance (usually between 50 and 500 ohms). The gate-to-ground resistor can serve double duty as part of a resistive divider for establishing the forward gate bias. This feature is helpful when using transmission-line broadband transformers of fixed-value integer ratios; a suitable gate resistor is chosen to provide an impedance match to the excitation source — usually 50 ohms. Bipolar transistors, on the other hand, have inherently low base impedances — typically 10 ohms or less in power amplifiers — which complicates the transformer design.

The high-order IMD of power FETs is on par with that of vacuum tubes. This ideal characteristic is not common to BPTs. Also, the efficiency of FETs is excellent, owing to the low internal resistance (R_{DS}) during conduction. This value is typically 0.25 to 1 ohm, which means that very little power is dissipated within the FET. This is especially noteworthy when using FETs that operate with high drain voltage (V_{DS}) and low drain current (I_D). Finally, the driving-power requirement for FETs is somewhat lower than for bipolar transistors. Only voltage (at a few microamperes) is needed to turn on the FET (30 V pk-pk maximum), which is easy to develop across a gate impedance of 100 or 200 ohms. Just 288 mW of driving power was required to obtain 60 W of output at 7 MHz from push-pull MRF138s in Class B service (see note 2). A simple model of a power FET is shown in Fig. 1.

Some Disadvantages

A cliche is in order: "Nothing is perfect," and this includes power FETs. Vhf self-oscillations haunt the designer. This is because most FETs are rated to 175 MHz for normal operation. The gain of an MRF-series FET is stated as 15 to 18 dB for 30 MHz, and it drops to only 10 dB at 175 MHz. So all of the encouragement

[1]Notes appear on page 29.
*ARRL Senior Technical Editor

needed for vhf parasitics is ever-present! The same kinds of preventive measures used with vacuum tubes are effective in stabilizing power FETs. That is, lowering the input impedance (swamping), bypassing the drains at vhf or using resistors in series with the gates will usually damp these unwanted oscillations. Careful layout (input-output isolation) is also necessary, as is effective bypassing of critical circuit points.

FETs can be damaged quickly — perhaps faster than one can destroy a bipolar device. The MOSFET is sensitive to excess gate or drain voltage. Too much drive, spikes on the supply lines or transients in the driving energy can dispatch an FET *instantly!* Self-oscillations, if of high magnitude, can create excessive peak voltages that will destroy an FET quickly. It's almost like the old "now you see it, now you don't" expression: The circuit can be working perfectly, when at the blink of an eye the FET is stone-cold dead! It's happened to the author more than once. Finding the cause is not always easy, because the damage occurs almost instantly. Reversed-parallel diodes from gate to ground (external to the FET) can be installed as protective clamps (Fig. 2), but they increase the effective input capacitance (C_{in}) of the circuit. They are recommended mainly for experimental circuits. Once stability is achieved, the diodes can be removed.

Similarly, Zener diodes can be used temporarily from drain to ground to prevent dangerous voltage peaks from causing damage in a circuit under development. They should have a voltage rating that is slightly greater than the anticipated peak drain-voltage under full excitation. Thus, for an FET rf amplifier that uses a 12-V dc supply for operation on cw or ssb, the peak swing at the drain would be on the order of 24 V. A 36-V Zener diode would be suitable.

The Self-Oscillation Syndrome

Taming an FET power amplifier is routine if preventive measures are taken. Most of the stabilization techniques used with bipolar transistors are applicable. The first order of business calls for careful layout of the circuit board. Input components should be isolated as much as practicable from the amplifier output components. Double-sided pc board is recommended for providing an effective ground plane on both sides of the board. The copper conductors of the etched circuit should be as short and as wide as possible to minimize unwanted inductive reactance. It must be recognized, however, that the etched conductors and the ground plane on the reverse side of the pc board form parasitic bypass capacitors. Capacitance values vary from, say, 5 pF to as much as 50 pF. Although this may be significant at vhf, it generally poses no problems in hf-band amplifiers. In fact, the added capacitance can be beneficial for discouraging vhf oscillations.

Fig. 3 illustrates stabilization methods that can be applied when self-oscillations occur. R1 and R2 establish the characteristic gate impedance for Q1 while serving as a bias-voltage divider. The lower the value of R2, the better the potential stability. R3, C1 and C2 form an R-C decoupling circuit to further aid stability. C1 is chosen as an effective bypass element in the mf and hf ranges, while C2 is selected for bypassing at vhf.

Z1, a small ferrite bead near the Q1 gate terminal on the pc board, may suffice as a vhf parasitic suppressor without R4 added. The bead or beads (two or three can be used) should have a high mu in order to be effective. An initial permeability (μ_i) of 125-900 is suggested. In stubborn cases of self-oscillation, a low-value resistor (R4) can be placed in series with Z1. Values from 10 to 27 ohms are effective.

C3 of Fig. 3 is suggested for stabilizing single-band amplifiers. The X_c should be four times or greater the characteristic drain impedance in order to prevent attenuation of the desired frequency. In other words, C3 is meant to be an effective bypass capacitor at vhf, but not at hf. Hence, if the drain impedance of the amplifier were determined from

$$Z_{D(ohms)} = \frac{V_{DD}^2}{2P_o} \qquad \text{(Eq. 1)}$$

where P_o is the required power output in watts, and V_{DD} is the drain supply voltage, we might have an impedance of, say, 15 ohms. Thus, the X_c of C3 should be at least 4 × 15, or 60 ohms. For an operating frequency of 3.8 MHz, we would choose the nearest standard capacitor value to 0.00069 μF (690 pF), determined from

$$C_{\mu f} = \frac{1}{2\pi f X_c} \qquad \text{(Eq. 2)}$$

where f is the operating frequency in MHz and X_c is in ohms. A rule of thumb is to use only that value of capacitance which stops the self-oscillation (the smallest value practical). C3 will also help reduce the level of vhf harmonic energy. The C3

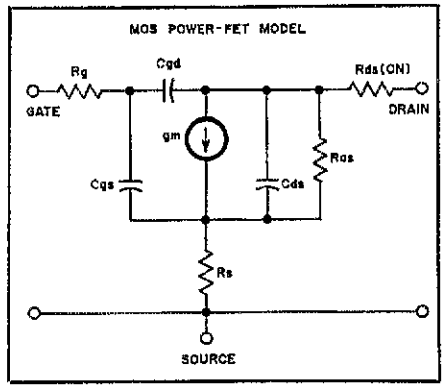


Fig. 1 — Simple model of a MOS power FET showing the intrinsic elements of resistance and capacitance.

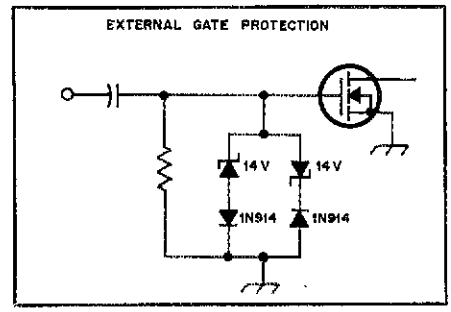


Fig. 2 — Arrangement for external gate protection of a power FET. Two 14-V Zener diodes are connected in series with two small-signal switching diodes to form a reverse-parallel network that will clamp the gate voltage at approximately 29 V pk-pk. This prevents damage from the application of excess gate voltage.

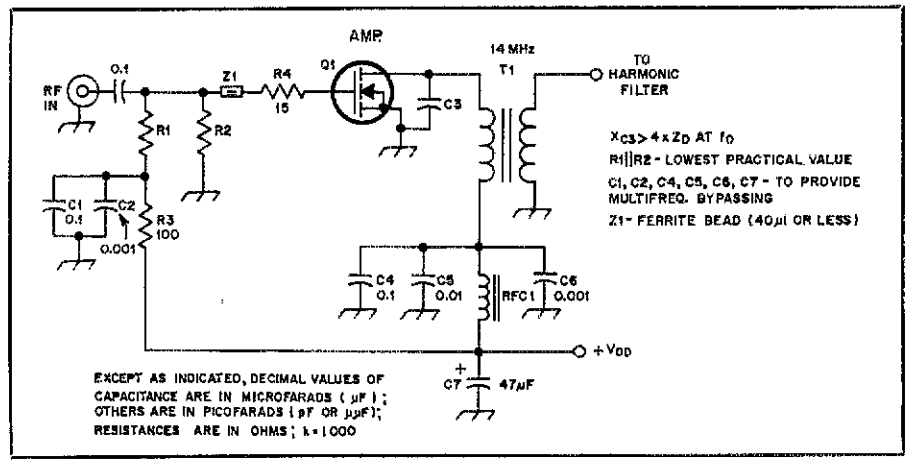


Fig. 3 — Techniques for preventing self-oscillations when using power FETs. C1, C2 and R3 comprise a decoupling filter in the bias line, while C4-C7 and RFC1 serve the same purpose in the drain supply. Capacitor values are chosen to provide effective bypassing from low frequency through vhf. C3 can be added to reduce vhf harmonic currents and aid stability. The X_c value should be four times or greater than the full-power drain impedance to prevent unwanted bypassing of the fundamental frequency. A high-mu ferrite bead in series with a low resistance (Z1 and R4) form an effective parasitic suppressor at vhf.

technique is not always practical in band-switched amplifiers, since the value of C3 might have to be changed along with the operating band.

C4, C7 and RFC1 form a decoupling network in the drain supply line. A ferrite choke of low dc resistance is suggested for RFC1. A few turns of no. 20 enameled wire on a 900-mu ferrite toroid core should suffice. Again, the capacitor values are selected to ensure good bypassing from vhf down to vlf.

The addition of negative feedback (drain to gate) will also aid stabilization. Linear power-FET amplifiers require feedback networks as part of the design procedure, but Class C amplifiers need not have feedback if stability can otherwise be achieved.

Power FETs at VHF

Impedance differences versus operating frequency are found primarily at the device input. Whereas an FET may present an almost infinite gate impedance at dc, the gate Z can approach or equal that of a BPT at vhf.[3] For operation at 150 MHz, the 45-W MRF171 FET has a large-signal input impedance of 1.94 − j4.59 ohms, as compared to the 45-W MRF315 BPT, which exhibits a characteristic of 1.2 + j1.0 ohms.

Noise figures under 3 dB are attainable with power FETs as vhf small-signal amplifiers in receiver front ends. The MRF134 5-W vhf FET exhibits a typical NF of 2 dB at 150 MHz (note 3) with a V_{DD} of 28 V and an I_D of 100 mA. Values as low as 1.5 dB have been measured. The vhf power FET is, therefore, excellent in receiver circuits that are designed for high dynamic range.

Agc for Power FETs

Another feature that sets the FET apart from BPTs is the agc capability. The output power of an FET is variable from full amplitude over a range of approximately 21 dB (note 3). This is possible without changing the amplifier excitation level. Manual or automatic gain control is effected by changing the value of gate bias. For example, an amplifier that can deliver 125 W of rf output can be adjusted to give only 1 W of output by shifting the forward gate voltage (dc) from +3 to −10. This makes the FET ideal for use in amplifiers that employ an output-level control. This feature is fine for cw and fm operation, but the gate bias must not be dropped below that value which ensures proper linearity for ssb service, lest the IMD quality be degraded.

Narrow-Band versus Broadband Operation

It is practical to operate a power FET in a narrow-band rf amplifier, just as we might utilize a triode vacuum tube in that type of circuit. The procedure is demonstrated in the transmitting chapter of the ARRL *Handbook* and in an IEEE *Preprint* paper.[4,5] The advantage in using narrow-band techniques is high efficiency. A single-ended 28-MHz Class C power FET amplifier built by the author yielded an efficiency of 85% (no gate bias applied). A Siliconix VN67AJ transistor was used.

The broadband push-pull FET amplifier of Fig. 4 exhibits an efficiency of 72.6% in Class B service (gate bias of 1 V). The efficiency of power FETs in broadband Class A linear service is typically 40-50%.

Practical 60-W Amplifier

A push-pull Class B amplifier for operation at +28 V is shown in Fig. 4. With an excitation power of only 228 mW, it is possible to obtain 60 W of out-

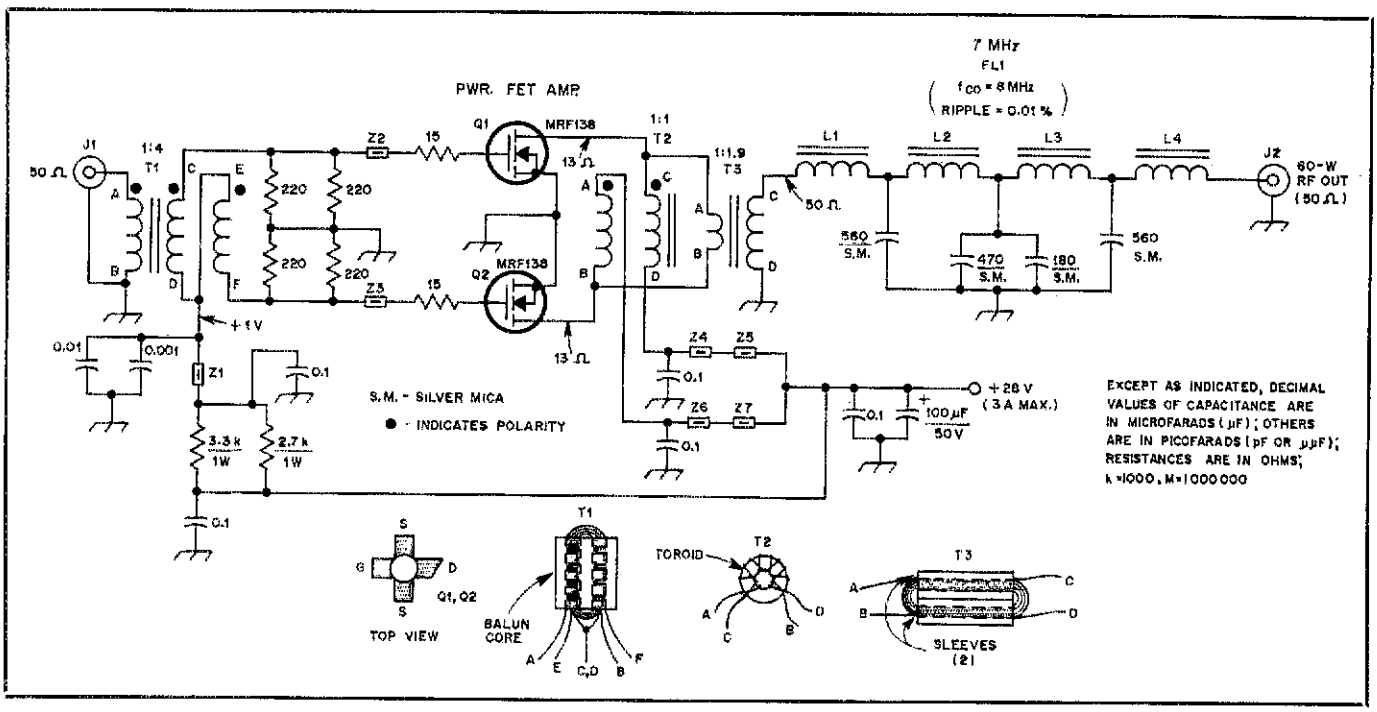


Fig. 4 — Schematic diagram of a practical power-FET amplifier that is biased for Class B service. Capacitors are disc or chip ceramic, 50 V or greater. The polarized capacitor is electrolytic (tantalum also suitable). Resistors are 1/2 W unless otherwise noted.

J1, J2 — BNC connector (builder's choice).
L1, L4 — 0.79-µH inductor. 13 turns no. 22 enam. wire on Amidon or Palomar T68-6 toroid core.
L2, L3 — 1.74-µH inductor. 19 turns no. 22 enam. wire on T68-6 toroid core.
Q1, Q2 — Motorola MRF138 MOS power FET.
T1 — 4:1 impedance ratio balun transformer (X_L = 200 ohms or greater). 10 trifilar turns of no. 28 enam. wire through Fair-Rite balun core no. 2843000302, type 1, 43 mix (950 μ_i) (available from Amidon Assoc.); or 12 trifilar turns of no. 26 enam. wire on an Amidon FT-50-43 toroid core.
T2 — Phase-reversal drain choke; 12 turns no. 22 enam. wire on two Amidon FT-50-43 toroid cores (stacked). The μ_i = 950.
T3 — Broadband conventional transformer. Primary has two turns of no. 18 plastic-insulated hookup wire. Secondary has three turns of the same type of wire. Both windings wound through the holes of two Amidon S43-621-1 ferrite sleeves. The sleeves are epoxy-cemented together, side by side (μ_i = 800). Two rows of six each T50-43 Amidon ferrite toroids can be substituted for the sleeves. Enameled wire can be used in place of the hookup wire, but will be more difficult to thread through the core material. Also suitable is the new Amidon jumbo balun core, part no. BN-43-7051.
Z1 and Z4-Z7, incl. — Jumbo 900-mu ferrite bead. Amidon FB-43-801. (See text.)
Z2, Z3 — Miniature 900-mu ferrite bead. Amidon FB-43-101. (See text.)

put after filtering. Peak drain current is 2.95 A, for an efficiency of 72.6% at 7 MHz. A gate bias of +1 V is used. Under these conditions, the amplifier gain is 23 dB. Operation on the bands from 160 through 10 meters is possible by selecting an output filter for the desired frequency.[6]

T1, T2 and T3 are ferrite-core, broadband transformers. The gate resistors consist of four 220-ohm, 1/2-W units, arranged to present a gate-to-gate impedance of 210 ohms. This permits the use of 4:1 transformer (T1) to match the amplifier input to 50-ohm driving source. The gate resistors form part of a bias divider with the parallel pair of 1-W resistors (3.3-kΩ and 2.7-kΩ).

Parasitic suppressors are located at the gates of Q1 and Q2. They stop a strong self-oscillation that was observed at roughly 60 MHz. Stability is aided further by the decoupling networks in the bias and drain-supply lines.

T2 is a phase-reversal drain choke. The windings are returned separately to the V_{DD} supply line in order to enhance the decoupling of the transistor drains from other parts of the circuit. This procedure is recommended by ARRL TA Helge Granberg (K7ES), of Motorola.

T3 is a conventional broadband transformer that closely matches the 26-ohm drain-to-drain impedance to the 50-ohm harmonic filter, FL1. For practical reasons, it is not possible to obtain a precise match, owing to the lack of a common integer ratio. However, the 2.25:1 transformation ratio is close enough to the calculated 1.9:1 ratio. This results in a 1.5:1 turns ratio for T3 (two-turn primary and three-turn secondary).

FL1 is a 7-element Chebyshev design. It provides excellent harmonic attenuation. Harmonic energy is 70 dB or greater below peak cw output power (Fig. 5). The two-tone IMD was not measured, owing to the design being aimed purely at cw operation. However, the MRF family of MOSFETs is rated for an IMD of 35 dB or greater below peak power in Class A service (note 1).

Zero-bias operation with this amplifier was checked to determine the Class C performance. Without changing the drive level, the output power declined to 52 W and the I_D dropped to 2.75 A. A slight increase in drive level restored the output power to 60 W. The Class C efficiency was 67.5%. This indicates that the amplifier gain and efficiency are somewhat better when the FETs are biased into conduction. This is reasonable, since power FETs are enhancement-mode devices.

The question may arise, "What kind of performance can be expected when the V_{DD} is lowered to, say, 12 V?" This procedure is not recommended because the transistors will saturate rather quickly. The result is poor efficiency and greatly reduced power output. The devices should always be chosen for the operating voltage, or vice versa.

Construction

The amplifier of Fig. 4 is laid out for single-band operation. The filter is located on the circuit board, which makes band switching impractical. There is no reason why the pc board could not be

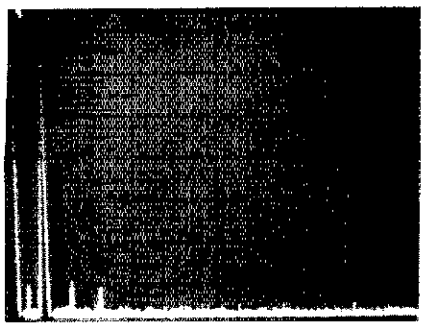


Fig. 5 — Spectral output of the 60-W FET amplifier showing the spurious energy at 70 dB below peak power output. The current FCC requirement for commercial amateur transmitters is −40 dB for all out-of-band spurious responses. This amplifier exceeds that level by some 30 dB. Vertical divisions are 10 dB; the horizontal scale is 10 MHz/div. The tall response at the far left is the spectrum analyzer reference. The full-scale response to the right of it is the 7-MHz desired signal.

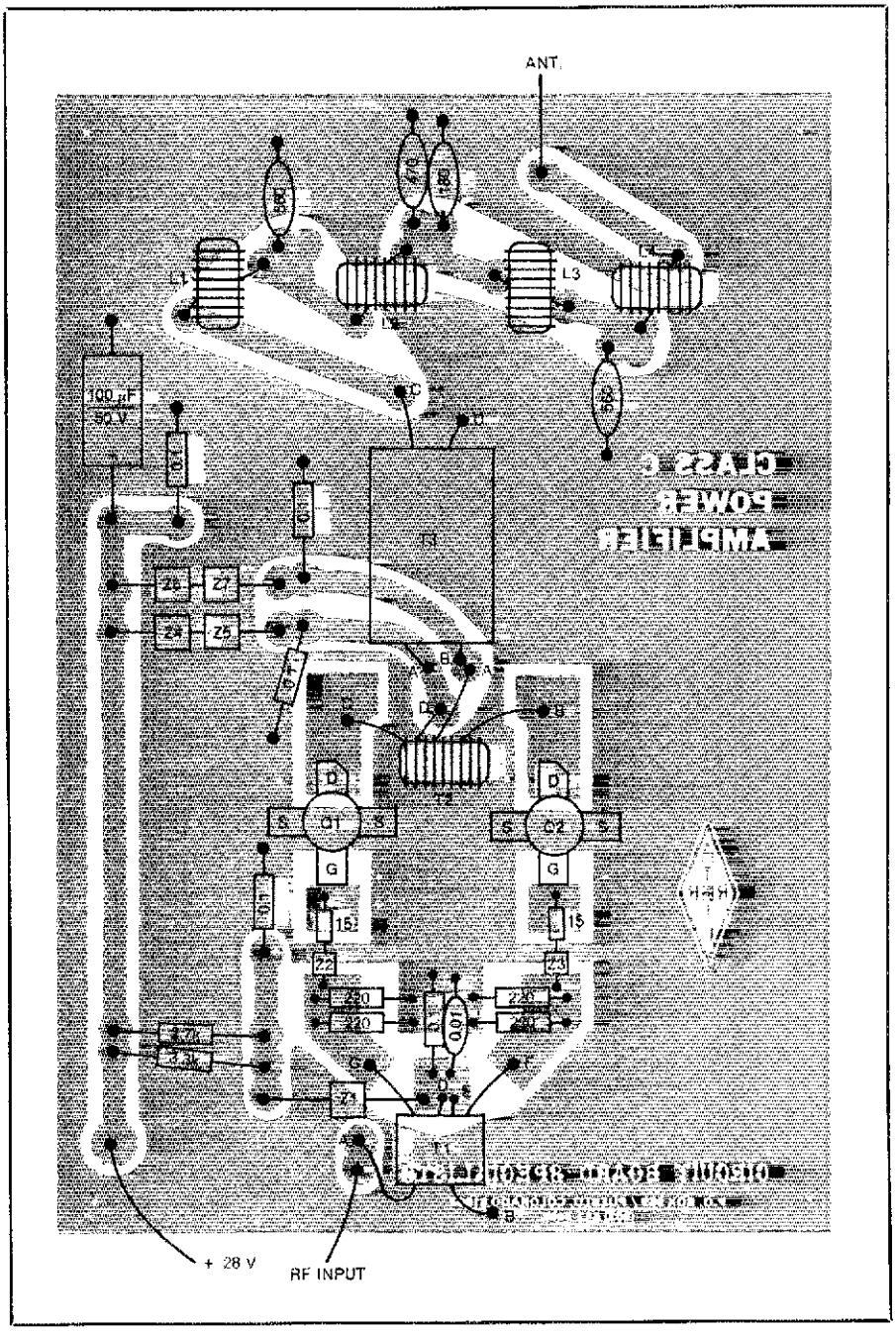


Fig. 6 — Parts-placement guide for the power-FET amplifier, shown in X-ray format from the component side of the pc board. The gray areas indicate unetched copper. Double-sided pc board material is used.

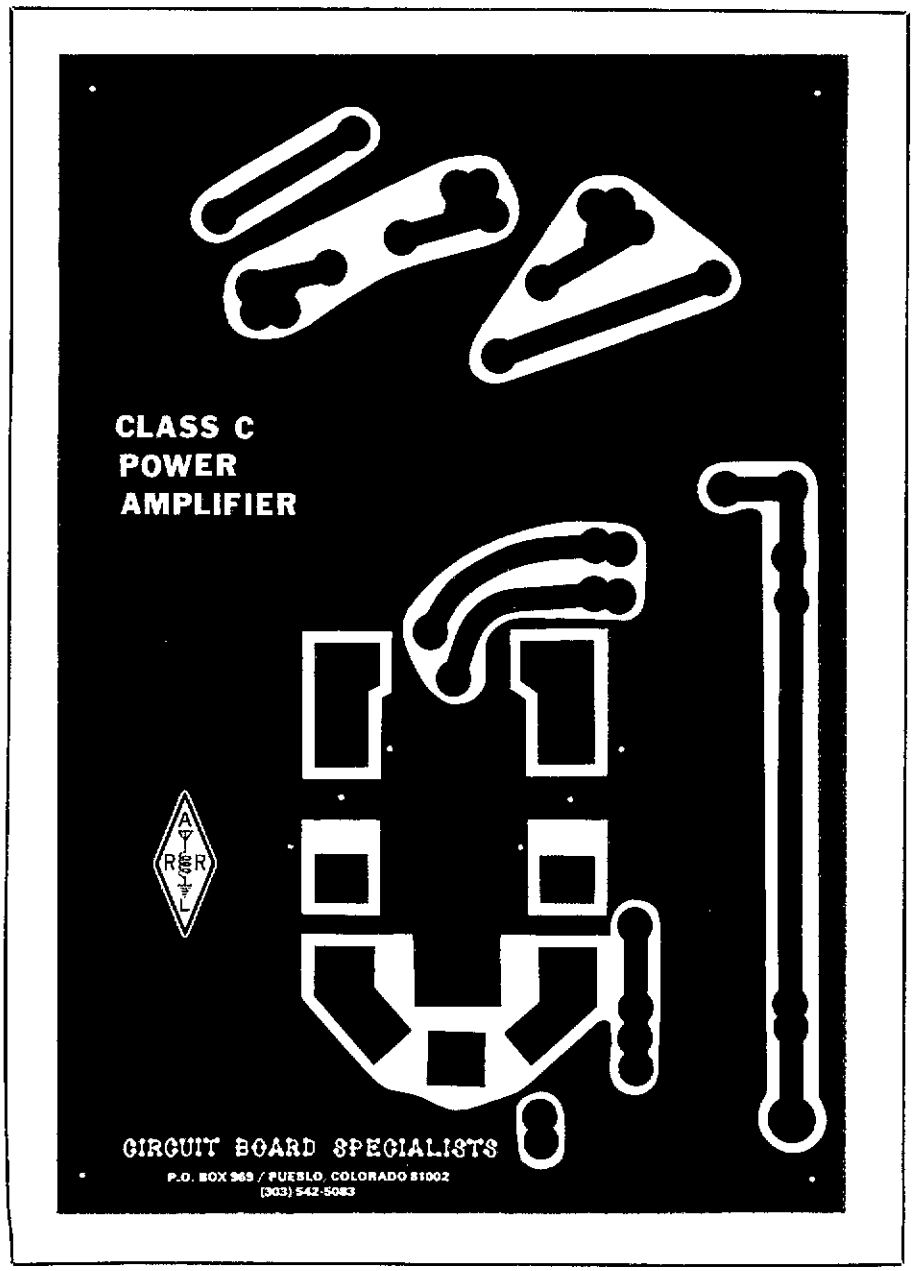
shortened to contain only the circuit up to the filter. Separate boards could then be employed to contain a bank of switchable filters.[7]

The pc board measures 6 × 4-1/4 inches.[8] It is mounted approximately 1/8 inch above the heat sink on metal standoff posts. This permits mounting the FETs with their strip-line tabs at right angles to the bodies of the transistors. This minimizes unwanted stress on the seals. *Always avoid soldering a transistor to a circuit board when the leads need to be bent up or down to mate with the pc-board pads.*

An extruded aluminum heat sink with cooling fins is suggested. It should be of the same length and width as the circuit board, or larger. If such a heat sink can't be located, one may be fashioned from heavy-gauge sheet aluminum, as illustrated in the construction-practices chapter of recent editions of the ARRL *Handbook*. The transistors and the heat sink should be no more than warm to the touch after a 3-minute key-down period at full output power. Under no conditions should the FET case temperature exceed the manufacturer's safe specifications. Be sure to use a thin layer of heat-conducting grease between the mating surfaces of the transistors and the heat sink. Tighten the transistors in place until the nuts are snug, but not super tight. Input and output coaxial connectors can be installed on aluminum L brackets at the ends of the amplifier module.

FL1 is designed for a cutoff of approximately 1.15 the highest desired operating frequency. In this example (Fig. 3), the f_{co} is 8 MHz. The center capacitance of the filter is a nonstandard value. Hence, there are two standard-value silver-mica capacitors in parallel to obtain the required value. Polystyrene capacitors may be substituted for the silver-mica units for frequencies through 14 MHz. Silver-mica capacitors should be used above 14 MHz. The leads of the capacitors need to be kept as short as practicable to minimize unwanted series inductance.

Z1 through Z7, inclusive, are formed by passing short lengths of bare bus wire through the holes of the ferrite beads. Miniature and jumbo beads are used in the amplifier.



Etched-foil side of power-FET amplifier circuit board to scale. Black areas are solid copper.

12-V Power FETs

We can obtain rf power FETs for operation at 12 V. Siliconix, Inc., has a DV1260 transistor that is rated for 60 W of output at 175 MHz. A 2-meter amplifier was built by Hq. staff member AK4L for the purpose of testing a sample of the DV1260. Operation was smooth and an output of 40 W was obtained easily. The power output would have been greater if the supply voltage had been set at 13.5.

Motorola also manufactures 12-V power FETs. The MRF128 is listed as the 12-V equivalent to the MRF138, and is rated for an output of 30 W at 30 MHz. These parts are aimed specifically at the land-mobile market. As production increases the price per unit should drop.

Notes

[1]H. Granberg, "MOSFET RF Power — An Update," *QST*, Dec. 1982 and Jan. 1983.
[2]Generally, power FETs in this class require a V_{DD} of 50 V.
[3]R. Hejhall, "VHF MOS Power Applications," *Preprint*, session 24, IEEE Midcon, Dallas, Texas, Dec. 1982.
[4]*The Radio Amateur's Handbook* (Newington: ARRL, 1980 and 1981).
[5]D. DeMaw, "Practical Class-A and Class-C Power-FET Applications at HF," *Preprint*, session 24, IEEE Midcon, Dallas, Texas, Dec. 1982.
[6]Filter tables with normalized values for various numbers of poles and ripple characteristics are available in the transmitting chapter of recent editions of *The Radio Amateur's Handbook*.
[7]Available from Circuit Board Specialists in both formats.
[8]Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002. Negatives, circuit boards and parts kit are available.

Strays

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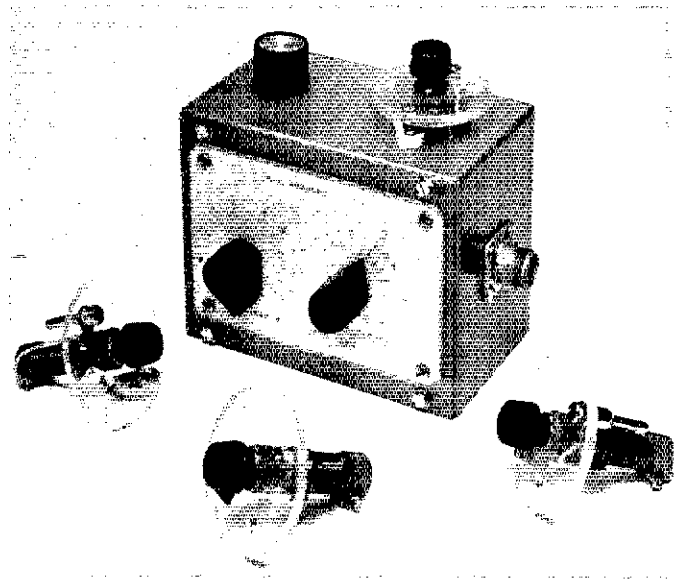
Measuring Impedance with a Reflection-Coefficient Bridge



Read the resistance and reactance components of an unknown impedance with this simple R-X adapter.

By Jack Priedigkeit,* W6ZGN

Voltage standing-wave ratio, or VSWR, is probably the most popular way of expressing the degree of impedance match between an rf transmission line and a load, such as the match between a 50-ohm coaxial cable and an antenna. However, VSWR does not provide sufficient information to design an impedance-matching network to correct mismatch. For example, a 4:1 VSWR in 50-ohm line can be caused by a resistive load of either 12.5 or 200 ohms, or, as may be seen on a Smith Chart, by a complex load impedance of many possible combinations of resistance and reactance.[1]

This article describes an R-X adapter for a reflection-coefficient bridge that permits both the resistance and reactance components of a complex impedance to be measured.[2] The measurement range of this adapter is extended, when necessary, by the addition of a known length of cable. A Smith Chart is then used to determine the impedance without the added cable.

The operational performance and accuracy of this simple R-X adapter should not be expected to be equivalent to that of more sophisticated (and expensive) test equipment, such as a vector impedance meter or a network analyzer.[3,4] Nevertheless, this adapter can provide useful information to the amateur interested interested in experimenting with antennas, transmission lines or rf circuits.

Fig. 1 shows the electrical schematic of the R-X adapter as a series circuit — tuned to resonance at the measurement frequency. In concept, the series-reactance component of the unknown impedance is canceled by adjusting C1 so that the reactance of L1 and C1 in series ($X_L - X_C$) produces a net positive, or negative, reactance that is equal and opposite to the reactance component of the unknown.

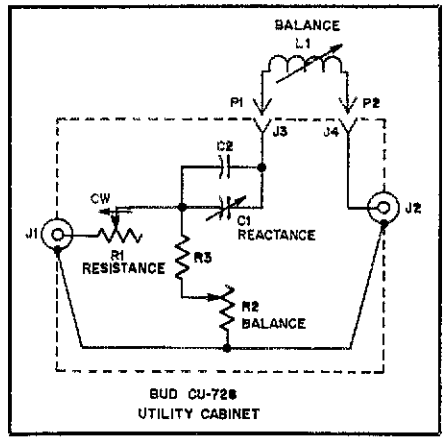


Fig. 1 — Electrical schematic for the R-X adapter.
R1 — 50 ohms, type "J" linear composition.
R2 — 1000 ohms, type "J" linear composition.
R3 — 220 ohms, 1/2-W composition.
C1 — 100-pF variable capacitor, modified (see text).
C2 — 10-pF silver mica.
L1 — Set of plug-in coils, National XR-50 form. See Table 1.
J1 — UG-1094/U or equiv.
J2 — 83-1R (SO-239) or equiv.
J3, J4 — Banana jack, H. H. Smith type 100.
P1, P2 — Banana plug, H. H. Smith type 256.

Assuming the resistance component of the unknown to be less than 50 ohms, the variable resistance R1 is adjusted so that the total resistance of the series circuit is exactly 50 ohms. This terminates the cable from the reflection-coefficient bridge — resulting in a null, or dip, in the S meter on the receiver used as the detector for the reflection-coefficient bridge.

The series resistive and reactance components of the unknown impedance ($R \pm jX$) are read from calibrated dials on R1 and C1. R2 is adjusted during an initial balance to compensate for the resistance of L1, which is in series with the unknown impedance.

It will not be possible to terminate the cable to the reflection-coefficient bridge when the resistive component of the unknown impedance is greater than 50 ohms. In this case, a known length of 50-ohm cable can be added between the adapter and the load to transform the load impedance to the measurement range of the adapter. A Smith Chart, Fig. 2, is used to find the impedance without the added cable.

Measurement Limitations of the R-X Adapter

The limits of the impedance measurement range, normalized to 50 ohms, are shown in Fig. 2. The normalized resistance range, zero to 50 ohms, is bounded by the outer circle of the chart and the $R = 1$ circle that passes through the center of the chart. The normalized reactance range is bounded by the outer circle of the chart and the $X = 1.7$ to $X = 13$ reactance circle, depending on the frequency.

Notes appear on page 32.
*441 Sherwood Way, Menlo Park, CA 94025

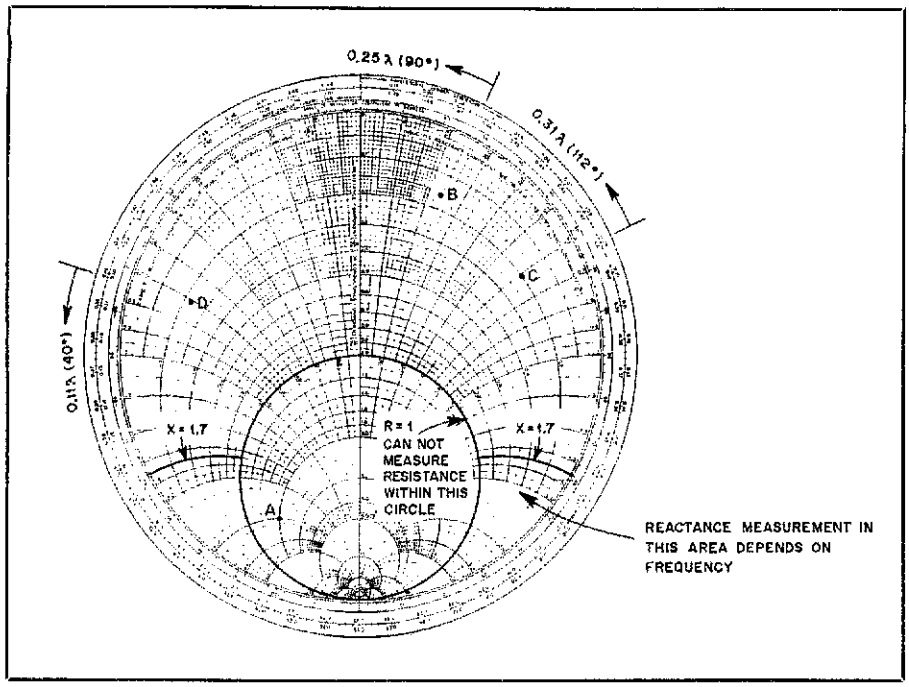


Fig. 2 — Smith Chart examples of using the R-X adapter. See text.

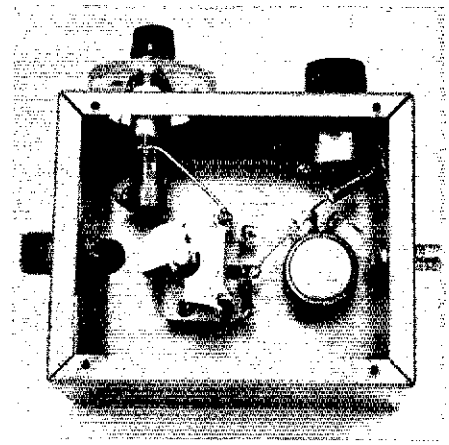


Fig. 3 — Rear view of the adapter with cover removed. Note the plates of C1 after modification, at the approximate center of the box as shown in this view.

Resistance and reactance values falling inside the R = 1 circle cannot be measured since the resistance exceeds 50 ohms. However, impedance values within this circle can be transformed, or rotated on the Smith chart, by adding a length of transmission line. For example, the addition of a 1/4-wavelength line (0.25 λ) will move the unknown impedance diametrically across the Smith Chart, as is illustrated by points A and B in Fig. 2.

Construction

The photos show the R-X adapter constructed by the author. A 3 × 4 × 5-inch (mm = 25.4 × in.) Bud model CU-728 utility cabinet is used. A BNC jack (UG-1094 or equiv.) is used for the cable connecting the adapter to the reflection-coefficient bridge. A type 83-R (SO-239) jack is used for the unknown impedance connector.

The component layout is not critical. However, type "J" molded composition variable resistors should be used for R1 and R2. Further, L1 and C1 must be insulated from the metal box. Point-to-point wiring with no. 16, or larger, solid wire is recommended. The rotor of C1 is connected to R1 and is isolated from the reactance dial with an insulated shaft extension to minimize the effects of hand capacitance.

C1 is a linear 10- to 100-pF capacitor that was modified by shaping the rotor plates on a belt sander. The modification decreases the rate of change of capacitance near minimum setting (see Fig. 3). This modification, together with the addition of the 10-pF fixed capacitor, C2, results in a nearly linear reactance range of approximately ±250 ohms at 10 MHz.

L1 consists of a set of five plug-in coils for the 80, 40, 30, 20 and 10-meter bands. These coils are each wound on a National XR-50 coil form, or equivalent, and plug into a hole cut in the side of the Bud box. Each coil is mounted on a 2-inch-diameter Lucite disc with two banana plugs (H. H. Smith type 100). The banana plugs mate with two plastic-insulated banana jacks (H.H. Smith type 256) mounted on the box. A small knob, for a 1/8-inch shaft, is installed on the slug adjusting screw for ease of tuning the coil to the measurement frequency. The winding details for the set of five coils are shown in Table 1.

Calibration

The resistance and reactance dials may be calibrated to be read in ohms or, as this author prefers, in values normalized to 50 ohms for use with the Smith Chart. The adapter is calibrated at 10 MHz by connecting known resistors, capacitors or inductors to the unknown connector, J2. The capacitance of the type 83-R connector used for J2 is approximately 5 pF, and this must be considered as it is in parallel with these discrete components used for calibration. The capacitance of J2 need not be considered when a 50-ohm coaxial cable is connected to J2 since, to the extent that the 83-R connector has a 50-ohm characteristic impedance, J2 is simply a very short extension to the length of the cable.

The calibration of the resistance dial changes slightly from band to band (see Fig. 4) as the rf resistance of the five plug-in coils differ. For most amateur work, however, it can be assumed that the resistance dial is independent of frequency.

The calibration of the reactance dial is frequency-dependent. The reactance at any frequency other than 10 MHz is

$$X = (\text{dial reading}) \times 10.0/f \qquad \text{(Eq. 1)}$$

where

f is the measurement frequency in MHz.

The actual capacitance and inductance values used to calibrate the reactance dial in 50-ohm increments are shown in Table 2. These values are corrected for the capacitance of J2.

Measuring A Complex Impedance

Initial balance: Fig. 5 shows connections for taking various measurements. (See earlier *QST* articles.[5,6]) Connect the R-X adapter to a reflection-coefficient bridge and tune the signal generator and bridge receiver to the frequency at which the measurement is to made. Plug in the appropriate coil for L1. Set the resistance dial to 1 (50 ohms) and the reactance dial to zero. Terminate J2 with a 50-ohm carbon-composition resistor and adjust L1 for resonance, indicated by a dip of the bridge receiver S meter. Alternately adjust

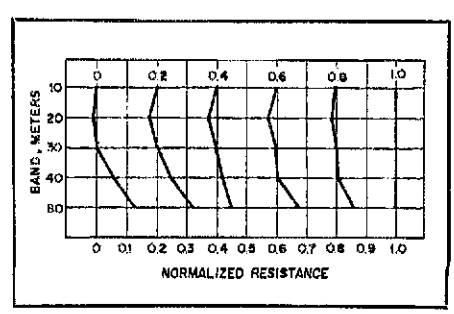


Fig. 4 — Resistance calibration vs. frequency.

L1 and R2 for initial balance — the lowest possible S meter reading.

Measuring an unknown within the range of the R-X adapter: Connect the impedance to be measured to J2. Adjust the resistance dial, R1, and the reactance dial, C1, for minimum reading on the S meter. *Do not* readjust the initial balance controls, L1 and R2.

The resistance and reactance components are indicated on the dials of R1 and C1. The reactance value must be corrected for frequency using the relationship:

$$X = (\text{dial reading}) \times 10.0/f \qquad \text{(Eq. 2)}$$

where f is the measurement frequency in MHz.

Measuring an unknown outside the range of the R-X adapter: It will not be possible to obtain a sharp, deep null on the S meter for impedance values outside the range of the adapter. In fact, for some impedance values, the S meter will change very little, or not at all, as the resistance and reactance dials are adjusted. In this case, add a known length of cable between the adapter and the unknown, and proceed as in the previous paragraph.

The electrical length of the added transmission line, in wavelengths, is calculated with the formula:[7]

$$N = Lf/984k \qquad \text{(Eq. 3)}$$

where

L = the physical length in feet
f = the frequency in MHz
k = the velocity factor for the particular cable type used

Some examples: Assume the normalized resistance and reactance dial readings for an unknown impedance measured at 7.2 MHz using a 1/4-wavelength line are 0.16 + j0.17. Correcting the reactance component for frequency, this impedance is 0.16 + j0.17 × (10.0/7.2), or 0.16 + j0.24 — point B on Fig. 2. Since a 1/4-wavelength line (0.25 λ) was used, the normalized impedance without the added line is located diametrically opposite point B, or point A on the Smith Chart of Fig. 2. The normalized impedance of the unknown without the added line is 2.0 − j3.0. This impedance in ohms is 50 × (2.0 − j3.0), or 100 − j150.

Had a 0.31-λ line been used in the above example, the normalized impedance shown by the dials on the R-X adapter would be 0.2 + j0.45. Correcting for frequency, this impedance is 0.2 + j0.63 — point C on Fig. 2. In this case, it is necessary to rotate point C through 112 electrical degrees (360 × 0.31) toward the load on the Smith Chart to find the impedance without the added line. This will move point C to point A on Fig. 2.

Similarly, if a 0.11-λ line had been used, the R-X adapter would show the normalized impedance to be 0.23 − j0.52. Correcting for frequency, this becomes 0.23 − j0.72 (point D on Fig. 2). The impedance without the added line is found by rotating point D through 40 electrical degrees toward the load, which again falls at point A of Fig. 2.

Table 1

Reactance Range and Coil Details

Band (Meters)	Reactance (Ohms)	Reactance (Normalized)	No. Turns	Wire Size	Inductance (μH)*
80	±670	±13	65	30	25-44
40	±350	±7	27	30	8.7-15
30	±250	±5	20	22	3.8-6.5
20	±175	±3.5	14	22	2.3-3.9
10	±90	±1.8	8	18	0.6-0.9

*Using a National XR-50 coil form or equiv.

Table 2

Inductance and Capacitance for Calibrating Reactance Dial

Reactance (Ohms)	Reactance (Normalized)	+jX Inductance (μH)	−jX Capacitance (pF)
50	1	0.78	313
100	2	1.5	154
150	3	2.3	101
200	4	3.0	75
250	5	3.7	59
300	6	4.4	48

These inductance and capacitance values include the correction for approximately 5 pF of capacitance in the "unknown" connector, J2.

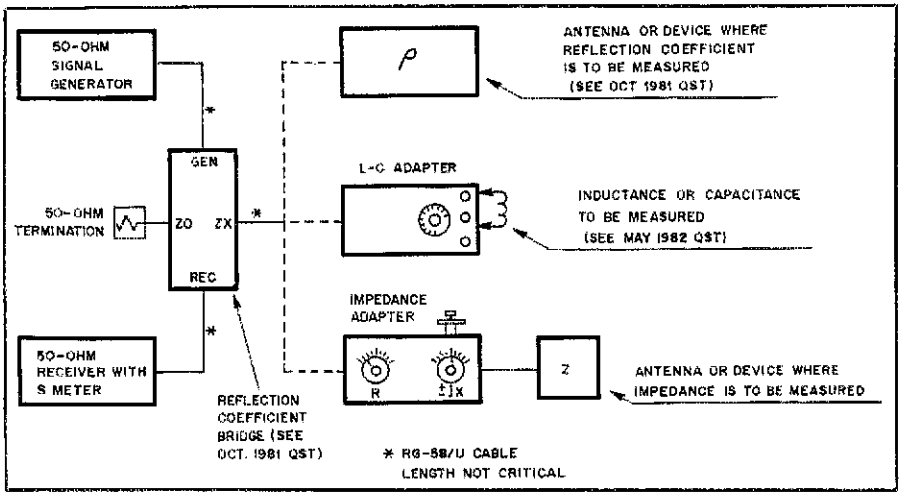


Fig. 5 — Block diagram showing connections for a reflection-coefficient bridge, L-C adapter or impedance adapter.

Jack Priedigkeit received his BSEE degree from the University of California in 1942. He was licensed as a radio amateur in 1947, and received his First Class Radiotelephone license in 1940. A registered electrical engineer in the state of California and a Senior Member of the IEEE, he retired in 1980 after more than 40 years of experience. He holds several patents related to research and development in the areas of instrumentation, antennas, propagation, avionics, communication and navigation systems, and position location.

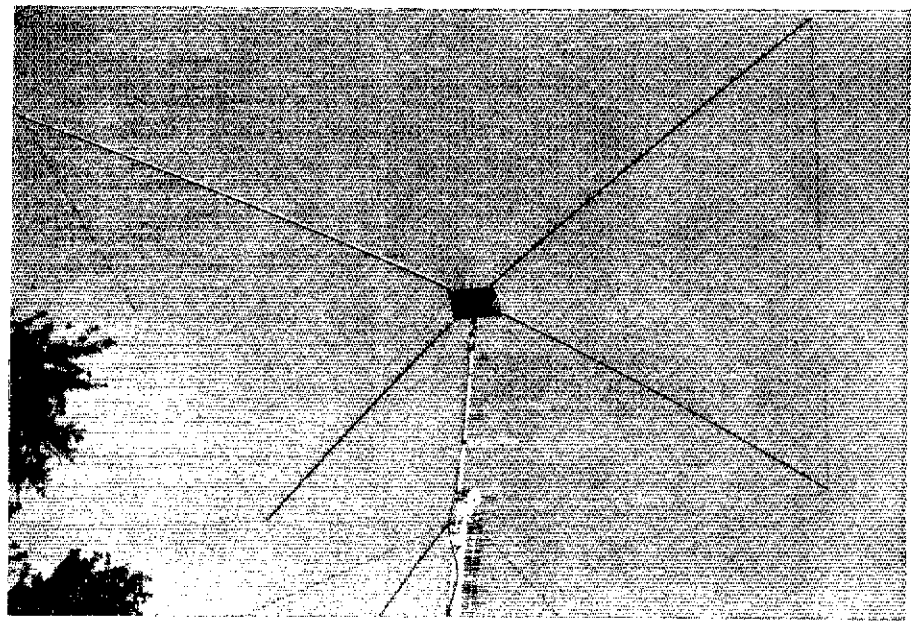
Notes

[1]*The ARRL Antenna Book* (Newington: ARRL, Inc.; 1974 [13th ed.] or 1982 [14th ed.]); Chapter 3, section titled "Smith-Chart Transmission-Line Calculations."
[2]J. Priedigkeit, "A Reflection-Coefficient Bridge — Impedance-Matching Measurements the Easy Way," *QST*, Oct. 1981, pp. 18-20.
[3]Hewlett-Packard Model 4815A Vector Impedance Meter.
[4]Hewlett-Packard Model 8407 Network Analyzer.
[5]See note 2.
[6]J. Priedigkeit, "Measuring Inductance and Capacitance with a Reflection-Coefficient Bridge," *QST*, May 1982, pp. 28-29.
[7]See note 1.

Horizontal X Beams for 15 and 20 Meters

Try this design from "across the pond" and enjoy BIG GUN performance from a small package.

By Brice Anderson,* W9PNE



Are you a serious 10, 15 or 20-meter operator who lacks a beam antenna? How would you like to build a compact, lightweight beam that offers good performance and a low SWR, band edge to band edge? This description fits the horizontal X-beam antenna. I have built "X" beams for 15 and 20 meters, and find their performance impressive!

The X-Beam Antenna

An on-the-air acquaintance, Bob Norwood, W6FWL, built an X antenna and then sent me an article from *Break-In,* journal of the New Zealand Association of Radio Transmitters, by J. F. Harper, ZL2NH, that describes it. The article covers the theory and construction of a compact 2-element beam antenna using aluminum-tubing arms and wire loading "tails." The X beam is derived from a 2-element Yagi design in which the parasitic element is self-resonant and serves as a director. The design apparently originated in England, where G4ZU had built a number of antennas with the "X" format. The concept traveled to Australia and to New Zealand, where VK4RF and ZL2NH built and used it with enthusiasm.

Fig. 1A shows a typical 2-element Yagi antenna. Suppose the centers of each element were pulled inward until the arms were at right angles to each other. This would form an X-beam antenna, which is shown in Fig. 1B.

This X design eliminates the need for a boom, but the overall physical size is not reduced significantly because of the long element lengths. By shortening the elements, the physical size becomes manageable. Resonance is restored by adding wire extensions to the element ends. This is shown in Fig. 1C. The effective spacing between the elements is 0.05 and 0.10 wavelength. For 20 meters, the element arms may be as short as 12 feet.[1] I felt that the antenna might have greater bandwidth, however, if the elements were a bit longer and the wire tails shorter. I used arms 13 ft 9 in. long — a convenient dimension for the tubing I had on hand.

Construction of a 20-Meter X

A trip to the lumber yard netted the necessary aluminum tubing and associated parts. I bought two 8-foot pieces of tubing in the following sizes: 1-inch OD, 7/8-inch OD and 3/4-inch OD. I also purchased 1 foot of 1-inch ID heavy-wall, clear-plastic hose; eight 1-1/4 inch pipe brackets; a 15-inch-square piece of 5/8-inch plywood; a 30-inch length of 2 × 4; a supply of lag screws; and some 1/4-inch stove bolts and nuts. The total cost was less than $30.

The ZL2NH design called for short pieces of angle iron, welded in the form of an X, with a stub mast welded on, to serve as the hub of the beam. Plywood is used as a hub in my design, with two 15-inch lengths of 2 × 4 wood bolted to the underside, spaced 2 inches apart. I used lag screws to fasten a 2-1/2 foot mast of 2- × 2-inch wood to the 2 × 4s. Fig. 2A shows the hub assembly. This arrangement gives me the option of vertical or horizontal polarization.

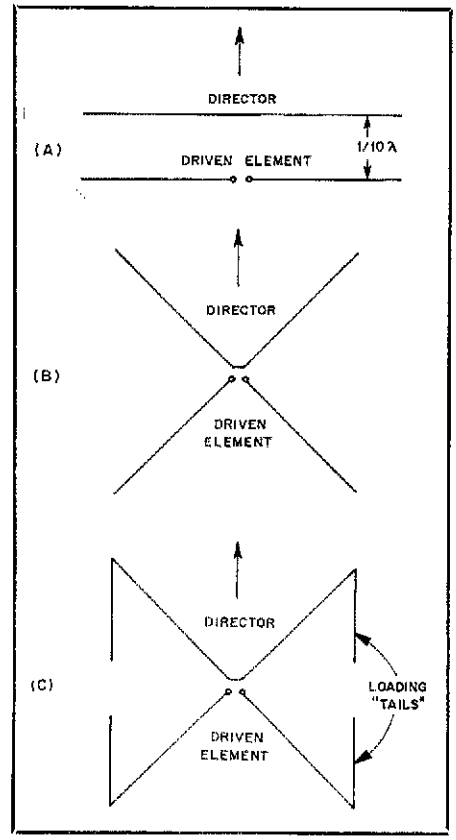


Fig. 1 — Derivation of the X beam from the Yagi design. See text for details.

Assembly

Each piece of tubing is sawed in half, deburred inside and out and lightly polished with emery paper until the sections telescope together. Old TV-antenna elements can be used for the 5/8-inch-OD end sections on the arms.

The 4-foot pieces of 1-inch tubing are mounted on the plywood square in the shape of an X, with a separation of 3

*P.O. Box 14, Lancaster, IL 62855

[1]m = ft × 0.3048; mm = in. × 25.4.

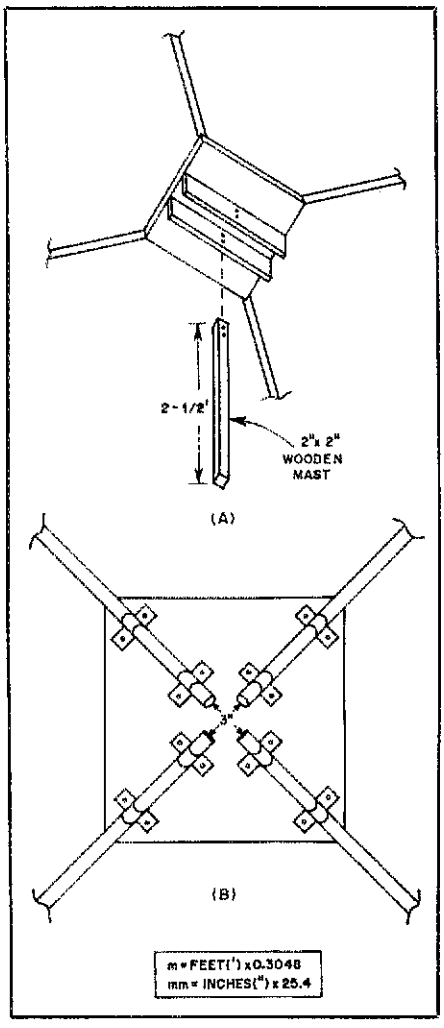


Fig. 2 — Details of the hub assembly. A shows the bottom view, and B details the top assembly.

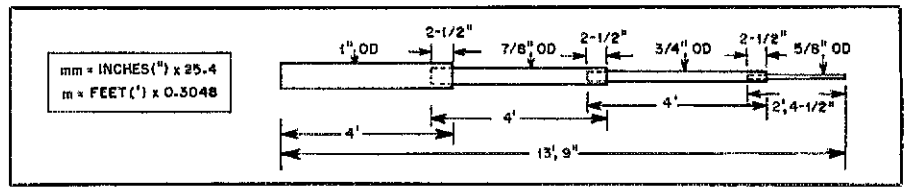


Fig. 3 — Details of the antenna-arm construction. No. 6 machine screws are used to hold the tubing together.

inches between tubing ends at the center. Insulation for the tubing is provided by 1-1/2 inch pieces of plastic tubing, which slip over the aluminum tubing. Stove bolts hold the brackets to the plywood. This provides a very strong and well-insulated mounting as shown in Fig. 2B.

Insert the 7/8-inch tubing pieces 2-1/2 inches into the 1-inch tubing and secure with two no. 6 self-tapping screws. Likewise, the 3/4-inch tubing is fastened to the 7/8-inch tubing. Four pieces of 5/8-inch tubing, each 2 feet 4-1/4 inches, are fastened to the 3/4-inch tubing in the same way. The total length of each arm is 13 feet 9 inches. See Fig. 3 for details on the arm assembly.

An SO-239 type coaxial connector is mounted to the hub by means of short standoffs. Solder lugs are fastened to the ends of each arm, and to the inner ends of each arm at the hub, with no. 6 self-tapping screws. A piece of no. 12 wire connects the director arms together, with the wire bent into a 3/4 turn to aid in coupling during tuning. The coaxial connector is wired directly to the driven element with no. 12 wire.

Tail-wire length will vary with different wire sizes. This length must be determined experimentally. Nylon cord runs between the ends of the arms to reinforce the assembly and to serve as a support for the tails. After finishing the mechanical construction, give the hub assembly several coats of aluminum paint. Be sure to mask the plastic insulators and coaxial connector with tape to keep them free of paint. The hardware is also sprayed with aluminum paint. The completed antenna is light enough to be carried up a ladder in one hand.

Tuning and Checking

It is important that the tails be longer than necessary at the start, and that each driven-element tail be 12 inches longer than each director tail. All four tails are trimmed 1 inch at a time until the director is resonant at the desired center frequency. This may be checked by mounting the antenna on a 10-foot mast, placing a 50-ohm load across the driven element feed point and checking the director resonance with a dip meter. After tuning the director, remove the 50-ohm load and trim the two driven-element tails until resonance is indicated on the dip meter. For the best frequency coverage, the antenna should be tuned for 14.100 MHz. At this point, the tail-wire lengths should be 7 feet 8 inches for the driven element and 6 feet 8 inches for the director. Fold back and tape the tail-wire ends to prevent ionizing effect of a sharp point.

Results

After tuning my antenna, I connected a Ten-Tec Argonaut 515® to the antenna and checked the SWR. The readings were

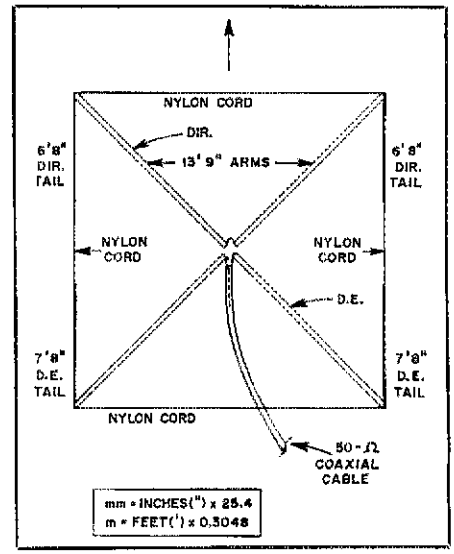


Fig. 4 — Layout of the 20-meter X. The nylon cord is used to hold the wire tails taut.

so low that another bridge was used to confirm the results. The antenna was then raised to its final height of 30 feet. As expected, the resonant frequency increased, but the SWR remained low across the band. The SWR curves for the X antennas are shown in Fig. 5.

On the Air

Well, does it work? As ZL2NH says, "She works, mate." I had three other antennas to compare with my X beam: A horizontal V with 160-foot legs, 50 feet high, a four-band trap vertical on top of a 20-foot pipe; and a dipole broadside to Europe, up 30 feet.

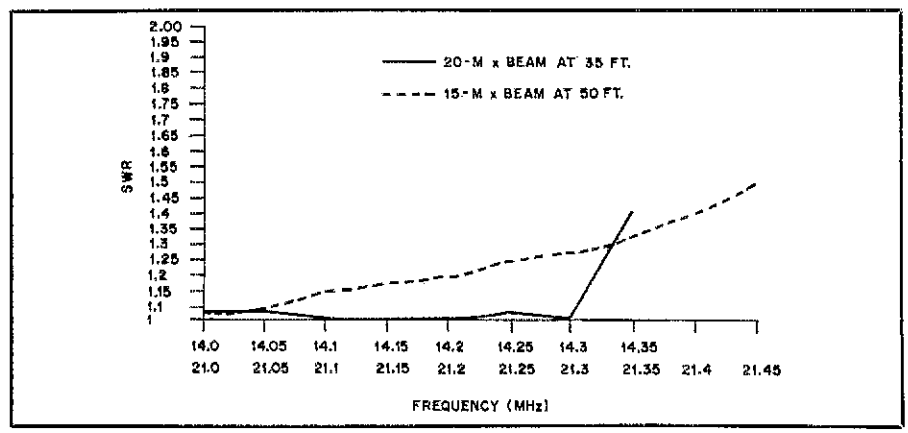


Fig. 5 — SWR curves for the 20- and 15-meter X-beam antennas.

Input power for my on-the-air tests was 5 W; there was no difficulty in raising DX stations with the X beam. I received many encouraging signal-level comparisons from U.S. and DX stations. In every case the X Beam produced the best signal reports, even though the inverted V was 15 feet higher. In general, the X Beam was 1 to 2 S units stronger than the V, and was always stronger than the trap vertical or dipole antennas.

A 15-Meter X

I decided to scale the 20-meter X to 15 meters and erect it next to a vertically polarized 4-element, 20-meter Yagi on my 50-foot tower. The 20-meter X was replaced by a 5-element commercial "tribander." Because of the size and weight of the tribander, it was raised to a height of only 30 feet.

Mechanical Changes

To change the 20-meter X to 15 meters, the arms are shortened to 9 feet 3 inches. Apply the same tuning procedure as before. The director tails should measure 4 feet 2 inches, and the driven-element tails 4 feet 10 inches. Prune the tails until resonance is indicated at 21.110 MHz. The SWR should be low across the band.

15-Meter X Performance

The performance of the 15-meter X beam at 50 feet has been spectacular! In normal operation, DX stations usually can be raised on the first call. During the CQ WW cw contest in November 1981, I ran the Argonaut 515 at an output of 4 W. During a 70-minute operating period, 23 stations were worked. Fourteen were raised on the first call and five on the second call. The X again proved its worth in the 1982 ARRL DX contests in the QRP division, resulting in 70 QSOs in 30 countries in the cw section and 53 QSOs in 30 countries in the ssb section.

A comparison of the performance of the X-beam antenna and the commercial tribander was made. Of course, the low height of the tribander (30 feet) was a disadvantage. The two antennas were equally good for medium distances, with the tribander a little better for short skip. However, on the long hauls, especially when the band was just opening or closing, the high X beam was superior. Transmitted and received signal-strength reports were at least 1 S unit better. Contacts made with the X beam were impossible to achieve with the tribander.

Conclusions

Since this article was written, I have found that the addition of a coaxial balun, mounted at the antenna feed point, will improve the azimuthal pattern considerably. Also, the director does not have to be insulated from the hub; I removed the element insulators and performance remained identical.

The X beam has a lot going for it. I wish the design were my invention! I am looking forward to building an all-metal "plumber's delight" version for 10 meters using inexpensive aluminum clothesline props and aluminum angle stock. I also hope to try a 40-meter version in which the arms would be only 25 feet long.

New Books

☐ *Three New Directories for Amateurs.* Ever wondered how many hams there are in your town? Unless you know everyone in town, you would probably be surprised at just how many hams there are. Or, how about hams with the same name as yours? There are many uses for this information, not the least of which is to build a list of other hams who might want to start a club.

One of three new directories, the *Amateur Radio Call Directory,* can make an otherwise impossible task easy. Every U.S. amateur is listed alphabetically by state, town, street address and call. It's interesting to pick a town, any town, and observe the number of hams who live there. For example, opening the book completely at random, and placing my finger blindly on a page produced the information that there are 55 hams in Cinnaminson, New Jersey, and 76 hams in Conyers, Georgia. Of the approximately 80 hams shown in Newington, including many staff members who use Hq. as their FCC address, more than 40 were unknown to me. Our club secretary will be contacting them about coming around to club meetings.

The second directory is more of a curiosity at the moment, though it will no doubt prove of value in the future. It indexes, by last name, every ham in the country. There are, for example, only two Auricks: my son in Pennsylvania and myself. Information is listed by first name, initial call and state. There are more than 28 columns of Smiths, and only one listing for Sneary. It's fascinating to see the diversity of names, and the duplication of middle initials of hams who are undoubtedly never had the faintest idea that there was another ham with exactly the same name.

The third directory is similar to the listing we are all familiar with one important exception: There is no break between the name of the community and the state and ZIP code. It appears to make for easier reading. Everyone is listed by call district, name and QTH.

The three directories are available from Buckmaster Publishing, 70 Florida Hill Rd., Ridgefield, CT 06877. Prices: *Amateur Radio Call Directory* (by districts and by call signs), $12.95; *Geographical Index,* $25; *Name Index,* $25. — *Lee Aurick, W1SE*

☐ *The 10 Meter FM Handbook,* by Bob Heil, K9EID. Published by Melco Publishing, P.O. Box 26, Marissa, IL 62257. First edition, 1980. Soft-bound volume, 6 × 9 inches, 80 pp., $4.95.

Many hams seem to be interested in 10-meter fm so it would appear that *The 10 Meter Handbook* might go a long way toward answering many questions. There have been articles about converting CB transceivers to operate on the 10-m band, and that seems to be the main idea behind this book. Almost half the book is devoted to describing the advantages of 10-m fm operations, what is involved, some of the problems and other introductory information.

The later sections are used to describe the steps in converting a surplus Cybernet (HyGain) CB transceiver board so that it can operate on 10-m fm. I was looking forward to the technical details, but was greatly disappointed by the coverage provided. The descriptions of the conversion steps are poorly written, and a great deal is left to your imagination.

For example, the first step appears to be a checkout of a surplus board on the citizens' band to be sure it is operating. This is a good idea, since you don't want to "convert" a defective board. However, here's a typical description: "All check out is done with frequency programming on channel 1, if it is a 23-channel unit or channel 20 if it is a 40-channel rig. This will become 29.5 when conversion is finished." This left me a bit confused, since there was no mention of *how* the unit was supposed to be "programmed" for these channels. Remember, you're supposed to be working with an open pc board, with no external controls. Other steps assume that you know exactly what parts are needed, and that you can identify solder connections on the pc board without a diagram. Eight pages later, a wiring diagram is shown, but it is dually labeled as the MELCO FM I.F. BOARD and the Cybernet board. It is also missing the resistance values for the volume and squelch controls and the current range of the meter.

Since the CB transceiver doesn't have the ability to process fm, an fm detector must be added. A detector circuit is shown, but component values are missing from both the diagram and the text. Likewise, the schematic diagram shows an LM3065 fm detector IC, while all the descriptions mention a 1358P IC. Over 20 pages later, the chips are mentioned, along with others, in a two-page chapter about fm detection systems. The two chips appear to be functional equivalents, but not pin-for-pin replacements for each other.

Diagrams and figures are hand-drawn, and the lack of complete information about parts and connections makes much of the information less than useful. The book suffers from lack of detail and from poor organization. It is difficult to see how this 80-page book can be called a handbook.

Since many of the needed parts, as well as the main CB transceiver board, are available from the publisher, the book can be best viewed as a "sell job" for their kits and assemblies. You shouldn't have to spend $4.95 for a short, incomplete introduction to 10-m fm. The book is also billed as a "must" for builders of the Melco kits. I hope the builders don't have to rely on the information in the book to assemble their systems. — *Jon Titus, KA4QVK*

The Two-Band Delta-Loop Antenna

An interesting antenna, indeed! But you may be more interested in the electronic switching for a remote impedance-matching network.

By Richard O. Gray,* W9JJV

This antenna provides excellent performance on the 40- and 80-meter bands. It requires a limited amount of space, and includes a pretuned, remotely located antenna-matching network. The design illustrates the use of resonant circuits instead of switches to select the proper matching circuit for each band. You can build a similar antenna, with variations in loop shape or with different impedance-matching circuits, if you follow the basic philosophy that I did.

Fig. 1 shows the arrangement I used in developing the matching networks. The open-wire feeder was connected to an 18-inch length of RG-8/U cable at the outside wall of my house.[1] This short length of coaxial cable served as a feed-through line, so the experimental work could be carried out in the comfort of my home.

Only two pieces of test equipment — an rf voltmeter and an SWR indicator — were used to adjust the matching network. An exciter with a 50-ohm output impedance was adjusted to produce just enough power for a full-scale reading on the SWR meter. The rf voltmeter was connected between the inner conductor of the short coaxial cable and ground. The rf voltage at this point can be 1000 or greater when operating at full power, so be careful! Alternatively, a field-strength meter can be loosely coupled at this point. Short pieces of coaxial cable connect the transmitter to the SWR meter, and the meter to the matching network.

The total length of wire in the triangular loop is 140 feet, which is close to being a full wavelength on 40 meters and a half wavelength on 80 meters. I am sure the loop is affected by the close proximity of the vertical portion to the steel tower leg.

The apex of my loop is mounted by means of an insulator tied to a nylon rope through a pulley at the top of my tower. The rope is a continuous loop from the ground through the pulley and back to the ground. Should the wires break, or I have to lower the antenna for any reason, I won't have to climb the tower.

My matching network was determined empirically by trying parallel and series tuned circuits, pi networks and various other circuits. You may find it easier to discover the best network for your particular case by using a commercial antenna-matching network that has most of the common combinations included. When a proper impedance match is obtained, you can build a pretuned network using the appropriate components and values.

All of the parts used in the experimental work came from my junk box. Inductors are wound on various tubing sizes that I had available. All of the wire for the loop, open-wire line and coils is no. 16 copper conductor.

To adjust the experimental matching network, I tuned the capacitors and changed the inductor tap points while watching the SWR meter and the rf voltmeter. Look for a decrease in SWR and an increase in the rf voltage. Patience and practice will lead to a low SWR and a fairly high rf voltage at your favorite operating frequency.

The End Result

In the final configuration, I moved the matching network to the outside wall of my house. Fig. 2 shows the final matching-network circuit. Since most of the components are above ground potential, I used a 12- × 12-inch piece of 1/4-inch-thick Lucite® as a base. The enclosure is made of 0.018-inch-thick aluminum gutter flashing, available from most hardware stores. I no longer needed the 18-inch piece of RG-8/U to feed through the house wall, but it is still a part of the circuit capacitance. I connected one end of the center conductor to the network output, and the shield braid to ground. The other end of the cable is wrapped with electrical tape to prevent shorting to any other part of the circuit. This is C5 in Fig. 2.

Next, I simplified the operation by eliminating the three switches. I did this by using tuned circuits to switch the signal

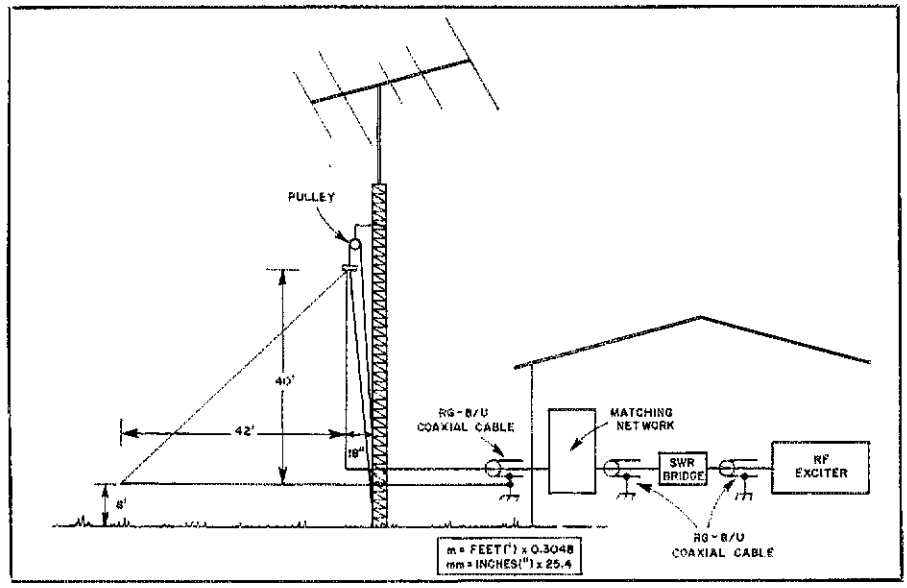


Fig. 1 — Construction details for the two-band Delta Loop. Notice that the matching network was located inside the house during the design stage. It was moved outside for the final arrangement.

[1]mm = in. × 25.4; m = feet × 0.3048

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paths automatically. I determined that the impedance of L1′ and C1 is negligible on 80 meters when compared to that of L2′ and C2. S1 can simply be eliminated. The S2 mode must present a high impedance on 80 meters and be near zero on 40 meters, so I replaced the switch and its function with a series-resonant circuit tuned to 40 meters. This circuit presents a capacitive reactance on 80 meters and reduces the required value of C2. The S3 mode should provide a low impedance on 40 meters and a high impedance on 80 meters. S3 can also be replaced by a series-resonant circuit that is tuned to 40 meters. The refined circuit is shown in Fig. 3. Fig. 4 shows the internal layout with the aluminum cover removed from the box.

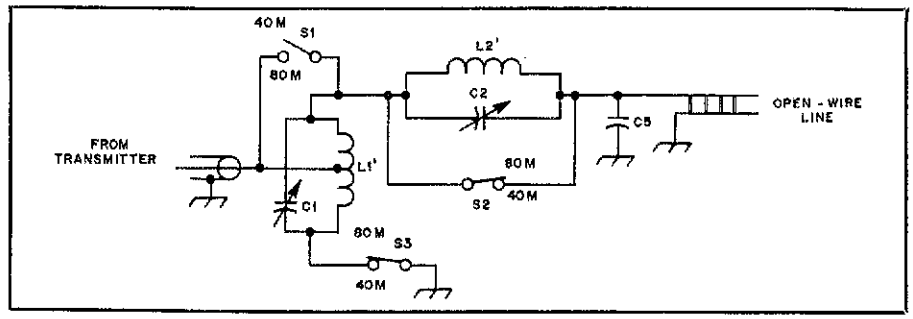

Fig. 2 — Schematic diagram of the matching network. Switches S1, S2 and S3 are shown in the 40-meter position.

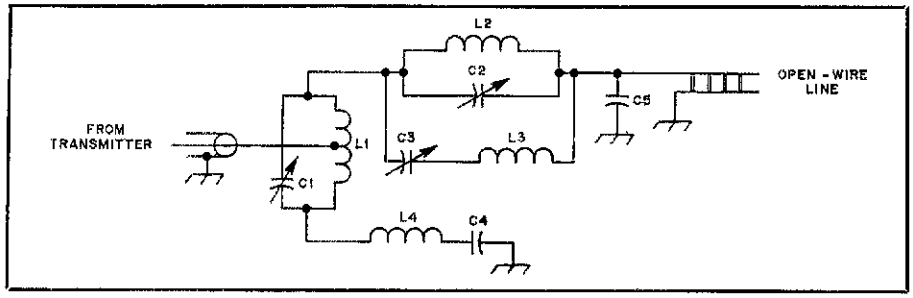

Fig. 3 — Schematic diagram of the matching network after the switches have been replaced with series-resonant circuits.

C1 — 10 to 80 pF, with 0.035-inch spacing between plates.
C2 — 21 to 100 pF, with 0.080-inch spacing.
C3 — 8 to 50 pF, with 0.080-inch spacing.
C4 — 400 pF, 1000 V.
L1 — 18 t, center tapped and tapped up two turns from bottom. The coil is wound on a 1-3/4 inch diameter form, and is 2 inches long (approx. 6.3 μH).
L2 — 19 t, tapped up five turns from input end. The coil is wound on a 1-3/4 inch diameter form, and is 2 inches long (approx 5.5 μH).
L3 — 20 t on a 1-7/8 inch diameter form, 1-5/8 inches long (approx. 12.0 μH).
L4 — 7 t on a 1-1/16 inch diameter form, 5/8-inch long (approx. 1.35μH).
All coils were wound with no. 16 copper wire.

Circuit Analysis

On 40 meters, the resonant impedance of L4 and C4 is about 3 ohms, assuming a conservative Q value of 20. This is considerably less than 50 ohms, and so meets my requirements. On 80 meters, the impedance is about 70 ohms, which is not considerably greater than 50 ohms. This impedance is a capacitive reactance, however, and can be tuned out by the adjustment of C2.

The resonant impedance of L3 and C3 on 40 meters is approximately 30 ohms, again assuming a Q of 20. This is much lower than the anticipated impedance of the antenna system. On 80 meters, the impedance is equivalent to a 60-pF capacitor, which is in parallel with C2. The capacitance of C2 will have to be reduced accordingly.

Final Adjustment

C1 and C3 should be adjusted for the lowest attainable SWR on 40 meters. Next, adjust C2 for a low SWR on 80 meters. Any change in the setting of C3 on 40 meters will affect the setting of C2 on 80 meters. As a final step, switch between the 80- and 40-meter bands to be sure the performance is satisfactory on both.

The SWR curves for my system are shown in Fig. 5. If the frequency of lowest SWR is chosen properly, you should have an SWR of 2.5 or less across the entire 40-meter band, and for a 300-kHz segment of the 80-meter band.

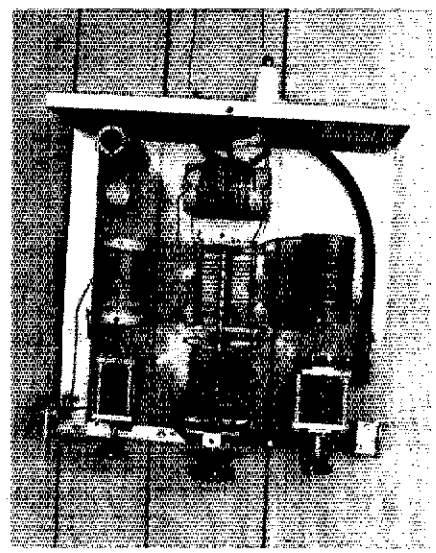

Fig. 4 — Construction details of the automatically switched matching network for the two-band Delta-Loop antenna.

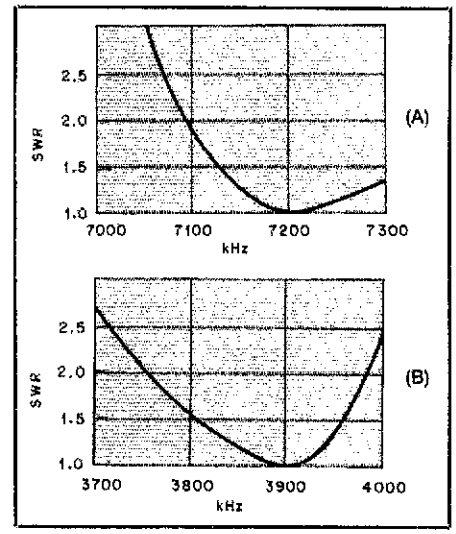

Fig. 5 — SWR curves for the W9JJV two-band Delta-Loop antenna. The 40-meter curve is shown at A, and the 80-meter curve is shown at B.

Conclusions

My station is equipped with a 50-foot tower and is a triband Yagi antenna. The tower is grounded and is tuned for 40- and 80-meter operation by means of a gamma match. Tuning and switching are done remotely from the operating position. I used this as a vertical antenna for comparison with my Delta Loop.

The most noticeable difference between the antennas is in reception on 80 meters. The atmospheric and man-made local noise can be as high as S5 or more when using the vertical antenna. At times, I know there is a signal present, but I can't copy it through the noise. Upon changing to the Delta Loop, the station is "solid copy." This is what I was looking for.

I expected the loop to exhibit directional characteristics, with the maximum propagation being perpendicular to the plane of the loop. This was not borne out in the limited number of tests I conducted. The directivity might be affected by the tower, which is only 18 inches from the vertical side of the loop. It could also be affected by the aluminum siding on my house (10 feet away) or by the forest on the other side of the tower.

The receive sensitivity is about the same as with the vertical antenna. The Delta Loop may be 1/2 S unit better. On transmit, the loop results in better reports by an average of 1 S unit.

Some Aspects of the Balun Problem

Why all the mystery surrounding baluns? Here's some straight talk to dispel the rumors!

By Walter Maxwell,* W2DU, ARRL TA

The balun — to use, or not to use — is one of today's hottest topics in Amateur Radio. Because certain aspects of the connection between a coaxial feed line and a balanced antenna have been ignored, misunderstanding still exists concerning the function of baluns. Many commercial baluns embody some form of impedance transformer, promoting our tendency to misconstrue them as little more than a matching device, while their *primary* function is to provide proper current paths between balanced and unbalanced configurations.

To help clarify the misunderstanding, I will explain some of the undesirable effects that occur when a balun is not used, and some that occur when using baluns employing coupling transformers. (In many cases, these effects cause significant errors in measurements of antenna impedance and SWR.) I will also describe a simple and inexpensive method of loading the outside of a coaxial feed line with ferrite, which effectively produces a well-balanced, wide-band choke balun. Because this configuration eliminates the coupling transformer (with inherent impedance-transfer ratio errors), the accuracy obtainable in antenna impedance and SWR measurements is greatly improved. In addition, antenna-matching networks may be used with this choke balun, because no mismatch limits are imposed.

Transformer Accuracy

Using precision impedance bridges, (General Radio GR-1606-A and the Boonton 250A RX Meter), I have made measurements of transformer-type baluns that prove with a 50-ohm resistive load, the transformers in typical 1:1 or 4:1 baluns do not yield a true 1:1 or 4:1 impedance transfer ratio between input and output. This is because of losses, leakage reactance and less-than-optimum coupling; my findings have been substantiated by the work of John Nagle, K4KJ.[1] Furthermore, when we move away from the resonant frequency, the antenna becomes reactive and the impedance-transfer ratio degrades even further. This degradation of impedance transfer associated with baluns poses no serious operational problems. However, SWR curves plotted of an antenna using such a balun differ significantly from those plotted using a balun having no impedance-transfer error. Thus, when a precision bridge is used to measure antenna impedance (R + jX), the data will be erroneous with either a transformer-type balun in the circuit, or with no balun at all.

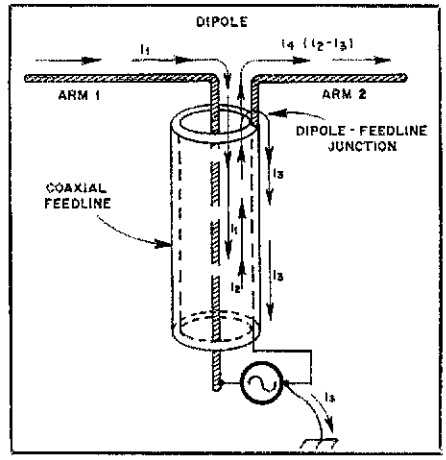

Fig. 1 — Illustration of the various current paths at a dipole feedpoint.

Should SWR Change with Line Length?

We know that the feed-line input impedance changes with line length when the load (antenna) is not matched to the line. Sometimes, trimming the length of our feed line helps to obtain a load impedance better suited to match the transmitter. Theoretically, SWR should not change with line length — except for a barely perceptible change because of line attenuation. Then why does the SWR sometimes change? If the SWR changes significantly with line length, it must mean that the load impedance is also changing. The *load* impedance changes with line length? Yes. If a balun is omitted when you feed a balanced antenna with coaxial cable, the load impedance will change, as will the SWR! To explain this, we must investigate how current flows in an antenna system.

Examination of Current Flow

To understand the functions of a balun, it is essential to be familiar with current paths at the dipole feed point. This is shown in Fig. 1. Because of their symmetrical relationship, the dipole arms couple energy of equal magnitude and opposite phase to the feed line, thus cancelling induced current flow on the outside of the feed line.[2] What is disturbing is the discovery that there are *three* paths for current flow in a coaxial feed line, instead of only two. How can there be three current paths in only two conductors? At rf, skin effect "divides" current between the inner and outer surfaces of the coaxial shield. This effect, which does not occur significantly at dc or low-frequency ac, prevents currents flowing on the inner braid surface from interacting with those on the outer surface, and vice versa.

While traveling within the transmission line, I_1 flows on the center conductor, and I_2 flows only on the inner surface of the outer shield. When antenna current is flowing from left to right (Fig. 1), I_1 flows out of dipole arm 1 onto the center conductor, and returns to the generator. I_2, being of opposite phase, flows along inside the feed line until it reaches the junction of dipole arm 2. At this junction, I_2 divides into two separate paths and forms I_3, which flows back down the *outside* surface of the feed line, and I_4, which equals $I_2 - I_3$ and flows onto dipole arm 2. The magnitude of I_3 depends on the impedance to ground provided by the outside surface of the coaxial shield.

If the effective path length to rf ground is an odd multiple of a quarter wavelength, the impedance will be very high, making I_3 negligible. In this case, I_1

[1]Notes appear on page 40.

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and I_4 will be nearly equal. On the other hand, if the rf path to ground is a multiple of a half wavelength, the impedance will be fairly low and current I_3 may be substantial, — resulting in unequal currents in the dipole arms and radiation from the feed line. In many instances, this rf path to ground includes the transmitter line cord and some house wiring, terminating at the power-line ground! Thus, the amplitude of I_3 varies with changes in feed-line length because of impedance effects.

Effects of I_3 on Antenna Impedance

It should be kept in mind that transmission-line currents I_1 and I_2 cannot produce radiation because their fields are not only of equal magnitude and opposite phase, but are confined within the shield of the coaxial cable. The field developed by I_3 *does* radiate, however, and thus the outer surface of the coaxial braid effectively becomes "dipole" arm 3, which is connected in parallel with arm 2.

To clarify this equivalent connection of radiators, I've simplified the circuit as shown in Fig. 2. Since I_1 and I_2 do not interact with any other currents, we may hypothetically place the rf generator directly between the input terminals of the antenna. Now that coaxial cable is no longer needed to transfer power from the generator to the antenna, the third conductor of the feed line (the outside surface) can be replaced with a single wire connected between arm 2 and rf ground. We have not changed the circuit electrically because I_3, which previously flowed on the outside of the coaxial cable, still flows to ground — but on the single wire.

We know that, depending on height, the impedance of a dipole (at resonance) is usually between 50 and 75 ohms, and is purely resistive. At frequencies above resonance, the resistance increases gradually and series inductive reactance appears; below resonance, the resistance decreases and capacitive reactance appears. The impedance of each dipole arm is one half of the total dipole impedance. Since the far end of arm 3 is at rf ground, its impedance behavior follows that of a short-circuited transmission line. Thus, when the length of arm 3 is an odd multiple of a quarter wavelength, its impedance is a parallel-resonant maximum, a high resistance typically of about 2000 or 3000 ohms. This high resistance in parallel with arm 2 has little effect on the total dipole impedance. However, as the effective length of arm 3 departs from a quarter wavelength (or odd multiples thereof) by changes in either its physical length or the generator frequency, the input resistance of arm 3 decreases, and reactance also appears in series with the resistance. This reactance is inductive when length decreases and capacitive when length increases. If the length of arm 3 is a multiple of a half wavelength, the resistance will be a series-resonant minimum value (but not zero, because of radiation). Thus, when arm 3 departs substantially from an odd multiple of a quarter wavelength, the net resistive and reactive components of the parallel combination of arms 2 and 3 are different than those of arm 1. Consequently, the dipole impedance is different than if arm 3 was not present.

Returning to Fig. 1, we can now see that, without a balun, changing the feed-line length is also a change in the antenna length, which in turn affects the impedance at the far end of the feed line. Therefore, the SWR measured at the transmission line input *changes with line length* when no balun is present to eliminate I_3. This phenomenon explains a point that is often puzzling for the amateur who uses no balun, and must trim his dipole each time the feed-line length is changed!

Function of the Balun

It is evident that, in coupling an unbalanced line to a balanced load (such as a dipole), the *primary* function of a balun is to block the current path between the inside and outside surfaces of the coaxial shield. With a balun in the circuit, I_2 will not divide at the end of the feed line to form I_3, but instead will flow only onto dipole arm 2. Thus, when I_3 is zero, $I_4 = I_1$, and the currents flowing on dipole arms 1 and 2 are balanced.

Although I pointed out this concept to Reisert for use in his balun article,[3] he apparently missed my point concerning the source of external current I_3. Consequently, his Fig. 2 and associated paragraph do not address the *principal* function of a balun. Contrary to his explanation of Fig. 2, when antenna currents on the feed line are caused by *asymmetrical coupling* to the antenna, a balun *will not* eliminate these currents, but will only change their phase and magnitude.

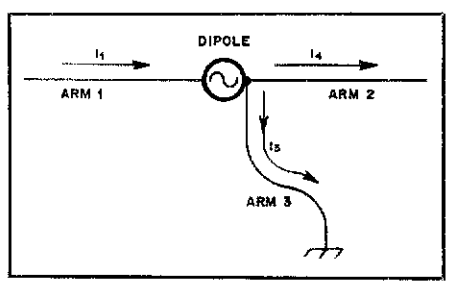


Fig. 2 — Simplified electrical representation of Fig. 1.

Effect of No Balun on Measurement Accuracy

It should be obvious that obtaining accurate impedance measurements of a dipole antenna is difficult. When a transformer-type balun is used to avoid errors caused by I_3, impedance-transfer errors obscure the true impedance at the antenna terminals. If the balun is omitted, the true impedance is obscured by the impedance of arm 3 shunting one half of the dipole. Since there is no practical way of determining the impedance of arm 3, the true antenna impedance and SWR cannot be calculated from the measured data.[4]

We should bear in mind that for any given physical length of feed line, the *electrical length* of the coaxial braid surface carrying I_3 is not the same as the inside conductors carrying I_1 and I_2. This is because the dielectric constants and the propagation-velocity factors are different. For example, the velocity factors for polyethylene and Teflon dielectric coaxial cable are 0.659 and 0.695, respectively. If the outside surface of the coaxial cable is bare, the velocity factor for the outer shield carrying I_3 approaches 0.95. However, the usually thin outer covering of polyvinylchloride (or sometimes Teflon) will reduce the antenna-current velocity factor to a value somewhat less than 0.95.

Effect of No Balun on Antenna Performance

From an operational viewpoint, I_3 itself is usually not detrimental to the perfor-

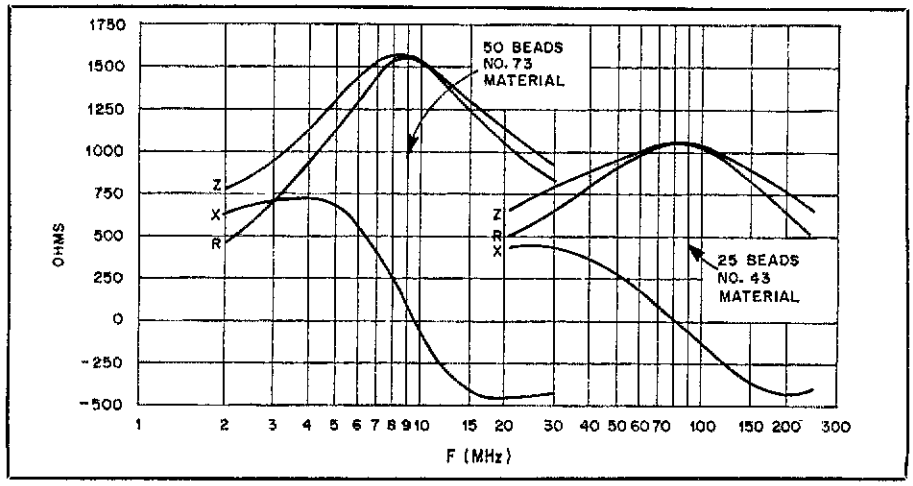


Fig. 3 — Graph of frequency vs. series impedance of coaxial-balun shield outer surface.

mance of simple dipoles for 160 through 40 meters. In addition, I_3 alone does not cause TVI, but radiation from external feed-line current can cause severe distortion in the radiation patterns of directive antennas, such as Yagis and quads. Unless a gamma match or other type of unbalanced input-matching scheme is used, all beam antennas with balanced input terminals require a balun if the optimum performance of the antenna system is to be achieved when fed with coaxial cable. For example, when a balun is not employed, the feed line and tower together become a separate, nondirectional antenna. This produces unwanted vertically polarized radiation that fills in the rearward null in the beam pattern, destroying the front-to-back ratio. The tower radiates along with the feed line, because currents are induced through coupling between the feedline and the tower.

The Choke Balun

Although many baluns embody some form of coupling transformer, an alternative is to insert an rf choke in the outer conductor of the feed line. This presents a high impedance to I_3 without affecting the internal currents. Advantages of this method are the lack of limitations on either maximum SWR or power handling. In addition, there is no impedance-transfer error that plagues transformer types of baluns (causing a skewing of SWR and impedance plots), because the choke balun has no coupling transformer — the feed line goes straight through to the antenna terminals!

The simplest choke balun is formed by coiling up a few turns of the feed line, starting where it connects to the antenna terminals. In the frequency range of 14 to 30 MHz, several turns of feed line coiled in an 8-inch diameter form an inductor with enough series reactance to minimize I_3 and practically eliminate feed-line radiation. Unfortunately, this form of choke (with an air core) is not practical below 14 MHz, because too much coiled-up feed line would be required to reduce I_3 to an acceptable level.

A word of caution is in order when the choke balun is used on tower-mounted antennas: The choke coil should be placed directly at the feed terminals of the driven element. If the coil is placed away from the feed terminals, any portion of feed line between the terminals and the coil is coupled to the boom or mast, which in turn is coupled to one arm of the driven element. The result — imbalance of currents in the driven-element, pattern skewing and tower radiation.

The frequency range of the choke balun can be extended to well below 2.0 MHz by using a core of high-permeability ferrite instead of air. With higher core permeability, the choke inductance increases dramatically, thereby retaining the high reactance needed to minimize I_3 at the lower frequencies. Of great importance, no core saturation occurs at high-power levels in the choke balun (a serious problem in transformer-type baluns), because the core excitation is low level, produced only by I_3 and not by the high internal current that feeds the antenna.

At my suggestion, Reisert made his choke balun with a Q1 material (μ = 125 to 400) ferrite toroid, winding 9 turns of RG-141/U coaxial cable on the core for use from 14 to 30 MHz.[3] However, his 12-turn balun appears to provide marginal performance at 4 MHz. The problem stems from the toroidal winding arrangement. It is difficult to get a tight wrap of coaxial cable around the toroid, resulting in a coupling loss that makes it impossible to utilize the full value of the core permeability.

Balun Construction Using Ferrite Beads

I have obtained greatly improved choke-balun performance by placing several ferrite beads or sleeves of even higher permeability around the coaxial feed line.[6] For readers who wish to build this simple coaxial balun, bead materials of various size and rf characteristics are available that dramatically increase both the reactance and resistance of a conductor. (Adding resistance to the reactance in this circuit improves the operational bandwidth of the balun with no increase in loss.) In general, the impedance of the outer coaxial braid surface increases almost proportionately with the number of beads placed over it. A combination of 50-ohm teflon-dielectric RG-303/U cable (or RG-141/U, with the fabric covering removed) and ferrite beads having an ID of 0.197 in. and a length of 0.190 in., form a superb, compact, wide-band balun.[7] While the two inner conductors of the coaxial cable remain unaffected, the beads introduce a high impedance in series with the braid outer surface. This configuration effectively isolates the external output terminal of the feed line from that at the input end.

A test balun was made by slipping 300 no. 73 beads (μ = 2500 to 4000) over a piece of RG-303 coaxial cable. The impedance of the outer conductor of the cable measured 4500 + j3800 ohms at 4.0 MHz; 15.6 + j13.1 ohms was measured utilizing a single bead. For practical baluns (less than 12 in. long, including connector) used from 1.8 to 30 MHz, use 50 no. 73 beads (Amidon no. FB-73-2401 or Fair-Rite no. 2673002401-0); for 30 to 250 MHz, use 25 no. 43 beads (μ = 950 to 3000, Amidon no. FB-43-2401 or Fair-Rite no. 2643002401). No. 64 beads (μ = 250 to 375) are recommended for use above 200 MHz, but I have not yet experimented with them.[8] The coaxial cable need only be long enough to hold the beads, and to access the end connectors.

The graphs in Fig. 3 show the measured values of series resistance (R), reactance (X) and impedance (Z) versus frequency of the outer braid surface of a choke balun, for both the 25- and 50-bead types. With either balun, I_3 will be negligible. Using a balance-measuring technique learned from my RCA antenna-lab colleague, O. M. Woodward, the output terminal imbalance relative to ground of these baluns is undetectable using an HP-410C rf VTVM.[9]

At legal input levels, no power-handling problems will arise using these baluns, because the cw power-handling capability of the cable is 3.5 kW at 50 MHz, and 9 kW at 10 MHz.[10] Any suitable connector that will mate with the load end of your feed line can be used at the input of the balun, and the balanced-output terminals may simply be pigtails formed by the inner and outer conductors of the feed line. Methods for connecting the output terminals to the antenna are left to the ingenuity of the reader.

To emphasize simplicity, what vhf antenna buff wouldn't delight in dumping his unwieldy, frequency-sensitive, half-wavelength line balun? He can replace it by simply putting some ferrite beads on the last few inches of his coaxial feed line!

Notes

[1] J. Nagle, "RF Impedance Bridge Measurement Errors and Corrections," *Ham Radio*, May 1979.
[2] G. Hall, ed., *The ARRL Antenna Book*, 14th ed. (Newington: ARRL, 1982), Chapter 5, p. 5.
[3] J. Reisert, "Simple and Efficient Broadband Balun," *Ham Radio*, Sept. 1978, p. 12.
[4] W. Orr, "Multiple Dipole for Portable Use," *Ham Radio*, May 1970, p. 14.
[5] See note 3.
[6] D. DeMaw, *Ferromagnetic Core Design and Application Handbook* (Englewood Cliffs, NJ: Prentice-Hall, Inc., 1981), Chapter 4.
[7] mm = in. × 25.4.
[8] Ferrite bead materials are available from Amidon Associates, 12033 Otsego St., N. Hollywood, CA 91607, or Fair-Rite Products Corp., 1 Commercial Row, Wallkill, NY 12589.
[9] O. Woodward, Jr., "Balance Measurements on Balun Transformers," *Electronics*, Sept. 1953, p. 188.
[10] *RF Transmission Line Catalog and Handbook, No. TL-6* (Wallingford, CT: Times Wire and Cable Co., 1972).

Strays

QEX: THE EXPERIMENTERS' EXCHANGE

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

- Second ARRL Packet Conference Pre-registration
- "PROM Programmer/Reader and Utility Software for the 2708 and 2716," by G. M. Palmer, K8LG
- "VHF + Technology," by Geoff Krauss, WA2GFP

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 Headquarters for details.

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

THE J² ANTENNA FOR 10 AND 24 MHz

☐ This J² antenna was developed to cover the 10-MHz band, but with an eye toward future operation on the 24.89- to 24.99-MHz band. The antenna provides omnidirectional low-angle radiation with a single feed point. Fig. 1 shows the antenna dimensions.

On 10 MHz, the J² is configured as a 5/8-λ vertical, which exhibits a theoretical gain of about 3 dB compared to a 1/4-λ vertical. At 24 MHz, the J² becomes two in-phase, half-wave J antennas. The antenna base should be mounted not more than 2 feet above ground for best performance.[1] You should provide a few 1/4-λ radials for 10-MHz operation (23 feet). No radials will be required for the 24-MHz band, when that one becomes available for amateur use.

Matching to the base of the J² can be implemented with either an open-wire transmission line and matching network in the shack, or by means of an L network at the base of the antenna. The feed-point impedance will be high on both bands (>1000 ohms).

The antenna can be suspended from the side of a tower or from the limbs of a tall tree. Remember that both ends of the antenna are high-impedance points, so the rf voltage will be high. Use good insulators to support the main vertical wire.

The 1/4-λ stubs are held away from the main wire by means of homemade Plexiglas spreaders. The length is not critical up to a maximum of about 6 inches. Position the spacers about 1 foot apart along the stubs, to maintain an even spacing.

This antenna is a little short of being 1/2-wavelength long on 40 meters. By switching in some additional inductance at the base of the antenna, you should be able to use the J² on that band also. Operation as a 1/4-λ vertical for 80 meters should also be possible, but that would require a much more extensive radial system. — *Richard Schellenbach, W1JF, Reading, Massachusetts*

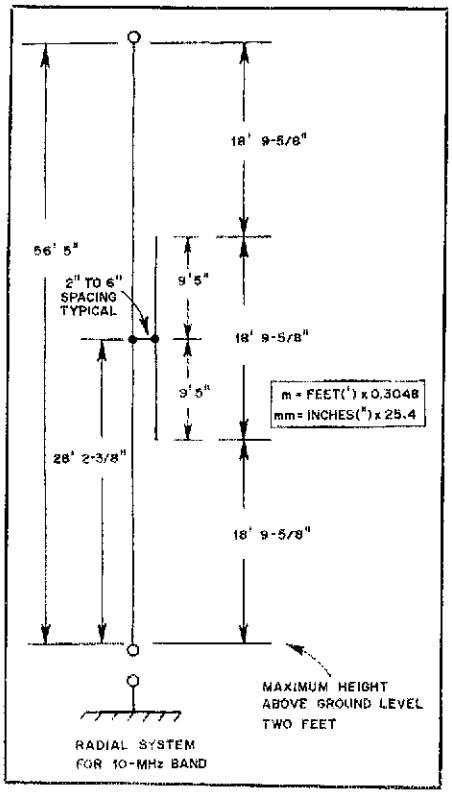


Fig. 1 — Dimensions and construction information for the W1JF J² antenna.

FIBERGLASS POLES FOR ANTENNA CONSTRUCTION

☐ John Williamson, WA2UTG, and George Smith, W4AEO, have passed along some information about locating fiberglass poles for use in building the YV5DLT Telerana antenna. Others interested in building this antenna or looking for fiberglass poles for quad antennas may find it useful. Each of the listed companies has expressed a willingness to sell to individuals. You should contact them for prices and specific sizes available at the time. Two of the companies handle materials specifically for Amateur Radio antennas: db+ Enterprises and Viking Instruments, Inc. They also have other antenna hardware available. The other companies have various sizes of tubing and solid poles. The lengths and diameters may depend on the size of the production-run stock at the time of your order. Table 1 summarizes the ordering information provided by each company. All shipments are made by truck, because of the pole lengths. You may have to pay a minimum charge set by the motor freight companies. — *Larry Wolfgang, WA3VIL, ARRL Hq.*

[1]mm = in. × 25.4; m = ft × 0.3048.

*Assistant Technical Editor

ALLERGIC REACTION TO JULY 1982 HINT & KINK

☐ I was alarmed to read the Hint by Charlie Burke, WA2SLK, in the July 1982 Hints and Kinks column. I have used this method of heating with a propane torch to remove components from surplus pc boards, but have two cautions for others who would use this method.

I donated some old pc boards to our high school. A student was using a propane torch to strip the parts in a well-ventilated area outside the building. He developed an allergic reaction that caused swelling and hives. As a result, he spent several days out of school. I'm not sure what caused the reaction, but others should be aware of this case.

The second caution is that resistor color bands may shift colors when heated (orange becomes red, for example). I find that a large soldering iron and an awl or probe used as a pry bar will remove resistors almost as fast. — *Robert Dixon, W8HGH, Rochester, Michigan*

LUBRICATION FOR THE HEATH REMOTE COAX SWITCH

☐ I have owned a Heath SA-1480 remote coax switch for several years. It worked fine in the warm months, but when the weather got cold the switch became unreliable and sometimes refused to operate until I would climb the tower and hammer on the assembly. Finally, I disassembled the unit and applied a liberal amount of CRC 5-56 spray lubricant on the solenoid end of the motor. This seems to have completely cured the problem. The lubricant I used is manufactured by CRC Chemicals, Warminster, PA 18974. It should be available in most auto-supply stores. — *Ed Kuebert, K3KA, Brookeville, Maryland*

END CAPS FOR ANTENNA ELEMENTS

☐ Don't discard the plastic or metal tops from spray paint cans! You may find that they will come in handy as end caps for antenna booms and masts. Not only are they functional, they will also add a bit of color to your antenna.

Many plastic paint-can tops will fit pipes of two different outside diameters, 1-1/4 and

Table 1

Fiberglass Pole Ordering Information

Company	*Material Size*	*Orders*
Advanced Composites P.O. Box 15323 Salt Lake City, UT 84115	1-1/4 and 1-1/2 in. OD 12- and 20-foot lengths.	Cash in advance; no minimum order.
db+ Enterprises P.O. Box 24 Pine Valley, NY 14872	1-1/16 in. diameter 13-ft lengths. Severe-duty cubical quads and accessories.	No minimum order.
Dynaflex Manufacturing Corp. Rte. 14, Box 370 Tallahassee, FL 32304	Three-section telescoping poles, 15-foot total length.	$19.50 each; minimum order four poles. Payment with order, plus $8 shipping and handling charge.
Sky-Pole Manufacturing, Inc. 1922 Placentia Costa Mesa, CA 92627	Vaulting poles and tubing of various sizes and lengths. 1 to 1-5/8 in. tubing in odd lengths; $1 per foot.	No minimum order. Payment with order, or C.O.D.
Viking Instruments, Inc. Kirk Electronics Div. 73 Ferry Rd. Chester, CT 06412	Arms for quad antennas, 9- and 13-foot lengths. Hollow and tapered, but reinforced at the 10, 15 and 20-meter drill points.	No minimum order. 9-foot arm, $17; 13-foot arm, $21 each.

2-3/8 inches. The 1-1/4 inch part is a firm fit over the end of a standard piece of steel TV mast. — *Paul Pagel, N1FB, ARRL Hq.*

THE CW PARROT

☐ One of the net control operators on the Idaho-Montana Net (IMN), Kevin Nathan, K7RX, is blind. Kevin is a very competent net control operator, and also serves as RN7 liaison. He uses a device, developed by several other net members, that allows him to retransmit cw messages without first having to transcribe them into Braille. Kevin tape records the traffic, then uses the CW Parrot to interface the recorder with his transmitter for playback.

Fig. 2 shows the schematic diagram of the basic unit. Additional features, such as peak, notch, high-pass and low-pass filters or a noise blanker, could be included to aid the operator. For transmitters with a positive keying voltage (up to about 30 V), the Parrot can be wired in parallel with the transmitter key line. It could serve as a "poor man's memory keyer," or to let others hear what their fists sound like.

All components are mounted on a small etched-circuit board (or perfboard) in a 2-3/4 × 2-1/8 × 1-5/8 in. aluminum box. Rubber grommets in the box protect the two shielded cables from damage. The construction details can vary to suit the needs of each individual.[1]

The cw signals are recorded directly from the receiver. When it is time to retransmit the message, simply plug the Parrot into the recorder earphone jack, and the tape will be reproduced faithfully over the air.

Ferrite beads and C1 are used for rf suppression. D1 and D2 provide full-wave rectification of the audio signal. This pulsating dc causes Q1 to switch on, keying the transmitter. — *Jim Voyles, K7JV, Boise, Idaho*

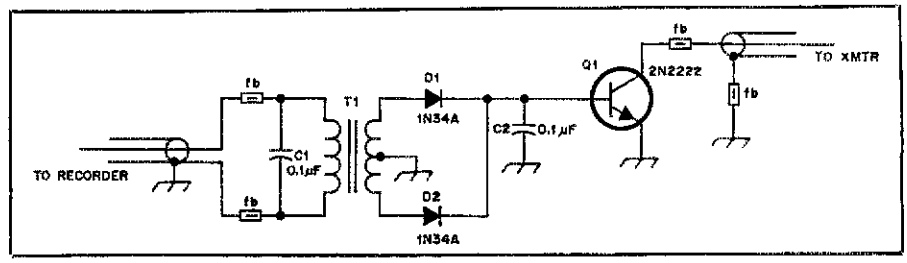


Fig. 2 — Schematic diagram of the CW Parrot, used to transmit a cassette-recorded message.
T1 — Audio transformer, 8-ohm primary, 1000-ohm secondary, ct. Radio Shack no. 273-1380.

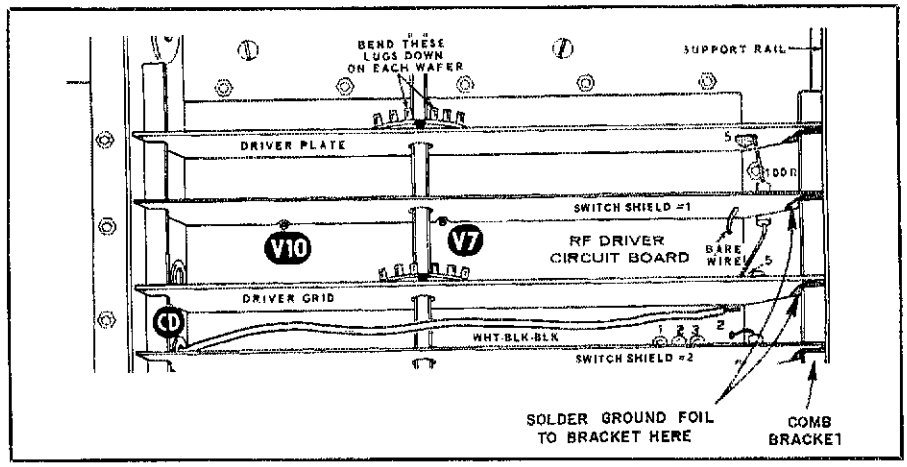


Fig. 3 — Pictorial diagram showing where NØAXK soldered the ground foil of the driver grid-switch board to the supporting comb bracket.

HW-101 OSCILLATION PROBLEM

☐ My Heath HW-101 developed a sudden problem that had a simple cure. I noticed that the rig would start to oscillate on every band as I tuned it for maximum-rated output power. My first guess was that the driver or final-amplifier tubes were weak, but they proved to be okay. Further checking turned up a ground foil on the driver grid-switch board that was not making contact with the comb bracket. Fig. 3 shows a portion of detail 8-19A, found on page 99 of the HW-101 manual. My construction manual contains no mention of the need to solder this connection, but after I did, the oscillation was eliminated. Later manuals include this step. I suggest you check your transceiver to see if the connection is soldered. — *Robert St. Amant, NØAXK, Edina, Minnesota*

INEXPENSIVE BURGLAR ALARM

☐ Photoconductive cells are less sensitive to light changes than are phototransistors. For burglar-alarm purposes this can be an advantage. A very simple alarm system can be built on a piece of perforated board 2 × 3 inches or smaller. I mounted mine on the lid of a tobacco tin. A 12-V dc supply is fed directly to a 5- or 6-V DIP relay through a CdS cell, which has a dark resistance approaching 0.6 MΩ and a bright-light resistance of about 100 Ω. The complete diagram is shown in Fig. 4. S1 is used to select whether V + is fed through the normally open or normally closed relay contacts. This provides for beam-open or beam-closed operation. K2 has two sets of normally open contacts. One set is used to lock the relay closed when the alarm is tripped, and the other supplies voltage to a horn or other warning device. An LED across this line serves as a beam-reception indicator for alignment purposes, or as a remote indicator that the alarm has been set off.

With the CdS cell mounted in a cardboard tube with lenses from a toy telescope, the relay can be held "on" by a pocket-flashlight beam at about 25 feet. The alarm will be triggered by any object crossing the beam, including a person at a brisk run. This simple form of security fence is adequate for many purposes, and can be built for under $10.

Other warning devices can be used instead of the horn. An LM-3909 IC can be wired as an audio oscillator to drive a small speaker. An amplifier can be added for a louder signal. A 12-V bulb and reflector could be mounted alongside the photocell, and the beam reflected by a mirror.

There are many applications for such a simple device. Mine keeps unauthorized people out of the ham shack! — *Alex Comfort, M.D., KA6UXR, Santa Barbara, California*

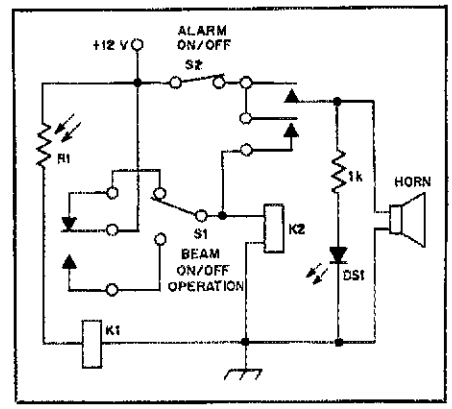


Fig. 4 — Schematic diagram of a simple burglar alarm, using a CdS photoresistor. K1 has a 5-V coil, and K2 has a 12-V coil. R1 is Radio Shack part no. 276-116 or equivalent.

ETCH-RESIST IDEA FOR CIRCUIT BOARDS

☐ Most hams have struggled with marker pens, stencils, rub-on patterns and other ways of tracing etching patterns onto circuit-board material. Each of these methods has certain drawbacks. For all but the most complex patterns I find it easier to draw freehand on the board. I use an inexpensive straight pen with replaceable points.

The ink I use is an etch-resist lacquer purchased in an electronics-parts store. Dilute the ink with the solvent listed on the label (toluol, in my case) so it has a consistency that works well with your pen. Nail polish diluted with remover (acetone) also works. Either of these inks will gum up the pen points, so be sure to wipe them clean when you're finished tracing the pattern. After etching, remove the lacquer with fine steel wool. — *John S. Mason, Jr., EA4AXW, Madrid, Spain*

[1]Parts for this project are available from RADIOKIT, Box 411, Greenville, NH 03048.

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

YAGI ELEMENT MOUNTING ADVICE

☐ The article by Lusis, "Go for the Gain, NBS Style," (Aug. 1982 *QST*) is valuable for pointing out the effect of element and boom diameters on Yagi tuning. As a Yagi is increased in length, element dimensions become more and more critical. Failure to take element and boom diameters into account can make the difference between full performance and a gain figure little better than a dipole. However, Lusis neglected to mention that Yagi performance is also influenced by the way in which elements are mounted to the boom.

These effects can be understood by considering the parasitic element as a parallel tuned circuit containing distributed inductance and capacitance (Fig. 1). As with any tuned circuit, the element resonant frequency will be determined by the values of inductance and capacitance.

The inductance of a straight conductor depends on diameter as well as length — the larger the diameter, the less the inductance. For the case of a half-wave antenna element, the diameter at the center has more influence on inductance than end diameter — because that is where current is maximum.

Capacitance of a cylindrical rod is approximately proportional to the diameter. Unlike inductance, capacitance is more influenced by the diameter at the ends of the half-wave element, where voltage is maximum.

If we uniformly increase the diameter of our element, we decrease the inductance, which raises the resonant frequency. We also simultaneously increase the capacitance, which lowers the resonant frequency. Unfortunately, the two effects do not completely cancel; diameter has more influence on capacitance, which means that a larger diameter element of given length will have a *lower* resonant frequency. Put another way, the larger-diameter element will need to be cut shorter for resonance at a given frequency.

The effect of boom diameter can also be understood by referring to Fig. 1. Where the element pierces a larger diameter boom, the boom in effect "shorts out" a small amount of inductance at the center of the element, and thereby raises the resonant frequency. The boom has a negligible effect on capacitance because there is a voltage minimum at the center of the element. Of course, the boom cross section also has some inductance, but since the diameter is greater than that of the element, the effect is to slightly diminish total inductance. We can conclude, therefore, that the influence of the boom will be much less when the element is insulated from the boom, as in Fig. 2A, than when the element is in electrical contact on both sides, as in Fig. 2B. The effect of the boom will also be much less when the element is mounted atop the boom, as in Fig. 2C.

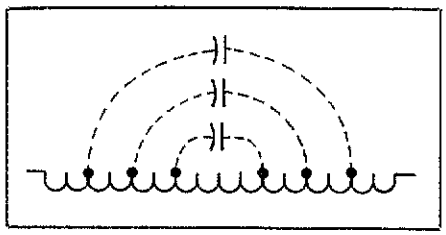


Fig. 1 — Electrical representation of an antenna element.

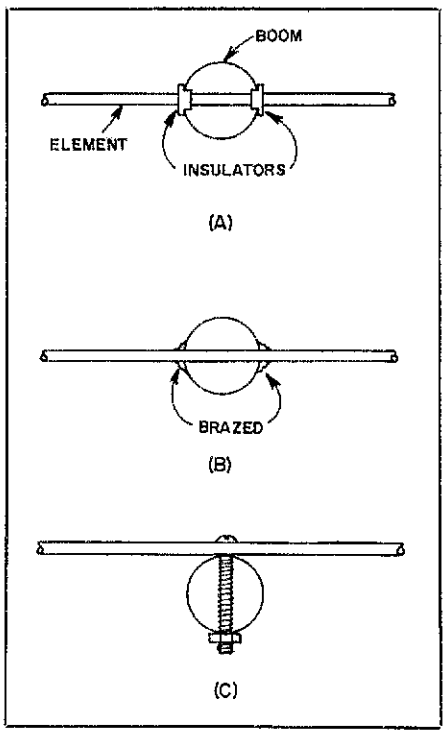


Fig. 2 — Various mounting techniques for Yagi elements.

Unless proper precautions are taken, corrosion can eventually result in poor electrical contact at the point where the element pierces the boom, changing the resonant frequency of the element. For this reason, the junction should either be soldered or brazed around the complete circumference of the element, or be completely insulated from the boom by the use of plastic sleeves.

When the element is mounted to the boom by means of a conducting plate, as in the W1LJ 6-meter antenna, the resonant frequency will be influenced much more by the size of the plate than by the diameter of the boom. — *Fred Brown, W6HPH, Lake San Marcos, California*

NBS BOOM-CORRECTION FACTORS

☐ I would like to make some points concerning the Lusis article, "Go for the Gain, NBS Style," (Aug. 1982 *QST*). The boom-correction factor in Viezbicke's preliminary data was based on elements passing *through* the boom. When the *NBS Technical Note 688* was published, *this point was omitted.* Mounting elements on top of the boom with a plate and muffler clamps requires a different correction factor, as pointed out by Lawson in "Yagi Antennas: Practical Designs" (Dec. 1980 *Ham Radio*). The length of the elements is so sensitive to the type of boom and the mounting procedure that Viezbicke's preliminary data show separate curves for elements passing through round and square booms — even though the final report states "round and square booms yielded similar results" (Fig. 3).

For a typical vhf Yagi, elements passing through the boom require a correction factor of approximately 60% of the boom diameter. Elements mounted on top of the boom may require a correction factor as small as 6% of the boom diameter, plus a correction due to the increased element diameter attributable to the mounting plate. Misapplication of these correction factors on a typical 2-meter Yagi can result in element-length errors of up to 1%. Viezbicke states that element lengths must be cut to an accuracy of 0.3% to maintain performance.

These boom corrections are relatively small, but at vhf and uhf they can make the difference between an optimum design or just another mediocre Yagi. Because of the mechanical variables inherent in mounting elements on top of the boom, I recommend that at 100 MHz and higher all NBS Yagis be constructed with the elements passing *through* the boom, using the boom-correction factor published in *NBS Technical Note 688.* — *John Brosnahan, WØUN, Boulder, Colorado*

ALTERNATIVE FILTER DESIGN

☐ John Webb suggested a fifth-degree elliptic high-pass filter design in his interesting article, "Electrical Antenna Null Steering" (Oct. 1982

*Assistant Technical Editor

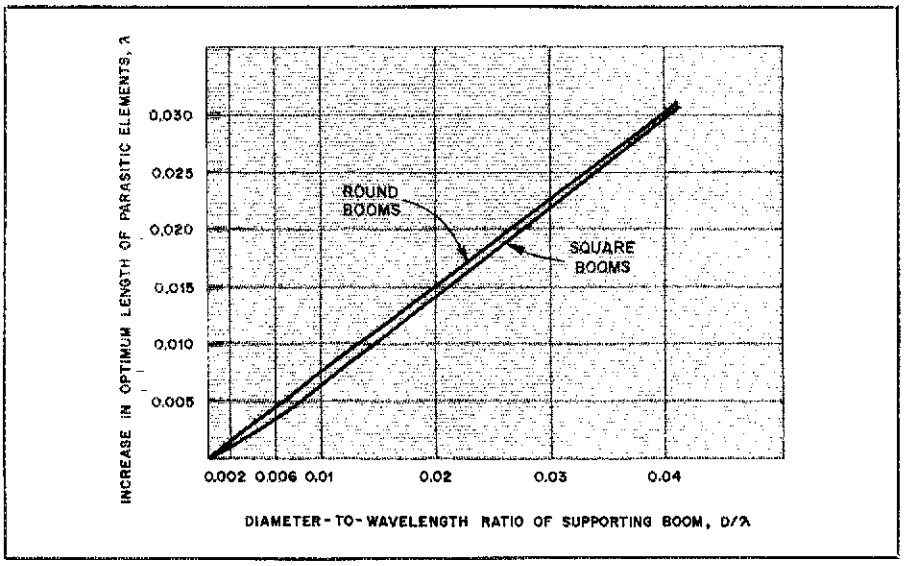


Fig. 3 — Viezbicke's early data for *NBS Technical Note 688* shows different correction factors for round and square booms.

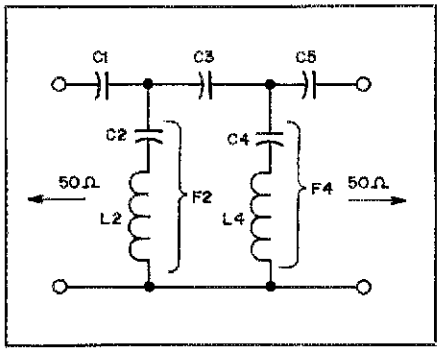


Fig. 4 — Schematic diagram of a fifth-degree elliptic high-pass filter. See Table 1 for component values.

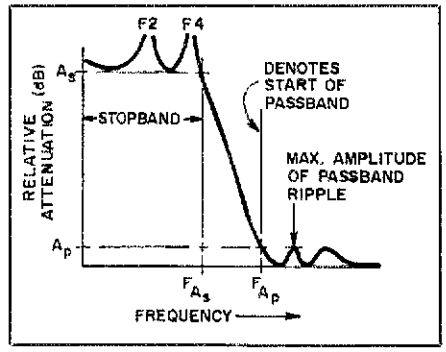


Fig. 5 — Response curve of a fifth-degree elliptic high-pass filter. See Table 1 for response figures.

Table 1

Comparative Parameters of W1ETC and W3NQN Elliptic High-Pass Filter Designs

Design and Response Parameters

	W1ETC	W3NQN
FA_s (normalized) =	0.49167	0.52754
A_s (dB) =	70.3759	62.0793
A_p (dB) =	1.03451	0.37677
R.C. (%) =	46.04	28.83
VSWR =	2.706	1.810
F_{co} (MHz) =	3.4	3.423
FA_s (MHz) =	1.67	1.806
F2 (MHz) =		1.118
F4 (MHz) =		1.730

Filter Component Values†

	W1ETC	W3NQN
C1 =	456	620
C2 =	10,600	10,415
C3 =	343	430
C4 =	3900	3844
C5 =	487	680
L2 =	2.28	1.947
L4 =	2.5	2.201

†All capacitance values are in pF; all inductance values are in μH.

QST), for attenuating broadcast-band signals below 3.4 MHz. Since the three series capacitor values in Webb's design are nonstandard, construction could be simplified by using a design employing standard values. I have completed such a design, which closely approximates the performance of Webb's. A comparative listing of the designs and performance parameters of the two filters appears in Table 1.

The shunt capacitors in my design are not standard values, but one close to (and below) the design value can be used with additional capacitance added in parallel to achieve the desired resonant frequency. Further fine tuning can be accomplished by squeezing or spreading the inductor windings.

For attenuation levels in excess of 50 dB, my personal preference is to use a seventh-degree elliptic design with a much lower VSWR than that used by Webb. Of course, this complicates the design by requiring additional components and more tuning.

I am completing tabulations of 50-ohm, 1-10 MHz, fifth-degree elliptic low-pass and high-pass filter designs similar to the one provided. When these tabulations are completed, standard-value capacitor filter designs should become popular because of their obvious convenience. Furthermore, choosing different cutoff frequencies may be done without the use of calculations, if input and output impedance levels remain equal to an integral power of 10 times 50. A relatively simple scaling procedure is used for other impedance levels. — *Ed Wetherhold, W3NQN, ARRL TA, Annapolis, Maryland*

RECONSIDERING ELLIPTIC FILTERS

☐ Correspondence regarding my article, "Electrical Antenna Null Steering," (Oct. 1982 *QST*), led to further consideration of operating the device at lower frequencies, particularly regarding the input filters. The 3.4-MHz elliptic filter mentioned in my article, as well as other filters to be described, were taken from "Simplified Modern Filter Design," by Philip R. Geffe, John F. Rider Publications, 1963. The filter attenuation of 70 dB (below 1.6 MHz) and passband ripple of 1.0 dB were verified on a 2.0-MHz scale model. This ripple factor results in a VSWR of nearly 3.0:1; however, the attenuation at 1.6 MHz is slightly better than the amount provided by filters having less ripple. The filter is to be used in a receiving application, so the impedance mismatch is not a critical issue.

A five-pole elliptic filter would provide only 30 dB of attenuation at 1.6 MHz, with the cutoff frequency at 1.8 MHz to allow 160-meter operation. Thus, seven- and nine-pole filters were considered for 160 meters. Broadcast-band attenuation will be 45 dB for seven poles and 65 dB for nine poles. The passband ripple of these designs is 0.18 dB, giving a VSWR of 1.5:1. A nine-pole filter is being built on a circuit board, and the results will be reported in *QST* when more data is available.

My filters are built with standard-value parts that add to near the calculated values. Other designs that can be implemented with single, standard-value components may be available — hopefully with only small compromises in performance. As the number of parts in a filter increases, a goal of using single, standard-value components becomes increasingly difficult. I wish to thank ARRL TA Ed Wetherhold, W3NQN, and others for their contributions to discussion of the broadcast-band filter issue. — *John K. Webb, W1ETC, Amherst, New Hampshire* QST

Feedback

☐ The schematic diagram of "A Simple Capacitance Meter You can Build" (*QST*, Jan. 1983, p. 35), shows the 10-μF range resistors as 8.2 kΩ and 1 kΩ. These resistors should be 8.2 MΩ and 1 MΩ, respectively.

☐ Fig. 7, page 33, of the article by H. Granberg in Jan. 1983 *QST* has a minor error: R2 should be labeled R24. In Fig. 8, the adjustment control, R4, should be 100 kΩ, rather than 100 Ω.

☐ Last month's In Training column recommended the ARRL book *A Course in Radio Fundamentals* for review in licensing courses. Unfortunately, this book is out of print and no longer available for sale. QST

Product Review

Conducted By Paul K. Pagel,* N1FB

Cushcraft R3 Three-Band Vertical Antenna

When asked if I would be interested in reviewing the Cushcraft R3 10, 15 and 20-meter antenna, I was pleased to accept. I had moved from a "no antennas" townhouse to a single-family house just two weeks earlier. Outside antennas were now allowed, but space was limited. I needed an effective antenna system for these three higher-frequency bands; a trap vertical seemed like a good compromise.

The R3 is more than an ordinary trap vertical! It operates as a 1/2-λ radiator on the three bands, and comes equipped with a sealed matching-network assembly and a remote tuning capacitor. A 24-V motor drives the large variable capacitor to match the antenna impedance to 50-ohm coaxial cable. Coupled to the capacitor shaft is a potentiometer, which provides a voltage drop that is monitored in the control box. The tuning control unit meter face is calibrated to show for which frequency band the capacitor is set.

Assembly

I spent a little more than an hour taking inventory of the kit hardware and reading the assembly instructions. As I examined the capacitor tuning assembly, my curiosity caused me to remove the cover to see what was inside. The cover should not have come off as easily as it did! A ceramic feed-through bushing on the top of the unit has a short piece of wire soldered to a lug on the variable capacitor (Fig. 1). This joint was cold soldered and loose on the review unit! Reconnection required that I remove the feed-through insulator, solder the wire and then reinstall the insulator as the cover was being put back in place. Had I not found this problem before installing the antenna, it would have led to frustration and much wasted troubleshooting time.

Antenna assembly took about two hours. I usually work slowly, reading directions several times as I go. The instruction sheet that comes with the R3 refers you to four different drawings for assembly details. Even after careful study, I had a few nuts, bolts and washers left over at the end. As I looked at the drawings again, I saw where I had forgotten to install the parts. I had to disassemble some of my work to correct the errors.

The instruction sheet says the antenna is designed to fit "conveniently" over a 1-7/8 inch OD tube.[1] A check with local electronics shops and TV dealers led to a morning spent trying to locate a short mast on which to mount the antenna. I found a hardware store that could supply galvanized pipe of the proper dimensions, but at a price greater than $5 per foot! I found a 6-foot section of 1-1/2 inch copper pipe at home. With a wooden plug in the top (to prevent crushing), this has served as a mast. The antenna is mounted on a 4-foot-high extension attached to the back of my garage. This places the bottom of the antenna about 10 feet above ground.

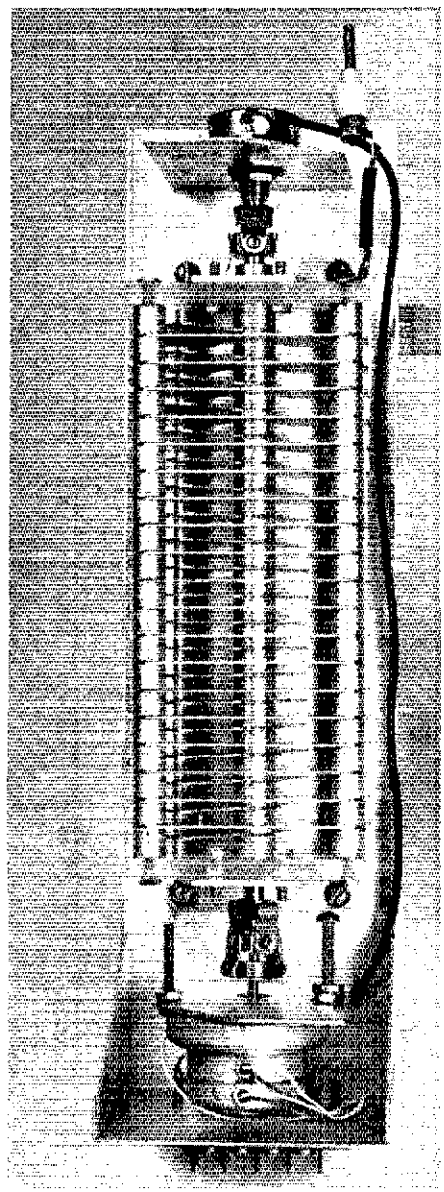


Fig. 1 — A look inside the capacitor tuning assembly. The short piece of wire between the capacitor and the ceramic feed-through bushing can be seen at the top right.

The instruction sheet cautions you to be sure the four-conductor control cable (not supplied) is connected in the same sequence at both ends. I found no indication of the correct sequence, so I assumed that as I looked at both terminal strips they would be the same from left to right. I connected a color-coded cable in this manner and turned on the control unit. The meter needle vibrated noticeably, and the TUNE control did nothing. I reversed the leads on the control unit and everything worked fine! A label on the terminal strips would be helpful. (As I prepared to write this review, I glanced at the instruction sheet again. Sure enough, the terminals *are* shown there, numbered — you guessed it — in reverse order from each other!)

Included with the literature is a pamphlet entitled, "How to Install your Outdoor Antenna Safely." It begins, "These safety recommendations apply to all Cushcraft CB, TV, Amateur and General-Purpose Communications Antennas." It contains a wealth of information on safe antenna installation procedures, stressing the danger of allowing the antenna to contact power lines. There is an inappropriate warning, however: "Remember that the FCC limits your antenna height to 60 feet." There is no indication that this applies only to CB installations.

Tables of voltage and resistance measurements taken at the control box and at the capacitor tuning assembly are included to aid you in troubleshooting the control circuit. A chart of troubleshooting checkpoints should also prove helpful if any problems develop.

Performance

SWR curves for the completed antenna are shown in Fig. 2. I built it to the dimensions suggested in the instructions. As you can see, lengthening the 10-meter portion would improve the SWR on the low end of the band, but I didn't think it was worth taking the antenna down to fool with it! Of course, the SWR curve doesn't tell the whole story. Even a dummy load should have SWR characteristics like this. The R3 is no dummy, though. When compared to using a 120-foot wire antenna and Transmatch, it provided two to three S units improvement in received signal strength at most times. On transmit, it also performed admirably. In my installation, the antenna is not high above the ground, and is within 20 feet of three very tall maple trees. In spite of this poor location, I was able to work plenty of European and West Coast stations and I received good signal reports.

The R3 requires no radial system, and so takes up almost no horizontal space at all. It is light in weight and mounts easily on a roof or to the side of a house. If you are looking for a good three-band antenna without the expense and effort of installing a tower and triband beam, the R3 could be for you. Leaving the tuning assembly and bottom section together, the antenna should be easy to take apart and put back together. This would make it an ideal

[1]mm = in. × 25.4; m = ft × 0.3048

*Assistant Technical Editor

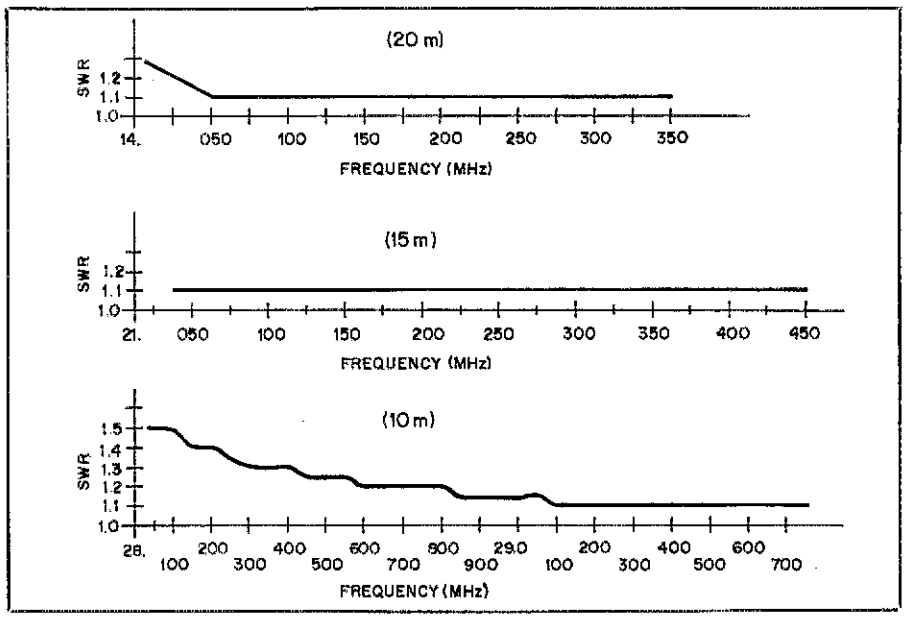


Fig. 2 — SWR curves for the Cushcraft R3 vertical antenna. No length adjustments were attempted after the initial construction.

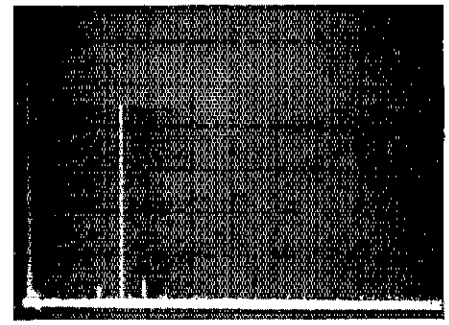


Fig. 3 — Worst-case spectral display of the Mirage C-22. Vertical divisions are each 10 dB; horizontal divisions are each 100 MHz. Output power is approximately 20 W at 220 MHz. The fundamental has been reduced in amplitude approximately 23 dB by means of notch cavities; this prevents analyzer overload. All spurious emissions are at least 64 dB below peak fundamental output. The C-22 complies with current FCC specifications for spectral purity.

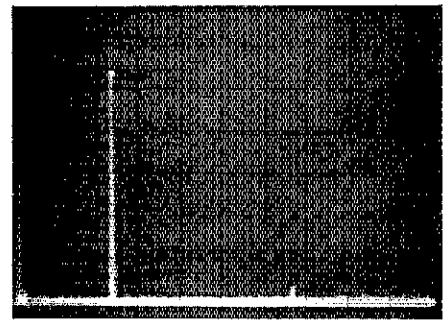


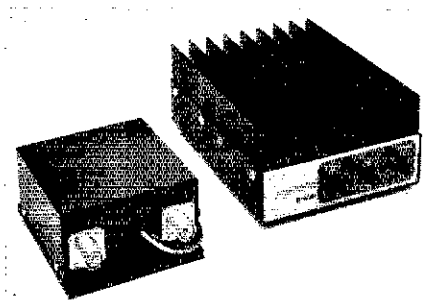
Fig. 4 — Worst-case spectral display of the Mirage C-106. Measurement conditions remain the same as for the C-22. The fundamental has been reduced in amplitude by about 15 dB to prevent analyzer overload. Power output is approximately 60 W at 220 MHz. The C-106 complies with current FCC specifications for spectral purity.

antenna for portable applications.

The R3 is available from Cushcraft Corporation, 48 Perimeter Rd., P.O. Box 4680, Manchester, NH 03108. Price class: $330. — *Larry Wolfgang, WA3VIL*

MIRAGE C22 AND C106 ALL MODE 220-MHz AMPLIFIERS

☐ One of the brighter aspects of vhf fm operation is the wider range of products available for the 220-MHz enthusiast these days. Mirage has introduced two amplifiers ideally suited for use



with low-power hand-held transceivers. As with their amplifiers for the other bands, these are linear amplifiers and may be used for any mode of operation. Depending on input/output power requirements, one or both of these amplifiers might be ideal for the operators on the "low end" of 220 MHz.

The C22 is identical in appearance to the B23 reviewed earlier (May 1981). The resemblance to the 2-meter version goes even deeper than looks. Like the B23, the C22 uses an MRF240 for a single stage of amplification. At 220 MHz, the potential output power for the transistor is lower, but otherwise it functions quite well. Engineers from Motorola tell me that this is true for most of their line of modern "vhf" transistors. The C22 produces 20 W of output power with an rf input power of 2 W. A signal as low as 200 mW will key the rf switching circuit — which is identical to that of the B23. The first C22 failed shortly after it arrived, and Mirage replaced it. The second C22 has performed flawlessly during several months of mobile use. If you are looking for a compact "brick" to go along with your 220-MHz hand-held unit, consider the C22.

Mirage has provided for the mobile or base operator who wishes to boost the output of the typical 10-W transceiver to the 60-W level. The C106 is similar in appearance to the B108 2-meter amplifier, and it has the same features. Like the C22, the C106 can be keyed with as little as 200 mW. With a 2-W drive level, it will deliver approximately 20 W of output power, making it useful with "hand-helds." With 10 W of drive power, the output power climbs to 60 W or more. A single MRF247 provides this gain.

The C106 also has a built-in receiver preamplifier which provides 10-dB gain with a 2.5-dB noise figure. A front panel switch permits the user to turn the preamplifier on and off. A second switch allows the user to add a dropout delay to the antenna relay, facilitating use with an ssb transmitter. The third switch on the panel of the C106 applies power to the transistor driving the antenna relay. If the amplifier is located near the operating position, the user has complete control at this fingertips.

Of course, I wanted to mount the C106 in the trunk of my car. Mirage has very wisely taken care of that contingency. An option for the C106 is the RC-1 remote-control head. The RC-1 is a 1-1/2 × 3-1/2 × 1-1/2 inch (HWD)

Mirage C22 220-MHz Amplifier

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency range: 220 to 225 MHz.	As specified.
Power output: 20 W (nominal) at 13.6-V dc with 2-W drive.	As specified.
Input VSWR: Not specified.	Less than 1.5:1.
Spurious and harmonic output: Not specified.	−65 dB (See Fig. 3).
Size: (HWD) 2.25 × 4.75 × 4 inches (57 × 120 × 100 mm)	
Weight: 1.25 pounds (0.567 kg)	

Mirage C106 220-MHz Amplifier

Manufacturer's Specifications	*Measured in ARRL Lab*
Frequency range: 220 to 225 MHz.	As specified.
Power output: 60 W (nominal) at 13.6-V dc with 10-W drive.	As specified.
Input VSWR: Not specified.	Less than 1.5:1.
Spurious and harmonic output: Not specified.	−65 dB (see Fig. 4).
Receive preamp: Nominal 10-dB gain with 2.5 (±0.5) dB noise figure.	6-dB gain with 2.8-dB noise figure.

box with three switches and two LED status indicators that connects to the amplifier with a 20-foot-long cable (supplied). One simply sets the amplifier switches to POWER OFF, FM and PREAMP OFF; control of these functions is then accomplished with the RC-1. I've used the C106 and RC-1 with a Midland 13-509 transceiver for several months and am delighted with the performance. The combination of the receiver preamplifier and the extra output power is ideal for fringe-area usage. If you are on 220 MHz with a "barefoot box," you may want to consider the C106. It'll help you "hear" as well as "talk."

Price classes: C22, $90; C106, $200; and RC-1, $25. More information may be obtained from Mirage Communications Equipment, Inc., P.O. Box 1393, Gilroy, CA 95020, tel. 408-847-1857. — *Peter O'Dell, KB1N*

KANTRONICS CW TRAINING SYSTEM

☐ Contrary to the belief of some, cw is *not* dead! With this thought in mind, Kantronics developed a system that teaches cw to the beginner, and it also can be used by those who are already familiar with the Morse language to increase their proficiency. The system consists of a booklet and a computer code-practice program.

The Text

Morse Code, Breaking the Barrier, by Phil Anderson, WØXI, is a step-by-step instruction manual written to familiarize the beginner with the Morse code. The booklet contains five chapters. The subjects range from the structure of the Morse code right through copying off the air.

Chapter 1 introduces the "mechanics" of the code. The reader is made familiar with the elements that letters are "coded" from. Several examples are given, with the proper timing emphasized through "real-time" figures.

Chapter 2 defines the FCC regulations regarding the speed at which one must copy cw to obtain an amateur ticket. This chapter then presents a method for determining the speed of a tranmission.

Chapter 3 is entitled "Learning to Receive Code." The text in this chapter instructs the student in the proper method of learning "letter codes," with the intent of learning to copy the entire alphabet, a few basic procedure signals and punctuation.

Chapter 4 contains flashcards for initial memorization of letter sounds. The user is instructed to "read" a sound from the card and say the letter that corresponds to that sound. The correct letter, by the way, is printed on the back of each card.

Chapter 5, entitled "Special Codes/Copying Off the Air," introduces the aspirant to some Q signals and a few procedure signals.

In addition to the five chapters mentioned previously, the book contains separate appendices for symbols, numbers, abbreviations and Q signals. After reading these the user will be familiar with the jargon likely to be encountered in typical QSOs.

Software

The second portion of the training system is a computer program, "Hamsoft Code Practice: APPLE," written for use with a disk-based Apple II microcomputer system. The program is divided into six segments, ranging from beginner to actual QSOs (similar to the format used by the FCC). Each of the segments allows the user to select the desired speed, from 1 to 60 wpm.

The Beginner selection contains a choice of seven four-letter groups, with the XCAD group suggested as a starting point. Using this option, the student can practice the letters that are the most troublesome. After a slight pause, the previously sent letter is displayed on the screen.

"Letters" and "Numbers" choices send 18 five-character groups, and print them on the screen after the 18 groups have been sent (a handy tool for checking the accuracy of copy).

The "Calls" option sends a list of 15 call signs and displays them on the screen after the group is sent. This selection is handy for the experienced ham who is planning on going on a DXpedition and wants to practice call sign copying.

The program also contains an "Abbreviation" option, which sends 16 short words/abbreviations at a clip, displaying them on the screen.

"QSOs" allows the user to copy two FCC-type QSOs, and then check the copy by comparison to the "sent text" shown on the screen. I noted that the software could provide sending faster than 60 wpm in this mode, but after the text was sent, the computer "crashed" or locked up.

Comments

The program performed flawlessly during the time I was reviewing it. The training system is available from Kantronics, 1202 East 23 St., Lawrence, KS 66044. Price class: $30. — *Michael B. Kaczynski, W1OD, ARRL Hq.*

MACROTRONICS CODE CLASS

☐ Learning the Morse code can be difficult if one does it the wrong way (as I did). I memorized the code from a list of dots and dashes. When I copied the code off the air, I had to translate each character from a sound (di-dah) to the dot and dash equivalent, and finally to the alphanumeric equivalent. At 5 wpm, I could perform these mental acrobatics easily. As the speed climbed toward that enigmatic 13 wpm, however, I could not make the translation fast enough — getting it down on paper was impossible.

At that point, I discovered that I had to relearn the code by character sound and translate that sound directly into an alphanumeric format. The Macrotronics Code Class is a computer program for the Radio Shack TRS-80® Models I and III that teaches code in this manner. You never encounter a dot or a dash — only sounds and their alphanumeric equivalents. To hear the code, you must connect an audio amplfier and a speaker to the TRS-80 cassette audio input. The video display will "tell" you or "test" you on the code that is being sent.

Code Trainer

The code may be sent at speeds of 1 to 1000 wpm. Transmission speed is controlled by pressing the up-arrow and down-arrow keys on the computer keyboard. The program has five functions. A "code trainer" function consists of 11 lessons that drill you, four characters per lesson, in the following manner:

1) The program generates the code audibly for one character.

2) You press the key of the character that the sound represents.

3) If you are correct, the program tells you so both visually and aurally.

4) If your entry is wrong, you are visually and aurally informed and you hear what your guess actually sounds like (instant feedback). You are then retested for the incorrectly guessed characters. As you progress, you can include all the characters from previous lessons in the current lesson, or you can limit the drill to the four characters in that particular lesson.

Code Practice

Three of the other functions, the "code practice" portion, fill the video display with random words, random alphanumerics (in five-letter groups) or random call signs. The program generates the code for all of the characters on the screen at the speed you desire, and you attempt to copy the code. When the program has generated the full screen of characters, you can check your written copy against the display to see how well (or how poorly) you did.

The fifth program function allows you to send cw to the computer to check the quality of your sending. Whatever you send is displayed on the screen, allowing you to see how others copy your "fist." The program also displays your sending speed. (To use this fifth function, you must have Macrotronics interface — models M80, M83, CM80, CM83, TM80, TM83 or Terminall — connected to the TRS-80 to provide interface for your key, bug, etc., to the computer.)

Evaluation

The program runs flawlessly; I found no bugs. Documentation (a nine-page manual) is good. The program loaded from diskette perfectly (it is available in both disk and tape version for the TRS-80 Models I and III). This program teaches Morse code in a logical manner and can be adapted for classroom code learning.

Code Class is produced by Macrotronics, Inc., 5125 N. Golden State Blvd., Turlock, CA 95380. The cassette version costs $29; the disk version costs $39 (when ordering, specify Model I or III). — *Stan Horzepa, WA1LOU*

COMMUNICATIONS SPECIALISTS SS-32M CTCSS ENCODER

☐ When the ICOM IC-3AT came in for review and was assigned to me, I had only one question, "How am I ever going to get a CTCSS (PL) encoder inside that tiny little thing?"[2] Some of the people on W1NI/R had already purchased IC-3s and installed encoders, so I knew it was in the realm of the possible. Upon calling ICOM, I was told they did not have a CTCSS option for the IC hand-held series, but they did recommend the Communications Specialists SS-32M. Communications Specialists happily supplied us with an SS-32M for use with the IC-3AT.

The problem was the installation — a miniature encoder must fit exactly into a miniature space inside a miniature transceiver. Finding my medicine cabinet devoid of "dauntless technician" pills, I called Arnie Chase, WA1RYZ, and asked if he would help. Sure, he had already installed several in other IC-3s.

Arnie performed the surgery with minor assistance from me. The encoder nests in a

[2]Product Review, *QST*, February 1982.

hollow spot between the two circuit boards — it is critical that the encoder board be positioned properly. Instructions provided with the SS-32M give detailed installation information for any of the ICOM hand-helds. Three wires coming from the encoder must be routed to the proper circuit board areas. Communications Specialists suggests modifying the IC-3AT by adding a 4.7-μF capacitor (supplied) in parallel with C13 (2.2 μF) on the PLL. Arnie felt it was easier to remove C13 and replace it with a 6.8-μF capacitor. A subminiature 100-kΩ potentiometer (included) serves as a deviation control.

Circuitry and specifications of the SS-32M are similar to the Communications Specialists TE-64;[3] the SS-32M is designed for the 32 standard CTCSS tones only and does not have provisions for generating the audible tones. Frequency selection is accomplished by grounding pins on the single IC with solder-bridge jumpers. A programming chart provides information on which pins should be grounded to produce a specific CTCSS frequency. For example, the code for 100.0 Hz is 01011 (the sequence represents pins 10, 11, 12, 13 and 14); pins 10 and 12 are grounded with the jumpers, and pins 11, 13 and 14 are left unconnected. Any of the other 31 standard tones can be selected by grounding different pin combinations.

Before starting the installation, I estimated it would take about 20 minutes to complete the job. It took closer to 60 minutes, and Arnie said it was typical. If you are not intimidated by the thought of working on miniaturized equipment and you have some experience, it is reasonable to expect a similar installation time. If you are hesitant to tackle the installation, I suggest you turn the project over to the service department of a qualified dealer (if you don't have a friend like Arnie).

Price class is $30 (without installation). Additional information can be obtained from Communications Specialists, Inc., 426 W. Taft Ave., Orange, CA 92665. — *Peter R. O'Dell, KB1N*

[3]Product Review, *QST*, September 1980, p. 41.

Bearcat 100

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Sensitivity for 12-dB SINAD:	Sensitivity for 20-dB quieting:
Low band — 0.6 μV	33.760 MHz — 0.85 μV
High band — 0.6 μV	138.150 MHz — 1.2 μV
Uhf — 1 μV	406.125 MHz — 1.8 μV

BEARCAT 100

☐ The Bearcat 100 is a 16-channel hand-held programmable scanner featuring coverage of the 30-50 MHz, 138-174 MHz and 406-512 MHz bands. It is about the size of a typical amateur hand-held transceiver 7 × 3 × 1-3/8 in. (HWD) and weighs approximately 1 pound[4]. It has a liquid crystal display and a two-second scan rate, and is powered by six AA NiCd batteries.

In addition to the scan feature, which will sample up to 16 discrete frequencies that you have entered into the unit's memory, the Bearcat 100 has a search mode. It will sample all frequencies within a specified range of frequencies to locate signals that would otherwise be undetectable. All you have to do is enter the lower and upper search limits.

A logical question is, "Why would an amateur want to have a portable scanner?" There are at least four good reasons, not all of which might apply to you. I live within range of at least a dozen 2-meter repeaters. With the Bearcat 100, all of them, plus simplex frequencies, can be monitored with ease. For those who travel and frequently find themselves in strange cities, the search feature can be used to locate active repeaters — even those not listed in the *Repeater Directory*. Police, fire and other public service channels can be monitored, potentially improving response time in emergencies. Of course, scanning can be fun, too.

One disadvantage of the Bearcat 100 is that the front-panel pushbuttons have a distinct lack of tactile feedback; they fail to give you a positive indication that the data has been successfully and accurately entered. You'd best keep your eye on the display. This can cause problems at night or when driving. The unit comes with a heavy-duty carrying case with a belt loop. You can't access the pushbuttons while using the case unless you use a razor blade to cut out a suitable opening. All in all, if you feel you have use for a portable scanner, the Bearcat 100 packs a lot into a small package. Price class: $450. Available from Electra Co., Div. of Masco Corp. of Indiana, 300 East County Line Rd., Cumberland, IN 46229. — *Hal Steinman, K1FHN*

[4]kg = lb × 0.454

New Books

☐ *Ferromagnetic Core Design & Application Handbook*, by M. F. "Doug" DeMaw. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ. First edition, 1981. Hard-bound, 6 × 9 inches, 256 pp., $24.95.

There is hardly a circuit today — from the milliwatt QRP rig to the most complex computer — that does not employ a ferromagnetic-core device of one kind or another. Are you one of those who simply wondered what these modern-technology devices are all about? Or are you the experimenter and "homebrewer" who has collected folders full of manufacturers' data sheets for toroids, rods and pot cores, and who prayed for a comprehensive reference manual? Cheer up! Doug DeMaw, W1FB, who has contributed so much to the pages of *QST* as Senior Technical Editor, has written an outstanding book on the subject. It has all the ingredients to become the standard reference manual on ferromagnetic-core devices for amateur, technician, student and engineer alike in the years to come.

The 256 pages of this handsome hard-cover book, comprising five chapters and appendix, are well organized and illustrated. The author covers a seemingly complex subject in easy-to-understand language and superb writing style. He refers to basic formulas associated with ferromagnetic-core technology only when essential and keeps cumbersome textbook-type math to a minimum. This handbook does not seem to omit anything, yet is not technically overpowering — going from basic theory and application to proper selection and use of design concepts. For a layman such as I, it is especially gratifying that the practical aspects of ferromagnetic cores are covered so well for amateur and professional alike. For instance, the author's treatment of ferromagnetic-core baluns is most valuable and suitable to the amateur. Likewise, the reference table for standard core sizes of ferromagnetic material will be a real asset to anyone trying to wind a coil, choke or transformer. The circuit examples given are practical, lab-researched and proven.

The many topics presented in this book defy individual listing. Rods, bars, slugs, beads, sleeves and pot cores — all are dealt with in a "hands-on" manner. Sample circuits are added throughout. The appendix is full of valuable references, including IEC publications, magnetic-core symbology, manufacturers' names and locations, core size and selection charts — just to mention a few. Ferromagnetic-core technology is ably presented in this remarkable book. — *Hans J. Meurer, W2TO*

FCC Proposal for "Codeless" Operator License Class

Editor's Note: Because of the intense interest in the FCC proposal for a codeless class of vhf amateur license, the FCC notice of proposed rulemaking is printed here in its entirety except for a section dealing with procedural matters. Anyone wishing to participate in the FCC proceeding may do so by sending the original and five copies of their written comments to The Secretary, FCC, Washington, DC 20554. Informal comments, sent without additional copies, will be placed in a public file. Your comments should clearly indicate at the top of the first page that they refer to PR Docket No. 83-28, and should reach FCC before the filing deadline of April 29. Your ARRL Director and Headquarters would also appreciate receiving copies. Please also see page 9 of this issue.

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Establishment of a Class of	)	
Amateur Operator License Not	)	PR Docket
Requiring a Demonstration of	)	No. 83-28
Proficiency in the International	)	
Morse Code.		

NOTICE OF PROPOSED RULE MAKING

Adopted: January 20, 1983. Released: February 1, 1983. By the Commission:

Introduction

1. Notice of Proposed Rule Making in the above captioned matter is hereby given.

2. The Commission is proposing to establish an amateur radio operator license class which an individual may obtain without first demonstrating a proficiency in the international Morse code. We are doing this in the belief that there are intelligent, disciplined persons who can make a valuable contribution to the Amateur Radio Service without such a proficiency. These persons may include, but are not limited to, many of our nation's younger, school-aged individuals whose primary interest lies in the burgeoning field of computer technology or individuals with a physical handicap which prevents them from being able to successfully complete a Morse code examination. The license class we propose to establish would be an "entry" type license class which would provide to these individuals the same introduction to amateur radio that the current Novice class license provides. However, instead of requiring a demonstration of proficiency in the Morse code, the proposed license class would require additional testing, above that required of a Novice class license applicant, in the areas of radio theory, operation and practice. In this way, we believe that individuals can prove in an alternative fashion that they have the ability and discipline to make a serious contribution to the Amateur Radio Service.

Background

3. As the amateur community is aware, the issue of a "codeless" amateur operator license has been addressed in past Commission proceedings. On December 4, 1974, the Commission adopted a Notice of Proposed Rule Making in Docket 20282 that dealt comprehensively with the Amateur Radio Service Rules concerning operator classes, privileges and requirements.[1] In that Notice, the Commission said:

> We recognize the desire by some amateurs, and would be amateurs . . . for a class of amateur operator license having requirements that do not include a knowledge of telegraphy . . . . A survey and analysis conducted in 1971 indicated that there may be as many non-licensees interested in amateur radio activities, if not more, than there are persons already licensed in the Amateur Radio Service. The most often mentioned reason for not obtaining an amateur license is the telegraphy requirements.

The Commission then stated, "We believe, under carefully established provisions, a new 'telephony-only' type of operator license (the "Communicator class" license), limited to frequencies above 144 MHz, could and should be incorporated into the Amateur Radio Service."

4. On August 8, 1978 the Commission adopted a Notice of Inquiry in General Docket 78-250 concerning the administration of Morse code examinations to handicapped applicants for amateur operator licenses.[2] That Notice contained information about our current examination procedures and sought comments about improvements that could be made in administering Morse code examinations to handicapped applicants. One of the alternatives that was considered in that proceeding was the creation of a new class of amateur operator license which would not have a Morse code examination and which would have an eligibility restricted to handicapped applicants.

5. On March 6, 1979 the Commission adopted a Third Report and Order in Docket 20282 to address matters not disposed of in Commission actions since the adoption of its Notice in that docket.[3] Among these was the issue of a codeless operator license. The Commission stated:

> (W)e have decided to take no action at this time . . . on the creation of a . . . license having no telegraphy privileges or requirements. We firmly believe in the principle, articulated in the Notice, that in any licensing system there should be a logical relationship between the qualification requirements and the operator privileges authorized at each license class level. We feel that the (codeless) "Communicator Class," as proposed, was in keeping with this principle; and we do not agree with the majority filing comments who asserted that the privileges to be conveyed by the "Communicator Class" were "out of proportion" to the qualification requirements. Nevertheless, since much time has elapsed since the issuance of the Notice (4 years) . . . we would like to get the views of . . . newer licensees on the need or desirability of a "codeless" class of amateur license. Accordingly, we hope to revisit this matter later . . . in a new rule making proceeding.

6. On March 11, 1982 the Commission adopted a Report and Order terminating, without action, the proceeding in General Docket 78-250.[4] The Commission stated:

> After careful consideration of the issues and comments in this proceeding, it appears that selecting a particular group of license applicants for favorable treatment in terms of less stringent amateur operator requirements would not be sound licensing policy. For example, if such policy were instituted, the Commission ultimately could find itself in the untenable position of deciding which applicants actually qualified for telegraphy exemptions and which did not. Commission personnel clearly are not trained to make such judgements. Therefore, if we decide to introduce a class of amateur radio operator license without telegraphy requirements, it will be available to any applicant, instead of limited to applicants with certain physical or learning disabilities.

7. Today, we note that internationally there are at least two countries with significant amateur radio operator populations which provide for a class of operator license which does not require a proficiency in the Morse code: Japan and Canada. In Japan, where the difference in privileges between operator classes is for the most part determined by authorized maximum operating power, license classes are provided for low power operation in the HF as well as VHF bands' without a Morse code examination requirement. In Canada, operators holding a Digital Amateur Class Certificate may use virtually all emission types throughout the Canadian amateur frequency bands above 144 MHz. The examination requirements for the Digital Amateur Class Certificate include a test in radio regulations, a test in radio theory and operation of modern amateur radio transmitters and receivers, and a rigorous examination in the theory of communications, computing, and analog and digital transmissions, but no examination in the international Morse code. For each of these cases, we are unaware of any difficulty that has been experienced because of the creation of such license classes.

Proposals

8. The Commission is proposing to establish one of two kinds of codeless operator license class. The first kind would be created by eliminating the five-word-per-minute Morse code examination element from the existing Technician class operator licensing requirements. The operator license to be issued would still be called the "Technician class" license and the privileges would continue to include all authorized amateur privileges above 50 MHz. However, the license would convey the Novice class privileges (Morse telegraphy in portions of certain HF bands) — which are authorized to current Technician class licensees — only after the license holder had successfully completed the additional examination element 1(A) (beginner's code test at five words per minute). The second form that such a license could take would be one similar to the Canadian Digital Amateur Class Certificate. We propose to call this license the "Experimenter class" license, since, as will be explained later, this would more accurately reflect the privileges to be conveyed.

9. Both of *the potential codeless license* classes we propose to establish have certain features in common, most notably, the authorized frequencies under consideration. The

Commission believes that requirements for a knowledge of the international Morse code still serve an important purpose for operation on the frequencies below 30 MHz. Furthermore, the United States is a signatory of the treaty established at the 1959 Administrative Radio Conference and that treaty requires that the operator of an amateur radio station using frequencies below 144 MHz must be capable of sending and receiving Morse code signals.[6] At the 1979 World Administrative Radio Conference (WARC) the specification of 144 MHz was changed to 30 MHz and this new limit will apply upon ratification of the new treaty by the United States. Accordingly, the Commission will consider only privileges above 30 MHz for the codeless license class. The specific frequencies above 30 MHz to authorize for such a license class is an issue upon which we encourage comments. Our proposals for frequencies as well as other specific aspects of the two proposed license classes are discussed below.

10. Another common aspect of the two codeless license classes under consideration is that they would both be "entry" type licenses, and, in that respect, be similar to the existing Novice class license. As mentioned earlier, the intention of the entry type license is to provide an individual with an introduction to amateur radio in order that he/she may come to learn more of the art and techniques of radio and become interested in different and varied aspects of the Amateur Radio Service. The license classes we propose to establish would supplement the Novice class license in this regard. They would differ from the Novice class in that instead of requiring the five-word-per-minute code test, the new entry class license would require additional examination in radio theory and practice.

Technician Class License (Without Morse Code Examination)

11. With the elimination of the five-word-per-minute Morse code examination requirement (examination element 1(A)) from the Technician class license the remaining requirements would include examination element 2 (basic law comprising rules and regulations essential to the beginner's operation, including sufficient elementary radio theory for the understanding of those rules) and element 3 (general amateur practice and regulations involving radio operation and apparatus and provisions of treaties, statutes, and rules affecting amateur stations and operators). We note that elements 2 and 3 are also the only examinations in theory, practice and regulations required for the General class operator license — a license which conveys all amateur privileges on frequencies in all amateur frequency bands and which is considered to be a significant credential of an individual's technical competence. In essence, we would be requiring the Technician class licensee to meet all of the requirements of the General class licensee, save for the examination in Morse code. Under these circumstances, we believe that an individual, having obtained a Technician class license under our proposal, would be able to make a worthy contribution to the Amateur Radio Service and that the individual would possess the degree of discipline appropriate to amateur radio.

12. Under our proposal, the privileges for the Technician class license would continue to include operation on all amateur frequencies above 50 MHz since this would be consistent with the current privileges for that license class (with the exception of the Morse telegraphy privileges in the HF bands which would be authorized upon the licensee's successful completion of examination element 1(A)). Such privileges would also be consistent with our international responsibilities. We are also proposing that the privileges include the use of all emission modes currently authorized to amateurs on those frequency bands. Once again this is consistent with the privileges currently authorized to Technician class licensees and is in keeping with our objective of having the proposed license class provide a broad exposure to the Amateur Radio Service and opportunities for experimentation. We believe, for example, that persons whose primary interest lies in the field of computers will take advantage of the emission modes used for radio-teleprinter and computer communications (i.e. A2, F1 and F2 emission modes). In this way they could discover more about radio communications through the converging technologies of amateur radio and personal computers. They would then have an opportunity to go on to learn about other modes such as facsimile (A4 and F4 emissions), television (A5 and F5 emissions) and the Morse code (A1 emissions) in addition to the common voice modes (A3 and F3 emissions).

Experimenter Class License

13. As noted earlier, the requirements for the Canadian Digital Amateur Class Certificate, while not including an examination in the Morse code, do include examinations in radio regulations, radio theory and digital techniques. The examinations in radio regulations and theory are the same as those given to applicants for the Canadian Advanced Amateur Class Certificate which has as its only additional requirement a fifteen-word-per-minute Morse code examination. So in essence, the applicant for the Digital Class Certificate must pass the same examinations requirements as an applicant for the Advanced Class Certificate except that the Morse code examination is replaced with an extremely difficult examination on digital techniques.

14. In keeping with this model, we propose to create for our Experimenter class license a new examination element — element 5 — which would be the sole examination required of the license applicant. The appropriate content for this examination is something which we believe deserves discussion in the comments on this proceeding. Clearly this examination element must test an applicant's knowledge of radio regulations and theory as is required for the Canadian Digital Amateur Class Certificate. However, the *level* at which this examination should test an applicant's knowledge is an issue that we believe should be addressed in the comments. The level of the examination in these areas could be at or between the levels required for any of the five current operator license classes.

15. To be in perfect keeping with the model of the Canadian Digital Class Certificate, the examination required for the Experimenter class license should also test an applicant's knowledge of digital techniques. We note, however, that applicants for the current Technician and Amateur Extra Class licenses are also tested in this area. Under these circumstances, and given that an examination in radio regulations and theory should clearly be required for the Experimenter class license applicant, we believe that it may be appropriate for our proposed new examination element 5 to simply be comprised of certain of our existing examination elements. For example, if the new element 5 consisted of the same subject matter as the current elements 2 and 3, the examination requirements for the Experimenter class license would be the same as those for our proposed codeless Technician class license. Alternatively, examination element 5 could, perhaps, consist of the current elements 2, 3 and 4(A). We specifically invite comments as to whether the approach of having element 5 be comprised of certain current examination elements is desirable, and if so which ones, or whether an entirely new examination and syllabus should be developed for it. This also brings us to the first reason that we believe this proposed new license should be called the Experimenter class rather than the Digital class license. Since the examination requirements in the area of digital techniques for the new license would not be unique to that license (unless we were to remove those requirements from other classes of licenses, which we do not plan to do), we believe it would be a misnomer to single that license class out as a "digital" license.

16. The Canadian Digital Amateur Class Certificate conveys all of the privileges accorded to the two other Canadian amateur operator classes on frequencies above 144 MHz, both in terms of authorized frequencies and emission modes. However, it also conveys emission mode privileges which neither of the other two license classes are entitled to use — specifically the use of pulse modulation (type P emissions). In the U.S., all classes of amateur operator licensees, other than Novice, are authorized full amateur privileges above 50 MHz, including the use of pulse modulation where it is permitted in those bands. Consequently, there are no exclusive mode privileges which we can reserve for the Experimenter class license without removing certain privileges from other license classes. Once again, this is something which we do not plan to do. Consistent with the above, we propose that the Experimenter class license convey all amateur privileges on frequencies above 144 MHz. We are proposing 144 MHz as the lower limit of frequency privileges since this is consistent with that of the Canadian Digital Amateur Class Certificate. However, there is nothing to prevent the authorization of privileges down to 50 MHz and, here again, we plan to be flexible on the issue of frequencies to authorize to the new codeless license. This also brings us to the second reason that we believe that calling this proposed license the "Digital class" license would be a misnomer. There are no "digital" privileges which we plan to exclusively convey to such a license.

Discussion

17. Essentially, we will be considering the authorization of the same frequencies for whichever codeless license we may implement. There are, then, only two principal differences between our proposed codeless Technician class and Experimenter class operator licenses. These are the subject and level of the written examination to be administered to the applicant, and the total number of operator license classes to be provided for in the Amateur Radio Service. In the case of our codeless Technician class license proposal, that license class would take the place of the current Technician class license and the total number of operator license classes would remain the same. In the case of our Experimenter class license proposal, we would be adding one entirely new class of operator license.[7] In this respect, we must point out that the Technician

class license proposal has an advantage over the Experimenter class license proposal. Implementation of the Experimenter class license may require the Commission to develop a new syllabus and provide, by some means, for the preparation and administration of new examinations. It would also certainly require the revision and reprinting of our application forms and other Commission publications as well as a complete revision of our data processing procedures and programs used for issuing licenses. We would be remiss if we did not consider these administrative burdens in weighing the respective desirability of the two license classes proposed. Accordingly, we request that this matter be addressed in the context of comments on this proceeding.

18. Finally, the Commission does not wish to de-emphasize the importance of the international Morse code as a communications mode in the Amateur Radio Service. In the recent proceeding regarding expansion of the HF telephony "subbands" the Commission stated: "Current regulations permit emission type A1 Morse telegraphy operation on all amateur radio frequencies. This unique universal authorization for that mode results from its character as an efficient and widely recognized communications language that can be employed with the simplest type of equipment."[8] We believe that this character has not changed. However, it is precisely these attributes that make us believe that Morse code as a valuable mode of communications "can stand on its own feet." We believe that once an individual has had an opportunity to become involved in the Amateur Radio Service and become acquainted with its many intricate facets, there is a desire to learn more about radio and the offerings of the service. We anticipate that in the case of the codeless class licensees these new interests may include the international Morse code, just as we anticipate with all other licensees that these interests may include radio theory at a greater level of comprehension and Morse code proficiency at a greater speed.

19. Beyond station identification and use in certain weak signal communications modes, we note that the Morse code is seldom used on frequencies above 50 MHz, even though all amateur operators are currently required to demonstrate their proficiency in it prior to licensing. We then ask why the Federal Government should continue to require of operators a skill which may have less utility than other skills in these bands for which the license would be granted to operate. We do not, for example, require applicants to demonstrate proficiency with a typewriter even though radioteleprinter may be the most efficient mode for certain "traffic" handling. We believe that a more important qualification for an operator license is an individual's ability to understand the Commission's regulations and the radio station for which he/she is responsible. Other than this, we would leave to the individual the decision as to whether learning the Morse code would benefit his/her endeavors in amateur radio.

Conclusion

20. The Commission is aware that the matter of a codeless license is probably the most controversial matter that we can raise with the amateur radio community. For many amateur radio operators, the Morse code stands as the absolute cornerstone of the service. We have taken note of a survey conducted for the American Radio Relay League, Inc. (ARRL) by Florida State University's Institute for Social Research,[9] which is indicative of these attitudes. Of those U.S.-licensed amateur operators responding, 83% believed that a Morse code requirement is either essential or important for operator privileges below 30 MHz, while 64% believed that such a requirement is essential or important for operator privileges above 30 MHz. We are also aware that many amateur radio licensees believe that our intention with a codeless license will be simply to increase the growth of the Amateur Radio Service. While this would be a likely consequence of the establishment of a codeless class license this, in fact, is not our principal intent. We wish to reiterate that our intention is to enhance, not necessarily enlarge, the Amateur Radio Service. We believe that this can be accomplished by allowing fully-qualified, technically competent individuals, who are not presently part of the amateur fraternity, to make a contribution to the Amateur Radio Service, provided only that the operating privileges they receive are commensurate with the examination material they are required to pass.

21. It has also come to our attention that some of the current amateur licensees are particularly concerned that even if a codeless license class were to convey privileges only in the VHF bands and higher, that those privileges might include certain well populated bands (e.g. the popular 2 meter band). With respect to this, we would like to reemphasize that we plan to be flexible on the issue of frequencies that would be authorized for the codeless license class (in particular the Experimenter class, since we are not considering changes in the privileges for Technician class licensees). We will carefully consider the comments of both amateurs and non-amateurs on this issue and make appropriate adjustments in the frequency bands eventually authorized.

22. Finally, we are in receipt of a letter from the ARRL requesting us to delay for 18 months the issuance of this Notice due to recent developments with respect to the fate of the amateur operator examination program. Public Law 97-259, adopted September 13, 1982, permits the Commission to use volunteers in the examination of candidates for amateur operator licenses. In response to that legislation, the ARRL has filed a petition for rule making, RM-4229, requesting that the Commission's Rules be amended to establish a volunteer examiner program. The ARRL letter states that, "It seems unwise and perhaps unfair to contemplate enlarging the license examination burden by an additional burden of unknown dimensions until the amateur community has responded to the principal challenge involved . . . . The amateur community needs time to absorb the Commission's license examination task before it as a result of PL 97-259 before it contemplates additional license examination assignments from the Commission."

23. While we are completely sympathetic to the burdens involved with the examination of amateur operator license candidates, we reject the ARRL's request. The ARRL has, in RM-4229, invited upon the amateur community the burden of the operator examination program. Although we recognize and appreciate that there are benefits to be realized by the public from the ARRL's proposal in its petition, the Commission is not forcing this burden upon the amateur community. The Commission has been considering the establishment of a codeless amateur license class for over a decade and we do not believe that any further delay can be warranted.

24. Accordingly, we are moving ahead with this proceeding and anticipate that the amateur community, as well as other interested parties, will carefully and objectively consider our proposals and provide constructive comments to aid us in our final decision on this matter.

25. NOTICE IS HEREBY GIVEN that it is proposed to amend 47 CFR Part 97 in accordance with the proposal set forth in the attached Appendix I or Appendix II.

FEDERAL COMMUNICATIONS COMMISSION
William J. Tricarico
Secretary

APPENDIX I

It is proposed that Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, be amended as follows:

1. In Section 97.7, paragraph (d) would be revised to read as follows: § 97.7 Privileges of operator licenses.

* * * * *

(d) Technician Class. All authorized amateur privileges on the frequencies 50.0 MHz and above. Technician Class licenses also convey the full privileges of Novice Class licenses if —

(1) The Technician Class operator license was first obtained prior to [the effective date of the Order in this proceeding]; or

(2) The licensee has been examined by a volunteer examiner meeting the qualifications set forth in § 97.28(b) who has administered Examination Element 1(A) to the Technician Class licensee and has determined that the licensee has successfully completed that element.

* * * * *

2. In Section 97.23, paragraph (d) would be revised to read as follows: § 97.23 Examination requirements.

* * * * *

(d) Technician Class: Elements 2 and 3;

* * * * *

APPENDIX II

It is proposed that Part 97 of the Commission's Rules and Regulations, 47 CFR Part 97, be amended as follows:

1. Section 97.5 would be revised to read as follows:

§ 97.5 Classes of operator licenses.

Amateur extra class, Advanced class, General class, Conditional class, Technician class, Novice class, Experimenter class.

2. In Section 97.7, a new paragraph (f) would be added to read as follows:

§ 97.7 Privileges of operator licenses.

* * * * *

(f) Experimenter Class. All authorized amateur privileges on the frequencies 144.0 MHz and above.

3. In Section 97.21, a new paragraph (h) would be added to read as follows:

§ 97.21 Examination elements.

* * * * *

(h) Element 5: Intermediate amateur practice involving intermediate level radio theory and operation as applicable to modern amateur techniques, including, but not limited to, radiotelephony and digital communications.

4. In Section 97.23, a new paragraph (f) would be added to read as follows:

§ 97.23 Examination requirements.

* * * * *

(f) Experimenter Class: Element 5.

Notes

[39 FR 44042, December 20, 1974.
[43 FR 37729, August 24, 1978.
[44 FR 16460, March 19, 1979.
[47 FR 14197, April 2, 1982.
[5]The HF (High Frequency) bands are the bands between 3 and 30 MHz. The VHF (Very High Frequency) bands are the bands between 30 and 300 MHz.
[6]Article 41, Section 3(l) of the Radio Regulations which complete the International Telecommunication Convention (Geneva, 1959) states, "Any person operating the apparatus of an amateur station shall have proved that he is able to send correctly by hand and to receive correctly by ear, texts in Morse code signals. Administrations concerned may, however, waive this requirement in the case of stations making use exclusively of frequencies above 144 MHz."
[7]Depending on the final examination requirements and privileges which may be included for the Experimenter class license, the license class structure may dictate that it be permissible for that class of license to be able to be held concurrently with another class of license. This is the case for the Canadian Digital Amateur Class Certificate.
[8]Notice of Inquiry and Proposed Rule Making in PR Docket No. 82-83, 47 FR 8798, March 2, 1982.
[9]The American Radio Relay League, Inc. is an association of amateur radio operators with over 100,000 members who are licensed by the Commission. Information from survey excerpted from "QST" (the official journal of the ARRL), March 1981, pp. 11-18.

Happy Anniversary, AMSAT-OSCAR 8

Five years after OSCAR 8 was fired into orbit, the Satellite Elmer Program sits ready on the pad. With your help, it'll be just as successful as the satellite has been.

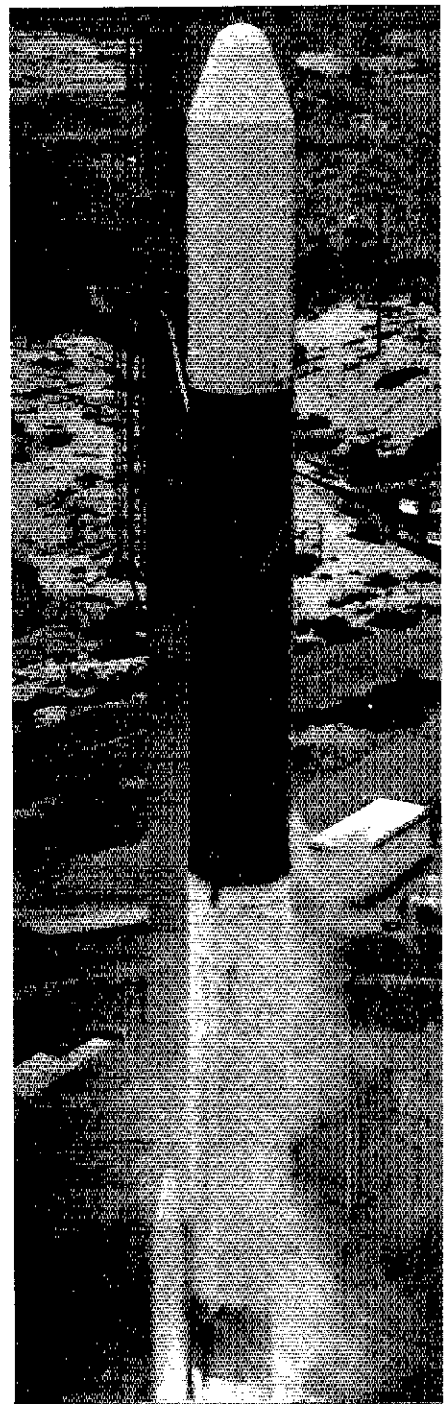
By Bernie Glassmeyer,* W9KDR

March 5 marks the end of five years of successful operation of AMSAT-OSCAR 8. This historic milestone should not be passed over lightly, for the amateur satellite was designed to operate for only a three-year lifetime. Its performance has been excellent; we couldn't have asked for a more dependable or consistent satellite. A joint project of AMSAT (Radio Amateur Satellite Corporation), JAMSAT (Japan AMSAT Association), Project OSCAR (builders of the world's first Amateur Radio satellite) and ARRL, OSCAR 8 is heading toward the record for amateur satellites — 6-1/2 years of service, set by OSCAR 7. To give you some idea of what it means to circle the globe for five years, AMSAT-OSCAR 8 has traveled nearly 700 million miles since its launch, on March 5, 1978, from Vandenburg Air Force Base, California.

One of the reasons for its unexpectedly long life has been on-time scheduling by command stations in England, Australia, Canada and the U.S. Without these devoted volunteers, who change the satellite's operating modes manually each day, OSCAR 8 wouldn't have survived into its sixth year, all the while providing a great deal of enjoyment for space-age hams around the world.

Assisting the command stations are the volunteer telemetry data collectors. Since the launch, we have gathered enough information about OSCAR 8 to overflow a four-drawer file cabinet! With this data, we have been able to monitor and analyze the satellite's vital functions.

AMSAT-OSCAR 8 was originally conceived to support the classroom OSCAR Education Program and to provide amateur communication between the demise of OSCAR 7 and the successful launch of a Phase III satellite. A launch failure in 1980 and subsequent delays have heightened the importance of OSCAR 8.



With AMSAT-OSCAR 8 mounted inside near the top, the Delta launch vehicle lifts off from Vandenberg AFB at 1754 UTC on March 5, 1978. To date, OSCAR 8 has completed more than 25,000 orbits, or nearly 3/4 billion miles. *(NASA-USAF photo)*

Soon after launch, the OSCAR 8 Mode J Club was introduced in "The Easy Way to OSCAR 8 Mode J" in January 1979 *QST*, page 56. Since then, the Club has grown to over 250 members from all over the world. The Mode J transponder (2 meters in, 70 cm out) is extremely reliable, although its signals are weak compared to OSCAR 7 Mode B. Its output power had to be set lower because of the satellite's dc power requirements.

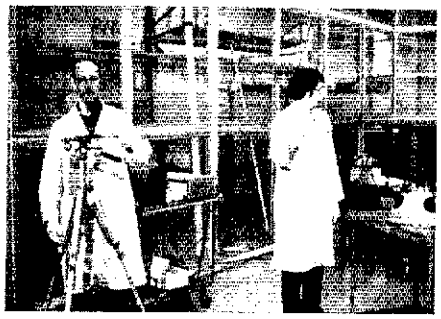
Although OSCAR 8 is still performing admirably, we should expect some decline over the next few years. Having enjoyed using OSCAR 8 for five full years, we should give a special thanks to those who made the project such a success. One way to do this is to make the best use of the satellite's remaining lifetime. To this end, all who have heard or operated through OSCAR 8 are invited to participate in a commemorative event designed to increase amateur satellite awareness among amateurs and nonamateurs throughout the world.

Earn a Satellite Elmer Award

From March 5 through September 5, ARRL will issue a commemorative QSL card with a special Fifth Anniversary sticker to all who report activity through OSCAR 8. To participate in the AMSAT-OSCAR 8 Fifth Anniversary celebration, all you have to do is report to ARRL Hq. the time, date, frequency and call signs of those working through the satellite. You needn't be an ARRL member or even an Amateur Radio operator to qualify for the special QSL card.

In addition, special Elmer certificates will be issued to all amateurs who help

'Notes appear on page 53.
*OSCAR Program Manager, ARRL



AMSAT Director Dick Daniels, W4PUJ (left), and Vice President of Engineering Jan King, W3GEY, test the 10-meter dipole just before launch. The antenna was deployed on orbit 5 by command station VE3SAT. This historic event was reported live on the East Coast AMSAT net. *(W9KDR photo)*

others make their first satellite QSOs. All you need to report to ARRL at the end of the commemorative event are the names and calls of those you helped and a brief report of your activities. Special endorsements will be given to these Satellite Elmers who are also members of AMSAT, ARRL or the Mode J Club.

This is not a contest; in fact, you can qualify for the QSL card and special certificate without making a single contact. What is unique about this event is that Amateur Radio and the OSCAR program will benefit from your participation, and you can enjoy helping others experience the same thrill you had from your first satellite QSO.

If you'd like to become a Satellite Elmer, ARRL has materials that can help.[1] We'll also furnish the name of your AMSAT Area Coordinator, one of the volunteers who will help you get started in satellite communications by giving advice on how to set up and operate a ground station.[2]

If you'd like to spread the word about satellite communications by giving a demonstration at your radio club, a school, a hamfest or a convention, let us know. We have slide shows and videotape programs in VHS, Beta and U-Matic available for loan at no cost. These are designed to make you an instant satellite "expert." Recently, we received a report from Jeannine Duane, WB2MBW, who told us that her recent presentation (including a showing of the videotape, "OSCAR and the Ham,") to professional educators at the Global Leadership Conference at Rider College in New Jersey, was very successful. "Using OSCAR and Amateur Radio as a classroom resource to develop better global understanding and to stimulate young people toward space science was the main objective of my talk," she wrote. "The questions we received indicated a great deal of interest in OSCAR for use as a valuable resource for schools. My personal interest is certainly piqued after this involvement, and I am beginning to study the materials available and get my equipment set up. Communicating with OSCAR will be exciting!"

If Jeannine, without any previous hands-on OSCAR experience, can convince professional educators who are not amateurs, think what you could do. We need your help to keep the Amateur Radio satellite program growing. Let us know what we can do to help you give OSCAR 8 a rousing fifth anniversary.

Notes

[1]The OSCARLOCATOR package, including satellite plotters and instructions, is available for $7 (mailed to the U.S.) and $8 elsewhere.

[2]If you have satellite communication experience and want to apply for a position in your area, write to the Radio Amateur Satellite Corporation, 850 Sligo Ave., Silver Spring, MD 20910.

Strays

SATELLITE WAS FROM HAWAII

☐ Qualifying for satellite Worked All States is a significant achievement, but from Hawaii it's another story. For some reason, states on the East Coast proved to be a problem. The fact that the closest state is 2400 miles and the farthest 5100 miles away is bad enough, but the big problem was the Koolau mountain range. Because of this, a portable operation was planned.

After reviewing the upcoming orbits, I determined that April 13-16 would be the best time to make the East Coast connection. Target states for the operation would be CT, DE, MA, ME, NH, RI and VT. With expert coordination from W2RS, who contacted the East Coast stations, the hunt was on.

On the 13th I set up the station at Waimanalo, on the east side of Oahu. For transmitting, I used a 2-meter multi-mode rig driving a solid-state amplifier and a 10-element circularly polarized antenna. A 10-meter receiver with a preamplifier and a sloping dipole were used to receive. The entire station was located on an ocean-front site, about 20 feet from the beach. On the 15th, at 0905 UTC, the first East Coast signals were heard, and K3JL (DE), W1NU (CT), K1LJL (VT) and WA1ZUB (MA) were worked. On the 16th, the final day of the operation, I worked K1DS (RI). Five of the seven scheduled stations were contacted; ME and NH would have to be worked at a later date.

The 2-meter, circularly polarized transmitting antenna (left) that WH6AMX used to nab all 50 states for the first satellite WAS from Hawaii. Rick took it along on two portable operations that increased his state total significantly.

The next few months were used to make schedules with the other states in the South and Midwest. They were worked from the home QTH. When this was completed, a second portable operation was planned for the elusive ME and NH stations. On this attempt I would use a 3-element Yagi to help improve signal reception. With only 30 seconds for a contact, I completed the 5190-mile two-way exchange with K1WHS (ME) on August 16. The hardest part was over; all I needed now was NH. The next day, I worked W1JSM to complete my WAS.

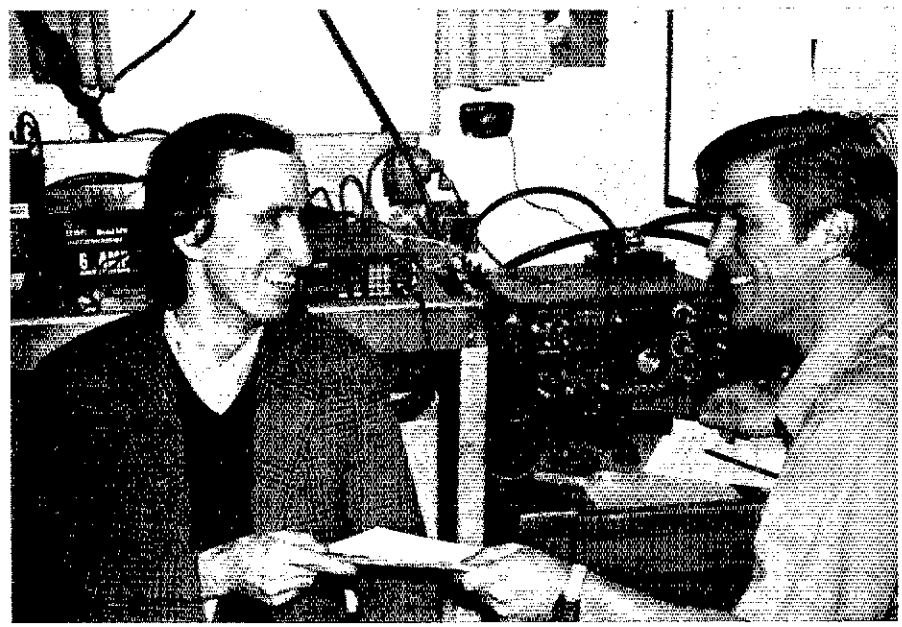
I sent my QSL cards to ARRL Hq., and on September 1, 1982 satellite WAS number 73 (an appropriate number!) was issued to WH6AMX. My special thanks go to W2RS, WA1ZUB and W1NU, who helped make the first satellite WAS from Hawaii a reality. — *Rick Dittmer, WH6AMX, Honolulu, Hawaii*

The National Traffic System Goes to Sea

What's more popular to a novice sailor than a bottle of seasick pills? A ham who can keep him in touch with dry land.

By Brian Churchill,* N1BBT/MM, Bill Vetterling,** KA1DB/W1AF and Jim Hatherley,*** WA1TBY

On July 18, 1982, the U.S. Training Ship *State of Maine* left the Massachusetts Maritime Academy in Buzzards Bay, Massachusetts, to begin the Academy's annual training cruise. Aboard the vessel were 585 cadets and 74 officers and crew. From July 18 to September 11, the ship crossed the Atlantic Ocean and visited Italy, Spain and Portugal. The following accounts describe the important link provided by ham radio between the ship's complement and their families and loved ones.



Bill Vetterling, KA1DB (left), receives "traffic" from Brian Churchill, N1BBT, on board the Massachusetts Maritime Academy training ship *State of Maine*. Two-thousand miles of ocean made this activity far more challenging.

The View from the Bridge

As a shipboard employee of the Massachusetts Maritime Academy, I had on several occasions at sea enjoyed the benefits of Amateur Radio. On this cruise, it was my intention to share the hobby with as many others aboard as possible. Because of the number of cadets, my major problem was finding the time to do this. Phone patching is difficult over long distances and would have involved more time than my leisure hours allowed. Routine traffic via the ARRL National Traffic System seemed to be the answer. Since I was a newcomer to traffic handling, the procedures for transferring large quantities of traffic into the NTS from sea were not obvious to me, so "Red" Counsel, W1BNS, offered to contact the local net for me. While Red was making arrangements with the Eastern Massachusetts/Rhode Island traffic net (EMRI) to find relay stations, I loaded my FT101-Z transceiver, antenna tuner and a Microlog ACT I computer aboard the vessel. (The Microlog communications terminal was on loan as a demonstration test unit.) The only antenna used during the entire cruise was a trap dipole for all bands, which was placed between the starboard boiler stack and the aftermast crosstree, approximately 75 feet above the waterline.

To introduce those aboard to my intentions, I posted notice that a free message service would be available through the courtesy of Amateur Radio operators. Included in this notice were the instructions on filling out the ARRL message forms available in the ship's office. Traffic handling began after we had passed through the Cape Cod Canal and were two days out to sea. I was surprised and very worried when, one hour prior to my first scheduled contact, I found myself with 65 messages in hand. My greatest concern was that W1BNS may not have been successful in finding a station to meet me for net QSP! At 5 P.M. EST, I loaded up the FT101-Z and said a silent prayer that someone would be there from EMRI traffic net. My prayer was answered when WA1TBY answered my first "QRZ EMRI."

Over the following three days, Jim kept our schedule faithfully, handling over 120 pieces of traffic. He was at this time able to recruit the help of Bill Vetterling, KA1DB, who operated most of this period from the Harvard University club station under the call W1AF. About 95% of my shipboard traffic was relayed to and from the NTS and local nets by these two fine operators.

During 46 days of operation (none in foreign ports) over 890 pieces of traffic were passed from the ship and over 450 replies were received. Hundreds of persons, both aboard the vessel and in the

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***46 Hobson St., Brighton, MA 02135

States, were given a valuable introduction to Amateur Radio and the dependability of the NTS.

The problems incurred (beyond the ever-present QRM, QSB and QRN) were minimal. I found it was very difficult to convey return routing information on "thru" traffic within the normal operating methods. Ship addresses are vague for amateur message-handling purposes, and if the delivering station was not a knowledgeable member of an EMRI net, the usual format would offer no clues about which nets or persons might be able to take return messages. My suggestion in this case is to include that information as part of the signature on the original message, as in the signature "VIKKI SEASIDE c/o W1AF/EMRI." Another problem was the time difference. At one point in the voyage I had to contend with a six-hour difference, and this change required that I stay up past 2 A.M. on occasion.

In addition to the respect and recognition that Amateur Radio received during this cruise, there was at least one additional bonus: 65 cadets from the Massachusetts Maritime Academy have enrolled in ham radio classes that are to be given at school this fall. All in all, a splendid view from the bridge! — *N1BBT/MM*

View from Harvard Square

The shipboard operator, N1BBT/MM, and I were completely inexperienced with traffic work. WA1TBY, our Section Traffic Manager (STM), got us through our training quickly and put us on to choosing frequencies and times intelligently, setting up alternate frequencies and coordinating the activity of stations with the NTS net schedules to distribute traffic to as many nets as possible. At 1630 EDST, while most EMRI members were working or commuting home, the college station, and often WA1TBY, would sign on with N1BBT/MM for about 1-1/2 to 2 hours. The routine called for outgoing traffic first, then incoming thru-traffic and, finally, incoming EMRI traffic. When WA1TBY was available, he would take the first pieces of incoming traffic to the EMRI phone net, while W1AF picked up the rest. Remaining traffic usually went to the early EMRI net and the East Massachusetts 2-meter net. It was rare that we could not clear all traffic through these three nets. On the later EMRI net, and the Heavy Hitters Traffic Net (another local 2-meter favorite), we passed residual traffic and picked up outgoing responses.

Our meetings with Brian were usually on 14.098 MHz. This unconventional choice was Brian's idea. He had found that on the traditional portion of the band one was likely, in long sessions such as these, to be interrupted several times each hour.

A more usual form of QRM was from European or U.S. amateurs whose curiosity overwhelmed them so they could not resist breaking in (language barriers notwithstanding). This form of "interference" was understandable and conducted in such a way as not to interrupt the passing of a message. More of a problem when the ship was in the Mediterranean was QRN, the kind in which cw and narrowband filters are a necessity rather than a luxury. While copying was often difficult, it only became impossible on two occasions.

A very unusual problem arose once in early September, following an aurora, when a very loud long-delay echo began accompanying Brian's signal. This phenomenon has been discussed in *QST* (Oct. 1980, p. 11) and it makes a rather amusing problem on cw. For 20 minutes our "communication" showed few signs of intelligence.

The cadets also got a lesson in the importance of amateur communication in "modern" times. Reaching home by commercial means required that the cadets invest the better part of their free time in the effort. In Lisbon, for example, those who were not registered in hotels had to place their telephone calls from a central location, and overseas calls were terminated at 8 P.M. The *State of Maine* also had the misfortune to be docked with three other major vessels, so the limited phone service was saturated. Brian himself devoted four hours to an unsuccessful try at this, and no doubt gained new respect for his FT101-Z.

On September 11, the *State of Maine* entered Buzzards Bay to the cheers of crowds on the pier, myself among them. As the ship dropped anchor, N1BBT/MM called me for the first time on 2 meters and I responded accidentally with my usual "Good evening, Brian," although it was actually 9 A.M. From where I stood, the sight of 600 cadets straining at the rails was a pleasant reminder of what we had accomplished. — *KA1DB/W1AF*

From the STM

The summer months unfortunately bring lulls in the traffic on the NTS nets. When W1BNS contacted us with the proposition that we handle maritime mobile traffic for the Massachusetts Maritime Academy training ship, it seemed an excellent opportunity to keep our nets active. The cooperation we received was extraordinary. All net stations reported the excitement with which the addressees received this traffic, and their thrill played no small part in making the messages easy to route. It is a surprising statistic that in 46 days of operating, and with over 1300 pieces of traffic, we never held even one piece of ship traffic overnight.

Of course, we all felt the satisfaction that comes with public service. More than that, we were aware of playing a major role in spreading information about our hobby. To the hundreds of cadets finding their sea legs on their first major voyage from home, and to the many-times-larger group of relatives and friends, our unanticipated service became a vital part of the trip. The most gratifying return for this work came in the following form as the ship prepared to reenter Buzzards Bay:

881 R N1BBT/MM 35 BUZZARDS BAY, MA SEP 10 TO ALL RADIO AMATEURS HANDLING N1BBT/MM TRAFFIC I WOULD LIKE TO EXPRESS MY APPRECIATION TO ALL THE HAMS WHO HAVE PROVIDED US WITH A SERVICE WHICH IS UNSURPASSED IN THE HISTORY OF THE MASSACHUSETTS MARITIME ACADEMY X I SALUTE YOU ALL X REGARDS — ADMIRAL JOHN AYLMER, PRESIDENT MASSACHUSETTS MARITIME ACADEMY

This note of appreciation extends particularly to the following operators who handled ship traffic: N1s BGW BQG AWX AJJ BNI BHH BZU CDI BYS GQ CW, W1s IDK CE EOF NUP YNE TN DGD IDR ATX WJS AHM, WA1s DXT LPM VMG VSY CSO EXU ZLQ FNM, WB1s GWS CMQ GQO GVD, KA1s EAZ BBU GBS MI JAN ON T GEK KF EMQ AFE ZV, K1s BA PAD IJV BZD, as well as KB1G, KD1B, KC1G, KE1U, KK1H, N8TM, K9HI, WA4STO, K1BA, AK1W and AK1J. — *WA1TBY*

Strays

I would like to get in touch with . . .

☐ any fellow ops equipped with pacemaker units. Robert L. Shand, W6TBG, 7941 Puritan St., Downey, CA 90242.

☐ anyone who is using or has successfully used a "hidden antenna." Michael H. Landwehr, KE7T, P.O. Box 4502, Huachuca City, AZ 85616.

☐ any amateurs who are Lions Club members and are interested in joining an international Lions ham radio net. John H. Wolfenden, KN1E/GM4HYH, Secy., Pelham Lions Club, 9 Willow St., Pelham, NH 03076.

☐ anyone who has a schematic for a Model ES-500 oscillograph built by Precision Apparatus of Elmhurst, New York. Daryll Thompson, VE3LFN, 149 Bedford St., Chatham, ON, N7L 2V5 Canada.

***QST* congratulates . . .**

☐ Harry W. Colborn, WB3EKT, of Kingston, New Jersey, on being named a Fellow of the IEEE.

Happenings

Conducted By Carol L. Smith,* AJ2I

- *WARC Docket Released*
- *FCC Adopts Volunteer Examining Docket*
- *CATVI — RM-4040 File Grows*

FCC Takes Big Step Toward Putting WARC-79 into U.S. Law

Just before the 97th Congress adjourned, the U.S. Senate approved Treaty Document 97-21, thus consenting to ratification of the Final Acts of the 1979 World Administrative Radio Conference. (See "League Lines" in February 1983 *QST.*) However, even while the senators were considering whether the United States should become a signatory party to the WARC Treaty, the FCC was laying the groundwork on plans to implement the new agreement in the likely event the Treaty would become the law of the land. (At presstime we were awaiting word on whether President Reagan had signed the Treaty document.)

The FCC's proposed plan for implementing WARC-79 was officially released as a Notice of Proposed Rulemaking in General Docket 80-739. ARRL, of course, intends to participate in these proceedings by filing comments by the March 10, 1983, deadline. Replies to comments are due April 11. Many of the issues affecting Amateur Radio have already been addressed by the ARRL in comments filed in earlier proceedings that were termed "Notices of Inquiry" (NOI). Nevertheless, ARRL officers, directors and staff are now placing a special emphasis on participating in this proceeding, a Notice of Proposed Rulemaking.

The proposal actually contains few surprises for U.S. amateurs. The FCC's NPRM generally follows the assignment of frequencies agreed to at Geneva in 1979, a conference in which worldwide Amateur Radio participation is now history. What follows is a brief summary of the FCC's proposed treatment of frequencies that are of interest to Amateur Radio operators.

1800-2000 kHz — The proposed Table of Frequency Allocations for the United States shows 1800-1900 kHz to be for the *exclusive* use of the Amateur Radio Service. The frequency allocation 1900-2000 kHz is a bit more complicated. ARRL, in previous NOI filings has claimed that the exclusive 1800-1900 kHz allocation is insufficient to meet amateur requirements for this portion of the spectrum. The League therefore requested continued access to the 1900-2000 kHz band. In response, the Commission is now proposing that a footnote be added to the Table permitting amateurs to use 1900-2000 kHz on a secondary basis, which had not been proposed at the NOI stage. According to the Commission, "It is apparent that the radiolocation service will not have to move into the 1900-2000 kHz band for several years." As to the present power limitations on that segment, the proposal states that the Commission will reevaluate the need for these restrictions to protect LORAN-A operations.

> ***"We don't intend to reopen a general discussion of issues or to initiate discussion of new issues in this [WARC] proceeding." — FCC***

According to the Commission, the power restrictions were necessary through January 1, 1983. Whether this implies that power restrictions in the 1900-2000 kHz segment now may no longer be necessary remains to be seen.

3500-4000 kHz — The proposed Table shows this segment to be allocated exclusively to the Amateur Radio Service in the United States. ARRL had previously requested that Canada be informed that U.S. amateurs will not tolerate harmful interference from Canadian broadcasting operations in the segment 3950-4000 kHz. However, the Commission states that this is not an appropriate issue in this proceeding. It believes that international interference problems should be handled through other channels, and it also pointed out that the post-1979 WARC Canadian Allocation Table had deleted the Canadian broadcasting allocation from this band segment anyway.

7000-7300 kHz — The proposed Table shows this segment to be allocated exclusively to the Amateur and Amateur Satellite Services in the United States (7000-7100 kHz for Amateur Satellite). However, under the new WARC agreement the countries of Regions 1 and 3 have an international shortwave broadcasting allocation at 7100-7300 kHz. In a prior NOI proceeding the ARRL had told the Commission that it wants the United States to maintain an Amateur Radio allocation at 7100-7300 kHz at the 1984 HF Broadcasting WARC. The FCC replied that this was not an issue appropriate for discussion in this proceeding.

10.1-10.15 MHz — The proposed Table shows a U.S. Amateur Radio allocation with the footnote that the band is "allocated to the fixed service on a primary basis outside the United States and possessions. Transmissions of stations in the amateur service shall not cause harmful interference to this fixed-service use, and stations in the amateur service shall make all necessary adjustments (including termination of transmission) if harmful interference is caused." In a prior NOI proceeding the League suggested editorial changes to this footnote, and the Commission has made these changes in this proposal. Also, the Commission made mention of the footnote it adopted late last year that permitted U.S. amateurs to use this band immediately (with the exception of 10.109-10.115 MHz) on a secondary basis. See December 1982 *QST*, page 68.

14.0-14.35 MHz — The proposed Table shows exclusive allocations to the Amateur and Amateur Satellite services (14.0-14.250 Amateur Satellite.)

18.068-18.168 MHz — The proposed Table shows an exclusive allocation to the Amateur and Amateur Satellite Services. However, a footnote states that this will not take effect until reaccommodation of the fixed stations presently using this segment is completed, which is to be no later than July 1, 1989.

21.0-21.450 MHz — The proposed Table shows an exclusive allocation to the Amateur and Amateur Satellite Services.

24.89-24.99 MHz — The proposed Table shows an exclusive allocation to the Amateur and Amateur Satellite Services. However, a footnote states that this will not take effect until reaccommodation of the fixed stations presently using the segment is completed, which is to be no later than July 1, 1989.

28.0-29.7 MHz, 50.0-54.0 MHz and 144-148 MHz — The proposed Table shows exclusive allocations to the Amateur Service. (The Amateur Satellite Service would be allocated 28.0-29.7 MHz and 144-146 MHz.)

220-225 MHz — The proposed Table shows this band allocated to the Amateur, Fixed and Mobile Services as primary users, Government Fixed and Mobile as primary, and Government Radiolocation as secondary users. A footnote says, however: "In the band 220-225 MHz, stations in the radiolocation service have priority

*Membership Services Assistant, ARRL

until January 1, 1990." ARRL, in previous NOI filings, requested that fixed and mobile allocations be deleted because such allocations would not be compatible with the existing secondary Amateur Service already in the band. According to text accompanying the proposal, "The current and future spectrum requirements for the 220-225 MHz band are undefined at the present time." A joint FCC/NTIA working group is studying the band, and until this study has been completed, the FCC is "proposing to maintain all three allocations, amateur, fixed and/or mobile services, pending further rulemaking."

420-450 MHz — The proposed Table shows this band allocated to Government Radiolocation as primary and Amateur as secondary. The main issue for amateurs in this part of the proposal is a footnote that would withdraw the 420-430 MHz allocation along the border with Canada to protect Canadian fixed and mobile stations operating in the segment. Specifically, the footnote would establish an imaginary line running roughly 140 miles south of the Canadian border, and amateur operation on 420-430 MHz above the line would be permitted only if the amateur obtained a waiver from the Commission. The major metropolitan areas that would be affected include Seattle, Detroit, Cleveland and Buffalo. ARRL opposed this action in a previous NOI proceeding (see August 1981 *QST*, page 57); however, the Commission chose to leave it in the proposed Table of Allocations. "We feel that it is necessary to include NG135 [the footnote] to insure adequate protection from harmful interference from amateur operations to the Canadian fixed and mobile operations. Waivers as appropriate could be considered based on technical consideration," the FCC stated.

As expected, the Amateur allocation in the 420-450 MHz band is secondary to Government Radiolocation, a continuation of the pre-WARC situation. Also, another footnote would continue to permit "pulse-ranging radiolocation systems authorization" used by government and nongovernment agencies along the shorelines, and "spread spectrum radiolocation systems" in the 420-435 MHz band in inland areas, such authorization to be granted on a case-by-case basis (for nongovernment radiolocation). Also, another footnote (International Footnote #664) permits the Amateur Satellite Service to operate from 435-438 MHz on the condition that no interference is caused to other services operating in accordance with the Table.

902-928 MHz — The proposed Table allocates this band to the Amateur Service on a secondary basis, with Government Radiolocation primary. However, a proposed footnote would further emphasize that amateurs not cause harmful interference to Automatic Vehicle Monitoring (AVM) systems. ARRL, in a prior NOI, requested that amateurs receive protection from AVM systems. Nevertheless, the FCC is now proposing that the AVM systems be the parties protected.

1215-1240 MHz — The proposed Table shows the amateur allocation withdrawn from this segment. In a prior NOI ARRL requested a secondary amateur allocation on the basis that the proposed NAVSTAR radionavigation system planned for the band would not be operational for a long time. The Commission made reference to the League's request by stating, "We are not proposing any changes to this band as the NAVSTAR system is well on its way toward implementation. There are currently six of nine experimental satellites built and in orbit."

1240-1300 MHz — The proposed Table gives amateurs an allocation secondary to Government Radiolocation. In a prior NOI, ARRL pointed out a typographical error in a footnote, and the present proposal reflects this correction. Also, International Footnote #664 would permit the Amateur Satellite Service to operate on the frequencies 1260-1270 MHz provided that such operation is limited to the earth-to-space direction.

2300-2310 MHz and 2390-2450 MHz — The proposed Table gives amateurs secondary allocations at these frequencies with Government Radiolocation being primary. The Commission did not adopt the League's prior proposal for a secondary amateur allocation at 2310-2390 MHz because "any interference to aeronautical telemetering, which may be supporting safety functions, cannot be tolerated." According to the Commission, "There is little evidence to support the ARRL proposal that it may be possible to share this band between aeronautical telemetering and the amateur service." Also, International Footnote #664 would allow Amateur Satellite Service operations on 2400-2450 MHz.

3300-3500 MHz, 5650-5925 MHz and 10.0-10.5 GHz — The proposed Table shows secondary amateur allocations at these frequencies. Also, International Footnote #664 would permit Amateur Satellite Service operations in 3400-3410 MHz (Region 2 and 3 only) and 5650-5670 MHz. Such Amateur Satellite operations would be limited to the earth-to-space direction on 5650-5670 MHz. Another International Footnote, #808, would allocate 5830-5850 MHz to the Amateur Satellite Service (space-to-earth) on a secondary basis.

The secondary allocation to the Amateur Service at 10.0-10.5 GHz would be maintained, with a new Amateur Satellite allocation at 10.45-10.5 GHz.

At 10.45-10.50 GHz, Footnotes NG 42 and NG 134 state that nongovernment stations in the Radiolocation Service shall not cause harmful interference to the Amateur and Amateur Satellite Services.

24 GHz and above — The Table proposed primary and secondary Amateur and Amateur Satellite Services allocations on the following bands: 24.0-24.05 GHz, 24.05-24.25 GHz, 47.0-47.2 GHz, 75.7-76.0 GHz, 76-81 GHz, 119.98-120.02 GHz (by International Footnote #915), 142-144 GHz, 144-149 GHz, 241-248 GHz, and 248-250 GHz. In prior NOI proceedings, ARRL commented that it was satisfied generally with amateur allocations at these frequencies, but it requested an amateur allocation above 300 GHz. The Commission is proposing "to maintain 'Amateur (97)' in column 6 of the Table; therefore, the provisions of Section 97.61(a) authorizing use of these frequencies is applicable."

This is only a brief summary of a document that runs 303 pages. The FCC staff contacts for additional information are William Torak and Fred Thomas at 1919 M Street, N.W., Washington, DC 20554. — *W. Dale Clift, WA3NLO*

VOLUNTEER EXAMINING PROPOSAL ADOPTED

In PR Docket 83-27, the Commission proposed to authorize volunteers to prepare and administer examinations for Amateur Radio operator licenses above the Novice level. This plan would provide more exam opportunities for amateurs in spite of "funding and personnel cutbacks."

Under the FCC's proposal

- *"individuals and organizations would propose questions for all examinations based on the FCC's Study Guide for Amateur Radio operator License examinations.* The Commission would issue lists of approved questions that would be used for the tests.
- *"written examinations for Technician, General and Advanced licenses would be given by three-person teams consisting of a chief holding the Amateur Extra Class license and two members holding either Advanced or Extra Class licenses.* All three team members for an amateur Extra exam would hold that class of license. Telegraphy exams above the Novice level would be given by an Extra Class licensee.
- *"no amateur owning a significant interest in or employed by a manufacturer or distributor of amateur station equipment, or a publisher or distributor or a publication used in preparation for obtaining amateur licenses, could be an examiner."*
- *an examiner must be 18 years old or older and not related to the license candidate.*

"One or more 'umbrella' entities would be established to coordinate the efforts of volunteer examiners. Such organizations would coordinate and publicize dates, times and places for examinations. Candidates would be required to present completed application forms.

"The examination team would certify and forward applications of successful candidates. Exam team chiefs would maintain files of test papers and pertinent information. Interim amateur permits would be issued to successful candidates, entitling them immediately to operate their stations for up to 90 days with the privileges and limits of the new, higher license class." This action will have no effect on the Commission's Novice examination proposal. The full text was not available at presstime, but members may request a copy from ARRL Hq. for an s.a.s.e. Be sure to specify the Docket number, 83-27. Comment deadline will be April 8, 1983; Reply comment deadline will be May 9, 1983.

RM-4040, "DRACONIAN MEASURE"?

American Video Corporation and Landmark Cablevision have submitted their joint com-

Are You a Lawyer? Amateur Radio Wants You!

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

ments, filed late, to RM-4040, the much-discussed petition to preclude cable operation on Amateur Radio frequencies. Their bottom-line conclusion, "the approach most likely to produce real results, [is] *voluntary* education and cooperation." American Video and Landmark reached this "solution" by following logic routes well traveled by the cable industry. They put forth

• *emphasis on meeting FCC radiation standards and absolution of other responsibilities because they comply with this section of the Rules.* As other cable organizations have, American Video and Landmark Cablevision argued that "While cable systems are essentially 'closed,' like any electronic device they will radiate. The Commission's radiation standards for various electronic devices differs [sic], but does recognize the principle that all things electronic radiate to some extent. . . Even cable television systems meeting FCC radiation standards sometimes place a signal into an Amateur repeater."

• *a "numbers" argument.* "The ARRL must realize that its 'preclusion' argument is a double-edged sword," the commenters cautioned. "If a determination must be made as to where lies the 'public interest' — the 25 million cable subscribers versus the quarter million amateurs — the ham radio fraternity is in serious danger of being on the wrong side of the equation. . . If any group is to be precluded from use of Channels E and K, it may very well be the amateurs."

• *that cable companies are "cooperative" in trying to resolve CATVI problems.* American Video and Landmark Cablevision submitted that they are responsive in attempting to settle complaints. Their comments nevertheless offered the following "solution" for the Olathe, Kansas, Repeater Group: "It is obvious that a practical solution is to *relocate the repeater frequency."* (emphasis added)

The joint comments concluded: "The principal point to be made here is that it serves no useful purpose for the ARRL and its membership to take an absolutist stance. The cable industry is still in its growth stage with much technological progress to be made. The signal leakage problem is one dramatic example of the growing public awareness of cable television and the cable industry's efforts at technological maturation."

The ARRL quickly submitted a Motion to Strike American Video and Landmark Cablevision's joint comments on several grounds:

• *the comments were filed long after the time both comments and reply comments were due.* In fact, both commenters had over seven months in which to file comments and reply comments, and these companies knew of these deadlines and even of extensions granted. Still they chose to file their comments 3-1/2 months late.

• *the stated reason for American Video and Landmark Cablevision's comments, "to respond to certain direct criticisms of the system operators," is false.* The League's motion noted that "American/Landmark waxes indignant that the League filed with its reply comments a number of complaints of CATV interference to Amateur Radio operations, including letters pertaining to inability of the American Video and Landmark Cablevision systems in Florida and Kansas to prevent interference to licensed Amateur Radio stations. Indeed it is unfortunate that American/Landmark cannot operate their respective cable systems so as to prevent interference to licensed amateur stations per the requirements of the Commission's Rules . . . It is quite obvious that these joint comments are being filed for a purpose totally unrelated to the proceedings in RM-4040, and the unconscionable lateness of the comments makes it apparent that they are being filed for purposes of delay and to muddy the waters of this proceeding."

• *American Video and Landmark don't understand the status of cable use of amateur frequencies.* The ARRL Motion continued, "American Video and Landmark claimed that the League initiated this proceeding (RM-4040) seeking exclusive rights for amateurs to frequencies that correspond to cable Channels E and K. The frequencies on which cable systems cause interference *are already* exclusively amateur frequencies, or frequencies on which amateurs are entitled to communicate without interference. Cable systems, on the other hand, are *not* entitled to use *any* radio frequency if interference is caused to over-the-air services. No frequency is 'shared' between over-the-air services and cable systems. The burden of solving interference problems is clearly on the cable systems pursuant to Section 76.613(b), *regardless* of the level of radiation present."

• *the problem is an inherent incompatibility between cable operation and amateur operation on amateur frequencies.* Cable systems, even with good maintenance of equipment, cannot avoid interference from leakage on amateur frequencies.

• *the argument that there are millions of cable subscribers and only a few amateurs by comparison is nonsense.* "One cannot compare the number of cable subscribers with the number of amateurs," the League's Motion said. "Rather, one might compare the number of amateur stations with the number of cable systems, or the number of cable subscribers and the number of persons served by Amateur Radio. The only really significant comparison is that of the impact on cable systems from abandonment of one or two out of 30, 50 or over 100 available channels, which is *de minimus,* versus the harm to the public from continued interference to amateur stations operating to serve the public and in emergencies, which is very great indeed."

• *voluntary cooperation is inadequate for solving CATVI problems.* "Offset of the video carrier frequency is touted as a means of resolving an interference problem. Video carrier relocation is just as likely to create an interference problem on another frequency, however. It is not a solution at all. It merely changes the frequency of an interfering signal. The League is not, nor is its membership, taking an 'absolutist' stance with respect to elimination of CATV interference. It is merely trying to insure an opportunity for amateurs to conduct public service and emergency communications without the constant interference that makes it impossible to do so throughout entire towns and cities."

LEAGUE COMMENTS ON CB, R/C LICENSE ELIMINATION PROPOSAL

Noting that its interest in this proceeding is "limited indeed," the ARRL nevertheless filed comments to NPRM 82-799. This Notice proposed to do away with individual station licenses in the Citizens Band Radio Service and the Radio Control Radio Service (see February *QST,* p. 63).

The League agreed with the Commission that international treaty still requires CB station identification "to maintain adequate control of stations capable of causing harmful interference to stations in other countries." It added, "Given the history of rule compliance in the CB Radio Service, especially the long-distance propagation characteristics of 27-MHz CB signals, it would appear that no system of CB station identification would be satisfactory absent a per-station identification signal designator that permits determination of the operator and the location of each station. It may be that the best method of accomplishing this is to continue the system of self-assigning temporary call signs using initials and postal ZIP codes."

Particular League concern was directed at the Commission proposal to have CB operators use automobile, truck or motorcycle license plate numbers for identification. The ARRL requested that

• *no system of identification be implemented that could result in the potential for Amateur Radio call signs to be used to identify CB stations on frequencies assigned to the CB Radio Service,* and

• *the Commission continue to require station i-d in the CB Service "to promote an awareness of Commission jurisdiction over the service and the resultant need for rule compliance."* Many radio amateurs are also CB operators, and many have their amateur calls displayed on their license plates. The League believes it would be "particularly inappropriate for amateur call signs to be used to identify individual CB stations, as it would lead to confusion by those monitoring CB frequencies and to those outside the U.S. who may hear CB transmissions."

Other commenters in this matter have also pointed out the problem with choosing CB station identifiers. Alternative methods, such as using automatic station i-ds, were among the suggestions offered.

ARRL SUBMITS LOGGING COMMENTS

In its Comments to NPRM 82-726 (see December 1982 *QST,* p. 69), the League generally supported Commission proposals to delete most routine logging requirements from the amateur rules. Cited as an example of the FCC concepts of deregulation, simplification and clarification of the Rules, the logging-elimination proposal exhibits the "level of faith the Commission has in amateur self-regulation."

Noting that logbooks provide good station history and are useful in amateur research and development and in solving TVI/RFI problems, the League "will continue to encourage amateurs to keep detailed logs of operations. The *ARRL Amateur Radio Station Log* will continue to be published for those amateurs desiring a standard format for keeping such information." However, the League agrees with the FCC that "there is no reason to *require* station logbooks. The present rules should be modified so that those amateurs *not* interested in keeping information that is of no value to the Commission can choose whether to make a log entry or simply to maintain the minimum necessary information among the station records."

The League also argued that

• *notation of international third-party message traffic should be retained.* International third-party traffic is *not* routine, and ITU regulations prohibit such operations except by special arrangement of the concerned governments.

Keeping this logging requirement would "insure operator awareness of the international treaty requirements" and permit the Commission to maintain control over such operations.

The ARRL proposes to add this paragraph to Section 97.114 of the Rules:

> (a)(1) A notation of international third party traffic sent or received between a U.S. and foreign station shall be maintained in the station's records. This notation shall include the date and time period of the operation, call sign of the non-U.S. station and a brief description of the traffic content. The notation may be in a form other than written, but one which can be readily transcribed by the licensee into written form. Any such notation shall be retained for a period of not less than one year.

In response to Commission-invited comments about the authority of Field Office Engineers-in-Charge, the League

• *supports the FCC's wish to investigate matters locally and to "empower Engineers-in-Charge to require a given station licensee to keep additional specific information in his or her station's records."* In fact, the ARRL proposes a new rule for Section 97.138:

> §97.138. Station Records. Upon direction of the Commission, an amateur station shall maintain among the station records any information not otherwise required to be kept concerning the operation of that amateur station. Such items of information are to be made available to the Commission as may be directed. Such information may be required to be kept either temporarily or, where necessary to clearly benefit Commission enforcement efforts, on a continuing basis.

The League is concerned, however, that

• *the Engineer-in-Charge exercise such authority in specific cases only, on an "as needed" basis.* "Such authority must *not* extend to the point that a geographic *blanket* requirement could arbitrarily be applied to a number of licensees."

STAFF NOTES

The Club and Training Department's Training Branch has expanded to handle the increasing demands of the Training Program. Training Manager Steve Pink, KF1Y, originally from Minneapolis, Minnesota, came to Headquarters in 1982 from the University of Utrecht, The Netherlands, where he was teaching philosophy. Leo Kluger, WB2TRN, of Rochester, New York, joined the ARRL recently as Assistant Training Manager upon earning his undergraduate degree in geology from the University of Pennsylvania in Philadelphia. Training Assistant Steve Ewald, WA4CMS, moved north in 1982 to join the Headquarters staff after receiving his degree in communications from the University of Tennessee in his home town of Knoxville.

Responsible for serving more than 6500 registered instructors by providing effective introductory and advancement programs, the Training crew writes *QST* training columns and articles, newsletters for instructors and newly licensed hams, and training-related books, such as *Tune in the World with Ham Radio* and the *License Manual.* If you're teaching a class for the first or 50th time, contact them for assistance and for useful student materials and instruction aids.

SECTION MANAGER ELECTION RESULTS

The following were elected for a two-year term of office beginning April 1, 1983:
Uncontested

Mississippi	Thomas Hammack, W4WLF
Ontario	L. P. Thivierge, VE3GT
Orange	Sandra Mae Heyn, WA6WZN
West Indies	Gregorio Nieves, KP4EW

FCC ASKS CUBA TO ELIMINATE HARMFUL INTERFERENCE TO AMATEURS

During the latter part of 1982, amateurs in Florida began to experience harmful interference from a beacon-like signal occupying several discrete frequencies in the 1800-1825 kHz band. Complaints were sent to the ARRL Intruder Watch, which in turn referred the matter to the FCC.

The FCC Monitoring network obtained a direction bearing, fixing the offending station as being in the vicinity of Cuba. Based on this, the FCC sent a telegram to its counterpart in Cuba requesting that the harmful interference cease and that Cuba abide by the noninterference provisions of the International Radio Regulations.

By the time you read this, the interference may be gone. If you hear it, please send reports to the ARRL Intruder Watch, 225 Main St., Newington, CT 06111. — *Hal Steinman, K1FHN*

R. H. G. MATHEWS, 9ZN

Ralph H. G. Mathews, the famous 9ZN of early spark days, who was deeply involved in ARRL organizational affairs, died last July at his retirement home in Mexico. As 9IK in 1916, "Matty" was appointed manager of the central U.S. area in the League's then-new trunk line system. This relay operation spanned the country and matched or excelled the commercial wire services in speed of handling messages. He was appointed a League director in 1917 (this was before election by the membership), and also became Central Divison Manager, a sort of "super SCM."

At the first Board meeting after World War I, Matty was named an ARRL vice president. Since the League was broke, he joined his fellow directors in making up a $100 kitty to finance the first postwar issue of *QST.* He was a kingpin in relay activities after the wartime ban was lifted, with the coast-to-coast circuit of 1AW (Maxim)-9ZN-1LF (Louis Falconi in New Mexico)-6EA (Seefred brothers). Matty largely organized and was chairman of the first ARRL national convention in Chicago in 1921.

But professional interests drew him from ham radio, at least for a time. He helped organize the ZeNith Company and was its chief engineer. Some years later, then partner in an advertising agency, he responded to Chicago-area ham pleas and ran for Central Division Director; he was elected by a large majority and served two terms, 1937-1940.

Matty was active in the Naval Communications Reserve, particularly in the 1930s as lieutenant commander and executive officer of the 9th Naval District. He was buried with military honors at Fort Sam Houston, Texas. — *W1RW*

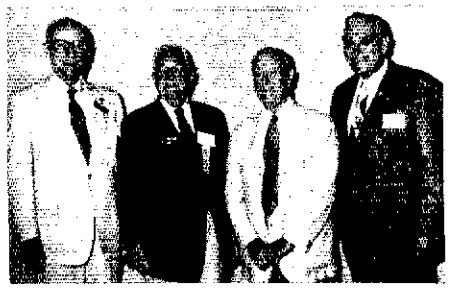
FREDERICK E. TERMAN

On December 19, 1982, Frederick Emmons Terman, Vice President and Provost Emeritus of Stanford University and ex-6FT and 6AE, became a silent key at the age of 82. He was widely known for his radio engineering text books, once ranked as the second most valuable property of the McGraw-Hill Book Company. His books were marvels of clarity and simplicity.

Few may be aware that Terman was an active ham radio pioneer during his student days before and after WW I. He collaborated with Herbert Hoover, Jr. (ARRL President, 1962-1966), and John C. Franklin in operating station 6XH around 1921. As a freshman at Stanford in the spring of 1917, he regularly contacted stations up and down the West Coast and as far away as Denver. His transmitter, of course, was a spark, radiating from a 100-foot-high tower behind his parents' home on the Stanford campus. In those days, amateur wavelengths were supposed to be shorter than 200 meters, but in actuality, he said, their frequency was "inversely proportional to distance from the radio inspector." Terman was once called by KPH, the Marconi Company's transmitter at Daly City, and asked to QRT so they could complete some commercial traffic with a ship at sea. (His was the fifth license issued in the sixth call area when formal licensing began.)

Always a staunch friend of the Stanford Radio Club, on more than one occasion vacuum tubes that 6FT acquired as "samples" during trips around the country found their way into W6YX transmitters. Later, during WW II, Terman headed the 3000-man Radio-Research Laboratory at Harvard University. This team developed "window" and carpet" — strips of tinfoil and noise jammers to defeat anti-aircraft fire control radars. For his work at the research lab, Terman received the Medal of Merit, the highest civilian award in the U.S.

Terman was unquestionably responsible for the productive relationship between Stanford University and industry in the immediate area that led to the "Silicon Valley" phenomenon. Some of his early work is just now showing its relevance to modern Amateur Radio practice. One of Terman's more visionary papers was "Some Possibilities of Intelligence Transmission when Using a Limited Band of Frequencies," published in *Proceedings of the Institute of Radio Engineers,* January 1930. While it's not surprising that spectrum management is one of today's burning issues, most amateurs would be astounded to read Terman's predictions and descriptions of coherent (synchronous) cw and frequency synthesis. — *O. G. Villard, Jr., W6QYT*



This impromptu reunion of past presidents of the Armed Forces Communication and Electronics Association who are Extra Class Amateur Radio operators took place recently after an AFCEA/Radio Amateur luncheon in Washington, DC. From left to right are W2ALS, W4AK/W9AC, AA3Y and N5RM. *(photo courtesy W2ALS)*

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Your CRRL Representatives and Workers

Having a problem, perhaps with your local cable-television company, your municipal officials, or even DOC? Have an idea on which you'd like some action? Need some materials for yourself, your club or your licencing class? How about a film, a slide show or even a speaker for your next club meeting? CRRL representatives and workers are located in every part of Canada, and they're willing to help. Here's whom to contact:

Western Region (British Columbia and Yukon Territory) — Director: William Kremer, VE7CSD, 536 Garfield St., New Westminister, BC V3L 4R7, tel. 604-522-3548. Assistant Directors and PIAs: Dave Fancy, VE7EWI; Wally Garrett, VE7CJT; Sid Jones, VE7FDR; Hank Van Der Mulen, VE7AQL; and Ralph Zbarsky, VE7BTG.

Prairies Region (Alberta, Saskatchewan, Manitoba and Northwest Territories) — Director: George Spencer, VE6AW, 18303 67th Ave., Edmonton, AB T5T 2H8, tel. 403-481-1081. Assistant Directors and PIAs: Bill Bowman, VE4AFO; Percy Crosthwaite, VE5RP; Gil Frederick, VE4AG; Bill Gillespie, VE6ABC; John Gowron, VE4ADS; George MacIver, VE6AMM; and Jim Munsey, VE6BKW.

Ontario Region — Director: Ray Perrin, VE3FN, 128 Withrow Ave., Nepean, ON, tel. 613-225-8132. Assistant Directors and PIAs: Wilf Antheunis, VE3FEA; John Bartlett, VE3DHB; George Davis, VE3BBW; Al d'Eon, VE3AND; John Duerdoth, VE3BKB; Bill Hardie, VE3EFX; Fred Hammond, VE3HC; Garry Hammond, VE3GCO; Sid Horne, VE3EGO; Bill Loucks, VE3AR; Tom McKee, VE3KO; Marv Nash, VE3FON; Noreen Nimmons, VE3GOL; Dick Reiber, VE3IBV; Dan Robertson, VE3FOV; Marty Rosenthal, VE3MR; Bill Rumball, VE3KGJ; Audrey Staines, VE3KGS; Ray Staines, VE3ZJ; Gord Steane, VE3BMG; Libby Stevens, VE3IOT; Jack Strangleman, VE3GV; and David Toth, VE3GYQ.

Quebec Region — Director: Albert Daemen, VE2IJ, 2960 Douglas Ave., Montreal, PQ H9R 4N9, tel. 514-737-3736. Assistant Director: Jim Ayherst, VE2XX.

Atlantic Region (New Brunswick, Nova Scotia, Prince Edward Island and Newfoundland) — Director: Andy McLellan, VE1ASJ, 2316 Rothesay Rd., East Riverside, Saint John, NB E2H 2K5, tel. 506-847-5656. Assistant Directors and PIAs: Clarence Mitchell, VO1AW; Ed Redman, VE1BIQ; Aaron Solomon, VE1OC; and Don Welling, VE1WF.

Your elected Section Managers/Section Communications Managers are also League contact people. Their names, addresses and telephone numbers appear on page 8 of every *QST*. Of course, you can always go to the top:

CRRL President — Tom Atkins, VE3CDM, 55 Havenbrook Blvd., Willowdale, ON M2J 1A7, tel. 416-494-8721.

CRRL Vice President and Secretary — Harry MacLean, VE3GRO, 163 Meridene Crescent West, London, ON N5X 1G3, tel. 519-433-1198.

CRRL Counsel — B. Robert Benson, Q.C., VE2VW, Suite 804, 1010 Ste-Catherine West, Montreal, PQ H3B 3R5, tel. 514-866-7851.

Finally, you can contact the good folks at CRRL Hq. by writing to CRRL, Box 7009, Station E, London, ON N5Y 4J9. If you prefer, telephone 519-451-3773, any time, day or night. If no one is available, an answering machine will record your message, which will be dealt with promptly.

DOC NEWS

☐ DOC has negotiated a new reciprocal-operating agreement with Italy. The agreement took effect on December 6, but was not announced until December 15, the anniversary of Marconi's 1902 transmission across the Atlantic.

☐ DOC will conduct Amateur Radio examinations across Canada on April 20. If you plan to write, your application should be in by March 23. Remaining dates for DOC examinations this year are June 15 and October 19.

☐ DOC announced it will likely change to one-year licences in the near future. At present, licence fees are collected every year, but actual station licences are issued only once every five years.

☐ At press time, there's still no word on the amendments to the Radio Regulations proposed by DOC last year. Apparently, these are still held up at the Privy Council level. Also, no word on the new TRC-24 Amateur Radio syllabus. Apparently, the document is ready but has not been released because of budget restrictions.

CRRL NEWS

☐ Plans to speed delivery of *QST* by having it mailed from London, Ontario, had been bogged down in red tape, but are now going ahead. CRRL hopes to implement the new system on a trial basis very soon.

☐ In January, CRRL sent a membership-development mailing to over 22,000 Canadian amateurs. League membership has been down everywhere, but especially so in Canada. Reasons are not hard to find. Cost of membership is up, economic conditions are bad, and everyone is spending their dollars very carefully. But League membership does pay for some very essential services. If you're reading this, you're probably a League member. Perhaps you could take a few moments to talk up League membership among your friends — $36 a year is only $3 a month, or 70 cents a week. Viewed this way, it doesn't seem like much to pay to become part of an organization that not only provides *QST*, but ensures the continued existence of our hobby.

That membership-development mailing also included a two-page survey of amateurs — their backgrounds, operating preferences and opinions on some questions affecting Amateur Radio. CRRL will use the results of the survey to determine what position it will take on some proposals about phone subbands and possible amateur involvement in the administration of DOC Amateur Radio examinations.

☐ CRRL is the Canadian member-society of IARU, the International Amateur Radio Union. CRRL President Tom Atkins, VE3CDM, and former IARU President Noel Eaton, VE3CJ, will be representing Canadian amateurs at the Triennial IARU Region 2 Conference, to be held in Cali, Colombia, in June.

☐ Canadian amateurs will be participating in World Communications Year. CARF has asked DOC to issue a special prefix to mark the occasion, and CRRL will be announcing a special awards program for the 1983 IARU Radiosport Contest, to be held in July.

NOTES FROM ALL OVER

☐ DOC has released some interesting data on electromagnetic interference (EMI). EMI complaints are up, but very little of the interference is caused by amateurs. Amateur interference falls into DOC's "other" category. In 1981, DOC had 17,420 complaints in this category. The six most severe causes of interference are swamping by GRS fundamental (2581), spurious radiation from land mobile (1752), unidentified transmitter deficiencies (1408), fundamental radiation from broadcast stations (1082), faulty antennas and grounds (1041) and frequency sharing (1013). Remember, none of these are from amateurs. Now here's our track record: swamping by amateur fundamental (208), fundamental radiation from amateur stations (64), spurious radiation from amateur stations (57), harmonic radiation from amateur stations (43) and swamping by amateur harmonics (13). Canadian amateurs may take a bow!

☐ Congratulations to Bob Eldridge, VE7BS. The Western Canada Communications Council recently instituted an annual cash award, to be given to a student who shows outstanding talent in technical writing — and named it the R. C. Eldridge Award.

☐ Geomagnetic predictions are available by telephone. For a current seven-day forecast, call Geomagnetic Prediction Service in Ottawa, 24 hours a day, 7 days a week, at 613-824-5595.

We ran out of space last month. Here's Gwen Burnett, VE3AYL. She's been a ham for 50 years and insists that her call letters stand for "A Young Lady." Gwen was CRRL 1982 Amateur of the Year. *(Toronto Star photo)*

*163 Meridene Crescent West, London, ON N5X 1G3

IARU News

Conducted By Richard L. Baldwin,* W1RU

The IARU Restructuring Committee

The growth of IARU, both in numbers and in organizational structure, has been a steady process of evolution, albeit at times seemingly slow and deliberate. When first formed in 1925, it was a union of individual members. Later, it was changed so that its members were the societies representing the amateurs in the various countries, with a headquarters society to provide administrative support and leadership.

Subsequently, to address the problems that were peculiar to a region, the three regional organizations of IARU were established. As a result of discussions prior to and during the WARC-79, a Restructuring Committee was established to consider ways in which IARU might be restructured to improve its decision-making process. Formed under the leadership of then IARU President Noel Eaton, VE3CJ, the Committee at first consisted of two members from each region, but then was expanded to include the entire executive committees or directors from each region. Over a period of more than two years, the members of the committee met by mail, exchanging their thoughts on how IARU might be restructured.

Restructuring was also a principal topic of discussion at the regional triennial meetings, and at the Region 3 conference in Manila in April 1982 it was decided to make the actual restructuring a two-part process. First, IARU membership would be asked to approve the formation of an Administrative Council, to consist of two representatives from each region plus the three headquarters officers. Then, the Administrative Council would assume the task of reviewing the work of the Restructuring Committee and obtaining additional input from the member-societies and the regional organizations, and would subsequently ask the membership for approval of a revised IARU constitution.

As reported previously, the membership has approved the formation of the Administrative Council, which has scheduled its first in-person meeting for Tokyo in March 1983. Subsequent meetings, to complete the preparatory work, will be held in the Americas and in Europe during 1983 and 1984.

Thus, the IARU Restructuring Committee has completed its work and has been discharged, with the thanks of VE3CJ, under whose leadership it was formed, and W1RU, who coordinated much of the correspondence. A letter of appreciation has been sent to each member of the committee, and we take this opportunity to publicly name and thank those who took part in the committee's work.

Region 1 — Louis v.d. Nadort, PAØLOU; Wojciech Nietyksza, SP5FM; Eric Godsmark, G5CO; S. R. Barlaug, LA4ND; J. Rottger, DJ3KR; H. Walcott Benjamin, EL2BA; M. Mandrino, YU7NQM; R. F. Stevens, G2BVN (deceased); Kjell W. Strom, SM6CPI; Janez Znidarsic, YU3AA.

Region 2 — Victor C. Clark, W4KFC; Pedro Seidemann, YV5BPG; Gustavo Reusens, OA4AV; Peter L. Parker, VP9GO; Hugo Coscio, CP5EC; Fabian Zarrabe, YN1FI; Carlos Kaufman, LU9CN; Alejandro Chanes, CE3ABZ; Luis P. Caamano, H18LC; Alberto Shaio, HK3DEU.

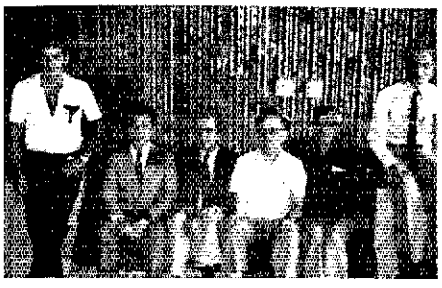
Region 3 — Keigo Komuro, JA1KAB; Michael J. Owen, VK3KI; Tom R. Clarkson, ZL2AZ; Jose J. Tupaz, Jr., DU1JJT; David H. Rankin, 9V1RH.

IARU Hq. — Carl L. Smith, WØBWJ; David Sumner, K1ZZ.

*Secretary, IARU

At the 60th anniversary celebration of the Radio Club de Chile earlier this year, LU9CN, president of the Radio Club Argentino (l), presented a special plaque from ARRL to CE3GF, president of the Radio Club de Chile.

At a recent meeting of the IARU Region 2 EC meeting were the following: (front row) HT1FI, PT2VE (president of the Brazilian society); (middle row) HK3DEU, VP9GO, OA4AV, YV5BPG, LU9CN's XYL, LU9CN; (back row) HI8LC, WØBWJ (IARU v.p.), PT2ACX. That's the entire Region 2 EC, except for W4KFC, who was unable to be present.



Earlier this year, Region 3 elected its directors for the next three years. L-r are DU1JMG, JA1KAB, VK3KI, 9V1RH (chairman), ZL1HV and JM1UXU (secretary).

Strays

I would like to get in touch with . . .

☐ any amateurs who have used parts or equipment for sale to a blind op confined to home. Curtis Floray, KA6MJO, 1135 E. 18th St., Oakland, CA 94606.

☐ anyone who can furnish and is willing to ship antique radio parts. Alan Shawsmith, VK4SS, 34 Whynot St., West End, Brisbane, Q 4101, Australia.

QST congratulates . . .

☐ Tom Christian, VR6TC, of Pitcairn Island, on being named to Queen Elizabeth's New Year's Honors List for MBE (Member of the British Empire). Tom, who is the island's sole link to the outside world, received the award for his "public service."

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Digital Codes Deciphered

With the advent of the home computer, interest among amateurs for digital communications is on the rise. ASCII, a popular computer code, is allowing hams to trade programs on the air and to facilitate computer-to-computer conversations directly. In recent times, the FCC has addressed rulemaking in the digital arena — ASCII was approved, additional digital codes were authorized for experimental purposes and AMTOR is now allowed. Let's take a look at digital codes in Amateur Radio today, and what may be in store for hams in the near future.

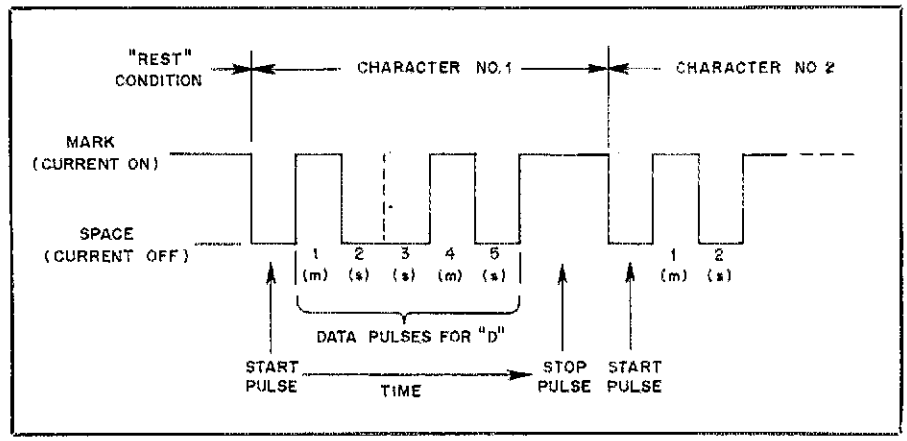


Fig. 1 — Time sequence of typical Baudot character, the letter D.

ASCII, AMTOR and Baudot

Q. What is RTTY?

A. RTTY means *radioteletype,* a form of telegraphic communication using typewriter-like machines or small home computers with alphanumeric keyboards. Two things happen when an RTTY message is sent: (1) a *coded* message is generated from electrical impulses made when typewriter keys are pressed for the desired words, and (2) the message is transmitted in this code to a distant receiver that converts the code back to plain language for the message recipient. So, you can easily talk to your friends on the air by typing out your message, pressing the transmit button, and then awaiting the response to appear on your TV screen or printout. It's not all that complicated. Sounds like fun? It is!

Q. What kinds of codes are used for coding these messages?

A. *Baudot* (also called *Murray* and *International Telegraph Alphabet No.2)* is a code used to encode the alphabet, numbers and some special symbols into five-level binary code (97.69[b][1]). Binary is a number system consisting of only two digits, 0 and 1. The binary system is used for ease in computer operations. There are only two states to deal with: *on* and *off,* or "mark" and "space" (two discrete frequencies) in RTTY applications. For example, the letter "D" in Baudot is "10010." An RTTY transmitter/encoder sends a "mark" (on one frequency) for each "1" and a "space" (on the other frequency) for each "0". The receiver/decoder at a distant station subsequently receives the coded "D" and converts it back into English.

Q. What is ASCII?

A. Like Baudot, ASCII is a binary code, but it has *seven* levels instead of five (an eighth parity bit allows for error checking). ASCII (American Standard Code for Information Interchange) is becoming popular because of a few key advantages: More punctuation and commands can be encoded, and many modern computers use ASCII, thus simplifying computer/ham activities (97.69[b][2]).

Q. What's AMTOR?

A. AMTOR, a digital teleprinter code that produces copy less prone to errors, is now authorized in the Amateur Service. Under marginal conditions, amateur stations using conventional codes often lose transmitted data, and must engage in time-consuming repeats. With AMTOR, the equipment checks itself periodically for errors and repeats only when necessary, thus increasing communications efficiency. Microprocessor circuitry is used to generate AMTOR signals. Lower power can be used, and interference will be reduced. See "AMTOR, an Improved Error-Free RTTY System," June 1981 *QST,* for more information.

Q. What about sending speeds? What's baud rate?

A. ASCII, AMTOR and Baudot code speeds can be given in terms of *baud rate,* which equals the reciprocal of the time of a unit or data pulse. For example, if you're using a data pulse 22 ms long in a Baudot character, your baud rate is 45 (1/0.022 = 45), safely within the FCC rules. (See Fig. 1.) For the Baudot code, 45 baud is by far the most common amateur data rate. The lowest standard ASCII data rate in common usage is 110 baud. Data rates up to 300 baud are allowed on frequencies below 28 MHz. Rates up to 1200 baud are okay between 28 and 50 MHz; up to 19.6 kilobaud between 50 and 220 MHz; and up to 56 kilobaud above 220 MHz (97.69[a][1]).

ASCII-encoded characters normally have shorter data pulses, and higher baud rates. The 110-baud rate is the most practical for hf use because of readily available equipment,as well as the increased susceptibility of the higher data rates to noise, static interference and so forth. Vhf fm activity finds 110 and 300 baud useful for terminal-to-terminal communications, and 300 and 1200 baud best for computer-related activities, such as exchanging programs.

Q. What modes and frequencies are used for ASCII, AMTOR and Baudot RTTY?

A. On the vhf bands where A2 and F2 transmission is permitted, *audio frequency-shift keying* is generally used. In this case, the steady rf carrier is transmitted continuously, the pulses being transmitted by frequency-shifted *tone modulation.* In afsk, the "shift" is of the modulating audio frequency, not the carrier. Below 50 MHz, F1, *frequency-shift keying,* is used. The carrier is on continuously, but in this case, it is the carrier frequency itself that is shifted. FCC permits shifts up to 900 Hz. (97.69[a][2]). In afsk, the same 900-Hz shift limit applies, and the tones may not exceed 3000 Hz. A 170-Hz shift is most commonly used (97.69[a][2] & [3]).

Q. How can I use my ssb transmitter for RTTY at hf?

A. Amateurs operating RTTY in the hf bands frequently use audio tones fed into the microphone input of an ssb transmitter. With properly designed and constructed equipment that is correctly adjusted, this provides a satisfactory method of obtaining F1-like emission and is okay with the FCC. The user should make certain, however, that audio distortion, the carrier and unwanted sidebands are not present to the degree of causing interference in

*Assistant Manager, Membership Services, ARRL

New AMTOR Rules

On January 27, the Commission approved the use of AMTOR in the amateur bands, and amended Section 97.69 of the Rules accordingly. Amateurs should modify their home copies of Part 97 to read as follows:

§97.69 Digital communications.

Subject to the special conditions contained in paragraphs (a), (b) and (c) below, an amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information. These digital codes may be used for such communications as (but not limited to) radio teleprinter, voice, facsimile, television, communications to control amateur radio stations, models and other objects, transference of computer programs or direct computer-to-computer communications, and communications in various types of data networks (including so-called "packet switching" systems); provided that such digital codes are not intended to obscure the meaning of, but are only to facilitate, the communications, and further provided that such operation is carried out in accordance with other regulations set forth in this part. (For purposes of this section, the sending speed [signaling rate], in baud, is defined as the reciprocal of the shortest [signaling] time interval [in seconds] that occurs during a transmission, where each time interval is the period between changes of transmitter state [including changes in emission amplitude, frequency, phase, or combination of these, as authorized].)

(a) The use of the digital codes specified in paragraph (b) of this section is permitted on any amateur frequency where F1 emission is permitted, subject to the following requirements:

(1) The sending speed shall not exceed the following:

(i) 300 baud on frequencies below 28 MHz;

(ii) 1200 baud on frequencies between 28 and 50 MHz;

(iii) 19.6 kilobaud on frequencies between 50 and 220 MHz;

(iv) 56 kilobaud on frequencies above 220 MHz.

(2) When type A2, F1 or F2 emissions are used, the radio or audio frequency shift (the difference between the frequency for the "mark" signal and that for the "space" signal), as appropriate, shall be less than 900 Hz.

(3) When type A2 or F2 emissions are used, the highest fundamental modulating frequency shall be less than 3000 Hz.

(b) Except as provided for in paragraph (c) of this section, only the following digital codes, as specified, may be used:

(1) The International Telegraph Alphabet Number 2 (commonly known as Baudot); provided that transmission shall consist of a single channel, five unit (start-stop) teleprinter code conforming to the International Telegraph Alphabet Number 2 with respect to all letters and numerals (including the slant sign or fraction bar); however, in the "figures" positions not utilized for numerals, special signals may be employed for the remote control of receiving printers, or for other purposes indicated in this section.

(2) The American Standard Code for Information Interchange (commonly known as ASCII); provided that the code shall conform to the American Standard Code for Information Interchange as defined in American National Standards Institute (ANSI) Standard X3.4-1968.

(3) The International Radio Consultative Committee (CCIR) Recommendation 476-2 (commonly known as AMTOR); provided that the code, baud rate and emission timing shall conform to the specifications of CCIR 476-2 (1978) Mode A or Mode B.

(c) In addition to the above provisions, the use of any digital code is permitted on amateur frequencies above 50 MHz, except those on which only A1 emission is permitted, subject to the following requirements:

(1) Communications using such digital codes are authorized for domestic operation only (communications between points within areas where radio services are regulated by the U.S. Federal Communications Commission), except when special arrangements have been made between the United States and the administration of any other country concerned.

(2) The bandwidth of an emission from a station using such digital codes shall not exceed the following (where for this purpose the bandwidth is defined as the width of the frequency band, outside of which the mean power of any emission is attenuated by at least 26 decibels below the mean power of the total emission; a 3 kHz sampling bandwidth being used by the FCC in making this determination):

(i) 20 kHz on frequencies between 50 and 220 MHz;

(ii) 100 kHz on frequencies between 220 and 1215 MHz;

(iii) On frequencies above 1215 Mhz any bandwidth may be used provided that the emission is in accordance with §97.63(b) and §97.73(c).

(3) A description of the digital code and the modulation technique shall be included in the station log during all periods of use and shall be provided to the Commission on request.

(4) When deemed necessary by an Engineer-in-Charge of a Commission field facility to assure compliance with the rules of this part, a station licensee shall:

(i) Cease the transmission of digital codes authorized under this paragraph.

(ii) Restrict the transmission of digital codes authorized under this paragraph to the extent instructed.

(iii) Maintain a record, convertible to the original information (voice, text, image, etc.), of all coded communications transmitted under authority of this paragraph.

receiving equipment of good engineering design.

Q. Can I use A1 or cw for ASCII?

A. Yes. A1 may be used where F1 is permitted. Novices (and Technicians using Novice subbands) may *not* use RTTY because they are restricted to radiotelegraphy code only.

In practice, however, *frequency-shift keying* is preferred because it gives definite pulses on both mark and space, an advantage in printer operation. And, since fsk can be received by methods similar to those used for fm reception, there is considerable discrimination against noise. Both factors make for increased reliability in printer operation.

Additional Digital Codes

Q. Are other codes allowed in Amateur Radio?

A. Yes, the FCC permits the use of experimental digital codes on amateur frequencies *above 50 MHz*, except those frequencies on which only A1 emission is permitted (50.0-50.1 and 144.0-144.1 MHz). "An amateur radio communication may include digital codes which represent alphanumeric characters, analogue measurements or other information." (97.69) Station i-d must be in plain English (a-m or fm voice) or Morse code (97.84[g]). Communications using such digital codes are allowed within the U.S. only, except if special provisions have been made between the U.S. and another country (97.69[c][1]).

Bandwidth may not exceed 20 kHz between 50 and 220 MHz, and 100 kHz between 220 and 1215 MHz. Above 1215 MHz, any bandwidth may be used, provided the sidebands are confined within the amateur band and all spurs are reduced or eliminated according to good engineering practice (97.69[c][2]). A description of the experimental code must be placed in the station log (97.69[c][3]).

Q. What is Packet Radio?

A. Packets are individual bursts of data (digitally encoded). A user's *packet* is made up at his or her "Terminal Node Controller," addressed, then transmitted to another station, which accepts packets, performs an error check on them and, if there are no errors, sends a confirmation. Members of a Local Area Network (LAN) can talk to each other by this system. Many *QSOs* can take place at the "same" time (the "time sharing" characteristic of computer use is employed) on a single channel, thus conserving spectrum. A packet compresses information into short "bursts" that take only milliseconds to send, allowing this frequency sharing. Packet Radio is gradually gaining popularity; systems are up in California, Washington, DC and Vancouver. For more information on this exciting new aspect of amateur communications, see *The Radio Amateur's Handbook*, 1983 edition, page 14-48.

[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.]

Correspondence

Conducted By Peter R. O'Dell,* KB1N

SEX BIAS AND GRID CURRENT

☐ First as a woman, second as an XYL — oops! make that YF — and third as a ham, I beg to differ with the opinions of N9AMC ("Sex Bias and the Hamfest," *QST*, January 1983, p. 63). Personally, I think he is so busy making toothpicks that he can't see the forest for the trees.

The past several years I have attended some interesting programs on antennas, repeaters, the care and feeding of nicads, computer language, and I am sure that Ray Wangler, W5EDZ, would be very happy if I never attended another ARRL Forum. When the ham programs were dullsville, I headed in the other direction and picked up a hint or two about rape prevention, handwriting analysis, belly dancing and even had my arm twisted into attending bingo with some nonham YFs.

Don't lose the chance to pick up some new converts to the pleasures of hamfests just because of semantics. The YF needs to know that there is something there for her, too. — *Linky Brokhausen, N5AKJ, Georgetown, Texas*

☐ What about your *QST* section, YL News and Views? Is not this gender-related terminology? — *Otho Rink, WN5EAT, Dallas, Texas*

SUCCINCTER

☐ Me too!!! ("Succinct," *QST*, January 1983, p. 63) — *Ronald J. Schwendt, Douglassville, Pennsylvania*

VIVA SIMPATCH

☐ It is true that the simpatch (Washington Mailbox, *QST*, January 1983, p. 62), as well as the traditional autopatch, is subject to a lot of potential abuse. It seems, however, unreasonable, to "throw out the baby with the bathwater." Patches must also be available for nonemergency communications for two reasons. First, equipment reserved just for emergencies without frequent use is often not in top operating condition when an emergency does occur, and operators do not have the familiarity with it so essential for efficient emergency operations. Second, the individual ham is less likely to be willing to finance a patch setup if it is only for emergency use and not available other times.

I do not believe a further redefinition of the FCC rules is necessary. If we are to be essentially a self-policing fraternity, the advent of more and more rules is unnecessary. Those rules often hamper the kind of technological experimentation and advancement that is supposed to be a part of ham radio. — *Gary Waddingham, KC7AX, Greybull, Wyoming*

☐ The simpatch should not be banned unless it proves a nuisance or creates some other problem serious enough to warrant such action. Yes, I believe the control operator rules could be relaxed a bit to facilitate simpatch use, but this should be only on a "temporary" basis until the full effect of the change can be seen and we have had time to look at how the simpatch is actually being used (or abused). In other words, I'd say give simpatch a chance — then we can come back in a year or two and discuss its use factually, instead of speculatively. — *David V. Black, N4FUS, Woodbridge, Virginia*

☐ The rules should be relaxed to further facilitate the use of simplex patches. For example, "No control operator need be present at the site of the transmitter or simplex autopatch so long as provision is made for automatic shutdown of the transmitter within three minutes of a malfunction and the patch has an automatic three-minute timeout."

I am not concerned that hams will abuse the patches for business purposes. Once the ham community gets its feet wet with doing more of its own policing, violators should be quickly ferreted out. — *Dick Rhodes, KH6IO, Dallas, Texas*

☐ In addition to personal communications, I have reported numerous wrecks, with and without personal injury. One of these wrecks was my own, first and only wreck after a 31-year perfect driving record. In this accident, a tractor-trailer rig ran over my van, wherein my wife received personal injury and an ambulance was called. On December 26, 1982, my wife and I were passing a branch bank when my wife noted that their 20-foot-tall Christmas tree had fallen from the roof and had been draped over the roof, gutter and front of the bank. I called the local police department, reported the tree and found out later a destructive fire was avoided because we called the authorities *in time*. In all these examples, phone booths (and phones) were not readily available, and the locally available "public" autopatches are all on Knoxville phone lines and thus not available for my exchange.

The simpatch has served me so well, both for personal use and for public service, that I would even be tempted to violate FCC rules if this type of "patch" were outlawed. And that was not an easy statement for me since I have belonged to ARRL for 24 years (life member for 12 years), Extra Class Amateur since 1966 and been licensed for 24 years. In this issue, I feel the most important point to remember is that it's not the equipment, but how it is used — just as with Amateur Radio in general. — *Lee Winkinson, WA4QXC, Maryville, Tennessee*

A CREDIT TO THE AMATEUR SPIRIT

☐ You ran a "Stray" for me in December requesting someone to help a disabled ham keep his station on the air. I've had responses from far and near! The first weekend in December was set aside to change my rotator and install a new 2-meter antenna. Murphy stayed away and we had 70° WX. The good hams who helped were W2OFB, WA2QWL, N2CUJ and KA2KKB. These gentlemen assured me that they would help me when I needed it. I salute them, and they're a true credit to the amateur spirit. — *Stan Obritski, Jr., WB2TTY, Jackson, New Jersey*

THE VIEW FROM CELL BLOCK 62

☐ I've been had. All through the phone and cw sweepstakes and the 10-meter contests nobody would believe my call sign. One guy said, "Your call can't be WC4." Another guy said his computer wouldn't accept my prefix. And I gave so many repeats I felt like I should have claimed two QSOs for everyone I completed. I was beginning to wish I had a good contest call, like WB0ZYJ/KL7.

Now I know why. On page 87 of January *QST*, you published a dupe sheet that says my call sign doesn't exist. In future contests, please listen for WC4B and believe it when you hear it. I and my fellow sufferers in cell blocks 60 through 82 will appreciate it. — *David A. Hammond, WC4B, Oakton, Virginia*

QST — MEAT OR POISON?

☐ It Seems to Us in the January issue was very interesting. It probably goes without saying that too few members of the ARRL realize how much their membership accomplishes. I feel sure that many of the Amateur Radio operators who joined the ARRL initially thought of their membership as a subscription to *QST* without realizing what was behind the magazine. I know this was so with me, a latecomer to Amateur Radio.

With the thought that to many *QST* is, in effect, the ARRL, would it not improve the potential for new membership if *QST* were made more readable? This question has been raised in a somewhat different fashion recently in Correspondence. I hesitate to make specific criticisms, since what is one man's meat may be another man's poison, but I would make a general comment that every issue of *QST* attempts to put 10 pounds in a five-pound bag.

The editorial says ". . . let's convince them that we have a new, fresh, responsive organization!" It also says ". . . let's show them the League is a lot more than a magazine subscription!" Most ARRL members know this to be a fact, but potential members do not. If they can be shown by a "new, fresh, responsive" approach to the format of the magazine that it is not dull, stuffy and boring, as has been claimed, then the potential for new members would be greatly enhanced, in my opinion. — *George A. Bates, WB1FNZ, North Kingstown, Rhode Island*

☐ ARRL is no longer the viable organization. I have maintained my membership simply because there was a need for unity and preservation of our privileges. The magazine is full of trivial gobble de goop data. I hope I will not be singing my swan song with this renewal, but if a change is not made then that will be that, and I am not by myself. — *Aubrey M. Roberson, W4OH, Homestead, Florida*

*Public Information Officer, ARRL

How's DX?

Conducted By Ellen White,* W1YL/4

1982

History never looks like history when you are living through it. It always looks confusing and messy, and it always feels uncomfortable. — John W. Gardner

In early January 1983, your reporter experienced many of the above feelings while trying to make something cohesive and of a certain form out of our 1982 DXing year. There was a distinct tendency to tidy all the "loose" ends and put them in good order. Life isn't like that, however, whether in the "outside" world or within the framework of Amateur Radio. If we *had* to encapsulate the year it might be reported as the excitement of China reactivating Amateur Radio, the deep concern about operating ethics, the anticipation of long-awaited activity from remote Heard Island, "list" operation, the arrival of operation on the new WARC band, the uproar about inept DXpedition operation, the loss of superior contributors in our field — all of these "made history," whether we realized it at the time or not. Let's try to review several DX-related happenings to aid us in keeping 1982 in good perspective.

The January issue of our journal reported the passing of "Mr. Amateur Radio," W1BDI, whose foresight provided for the inception of the DXCC program. Later issues would report the loss of both W1SZ and W3CRA, both of whom helped to formulate the award itself. Many DX-important calls joined the Silent Keys list during the year: KV4AA, HS1WR, AC3PT, 4S7YL, W3KT, W2PV, W2EQS — and many others documented monthly in *QST*.

Countries came and went, though not with the frequency of previous years. Effective January 1, the Sovereign Military Order of Malta (SMOM) became an addition. Deletions included Kamaran (7O/VS9K), deleted as of March 11 because it no longer met the criteria as a result of a significant change in administration. On December 1, futher deletions noted were Serrana Bank and Roncador Cay, and Bajo Nuevo (KP3, KS4, HKØ) — again as a result of a significant change in administration. After that date, contacts would count for San Andres and Providencia. The Saudi Arabia/Iraq Neutral Zone (8Z4) became deleted — the area no longer existed. At year-end, our DXCC List totals were 367 overall and 52 deleted countries, or a grand total of 315 possibles. DXCC mail followed the ebbing sunspot cycle, revealing a decrease of about 8% in "input." All in all, over a half million cards were reviewed for DXCC credit.

The new 30-meter band became available to the cw faithful, with good reports worldwide. Your ARRL Board of Directors followed IARU opinion, recommending that no contests or DX awards be offered, to avoid having the narrow segment be QRMed to death. As 1982 waned, the U.S. Congress was about ready to ratify the full frequency provisions of the WARC agreement — happy new bands to rediscover that special thrill of "first-time DXing"!

The IARU News column made interesting year-long reading. After a distinguished, statesman-like extended period of service, IARU President VE3CJ retired. Noel was replaced by retiring ARRL General Manager, W1RU, who was voted in by member societies. Expanded work on behalf of IARU was enhanced by the addition to the ARRL/IARU Headquarters staff of JH1VRQ. Early in the year, IARU News heralded the U.N. General Assembly proclamation of 1983 as World Communication Year. The purpose of WCY is to develop communication infrastructures (using communications as a force for economic, cultural and social development, particularly with developing countries).

In light of the above, it seems particularly appropriate to comment on the "rf" arrival of BY1PK late in March, joined by other BY stations during the year. Contacts were few and far between. Overt enthusiasm by those "needing" a card from China for DXCC totals might not be construed by some as enhancing our Amateur Radio image as a force for good in this world. From a DXer's point of view, the June cover of *QST* was a winner, depicting several versions of BY1PK cards, heralding the arrival of China — "Back on the air!"

Communications Manager W1XX wrote about DXCC integrity in the June issue. A particularly interesting portion of the feature certainly highlights why there are so few additions to the DXCC list of "workables" these days: "Some of the newer brethren to the DX game sometimes wonder about consistency in decisions. They query, 'How can the State of Kaopectate not count when there are 'countries' such as United Nations Headquarters, Kingman Reef and Desecheo?' What is not always readily understood is that, although the rules for country status have been followed faithfully, the rules have changed from time to time. For example, prior to January 1, 1979, the criteria for country status recognized the concept of 'separate administration.' Thus, such countries as the above, plus ITU Geneva, Southern Sudan, Scotland, Estonia, Åland Islands and a host of others, made the official countries list. The 'separate administration' rule was eliminated by the Board on the advice of the DX Advisory Committee when it appeared that such places as Catalina Island and the Statue of Liberty might indeed qualify as separate countries.

"With the removal of this clause from the rules it is far more difficult to qualify for separate country status. The only new country since 1979 is the Sovereign Military Order of Malta (SMOM). And it took the DXAC several months of research and a mountain of documents to confirm SMOM's territorial and governmental sovereignty."

It certainly helps to explain the rationale behind "separate administration," but from this writer's point of view it does remove some of the previous excitement from the award!

A steady hand on the DXCC reins is noted in June with an explanation as to why the KF1O/CEØX San Felix operation would not be credited. It turned out that documentation for a valid San Felix license and authorization for presence on the island could not be substantiated. The XZ9A operation early in the year generated a lot of excitement, but ultimately would not be credited. The central government (Rangoon) — responsible for countrywide licensing — does not currently recognize Amateur Radio.

Expeditions continued to be a major source of DX fever. The KP2A/Navassa event, sponsored by IDXF, got off the ground in mid-March and totalled a walloping 32,000 two-ways. Superior Amateur Radio publicity followed with a *Time* magazine report of this unusual bit of Americana. The ubiquitous Colvins, W6KG and W6QL, surfaced from Guyana under the guise of FYØFOL, working 10,000 of the clan, thanks to the generous hospitality of FY7YE. SMØAGD worked over 50,000 contacts during his Pacific Odyssey, cards via SM3CXS. The OHØW Åland Islands CQWW operation recorded in excess of 10,000 contacts — a new European record.

The Falklands, and other South Atlantic DXotic spots, became radio-quiet in early spring, with the LU-G fracas. The popular W9JUV newsletter, *HR Report*, became a thing of the past. Joe always caught that special flavor of DXing in an accurate, colorful manner. The venerable North Jersey DX Association, managers of the ARRL 2nd Call Area QSL Bureau, celebrated their 25th anniversary in September. As an example of the continuing foreign call confusion, effective March 1 all Bahrain calls were modified to replace the first letter "X" after the prefix of A9 to the number 1. Thus, A9XDD became A92DD!

The infamous list debate — correspondence on list operation, generated by the WB4ZNH mailings — continued to inundate ARRL. Extensive study during the year culminated in the W1XX September report on DX Lists, pros and cons. While hard to compress the extensive correspondence/report, it seems evident it wasn't the "list" concept per se that was at fault, but (as seemed rather evident) its abuse.

How's DX? topics during the year: (Jan.) The Turbulent Sixties: Winds of Change; (Feb.) The Wandering Years — G2RO; (March) Austrian-Pacific Expedition 1981; (April) International DX Convention, Dayton Convention announcements; (May) DXCC — The Way it Was; (June) Roots (Evolution of the DXCC Award); (July) International DX Convention Revisited; (Aug.) Alphabet Soup (unusual prefixes); (Sept.) Happy 25th Anniversary, NJDXA; (Oct.) DXCC Revisited — to Date with History; (Nov.) WØDX — Early DXpeditions; and (Dec.) the DXCC Process.

Only time itself will assess what was and what was not really significant from our DXing viewpoint. This compulsion to review the past year was felt rather keenly as (hopefully!) an aid to help future historians. Of course, there are many avid hams, keen DXers, continuing followers of the scene at hand, who look back and marvel that the only lesson history has taught us is that man has not learned anything from history.

*19620 SW 234 St., Homestead, FL 33031

THE ANTARCTIC

KA2MXO furnishes some particularly interesting information regarding Russian activity on the Soviet Antarctic bases. His correspondent is 4K1D (Novolazarevskaya Station, 71° S. long., 12° E lat.). Two operators man 4K1D — Mike, UA1AFM, and Slava, UA3SBQ (ex-UA1PAM). Mike notes that the station operates mostly cw, all bands (excluding 10 meters), and that there are six other active stations in the south polar region: 4K1A, Station Molodezhnaya, which currently has several operators from Moscow and Khabarovsk (4K1HK, operator UA3HK, who operated from this station several months ago, is back in Moscow and now replying to cards he has received); 4K1B, Station Mirnyi, which currently doesn't have any licensed operators on board, is, nevertheless, active; 4K1C, Station Vostok, not operational at this time; 4K1F, Bellinhausen, not represented either. If you are into satellite communications, you might like to talk with Serge (operator at UAØUBF), who mans 4K1G, Station Leningradskaya. Serge is monitoring the RADIO 5, 6, 7 and 8 satellites, and is willing to contact U.S. hams. 4K1H, Russkaya, is active by Anatol, UA1CJD.

There is also a brand-new station, Druzhnaya (i.e. "Friendly"), 4K1J, located close to Argentina's General Belgrano Base, on the shore of the Weddell Sea. The Central Radio Club of the U.S.S.R. is represented by 4K1CR/EK3CR, Leo Labutin, who is the major authority on the Soviet RADIO satellites. About the time this issue arrives, Mike, UA1AFM, should be back home in Leningrad.

On the opposite pole, the UA-DXpedition, *Sovetskaya Rossia,* finds six men making their way through the snow far above the Arctic Circle. They're enroute from the Chukotka peninsula toward the western border of the U.S.S.R. There are three stations: base, EK9E/Ø, with 200 W of power and good antennas, and two portables; EK9C/Ø and EK9D/Ø. The two portables use 10-W transceivers and simple antennas. The Arctic operation may be found on daily on 14.115 (±5 kHz) at 0330 or 1100Z. (They acknowledge cw calls as well.) The operation should last until early summer. UK9CAE handles traffic for them and manages their cards.

1982 QSL information for the 4K operations: 4K1A via UA3AEL, 4K1B (no manager at present), 4K1D via UA1AFM, 4K1G (via UAØUCJ, Serge's XYL), 4K1H via UA1CJD, 4K1J via UA1JJ (op. Slava), and 4K1CR/EK3CR via UA3CR.

QTH of the year — BY1PK. The new building to the left holds two dipoles and a new TH6DXX; the old building supports the old TH6DXX. *(thanks JA1BK)*

DX TIPS

Some months back, a discussion at the popular WIMU Hamfest in West Yellowstone reemphasized the importance of upgrading for enhancing DX results. Intrigued by the discussion, Fred Cady, KE7X, analyzed some 100 cw DX contacts made in the preceding six months on 20 and 15. Fred notes that many of the contacts were in the Extra Class portion of each band. Distribution graphs show that there is more 20-meter activity below 14,030, with 67% of the contacts being below 14,025 kHz. Activity on 15 meters is more evenly distributed across the band, but even here more than half, or 57%, of the contacts were made below 21,025. So, those of you who like to work cw DX had better start studying to upgrade.

THE CIRCUIT

☐ SARL Award: The South African Radio League is pleased to announce the Port Elizabeth Branch Award. Details: Confirmation of five QSOs with Port Elizabeth Branch stations. Certified logs of QSLs, plus $1 U.S. or 5 IRCs to be sent to the Awards Mgr., Box 462, Port Elizabeth, 6000 Republic of South Africa. Valid Branch Members: ZS1GV WD; ZS2s AB AE AI AJ AO AW BR BX CC CM CV CZ DD DK DR EA EE EQ FM GH GJ GR GU HE HR HV HW HZ ID JJ JR K KC KD KX LL LO M MC MJ NS OB PA PD PG PP PR QF RI RM RS RT SI SW TC TJ TW TX V VM WV; ZS4ME, ZS5DX, 3D6BP; ZS6s AEB AXO BTI BZX NX UF.

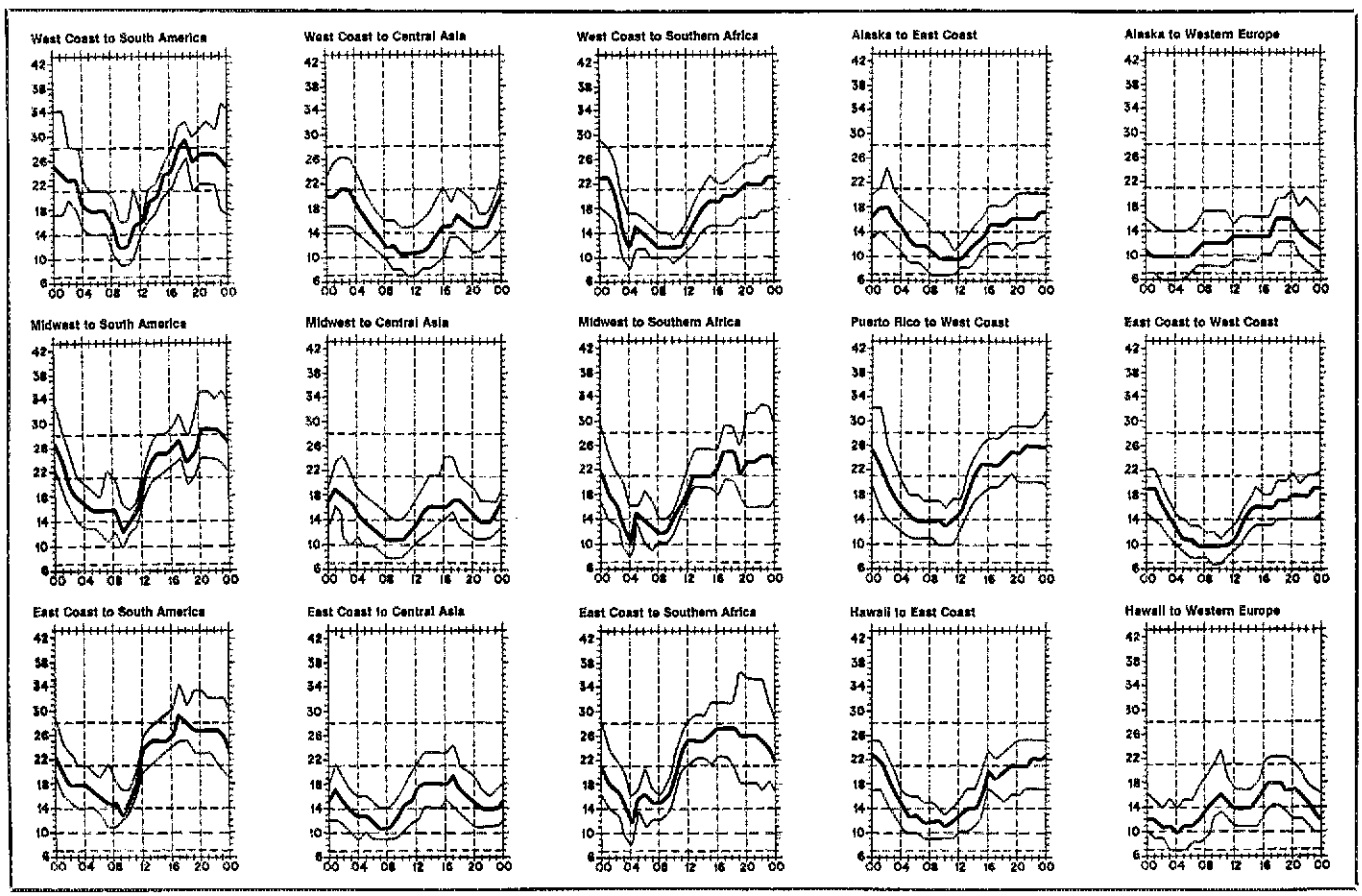
☐ Christmas Island: T32AM and T32AL were on the air Nov. 21-29, during CQWW. QSL via WB7SIC, Al Berg, Box 25088, Portland, OR 97225.

☐ Hong Kong: KL7IHP/VS6 expects to be active, and it is possible that a simultaneous operation will be run from Macao under the call CR9FE.

☐ Abu Ail: The YASME DXpedition of G5ACI/AA is now history. The difficult operation included W6KG, W6QL, FØECV and F6GBQ. The group used three transceivers, one amplifier, a couple of generators and assorted antennas and peripheral gear. They experienced rough seas on the trip from Djibouti to Abu Ail, but enjoyed a smooth return trip. The operation netted 4000 contacts with hams in 104 countries on five bands (including 10 MHz). From this unique location, Ethiopia can be seen (on a clear day!) to the west, and North Yemen to the east. QSL with s.a.s.e. to YASME, Box 2025, Castro Valley, CA 94546.

☐ PJ-6-7-8: K3UOC/YV4 expects to hit Saba, St. Eustatius and St. Maarten the end of March through early April. Mike has lived in Venezuela for four years and works as a teacher at the International School in Valencia. QSL direct stateside, W3 QSL Bureau, via the ARV in Venezuela, or direct to Michael Manafo, Colegio Internacional de Carabobo, Apartado 103, Valencia, Venezuela.

☐ DX: WN3VAW enjoyed a special thrill last October, raising 5W1DM using a 20+ year old transmitter with a random length of wire — and this was on



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

10-meter sideband, with a CQ! Ron says there must be some advantage to his having a weird call!

☐ Formosa: At the start of this year, the venerable BV2A/BV2B, Tim Chen, planned to retire from the Columbia Film Company. All future correspondence should go to Tim at Box 30-547, Taipei, Taiwan, ROC.

☐ QSL Cards as Historical Documents: G2HJT forwards a copy of the absorbing November 1982 *Radio Communication* article. In our current laissez-faire degree of regulation, it is easy to lose sight of the fact that (to quote the interesting article): "QSL cards from stalwarts of the past who helped to nurture the growth of our hobby and build up the influence of our national society are worthy of collection."

☐ DX Nets Around the World: The second issue of this useful publication is now available from Dieter Konrad, OE2DYL, Bessarabierstr. 39, A-5020, Salzburg, Austria. (EU 4 IRCs, overseas 6 IRCs.) Dieter manages an impressive list of pasteboards for VP2ARS, OE2VEL/HBØ/KH6/KH8, OE6BVG/KH6/KS6, A35EL, A35XX, 5W1DD, 5W1DE, 5W1DO, C21NI, ZK2EL, ZK2TA, T30BF, T30BG, T2VEL, T2ETA, A22EL, CR9EL, OE1ETA/KH6/KH8, OE2VEL/ZS6/ZS3/3D6, OE1ETA/KH6/KH8.

☐ Kenya Award: The Radio Society of Kenya lists the following requirements: Ten points are necessary. A contact with each 5Z4 station (who must be a member of the RSK) = 1 point, and a contact with club station 5Z4RS = 5 points; all bands/modes. Submit log photocopy, signed by a responsible local club officer (or licensing authority), for contacts on or after Dec. 31, 1977.

☐ 4NØATC will operate on all traditional hf bands March 21-25 from Split, Yugoslavia, in commemoration of the International Federation of Air Traffic Controllers Assns. Conference. Preference on 14.277 MHz.

☐ V3: The October 1982 operation from Belize revealed interesting highlights: 15,000+ contacts in 12 days on all bands, including many 6-meter contacts, operation during the CQWW. Cards via N6ADI. Good job, guys (included V3CQ/WA6VNR, V3JY/KA7EST, V3DX/N6ADI)!

☐ Philippines: N8CWX has headed out for a three-year USAF tour at Clark AFB and is awaiting a reciprocal permit. Cards via N2BCF.

☐ 10-Meter Mobile: WA1DBR has an enviable total of 66 countries using about 50 W to a whip. All contacts were made without using nets or other similar aids. Norm wonders about methods to get the other 34 for his personal 100-mobile total!

☐ HZ1AB: Impressive totals for 1982 — 20,000 contacts — and 30,000 the year before. The crew needs South America for WAC on 160, and Bob, WA8MOA, hopes to see the gang at Dayton (April 29-May 1).

☐ Resolutions: Among VP2ML's 10 resolutions for 1983 (which no doubt are well-read by those who are courteous operators, and totally ignored by those who could care less) is one to chew on: "I will be courteous at all times to my fellow DXers, no matter what they do." It requires a lot of self-control to avoid the trap of calling a lid "a lid" because he is calling a lid "a lid" (on the frequency of BY8AA, no doubt), but who, really, would then be the true lid? QST

Ali, VU2ALQ, is active in recruiting new hams in Hyderabad. *(VU2JOY photo)*

QSL Corner

Administered by Joan Becker, KA1IFO

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.

C31NP (A3BN)
CM2ER (KB7SB)
CO2HQ (KB7SB)
CO2OM (KB7SB)
CO2PY (KB7SB)
CO2QQ (KB7SB)
CO2RX (KB7SB)
EL2AI (AK3F) P.O.B. 573, Gettysburg, PA 17325
FB8ZQ (F6AJN)
FKØAE (F6EWK)
FMØGA (N6ZV)
FOØJO (W6GO)
FPØJA (KP2A)
FRØGGL/G, P.O. 386, St. Pierre, Reunion
GD4BLG (DL4FF)
GD4CGV (DL7FH)
JD1BAE (KB7SB)
L2M (LU1BR)
ON8VV (AK3F)
P42E (WA2SPL)
S79ARB (WA2PPN)
T32AK (W9RCJ)
UAØFCL (KB7SB)
V2AAW (NØDH)
V2AMK (NØDH)
V2ARO (WB6SHD)
VK6AHI (K8CW)
VQ9GD (KA6MKY)
Z21GN (NY4X)

QSL Manager Volunteers

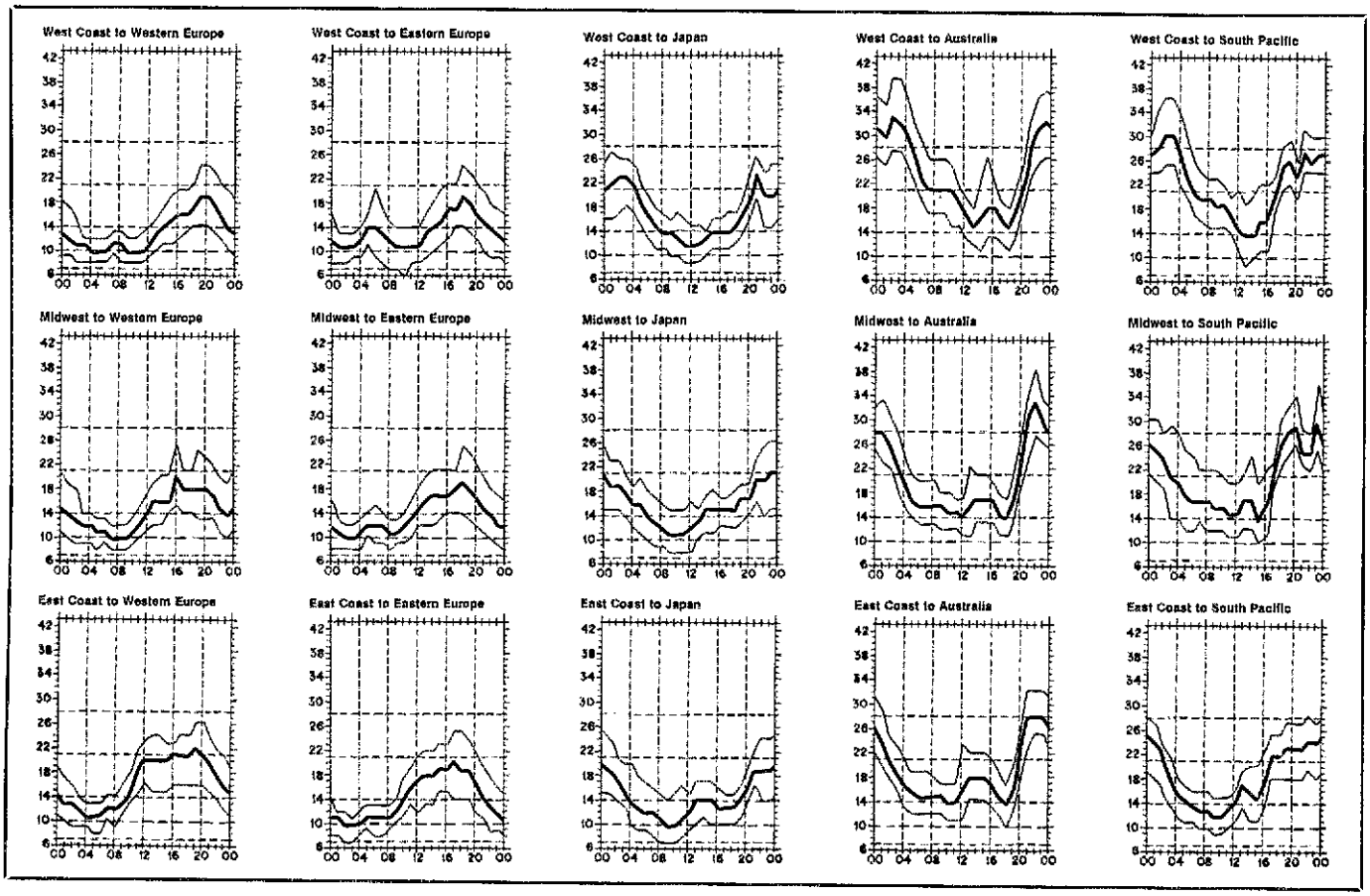
N4HPX
KD6KF
KT7X
WB8AWS
WAØRUD

Special Notes

☐ KD6KF is *not* manager for H44AP

☐ K4DYB is *not* manager for 3Y2L

☐ Dec. 1982 QSL Corner, page 77, 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. QST



lowest curve (optimum traffic frequency, or fot). See 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, 1983, assume a sunspot number of 74, which corresponds to a 2800-MHz solar flux of 123.

DX Century Club Awards

Administered by Don Search, W3AZD

The DX Century Club certificate is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL Countries List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from December 1 through December 31, 1982. 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

DF1CH/105 EA3BOW/106 ON4LD/115 YV3OS/249 WA1ACN/151 N3BGY/101 W5OHF/240 KA7BSD/105 WB8ONC/101
DF2CD/105 EA4AXW/128 SM5CZY/343 K1ECK/101 WB1FBV/105 KB4LA/109 WA5IPS/103 KA7KMP/102 WB8RVK/100
DF0AFZ/138 EA7AZA/136 SM5FBL/107 K1PLR/106 K2JLA/275 KC4HN/101 WA5ZIJ/278 KE7P/114 KA9DGS/105
DK2CX/107 EA9HU/127 SM6JNA/104 KA1CNI/103 KA2IHN/100 N4ENX/106 K6CL/134 KQ7Q/274 KB9CH/140
DK7BW/105 I2QMU/169 SM7FQM/103 KA1FGH/206 KB2EN/274 NF4E/105 K6HB/100 W7CUS/125 KC9LP/101
DK0BT/122 JA3UCQ/118 VE2AGQ/118 KJ1C/105 KC2MY/103 NW4I/120 KE6PQ/146 W7GLU/280 K0WEX/127
DL2ZAE/105 JA4DHR/103 VE3IAY/108 KK1O/103 W2GDV/101 W4PKA/146 WA6WHQ/101 K8SUS/106 KB0PY/108
DL4KG/133 JA5ADQ/107 VE3MRX/102 N1BLL/115 WA2LEZ/103 WA4AYC/121 WB6QGN/131 KI8X/155 KC0MS/108
DL5NO/117 JA9ZB/110 VE7HE/105 W1JOL/154 AA3B/103 NC5Q/109 K7OVM/108 WB8KFG/253 WB0PMT/219
DL0SP/110 OE7HHW/129 YU3ZZ/103

Radiotelephone

DF2CD/105 HI3FBE/125 VE3LAJ/165 WA1COA/150 KD4ZS/100 WB4HZR/103 KM6B/296 N8BNE/113 W9NTU/102
DJ5MK/125 I2CXI/125 VE5ADA/227 KC2KU/123 KE4IF/107 WB4YZC/110 W6HFJ/101 WB8KFG/253 K0OYP/101
EA1ALE/200 JA3UCO/118 VE7BXG/164 WA2ETT/134 KX4A/105 WD4CJJ/126 WA6TLA/182 WD8EOL/102 KB0CN/124
EA6OB/115 OH1OR/107 VK3WA/VE3/121 WB2QFV/154 N4ENX/104 KB5XH/100 KA8JHD/110 K9BK/102 KB0ZZ/103
EA7CTI/109 PY3DL/162 4Z4DX/305 WB2WEO/101 NW4I/114 N5ATW/127 KC8CR/156 K9RTB/152 KC0MS/104
EA7CZE/101 PT9OK/100 K1ECK/101 K3LWM/278 W4PKA/131 W5TWG/105 KC8IM/100 KB9CH/131 W0YZL/102
EI8EK/123 SM3BSF/201 KK1O/102 KB3NQ/100 WA4AYC/112 KA6D/100 KI8X/152 KC9IG/163 WB0PMT/219
F3XY/164 VE2AGQ/104 WA1ACN/144 N3BQS/110 WA4WZO/102

CW

DL7XS/167 EA7XO/204 JH1IZR/101 VE3IAY/100 K2TK/161 N3AXE/105 WD4IWO/120 KT6G/101 K0SE/107
EA4AXW/101 FC6FHX/113 OK3CWQ/110 VE3LAJ/110 K3LWM/132 NF4E/101 KS5D/101 KD8V/105 KE0Y/109
EA7AZA/115 JA1VMR/115

RTTY

KB9IS

160 Meters

G3RPB

5BDXCC

I1FNX K4NV I1ZQD YU7DX F3CPO KB9DB VK4SS K2YGM SV1IW
W0RT DF3FI

Endorsements

Mixed

CT2CE/253 JA2MGE/316 VE2PD/192 W1TPK/299 WB2QFV/264 NI4Y/254 KM6B/300 N7BES/252 KB9VF/239
DF6CY/272 JA2NPS/176 VE3BGX/260 WA1FCN/250 KB3KV/276 NV4Z/179 KM6N/251 N7TT/327 KE9U/281
DF6JC/217 JA3BLN/228 VE3LAJ/200 WA1NSJ/254 KC3EN/129 W4JFU/169 N6ADI/267 W7AHX/296 N9AIB/251
DJ1ND/261 JA3CSZ/302 VE3LDT/271 WA1ZLK/276 W3AX/305 W4PRX/284 N6OC/308 W7FP/301 N9RF/287
DJ6BN/290 JH3DAE/300 VE5ADA/234 WB1CCH/292 W3LPF/340 W4TJC/261 W6BFW/331 W7IUV/305 W9AND/315
DK1FW/304 JA4ESR/231 VE7VX/224 WB1GLH/124 W3POP/133 W4TL/266 W6GO/310 W7MI/324 W9GSB/229
DK2UA/290 JH4UVU/225 VO2CW/282 K2EUH/126 W3QLW/305 W4WSZ/250 W6MJY/201 W7QMU/290 W9HAH/201
DK3QJ/224 JA8AYN/320 VP9AD/225 K2OWE/256 W3VO/318 WD4CBA/204 W6OB/315 KA8JZR/177 W9MCJ/282
DK5QK/298 KH6BZF/289 YU1OHF/209 K2QE/204 W3XX/310 WD4R/249 W6VBI/323 KA8LAQ/200 W9OPD/251
DL3EAP/159 KH6GI/227 YU7DX/250 K2TK/261 WA3CGE/270 K5LP/309 W6YQ/292 KB8MR/277 WA9MAG/259
DL7XS/248 KP4BJD/271 9H4G/316 K2UU/319 WB3EWB/252 W5JK/252 WA6TLA/311 N8DE/297 K0JTW/160
DL0JK/235 LA9BM/225 AG1K/269 K2ZRO/310 WB3FID/257 W5SGT/250 WB6IYM/127 W8LKG/284 K0VGB/175
EA1BC/341 NL7J/250 AK1N/218 KB2HZ/280 AA4BA/294 WD5AAM/267 WB6WKM/250 W8PCS/269 KB0BL/250
EA1FD/315 OE1SKS/149 K1EFI/295 KO2H/132 AA4KT/301 AE6U/302 WB6ZUC/304 WD8MOV/300 KB0CN/126
EA3NA/315 OE3PKU/176 K1WJ/306 N2AEW/141 K4ELK/300 AJ6V/270 WD8EDY/131 WD8OTZ/204 KB0G/177
G2FFO/300 OH2VZ/320 KE1F/281 N2AQH/291 K4JW/283 K6AG/310 K7AOZ/300 K9HLG/229 KB0TD/209
G3DOG/320 ON4SH/258 KI1G/202 W2AK/270 K4KC/328 K6FS/224 K7EFB/209 K9IL/314 N0ASA/161
G3XBY/270 PY1LW/297 W1BFK/139 W2CKR/280 K4KKQ/187 K6PZ/322 K7EG/299 K9KK/250 W0BF/270
G4JCC/260 SK4BX/197 W1BWS/272 W2LOG/290 K4PR/225 K6UD/315 K7SZN/201 K9KU/317 W0HZ/333
HB9G/261 SM6AVM/177 W1DQH/320 W2MP/319 K4VJO/129 KA6DXY/205 KA7DLC/201 K9VTD/165 W0WAN/186
HB9HT/300 SM6BXV/253 W1GUW/295 WA2HZT/131 N4CQ/307 K6YUI/274 KC7EI/276 KA9ERV/201 WA0LWE/199
JA1NRH/311 SP6BZ/290 W1QUS/300 WA2MTI/295 NE4R/306 KB6ZL/254 KC7ET/211 KB9OG/163 WA0OVU/161
JA2APA/305 VE2FOU/232 W1RBU/250 WB2QAX/299 NI4M/130 KF6A/260 KC7WZ/175

Radiotelephone

CT2CE/253 HB9NU/262 OE2GKL/310 KA1PM/200 K3RX/305 W4BLB/150 WA5OHJ/259 N7GG/264 KB9OG/156
CX6AM/260 I3DUB/125 OH2VZ/254 KI1G/138 KB3HV/128 W4KHW/280 WB5CBJ/281 N7TT/271 KE9U/277
DF7NM/262 I5RCR/158 PA0KBI/304 N1API/253 KB3KV/276 W4TJC/261 WB5OFN/274 W7FP/301 KF9J/280
DJ2YL/305 I7RNH/311 PY5GA/322 W1BWS/249 KG3K/292 W4UW/262 WD5AAM/263 W7GLU/275 N9AIB/230
DJ5VQ/314 I8LEL/310 SM2EKM/318 W1GUW/295 W3AX/174 W4WKQ/175 K6CBL/257 W7KTI/282 W9DNE/316
DK1FW/304 I8WNF/183 SM5AQB/315 W1HJF/134 W3IF/311 W4YN/303 K6EDA/297 WB7VHA/217 W9DOR/298
DK8IF/183 I0SSW/291 SM6AVM/177 W1NM/274 W3ILG/141 WA4DRU/307 K6PZ/312 K8AXG/310 W9PHJ/201
DL3RK/330 JA1DCO/203 SV8JE/231 W1TPK/298 W3KBZ/225 WD4R/228 K6YUI/258 K8CDM/291 W9TC/280
DL4NN/143 JA1DM/325 VE2JO/134 WA1NSJ/237 W3RDE/145 K5BG/280 KD6WD/154 K8BDB/291 W9TEI/270
DL8QS/283 JH1EIG/320 VE2PD/190 WA1WTP/273 WA3CGE/260 K5CON/261 KM6N/201 KB8MR/277 W9WM/223
DL9VS/313 JA2APA/304 VE3BDB/323 WA1ZLK/276 WB3BGI/291 K5GH/316 N6ADI/247 KN8M/213 WB9JBH/265
DL0JK/216 JA1JSF/303 VE7AAQ/322 K2JLA/274 WB3CIW/294 K5GZ/299 N6FT/169 N8DE/239 WB9SYF/280
EA1FD/303 JA3BLN/210 VK4AJ/244 K2TK/239 WB3KOJ/226 K5IH/276 N6QC/305 W8DOK/164 K0IUC/305
EA2QU/262 JA3BQE/317 VK6HD/322 K2UU/318 K4JW/283 K5MLG/225 W6GO/306 W8ELE/201 K0JTW/140
EA3VM/299 JA3CSZ/270 VO2CW/277 KB2HZ/275 K4KC/325 KB5KA/152 W6KYJ/316 W8PCS/158 K0VGB/150
EA6GP/160 JH3DAE/286 VP9AD/211 N2AQH/290 KB4PL/178 KB5QQ/176 K7EG/264 WD8MOV/297 KB0C/252
EL2AO/125 JR7TEQ/301 YS9RVE/303 W2LOG/290 KD4OM/125 KB5RA/178 KA7DLC/158 WD8OTZ/201 KB0SY/256
F2VX/317 KH6BZF/286 8P6QV/154 W2LSQ/128 N4CQ/305 KD4RP/306 KC7EI/276 K9BLY/207 W0PT/280
F5JA/319 LA9BM/191 9H4G/316 W2MP/303 NE4R/285 W5IJE/176 KC7ET/205 K9HLG/229 W0PXM/250
G3DOG/301 LU7MAJ/273 AK1N/211 W2MP/298 NI4Y/231 W5JK/251 KC7WZ/167 K9KK/246 W0RWC/311
G3XBY/253 OE1PC/290 K1EFI/269 WA2BGE/201 W4AXR/332 W5OHF/239 KQ7Q/261 K9PFY/313 W0UQD/320
G4JCC/260 OE1SKS/149 K1JRE/142 WB2MVF/190

Cw

DJ5JH/252 JH1EIG/269 LA4YW/179 VE1BXI/212 K4CEB/285 AE6U/272 W6VKQ/150 W8DA/251 N9AIB/133
DJ5VQ/248 JA2MGE/277 ON4SH/204 VO2CW/240 K4FJ/270 K6CBL/290 W6YQ/250 W8ELE/208 W9BW/299
DJ7CX/268 JA3BG/259 OZ1LO/300 YS9RVE/270 KI4Y/180 K6RK/191 K7EG/201 W8ZCQ/286 W9DH/233
DL1KS/260 JA3BQE/284 SM2EKM/129 K1EFI/231 KU4N/226 KA6DXY/129 KQ7Q/202 K9BLY/151 W9GW/274
HB9BNB/175 JA3CSZ/274 SM4CQW/150 W1BWS/230 W4VQ/301 KM6N/206 N7TT/141 K9ZO/218 W9ZR/290
HB9HT/279 JA4ESR/163 SM6EOC/210 W1FZ/289 N5RR/186 N6ADI/135 W7IUV/280 KE9A/226 KJ0U/243
JA1BN/280 JH4UVU/204 SM0AJU/302 K2OWE/206 W5ORM/124 W6GO/276 KF8N/150 KE9U/225 N0RR/301
JA1FGB/212 JR7TEQ/265 SM0CCE/262 K2QIL/149 W5SJ/269 W6SN/224 KJ8Y/176

Honor Roll

The DXCC Honor Roll is comprised of those call signs which have been credited with at least 306 countries of the 315 current countries on the DXCC list.

Mixed

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DJ2BW/358
DL1BO/357
DL1HH/350
DL1JW/353
DL1KB/361
DL3RK/358
DL6EN/356
DL7AA/362
DL7AP/354
DL7EN/357
DL8NU/353
DL9OH/352
G3FXB/356
GW3AHN/360
HB9MQ/358
HB9PL/350
I2KMG/341
IØAMU/359
JA1BK/348
JA4ZA/342
LU6DJX/365
OH1ER/363
OH2BH/343
OH2QV/346
OH4NS/341
OK1ADM/346
OK1FF/359
ON4NC/361
ON4QJ/344
OZ3Y/[illegible]
PAØLOU/353
PY2BKO/341
PY2CK/364
PY2PA/342
PY2PE/342
SM3BIZ/358
SM7ANB/351
SMØAJU/353
VE5RU/353
ZS6LW/354
4X4DK/359
4X4JU/356
W1AA/354
W1AFF/347
W1BIH/364
W1CKA/351
W1DGT/345
W1DK/359
W1FZ/359
W1GKK/367
W1HH/352
W1HX/361
W1HZ/359
W1JR/357
W1NU/355
W1OO/340
K2BK/351
K2BS/342
K2BZT/358
K2FB/348
K2FL/357
K2EWR/355
K2TLM/341
K2TQC/348
W2AG/361
W2AGW/365
W2AO/358
W2BHM/354
W2BMK/357
W2BOK/35[illegible]
W2BXA/365
W2GP/346
W2FXA/353
W2FZY/354
W2GK/342
W2GKZ/343
W2JVU/362
W2LPE/358
W2OKM/359
W2OBU/361
W2QM/356
W2SSC/357
W2TP/350
W2TQC/354
W2UE/356
W2YY/349
WA2DIG/350
K3GL/359
K3MO/354
W3AFM/354
W3CWG/357
W3DJZ/347
W3EVW/361
W3GH/356
W3GRS/353
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W3NKM/358
K4LZ/347
K4IKR/339
K4JC/346
K4KQ/359
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K4PDV/358
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K4YYL/341
W4AAV/362
W4AIT/364
W4BFR/349
W4BQY/363
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W4EX/365
W4OM/362
W4QM/348
W4UG/343
W4WV/352
K5LLL/335
K5YY/338
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W5QK/352
K6DC/359
K6KII/353
K6WR/346
K6YRA/341
K6ZM/346
K6ZO/365
N6AV/342
N6FX/348
W6AM/366
W6BZE/361
W6EE/362
W6EL/346
W6EJ/353
W6EUF/340
W6ISQ/348
W6KNH/336
W6KTE/343
W6PI/358
W6QNM/350
W6REH/347
W6RGG/341
W6RJ/344
W6RL/358
W6ZH/351
W7AQB/353
W7CB/335
W7GN/357
W7IR/360
W7MB/365
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K8DR/352
K8DYZ/341
K8FL/342
K8OHG/345
W8AH/357
W8CUT/348
W8DMD/362
W8GT/364
W8GZ/364
W8JBI/359
W8JIN/365
W8LKH/360
W8MPW/359
W8OK/352
W8PHZ/356
W8RT/359
W8ZLQ/354
K9AB/354
K9ECE/350
W9CH/348
W9DWQ/354
W9DY/353
W9GTI/358
W9JUV/359
W9RCJ/353
W9SFR/356
W9ZM/364
WØAIH/356
WØAX/362
WØBW/362
WØDU/363
WØELA/364
WØMLY/362
WØPGI/357

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DL1CF/344
DL3BK/352
DL7HZ/346
F3AT/351
F9RM/349
G2FSP/351
G3AAE/359
G3FKM/357
I1ZL/352
IT9ZGY/355
JA1BN/345
JA1BRK/343
JA1DM/354
JA1MCU/336
JA1MIN/337
JA2JW/350
JA8ADQ/338
LA1KI/339
LU4DMG/355
LU5AQ/354
OH2NB/361
ON4DM/356
PY1APS/336
PY1HX/353
PY3CB/335
SM3CXS/335
SM5BHW/337
SM5CZY/343
SM6DHU/334
VE2NV/357
VE3MJ/338
VE7GI/363
VU2DX/335
YV5ANF/345
ZL1HY/364
ZL3IS/353
K1YZW/338
KA1QY/353
W1MLJ/347
W1SD/346
W1WY/352
K2PXX/344
W2AYJ/358
W2AX/355
W2CR/357
W2GT/358
W2HTI/356
W2LV/359
W2NC/340
W2NUT/356
W2PN/341
W2PV/342
W3GG/329
W3KT/363
K4CEB/334
K4DJ/337
K4ID/342
K4RPK/348
K4SM/357
K4XO/333
N4EA/336
N4SU/359
W4KEF/356
W4EO/354
W4GD/360
W4HR/350
W4LF/351
W4NL/335
W4QQN/341
W4SSU/347
W4TM/361
W4VQ/344
W4ZD/350
K5FJ/352
W5GO/353
W5RE/341
W5HJA/348
W5MMK/361
W5NUT/353
W5QKZ/346
W5RDA/346
W5SJ/335
K6EC/354
K6EV/346
K6JG/340
K6LGF/352
K6OJ/361
K6PU/342
K6QH/340
K6RF/348
K6RN/348
K6RQ/350
W6BA/359
W6BS/357
W6BSY/356
W6CHV/359
W6FW/344
W6HYG/352
W6KG/351
W6KUT/359
W6KZL/356
W6ONZ/351
W6RKP/355
W6TZD/360
W6YA/345
WA6GFE/339
W7CG/356
W7DX/348
W7JYZ/348
W7KH/363
W7LDC/358
W7PHO/358
K8EJ/339
K8ONV/349
W8ARH/343
W8KPL/356
W8PR/342
K9KA/334
K9MM/334
K9RJ/337
W9BW/344
W9HB/354
W9QLD/341
W9RF/330
W9RKP/356
W9TKD/349
W9ZR/332
W9ZRX/333
W9ZTD/346
WØLWG/351
WØSYK/358

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DJ1XP/334
DJ6RX/334
DL7HU/350
DL7FT/340
F8RU/333
G3HGT/350
G4CP/360
GI3IVJ/353
GM3ITN/347
HB9DX/346
HB9IL/355
I8KDB/352
IØJX/333
JA3DY/347
KP4RK/349
LA9CE/334
OH2QQ/351
OH3SR/333
OK1MP/344
ON4IZ/344
ON4UN/335
OZ1LO/336
OZ6MI/333
PY1HQ/354
PT7YS/349
SM6CKS/335
VE2WA/347
VE3CTX/330
VE3WT/340
VE3WW/336
VK4QM/362
XE1AE/348
YS1O/353
YU3EY/332
ZL1AJU/345
ZL4BO/346
ZS6RM/351
W1AXA/355
W1JNV/354
W1OT/331
W1RLQ/346
W1UU/345
W1YRC/333
K2CL/334
K2CM/332
K2LE/339
W2GC/353
W2GLF/352
W2HZ/335
K3II/353
AA4MM/334
AE4X/351
K4AIM/349
K4DY/335
K4HJE/333
K4MQG/343
N4TO/338
N4WW/335
W4EEU/340
W4MGN/347
W4OO/349
W4PVD/354
W4YJ/359
WA4WIP/338
K5DX/355
K5RC/336
K5UC/359
W5IR/333
W5LCI/349
W5UN/353
K6GA/347
K6KA/334
N6AR/343
N6CW/336
N6GM/342
W6BVM/353
W6FEI/336
W6FF/352
W6HFL/344
W6KH/351
W6MUR/351
W6YB/340
W6YK/356
W6YO/337
K7ABV/337
N7RO/328
W7ADS/357
W7CMO/349
W7DY/338
W7QK/352
K8FF/343
W8GKM/332
W8JQ/339
W8QY/352
K9PPY/331
W9BM/350
W9DC/336
W9FKC/358
W9GU/349
W9KRU/337
WØGKL/350

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DJ2AA/345
DJ5DA/339
DJ7CX/339
DJØKQ/339
G2FYT/348
G3JAG/333
G3LQP/330
G5VT/357
HB9AHA/334
HB9KB/351
HB9MX/348
I2LAG/331
IV3PRK/332
JA1ADN/344
JA1IBX/337
JA1JRK/331
JA1UQP/331
JA8JL/334
JA8ZO/334
KH6CO/360
KV4FZ/332
ON8XA/333
SM5API/334
SM5FC/330
SM6AEK/337
SM6AFH/333
SM6EOC/329
SP7HT/335
VE3AAZ/350
VE3BWY/350
VE3GMT/332
VE3NE/335
VE7IG/333
YV5AIP/347
ZL1ARY/337
ZS6IW/344
ZS6YQ/347
K1DFC/333
K1DRN/336
K1RM/333
W1GX/335
W1PM/352
K2AGZ/334
K2SHZ/349
W2PPC/333
W2SAW/354
W2XN/352
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W1DO/326
W1HGA/326
W1NG/319
N2SS/325
W2OK/333
WA2VEC/324
WB2VEG/323
W3XM/331
K4XH/322
W4AST/323
W4OTX/325
W5RNG/333
K6DT/319
K6EXO/330
K6IR/321
K6TXR/333
WA7DRP/318
K8PYD/322
K8CMF/336
NØRR/317
WØYDB/323

CW

307

W9KNI/315

305

K2TQC/309
K9MM/311
N4WW/313

304

N4RJ/310
ON5NT/308

303

DL6EN/309

302

W8AH/308

301

JA1JRK/309
K2FL/305
K3FN/306

300

K4PT/306
K6GA/307
W6PT/307

299

W1NG/303
W3KT/304
AA6AA/301
K8MFO/304
W9DWQ/304
W9ZM/304
W3GRS/302
WA6TLA/303

298

SM5BHW/304

297

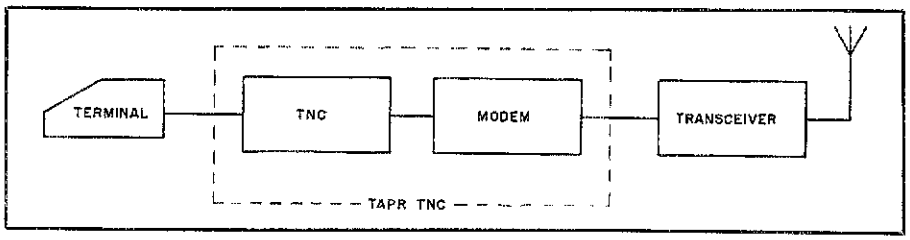
K4XO/301

FM/RPT

Conducted By Stan Horzepa,* WA1LOU

Digipeater

Tom Feeny, W8KOX, wrote the following piece describing packet radio and digital repeaters (digipeaters). FM/RPT addressed the ASCII simplex repeater concept during its infancy, in February 1980, and now picks it up three years later as it takes its first steps.



A typical packet radio station can be switched into the repeat mode to operate as a digital simplex repeater (digipeater). The Tucson Amateur Packet Radio (TAPR) "beta" TNC includes an onboard modem, thus eliminating the need for separate units.

Packet radio is a method of exchanging digital information in segments (packets), each a maximum of 255 bytes long. Each packet starts with a "header," which consists of a sync byte, an address (from: Tom / to: Lou), a control code and a flag. The data packet, a frame check (FCS) and a second flag follow the header. Although it is possible to generate packets with software, it is usually accomplished using a circuit called a terminal node controller (TNC), which has its own central processing unit (cpu).

Fig. 1 illustrates a typical packet station using a terminal and a TNC to send and receive packets through a modem and a vhf transceiver. The terminal can be a dumb terminal, a computer using terminal-simulator software or, simply, an ASCII keyboard/printer. It can also be an old TTY (Baudot) machine, but this would require additional software.

The TNC receives data from the terminal (it can be ragchew data, a computer program, etc.) and divides the data into packets, adds the header, FCS and flags, and "bursts" (transmits) the packet. Then, it waits for an acknowledgment (ACK) from the receiving TNC. An ACK will be sent automatically if the received packet is good; that is, if it agrees with its FCS. If the packet is faulty, a negative ACK (NAK) is sent to tell the originating TNC to repeat the packet. If no ACK or NAK is received, the originating TNC will repeat the packet automatically. (NAKs might be caused by QRM, QRN or QSB.)

An entire packet lasts approximately one second, and that's what makes packet radio different. Since the transmitting station is on the air for such a short time, simplex digital repeaters are possible. Such machines are on the air already, and they are known as "digipeaters." A digipeater monitors one frequency. When someone bursts a packet on that frequency, the digipeater stores it, checks its FSC and, if it is a good packet, repeats it on the same frequency.

Any packet station can be a digipeater by switching its TNC to the repeat mode. As a service to other packeteers, a ham with a good location might leave his packet station in the repeat mode when he's not using it. It would act much like a duplex repeater, linking stations that otherwise cannot communicate directly.

Another packet trick is "time division multiplexing," which means transmission in rotation, like a roundtable QSO. Since each station's transmission lasts only a second, the other stations don't have to wait for some "ratchet jaw" to clam up. And, if the local repeater is busy, jump in anyway. Your TNC is polite and will wait for an opening to join the rotation. Since each packet is addressed, you will only see those addressed to you; thus, other users of the repeater will be invisible unless they address a message to you. The only problem with time-division multiplexing is that the throughput rate (speed) decreases as more users log on.

The future of packet radio is in networking. Local repeaters (station nodes) will be interconnected via radio links, landlines or satellites. Packet stations (terminal nodes) will access the network through the repeater and leave traffic for automatic relay through the network.

The heart of packet operation is the TNC. It makes packets, then bursts, receives, checks and acknowledges each packet. If there is an NAK, the TNC repeats the packets. The most popular TNC was designed by the Vancouver (BC) Amateur Digital Communications Group (VADCG). The Canadians got a head start in packet radio because their government authorized ASCII for Amateur Radio quite a while before our FCC permitted it. The VADCG board uses the 8085 cpu. The software is stored in 2708 EPROMs, and there is RAM for buffering data waiting to be moved in or out of the TNC. The software consists of a terminal interface program, a link interface program and the protocol, which defines what a packet will look like (its address structure, etc.) and how the FCS check will be computed. There are many possible protocols, so it is necessary that the TNCs use compatible protocols in order to communicate.

A new TNC is on the way from Tucson Amateur Packet Radio (TAPR). This group designed a TNC quite different from the VADCG board. The first TAPR TNC was called "alpha." A few were built early in 1982 for testing and as a result an improved version, "beta," has been designed. TAPR is producing about 150 beta boards and will distribute them to hams at cost. The new design uses a 6809 cpu and has a modem and power supplies on board.

Another group active in packet radio is AMRAD (Amateur Radio Research and Development Corp.). AMRAD operates a repeater in the Washington, DC area. They have a link with another packet repeater in New Jersey, and also provide telephone access to their system. In Canada, VADCG is exploring the possibility of nonpacket access into a packet system. Vhf RTTY and landline access is planned, as well as access into a computer bulletin board system from packet radio. This is the beginning of networking.

Our AMSAT friends have incorporated a data channel on the Phase IIIB OSCAR satellite, and a protocol has been chosen. In the new protocol, the addresses will be call letters, and three addresses are available: an origination address, a destination address and a repeater address. The latter will be helpful when more than one repeater is operating on the same frequency. All the major packet groups have agreed to the new protocol, and appropriate software is being written for the VADCG and TAPR boards. PACSAT, a low-orbiting store-and-forward packet satellite, is also planned by AMSAT and the U.S. packet radio groups. These satellites will play a major role in a nationwide packet radio network. Herein lies the future of Amateur Radio. — *Tom Feeny, W8KOX, 1480 Meadow Dr., Walled Lake, MI 48088*

*72 Stiles St., Waterbury, CT 06706

REPEATER LOG MOVES

In case you haven't noticed, the Repeater Log has changed QTHs — from the Public Service column, a few pages away, to this column. It will appear here bimonthly, compiling the public service activities of stateside and VE repeaters. To report your repeater's activities, obtain a Repeater Log Reporting Form (CD-258) by sending an s.a.s.e. to your SCM/SM (listed on page 8) or to the ARRL Communications Department, 225 Main St., Newington, CT 06111. (Please send your reports to the ARRL in Newington, as the folks in the Public Service branch of the Communications Department will continue to compile the Repeater Log statistics.)

According to reports received between November 21 and January 19 repeaters were involved in the following public service events: 32 weather emergencies, 9 crimes, 6 medical emergencies, 240 vehicular emergencies, 10 fires, 5 search and rescues, 29 public safety events, 73 drills/alerts and 15 power failures.

The following repeaters were involved (followed by the number of events): WA1SOO 1, W1XJ 9, KC2CY 9, K2GE 5, WA2PAV 19, K2QIJ 12, W2VL 27, WB2ZII 14, N3AIA 1, N3BFL 7, VE3TTT 3, W3UER 5, WB4QES 18, WA4SWF 1, W4VQA 6, WB4WVH 2, W5GIX 5, W5RVT 5, W6ASH 45, WD6AWP 16, KH6ENC 1, WD6FGX 15, KH6H 1, KH6HHG 2, WC7AAT 2, K7CC 11, W7EX 101, KC7FA 8, WA7HTL 2, K7OMR 6, WR8AMD 1, WR8ARB 3, K8DDG 13, WD8IEL 4, WA8ULB 3, W9KXQ 4, W9VCT 3, WDØBQG 2, WBØHAC 4, WØKE 10, KØKRB 1, WØKUJ 2, WBØPDK 10, WØVQR 1.

YL News and Views

Conducted By Jean Peacor,* K1IJV

Check Those Cards

Clubs are for sociability and companionship, and for uniting for a common end. They need workers. They need members. As they fulfill their many purposes, clubs also provide a good time. Where but through Amateur Radio can you find clubs welcoming you at any age into general radio clubs, computer clubs, repeater clubs, DX clubs, YL clubs — to name just a few. If you live in a remote corner of the world, there is still a club for you, since many provide for international membership.

Clubs sponsor many awards and certificates in order to encourage Amateur Radio competition, which creates additional interest for members and nonmembers alike. Check your YL QSL cards. You could easily be missing out on one of the following club awards. If you need more YL contacts to complete an award, keep a watchful eye on Contest Corral for club contests. YL Activity Day, on the 6th of each month, provides another opportunity for YL QSOs. Listen on the hour on any ssb frequency ending with 88. Or, call "CQ YL"; others may be listening. Cw YL activities have been introduced by Anny, DF2SL. On the 15th of each month, call CQ YL on the hour on 21.050-21.060 MHz, 28.050-28.060 MHz or 14.050-14.060 MHz.

Buckeye Belle Certificate — Ohio stations are required to have 12 confirmed contacts; other U.S. stations 8 confirmed contacts; DX stations 4. Send complete log data — name, call, time, date, mode, frequency and Buckeye Belle numbers — with $1 for mailing to Marge Farinet, K8ITF, Certificate Custodian, 809 Decker Dr., Miamisburg, OH 45342.

Second Area Young Ladies' Amateur Radio Club (SAYLARC) Certificate — Contact 15 SAYLARC members in good standing. Associate members do not count. SAYLARC net contacts do not count, nor do vhf or repeater contacts. Contacts must have been made on or after Jan. 1, 1982. Log data should include name, call, QTH, time, date, number of the contact, frequency and signal reports, and be signed by you. Send log with $2 to Wilda Robinson, WB2FNF, 270 Palmer Rd., Churchville, NY 14428.

The Auto State Young Ladies' Certificate (TASYLS) — Michigan stations work 15 stations; VE and others need 10 points; DX and uhf work 6 points. Charter members nos. 1 through 50 count 2 points; all others 1. Send signed and dated log showing date, time, call signs, frequency, RST and TASYL number to Mary McCarthy, WA8WZF, 2823 West First St., Ludington, MI 49431. Certification of date and QTH must be on the application and signed by two licensed amateurs (General class or higher, nonfamily), by an official of a recognized club or by a notary public.

Women Radio Operators of New England (WRONE) — Work 6 WRONE members with at least 3 different NE states represented (contacts made on or after May 1, 1959, any band). Exceptions: WRONE net and repeater contacts do not count. Contacts to be made from one location, unless maritime mobile. Log data to show call, date, frequency and state, and certification by a club officer or two other licensed hams. Send to Chris Harrigan, K1ACM, 13 Douglas Ave., Beverly, MA 01915, with 50 cents for handling.

Future columns will include information on many more YL awards.

U.N.'S FIRST YL OPERATOR

The United Nations Amateur Radio station, 4U1UN, came into existence because of the tireless efforts of Dr. de Henseler, HB9RS, an avid DXer and traveler. The station may be operated only by U.N. employees and their invited guests. Peggy Arciero, WB2OHD, was the first YL to operate at the station. This came about through Peggy's friendship with Allen Singer, N2KW. In April 1980, she operated at 4U1UN during the DX-NA YL contest. She had the privilege of meeting Dr. de Henseler and Wolf Schubert, DJ6LV. Since then, they have been most accommodating in allowing Peggy to operate whenever possible. YL contests are her favorite time to do this.

Peggy was interested in DXing before the ink had dried on her first amateur license in May 1977. In 1978, she and her husband Tom, WA2OHD, became members of the Long Island DX Association (LIDXA), and DX interest turned to DX virus. They have since become Extra Class licensees, and Peggy has worked and confirmed 298 countries. If she could work an S2 station, she would catch up with Tom. She's talked with YLs in 151 countries, with 126 confirmed.

Peggy has served as QSL Manager for Michel, D68AP, and Alain, D68AM, who have operated in the Comoro Islands for two years. Michel has returned to France, but Peggy maintains skeds with Alain each Wednesday at 1900 UTC on 21.285 MHz. Alain prefers to work lists, as he speaks little English. As a result of handling Alain's QSL cards, Peggy began corresponding with Sasha, UJ8JCQ. On September 1, 1982, she became Sasha's QSL Manager for U.S. QSOs only.

At the time of the earthquake in Italy in November 1980, Peggy did extensive emergency-traffic operating. A local radio station announced that radio amateurs would be trying to get information for interested listeners. There was instantaneous response. Radio amateurs' concerted efforts allowed Peggy the privilege of calling many area residents and providing reassurance.

Peggy, Tom and their two daughters live in West Islip, New York. She is a life member of ARRL, a member of YLRL and SAYLARC, and treasurer of LIDXA. Her hobbies include skiing, scuba diving, sewing and knitting. But, of all her hobbies, Amateur Radio is what she enjoys spending her time with. If you hear a YL operating 4U1UN, chances are you will be contacting Peggy.

*Country Club Dr., Monson, MA 01057

Peggy Arciero, WB2OHD *(WA2OHD photo)*

HOWDY DAYS RESULTS 1982

YLRL Member High Score — WD4NKP 142.
Nonmember — DF3AO 25.

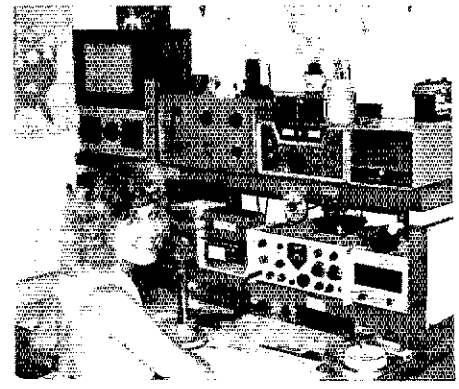
RESULTS, YL ANNIVERSARY PARTY

Cw	*Phone*	*Combined Phone and Cw*
WD4NKP Gold Cup	WD4NKP	WD4NKP Corcoran Award
K4AOH 2nd Place	K4AOH	DJØEK DX Worldwide Hager Award
VE2DPO 3rd Place	DJØEK	No entries for NA/CA Hager Award

Top 15 Cw Scores — WD4NKP, 2592*; K4AOH, 2100*; VE2DPO, 1750*; IIMQ, 1450; N7DHA, 1235*; WA2NFY, 1023*; WD8IKC, 1020*; W8YL, 1020*; WD5FQX, 1006*; VK3KS, 950*; N7COR, 870*; WD8MEV, 825*; VE3KTX, 770*; DF6UI, 722*; N4DDK, 665*.

Top 15 Phone Scores — WD4NKP, 15922*; K4AOH, 13072*; DJØEK, 11820; IT9JLA, 11812*; DF9YY, 10730; DJ1TE, 10533*; KA1JC, 10425*; WD5FQX, 8763*; KC7RY, 8662*; WD8MEV, 8190*; KA1YN, 7312*; KU7F, 6948*; K6KCI, 6308*; KA2ESQ, 6270*; G4GAJ, 6201*.

*Low-power multiplier



Nancy Battle, WA4WQH, works all bands, but prefers 10 and 15 meter DX hunting. An Advanced class license holder, she is also active on the AENB cw traffic net in Alabama. *(photo courtesy N4OE)*

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

Beacons

With the new FCC ruling on beacon operation (see The World Above 50 MHz, Jan. 1983), we may start to see the appearance of beacons on the microwave bands. Microwave beacons can serve a number of functions, some in common with and some in addition to the functions of beacons on the lower bands.

One important function is to check and align equipment. Without good test gear, there can be problems when constructing microwave receive converters — in making sure that local-oscillator injection is at the correct frequency or that the preamp stages and input filters have not been aligned on the image frequency. This is quite easy to do if a microwave signal source is not available. Beacons can provide such a signal source. In addition, a suitably constructed beacon can serve as a secondary frequency standard for calibrating equipment.

On the microwave bands, signal frequencies are often derived from basic crystal oscillators in the sub-100-MHz range with multiplication factors from 10 to 100. Small uncertainties in crystal frequency can soon turn into large uncertainties in final output frequencies. A 100-Hz error at 100 MHz translates to a 2.3-kHz error at 2304 MHz or a 10-kHz error at 10 GHz. Such frequency uncertainties can mean missed contacts when working with weak narrowband signals. A beacon based on a transmitter locked to a high-stability crystal oscillator can give both an approximate absolute frequency (depending on how good the stability and accuracy of the oscillator are) and also a local frequency standard to which many stations in the area of coverage of the beacon can reference their equipment. In this case, if the beacon is off frequency, then at least all the stations using it as a reference will be off by the same amount!

Of course, all beacons serve as indicators of propagation conditions. As such, they are particularly important on the microwave bands, where they may be the only signals on the band most of the time. Anyone putting up a beacon should give careful thought to the antenna system to be used. An omnidirectional antenna may not be best for all locations. In particular, a low-power beacon may be of use to the maximum number of stations if its signal is beamed toward an area of known microwave activity. A good compromise may be reached by the use of more than one antenna, perhaps of different types. There is no reason that a high-gain, omnidirectional antenna cannot be used in conjunction with a high-gain Yagi or dish beaming toward an area of high activity (with due regard being paid to the relative positioning of the antennas and the resultant overall antenna pattern).

*103 Division Ave., Millington, NJ 07946

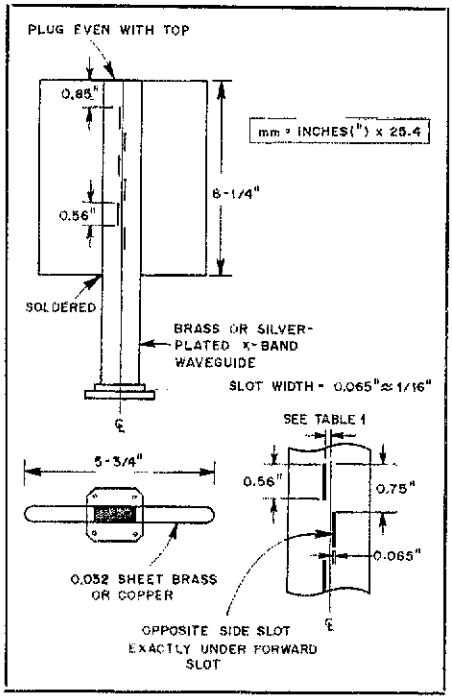


Fig. 1 — Dimensions of the 10-GHz Omni Antenna. Slots are (1/2 λ) (waveguide velocity factor) = 0.56 in. at 10.250 GHz. SWR is ≤ 2 across the entire band. A slot exactly on the center line will not radiate, so the distance from the center line determines the amount of radiation (that is, the antenna is its own power divider). Larger wings would reduce lobing.

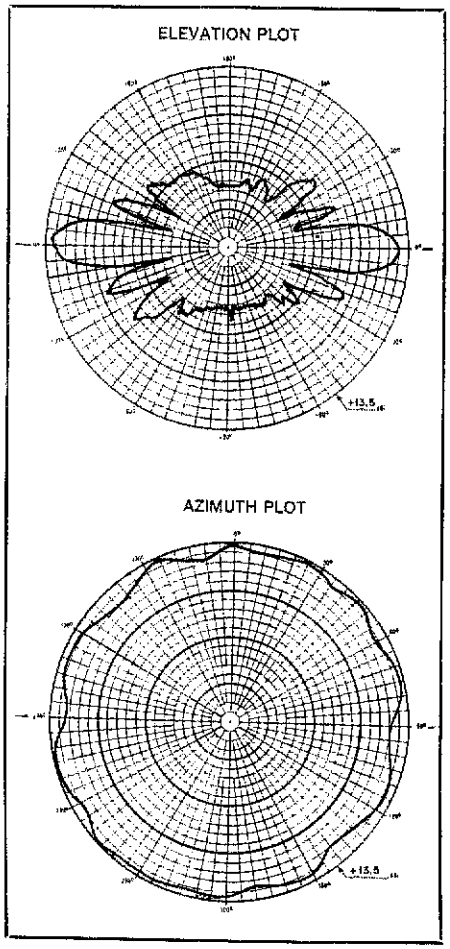


Table 1

Center Line to Center Line Distance of Slot, Inches

No. slots (each side)		*No. slots (each side)*	
2	0.14	6	0.077*
3	0.11	8	0.066
4	0.095	10	0.060
5	0.085	12	0.055

*shown above

An omnidirectional slotted waveguide antenna designed for use at 10 GHz is shown in Fig. 1. The antenna pattern shows good omnidirectional coverage with a gain of around 12 dBi. This antenna is a part of a 10-GHz beacon being developed by WA5VJB and K5SXK that will be included as part of the WB5PBZ 220-MHz repeater-remote base system. The beacon will sign WA5VJB, except when the repeater is in use, when it will carry the repeater audio (100-kHz deviation fm). The 10-GHz source for this beacon is a Mitsubishi GaAs FET DRO (dielectric resonance oscillator), type FO-DP13KF, which provides about 12 mW of output power and is tuned to 10.250 GHz. Others considering building 10-GHz beacons might find this antenna useful. The slots may be made by drilling a series of overlapping 1/16-in.-diameter holes. The "wings" on the sides of the waveguide are designed to reduce lobing. The hollow space inside the wings may be used for support or for mounting other components, as in this position they will not disturb the antenna pattern.

NEWS

Kent, WA5VJB, has also sent information that the North Texas Microwave Society is sponsoring a certificate to be awarded to those making contacts with members using the bands above 1 GHz. The certificate bestows membership in the society of experimenters using above L-band. To date, 17 certificates have been issued. *Kent comments that a few people have put* together systems just to get the certificate, so it obviously is helping to promote microwave activity in the Southwest. It sounds like a good idea that other groups might follow.

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,
W9KDR

AMSAT-OSCAR 8 FIFTH ANNIVERSARY

OSCAR 8, perhaps the most successful OSCAR of all, celebrates its fifth anniversary on March 5. More details of this historic event can be found in the article beginning on page 52.

Satellite Orbit Schedule Available to ARRL Members

The new, expanded satellite schedule available to ARRL members has been received very enthusiastically. KA6FBN writes: "The schedule is superb to use. My 12 s.a.s.e.'s are enclosed." W9VO says: "Received my January orbit schedule yesterday and was delighted. It is much more accurate and complete than the information that used to be in *QST*." W7XX writes: "The December sked you sent is just great! Used with OSCARlocator, it certainly makes tracking easier. Thank you very much!"

If you send us a year's supply of self-addressed stamped envelopes at one time (1 unit of postage for each s.a.s.e.), we will send you the list each month. Please write your return address on each envelope, and make sure the envelopes are at least 4 × 9 in.

Satellite WAC

The first satellite endorsement of the IARU WAC Award was issued to WØCA in 1981. Since then, VE2LI, W2BXA and W2LV have qualified. ARRL will issue this award on a special plaque to the first 10 amateurs who send confirmation of satellite contacts on the six required continents. Details of the first Satellite WAC can be found in *QST*, March 1981, p. 33, and Oct. 1981, p. 42.

AMSAT Annual Report

A special AMSAT 1982 Annual Report has been sent to all AMSAT members. A renewal form and a return envelope are enclosed with the report. So far, the renewal response has been very strong. Life members of AMSAT will receive their personal copies of the report along with ORBIT no. 12. Renewal forms (but no report) will be sent to those whose membership has expired. If you wish to renew and receive the report, include a 5- × 7-in. s.a.s.e. with 6 units of postage or 6 IRCs to AMSAT Annual Report Offer, 221 Long Swamp Rd., Wolcott, CT 06716. *(from* ASR *50, Jan. 17, 1983)*

OSCAR 9 Status

UoSAT-OSCAR 9 status is updated daily by the University of Surrey in England. A recording of the update can be received 24 hours a day by dialing the international number 011-44-483-61202. Present cost for a call from the U.S. for three minutes is $3 during the day and $2.40 nights and Sundays.

The January 19 recording reported that spacecraft attitude maneuvers were still in progress and that the next event scheduled will be the 50-foot-long magnetometer boom deployment. Orbital data is also given.

Space Shuttle Retransmissions

The FCC has granted an additional 90-day extension to the temporary waiver for retransmission by amateur stations W6VIO and W5RRR. The first waiver, dated November 9, 1982, will now extend operation until April 28, 1983. See ASPN, Jan. 1983 *QST*, for further information.

AMSAT Software Exchange

The AMSAT Software Exchange (ASE) has been providing useful Amateur Radio computer software. After a somewhat difficult time establishing workable procedures for ASE, AMSAT has filled all orders to date. If you would like a sample list of ASE software, write to AMSAT Software Exchange, Box 27, Washington, DC 20044. ASE also operates a dial-in Computer Bulletin Board by N5AHD in Texas. Users may interconnect their computers by using a 300-baud rate and dialing 512-852-8194. Once logged in, you can obtain information, pick up messages left for you and deposit messages for others to pick up. *(AMSAT 1982 Annual Report)*

PACSAT

Just as AMSAT led the way in the 1970s with the pioneering Mode A, B and J transponders on the AMSAT-OSCAR 6, 7 and 8 satellites, AMSAT intends to be the leader in amateur digital communication by providing PACSAT, the first all-digital satellite. PACSAT is a challenging new concept, to be sure. Basically a "flying mailbox," PACSAT will be a digital store-and-forward repeater satellite. It is scheduled to be launched sometime next year. The banner for this new concept is being carried by PACSAT Project Managers KD2S and W3IWI. Amateur digital communication techniques are evolving rapidly, and several AMSAT members have been at the forefront. Much of the background describing this concept and its place in AMSAT's long-range planning will unfold soon in *ASR* and *ORBIT*. For a fanciful preview of what PACSAT could mean to you and Amateur Radio, refer to *ORBIT* no. 1, March 1980, page 20.

Recently, AMSAT sponsored a meeting of packet radio experts to help define suitable protocols for both PACSAT and the Phase III AMICON Special Service Channel (SSC). The protocol that emerged seems destined to be the standard for all packet radio activities — involving both satellites and "down-to-earth" applications.

Several important PACSAT milestones have already been passed. G3YJO has met with officials of Space Services, Inc. (SSI) of Houston, including former astronaut "Deke" Slayton. Early in 1982, SSI successfully launched a small demonstration rocket from Texas. SSI wants to commercialize space, and AMSAT wants to work with SSI to the mutual advantage of both organizations. Thus, AMSAT may build a satellite payload package for SSI in return for SSI's placing PACSAT in an orbit similar to that of AMSAT-OSCAR 8.

PACSAT will add an important resource for Amateur Radio. Equally important, it will underscore our credibility as a leading force in the development of new technology. This is vital to ensure our continued access to new launch opportunities for all AMSAT projects. In this "game," it's evolve or perish; innovate or be displaced by others who are more innovative and who are fighting to fly their projects. Moreover, current trends toward digital activities have created a new set of enthusiasts who can benefit significantly from affiliation with AMSAT. Because of this wave of enthusiastic people, because of the possibility of attracting computer hobbyists into AMSAT and because of the keen interest in many quarters, we are confident PACSAT will be "self-funding." Thus, PACSAT will augment, rather than deplete, other AMSAT projects and activities. *(AMSAT 1982 Annual Report)*

Satellite Listening Post

The times and dates (Central North America Time Zone, not UTC) shown below are approximate. During these weekend periods, you can listen to amateur communication on the 10-meter downlinks between 29.300 and 29.500 MHz.

March 5 - 6 — 3:50-6:00 A.M. and 2:40-4:10 P.M.
March 12-13 — 2:00-4:00 A.M. and 1:40-4:00 P.M.
March 19-20 — 2:00-4:00 A.M. and 12:20-3:30 P.M.
March 26-27 — 1:35-3:40 A.M. and 12:10-2:20 P.M.

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $18 ($25 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ Project OSCAR 1983 Annual Orbital Predictions for every orbit of AMSAT-OSCAR 8 and RADIOs 5, 6, 7 and 8 are available for $10 postpaid in Canada, Mexico and the U.S.; $12 elsewhere. Send to Project OSCAR, Inc., P.O. Box 1136, Los Altos, CA 94022.

☐ ARRL members only: Send a 4- × 9-in. self-addressed, stamped envelope with your call sign to ARRL Hq. Club and Training Department for a complete, monthly orbit schedule for all operating amateur satellites. A year's supply of s.a.s.e.'s may be sent at one time; be sure to include 1 unit of postage for each s.a.s.e.

☐ Further information on the Amateur Radio Satellite Program can be obtained free of charge from ARRL Hq. The OSCARlocator package (satellite plotters and details) is now available for $7 U.S., $8 elsewhere.

*OSCAR Program Manager, ARRL

Strays

THE HAM IN SHAKESPEARE

☐ Was Old Bill into Amateur Radio? No caps, no coils, no circuit boards have turned up yet in Shakespeare memorabilia, but reading through his works suggests he had a not-so-peripheral involvement with ham radio. There was reason for him to suppress such an activity, as it may have smacked, during that era, of sorcery. Herewith, I bring thee some passages as proof:

- "Lead their charges off a little from this ground": *Julius Caesar*, Act IV, Scene 2
- "Do De, De, De": *King Lear*, Act III, Scene 5
- "The copy of your speed": *King John*, Act IV, Scene 2
- "Out of tune and . . . unmatched": *Hamlet*, Act III, Scene 1
- "This blasted Heath": *Macbeth*, Act I, Scene 3.

— *Ed Shea, WD8DYY, Toledo, Ohio*

Midwest Division Director Paul Grauer, WØFIR (left), presents an ARRL flag to Des Moines (Iowa) ARC President Ron Kinton, WBØMBZ, in honor of the club's 50-year affiliation with ARRL.

ATTENTION UN-DU AWARD APPLICANTS

☐ U.S. (continental) amateurs applying for the UN-DU Award need not send their QSLs to the Philippines. The award is given to any licensed amateur who has obtained confirmed QSL cards for contacts with at least 100 member countries of the United Nations. For more information, write to Pete Peterson, K6EDV, 845 Ramona Dr., Santa Rosa, CA 95404.

QST congratulates . . .

☐ David Williams, WB8LXA, formerly of Tallmadge, Ohio, on being named Chief of Police for Newport, Kentucky.

☐ David L. Sutherland, N4GMU, of De Land, Florida, on being named that city's Employee of the Year.

The World Above 50 MHz

Conducted By Bill Tynan,* W3XO

The New Capability — How We Can Use It

Last month, I described the Phase IIIB satellite and generally what will be required to access it. That subject will be treated in much greater detail in feature articles to appear shortly in *QST*. I also challenged vhfers to be in the forefront of helping fellow hams learn the techniques necessary to take part in this new facet of Amateur Radio. This worthwhile endeavor of assisting others to break into satellite communication will be the theme of a League-sponsored award program announced in page 52 of this issue.

But, there is more to amateur satellites than fun, challenge and being a good neighbor to fellow hams. There is the utility side. They can serve a practical function in many areas of our hobby, including our particular interest — long-haul propagation on the vhf and uhf bands. Even the low-orbiting satellites, such as OSCARs 6, 7 and 8, as well as the RSs, have demonstrated that amateur satellites can aid in many of our activities. The capability to handle traffic was shown. Regularly scheduled bulletins have been, and continue to be, transmitted. EME schedules were arranged. K2UYH and VE7BBG met regularly on OSCAR 7 Mode B to coordinate 70-cm moonbounce attempts. But the communications capability afforded by low earth-orbiting satellites and that which Phase IIIB is about to provide us is as different as the proverbial night and day. Whereas we were dealing with fleeting contacts spanning perhaps several thousand miles, we will soon have nearly continuous availability covering global distances.

Other than the sheer enjoyment that will be ours from being able to contact hams almost anywhere in the world, Phase IIIB will provide some very practical capabilities for vhfers. Probably the most obvious of these will be the ability to set up schedules for all types of vhf contacts. By establishing a specific frequency within the Phase IIIB passband, we can learn of impending enhanced propagation, such as aurora, E_s or F_2. Think about the advantage of being able to hear from European vhfers that they are in the midst of a super aurora and know that we in North America stand a good chance of experiencing the same conditions within a few hours. There is no frequency anywhere in the hf bands that can be counted on to provide this capability, especially when aurora is present. Usually, when geomagnetic conditions are disturbed enough to produce a good aurora, the low bands are very poor, if not completely dead. By establishing a dedicated channel to service as a regular meeting place for vhfers, in a fashion similar to the manner that 6-meter operators have used 28.885 MHz over the past few years, we can not only quickly circulate information on impending or existing propagation, but we can provide a place to exchange information on techniques, circuits, antennas, or any topic applicable to the world above 50 MHz.

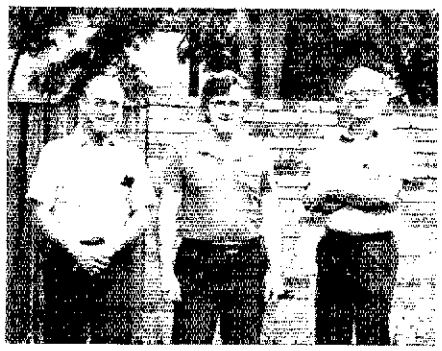
The best place in the passband for a vhf/uhf meeting place is being discussed with the AMSAT operations people, but it will most probably be in the upper end of both the Mode B and Mode L downlink passbands, just below each Engineering Beacon and voice Special Service Channel. For a discussion of the Special Service Channels, see an article by K1HTV and W4OWA in *Orbit*, March/April 1982.

The Phase IIIB satellite will provide us with an opportunity for an exchange of information hitherto unavailable in the entire history of radio. Let's be sure that we, who are the pioneers in using the amateur bands above 50 MHz, are prepared to take full advantage of this new and valuable resource.

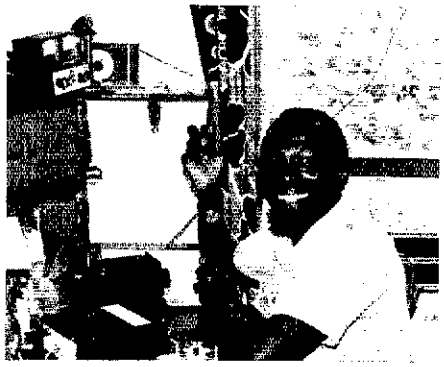
VHF PROGRAM AT NATIONAL CONVENTION

This year's ARRL National Convention is scheduled for Houston, Texas, the first weekend in October. Detailed information on this important annual event will be carried in a forthcoming issue of *QST*. The vhf/uhf program for the convention is being coordinated by the Six Meter International Radio Klub (SMIRK). K5ZMS tells me that among those notables expected to be on hand are W6JKV, who will recount some of his famous DXpeditions; WA8OGS, who will speak on large vhf arrays; K5MB, on antenna matching; WA8ONQ, on design and construction of high-power vhf amplifiers; W1HDQ, on the sun and its influence on vhf propagation; VK8GB, informing us about propagation down under; WB5LUA, with up-to-date information on EME techniques; and AL7C, talking about Aurora in the far north. Others who have stated their intention to be present include EI2W, JA1RJU and this conductor. K5ZMS emphasizes that, although SM1RK is planning to hold its international meeting in conjunction with the Convention, the program being assembled will include subjects of interest to all vhfers and uhfers.

In order to complete such details as the size of meeting rooms and the need for other facilities, K5ZMS needs an indication of the number planning to attend. Ray asks everyone expecting to be present to drop him a postcard or QSL indicating the number in their party. He must have this information before mid-March to complete arrangements with Convention officials. Send to Ray Clark, K5ZMS, 7158 Stone Fence Dr., San Antonio, TX 78227.



Two well-known U.S. vhfers, W5RCI (left) and W4HHK (right), with one of their Australian counterparts, VK6KZ. *(photo via W4HHK)*



A popular Caribbean 6-meter DXer, Errol, J6LOV.

ON THE BANDS

6 Meters — The period covered by this report, mid-December to mid-January, appears to have marked the end of the major F_2 openings. Of course, this assessment could turn out to be incorrect, but conditions certainly collapsed about the beginning of the new year. Unfortunately, the first week in January was the time that W6JKV was finally able to set up a 6-meter station in the Azores. As a result of the kind understanding and cooperation of the Portugese authorities, Jim was allowed to establish a 50-MHz beacon and listen for responses. Until January 8, no success was forthcoming. That was indeed the day of truth, as the group consisting of K6MYC and K6HCP in addition to W6JKV, was due to depart early the following morning. Half of North America hung on every word uttered on 28.885, and listened intently on 50.110, the only 6-meter frequency permitted the trio. Hearts leaped when K6MYC, operating W6JKV/CT2, announced over the 10-meter liaison frequency that they were hearing K8MMM's cw signals 5 kHz below their frequency. Moments later, Mike announced that Jim had exchanged signal reports with Tom. Everyone waited to find out who would be next. Unfortunately, no one was. The only 50-MHz signal heard by the three, who had traveled some 5000 miles in the interest of furthering Amateur Radio in general and our knowledge of vhf propagation in particular, was that of K8MMM near Cleveland. Tom's four-bay array at 100 feet was certainly a contributing factor to his getting through. But if propagation had been just a little better, others would have made the grade as well. In the late fall, and up to about two weeks earlier, CT2EE had been able to complete a number of cross-band exchanges.

W6JKV is desirous of returning to CT2 this summer during E_s season. But, more, he hopes for some kind of 6-meter operating privileges for CT2 residents. He feels that if the proper authorities can be shown evidence that amateurs in other Region 1 countries have been permitted to use the band, even if under specified conditions, chances might be better. Photocopies of permits or licenses from European and

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late breaking information.

African countries explicitly authorizing operation on 50 MHz would be very helpful in this endeavor. Those foreign operators wishing to assist are asked to send such photocopies to this conductor, in care of ARRL Hq. I will see to it that they get to the right people.

During the final two weeks of 1982, good openings were still being reported. K1FJM/4 near Miami says that December 17 brought an excellent West Coast session with very strong signals from 6s and 7s. In addition to working a number of them, Pete came up with state number 49 by virtue of a contact with KH6IAA. The following day, W2IDZ reports working HC2FG, PJ9EE, DL3ZM/YV5, TI2HL and 8P6CX. In addition, Ed heard YV4ABC and OA8CW. K4GL South Carolina found Sunday morning, the 19th, especially rewarding. Using his aged Swan 250 and homemade *Handbook* 4-element beam, Jack snagged J6LOV, 8P6CX, DL3ZM/YV5 and HC2FG. He feels that his "Good Luck" phonetics help. WA8LXJ Ohio lists many of the same stations, and notes a crossband with CT2EE on the 19th. The 20th was a big day for many, including this conductor. After chasing and missing OA8V and OA8CW for several months, that Monday morning turned out to be the charm. About 1415Z, the cw signal of OA8CW started to be heard along the East Coast, and he began working stations right away. Signals built up, and OA8V took over the pileup at about 1440. By 1600, he was 599, but disappeared about 30 minutes later. An over-two-hour opening to their Amazon jungle QTH had netted a new country for many happy 6-meter operators.

It's always nice to get letters from those for whom the thrill of long-haul vhf contacts is something brand new. It's still a thrill to this conductor after more than 30 years. One recent letter was sent by WB4RGQ Daytona Beach, Florida. Like many, Tom had spent some time on fm, but decided to give 6-meter ssb a try. After acquiring a Swan 250 and an antenna cut for the right end of the band, he was ready when the F_2 of December 17 arrived. After working a string of 6s, he hooked up with both KH6IAA and KH6JJI, and heard the KH6EQI beacon with S9-plus-20-dB signals.

The North Atlantic F_2 path put in what may have been its last stand during the final days of December. From New Hampshire, WA1OUB reports crossband contacts on the 27th, between 1451 and 1513Z, with G4GLT, G4BPY, G4IDE, G3WBQ, G3TCT and G4JCC.

Following receipt of authorization from their licensing authority, the GB3SIX beacon commenced 24-hour-per-day operation on December 28. Prior to this, beacon keeper GW3NNF says, it was on only from 0100 to 0830 local time. Located on the island of Anglesey, just off the northwest coast of Wales, it runs 25 W to a 3-element beam pointed at North America. The frequency is 50.020. It is understood that several U.S. stations heard GB3SIX on the 28th, but no reception reports have been received since that time. A lot of people will be listening for it during the summer E_s season.

As reported earlier, it appears that some 40 permits are to be issued to U.K. amateurs authorizing operation on 50 MHz outside of TV hours. As of this writing, further word is awaited on the specific stations that will be afforded this privilege.

In some DX news a long way from home, ZL1MQ writes that A35GW has recently become active on 6 meters and managed to work a pile of ZL1s and 2s on the last day of the old year. It is understood that he will be on Tonga until about June 1984.

From Montserrat, VP2MO writes that he regularly monitors 50.110. Since November 1981, when he got on the band with a 620B and a 6-element beam, Errol has worked 39 countries on all continents and 44 U.S. states. His QSL manager is KA4BOT.

WA1OUB (FN43) took good advantage of the Quadrantids meteor shower and the E_s of early January to get off to a good start in his quest for VUCC. Bob managed to exchange grids with some 30 stations in the 3rd, 4th, 8th, 9th and ϕ call areas.

An error appeared in last month's column concerning the recommendations of the SMIRK Board with respect to mode utilization on 6 meters. They propose that 50.2 be the *domestic* calling frequency, not the DX calling frequency as reported. They urge the retention of 50.110 as the DX calling spot.

2 Meters — The big aurora of January 9 and 10 certainly qualifies as the major 2-meter news this month. WB9MSV (EN50) considers this to be one of the best buzz sessions in the past year in terms of strength of the signals and the length of time it lasted. Larry thought that it even surpassed the big aurora opening of last July. As proof, he submits activity sheets listing contacts with 56 different stations in 19 states. He landed two new states, W0RLI/1 Massachusetts and WA1JEX Vermont. His only complaint was that only a few of those worked were giving their grids. Aurora certainly provides a great opportunity to collect grids, so it would be a good idea if everyone knew their grid designator in order to help those trying for VUCC (see January *QST*, page 49). N3ET (FN20) was also in on the fun. Although the session began about 0100Z, and he did not get home until about 0230, he nevertheless came up with three new states, bringing his total to 20.

A letter from PY2BBL passes along information on TE QSOs that have been taking place between Brazil and the Caribbean beginning in September. PY3BZM was the station involved, working J73PD and other Dominica stations, as well as Martinique. One of the unusual aspects of this is that all contacts except one were on 146.52 fm. One was on 144.3 ssb. PY3BZM uses 100 W to a 15-element Yagi, and J73PD runs 10 W to an Isopole. It is unusual for such work to be accomplished on fm, and it certainly attests to the strength of the signals.

The other piece of international news comes via WA0LSH, who announces an EME contact completed January 4 with KG6DX on Guam. This is thought to be the first moonbounce success for that station so well-known to 6-meter operators. The following day, KG6DX worked VE7BQH. KG6DX is said to be using a four-Yagi array. WA0LSH notes that he also uses only four Yagis. Another example of a four-Yagi-to-four-Yagi QSO. KG6DX will certainly be welcome as a new DX catch on 2-meter EME.

1-1/4 Meters — K4GL writes from Pickens, South Carolina, that he has 650-W output from a pair of 4CX250Bs. Jack sports two antennas: an array of eight 8-element quagis at 70 feet for terrestrial work, and a similar arrangement for EME. His problem is that he can operate only when the nearby Channel 13 TV station is off the air, from 0700 to 1100Z. K4GL is open for skeds with anyone willing to try during those hours.

Another vhfer has taken the plunge into 1-1/4-meter EME. It's W9UD, whose first QSO, on December 30, was with (you guessed it) K5FF. On the terrestrial side, K5FF picked up state number 31 during the Quadrantids by virtue of a contact with WA4CQG Alabama. They were both happy, as New Mexico represented 1-1/4-meter state number 21 for Dale.

WA3GOO in the Philadelphia area wishes it known that there is 220-MHz ssb activity on other evenings besides the regular Tuesday evening Activity Night. Vic says that he is there most evenings looking for contacts.

70 Cm — The *432 News*, put out by W0OHU, makes the point that, especially during the colder months, foggy conditions often mean enhanced tropo propagation. Ed notes that this appears to be true, at least in his upper midwest part of the country, and speculates that it probably holds for other areas as well. The same issue also has some good things to say about the VUCC and the grid system, and urges everyone to learn their designators. One of main purposes of the *432 News* is to list regularly kept schedules. This issue notes some 74 of them in various parts of the country. There should be no lack of signals to listen for on most evenings, at least.

I would expect the aurora that produced such good signals on 2 meters the evening of January 9 also made itself felt on this band. However, no reports have come in as of this writing (January 16), either by mail or via the telephone answering machine. One might conclude either that no one was on to catch the opening, the aurora didn't get up as high as 432 MHz, or no one bothered to report it. Unusual propagation on this band and higher, particularly of the ionospheric variety, is always newsworthy and hence warrants reporting. The answering machine is there to collect late-breaking information, such as an especially good opening that occurs near the mid-month column deadline. Maybe by the April issue I'll have something on how the January 9 aurora may have affected 70 cm.

70-Cm Standings

For WAS holders, listing is WAS number, call, state and 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 16, 1983.

WAS Holders

1	W0YZS*	MO	—
2	K2UYH*†	NJ	48
3	K5JL*†	OK	—
4	WB5LUA*	TX	41
5	W5FF	NM	18
6	W1JR*	MA	45

AD1C*	MA	33	10
K1PXE	CT	25	11
K1FO	CT	23	8
K1LPS*	VT	20	12
W1XJ	RI	15	5
W1GXT	MA	13	6
W1HDQ	CT	11	4
N1AIS	MA	11	4

K2RIW*	NY	28	12
W2VC	NJ	25	8
K2LGJ*	NY	24	10
W2BLV	NJ	24	7
W2DWJ	NJ	21	7
W2AZL	NJ	21	7
W2PGC	NY	20	10
W2CNS	NY	19	10
WA2FGK	NJ	18	7
K2YCO	NY	17	6
WA2FUZ*	NY	17	8
K2OVS	NY	16	5
W2CRS	NY	16	—
N2EO	NY	13	5
WA2TIF	NY	13	5
K2SHB	NY	12	5
WA2YWP	NY	12	6
WA2PVV	NY	10	5
WA2PMW	NY	10	5

K3QCQ*	PA	35	26
W3RUE	PA	30	10
W3OZ*	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
N4CD	VA	19	6
WB4NMA	GA	17	6
WB4EXW	NC	17	6
KG4P	AL	16	5
K4GL	SC	16	7
K4QF*	AL	12	8
WD4MUO	VA	12	5
K4LHB	VA	12	6
WD4CXU	VA	11	4
K4KAE	SC	8	2
K4KJP	FL	6	2
K5FF*	NM	32	11
W5UKQ*	LA	24	9
W5HN	TX	23	7
W5RCI	MS	22	6
WA5HNK	TX	16	6
K5JRH	TX	15	4
N4JS/5	MS	13	5
K5LLL	TX	11	6
WA5TBE	TX	9	3
W5UWB	TX	8	3
W5DC	LA	8	—
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
WA8VPD	MI	22	8
K8AXU	OH	20	8
WB9SNR	IL	33	11
W9JIY	IN	28	9
W9UD	IL	28	9
WA9HUV	IL	27	10
W9AAG	IL	27	8
K9XY*	WI	21	11
K9SM	IL	17	7
KB9NM	WI	9	3

K0TLM*	MO	42	21
WB0TEM*	IA	42	—
W0RAP*	IA	34	22
KA0Y*	IA	28	9
W0DRL	KS	24	9
K0DAS	IA	23	7
K0VXM*	SD	21	11
W0OHU	MN	20	6
K0ALL*	ND	19	8
W0LER	MN	18	6
K0CJ	MN	17	6
W0VB	MN	17	6
W0PW	CO	15	5
WB0IUT	NE	13	4
K0WLU	SD	10	3
WA0NOK	MO	9	3
W0SD	SD	7	2
KL7WE*		8	6
VE7BBG*†		39	32
VE4MA*		23	28
VE2DFO		12	7
VE3AIB		11	7
VE1RC		3	2
JA9BOH*		18	31

*Indicates WAC
†Indicates some EME contacts

Hamfest Calendar

Conducted By Marjorie C. Tenney,* WB1FSN

Colorado: The Grand Mesa Repeater Society will hold the fourth annual Western Slope Swapfest on Saturday, April 2, from 10 A.M. to 4 P.M. at the Plumbers and Steamfitters Union Hall, 2384 Hwy. 6 & 50, Grand Junction. Admission is free and swap tables are $5 each. Features will include an auction, prizes and refreshments. Talk-in on 22/82. For further information, send s.a.s.e. to Bill Brown, KØUK, 582 S. Maple St., Fruita, CO 81521 or tel. 303-858-9661.

Connecticut: The ICRC Flea Market will be held March 20, from 11 A.M. to 5 P.M., at the Farmington Youth Center, 99 School St., Unionville, just off the Rte. 4 and 177 junction. Limited tables at $6, space at $4 (bring your own table). Donation at door $1. Refreshments. Write ICRC, 22 Woodside La., Plainville, CT 06062 for reservations.

†**Florida:** The 1983 North Florida Swapfest sponsored by Playground ARC (PARC), will be held at the Fort Walton Beach Shrine Fairgrounds, SR 189, Fort Walton Beach, March 12-13. Hours on Saturday are 8 A.M. to 4 P.M.; on Sunday 8 A.M. to 3 P.M. Advance tickets $2, at the door $3, women and children free. Forums and contests, including a homebrew contest. Craft tables. QCWA, MARS, TEN-TEN and ARRL. Talk-in on W4LRC repeater, 19/79, call W4ZBB. Large indoor swap area — tables can be reserved early. For info and reservations write PARC, c/o Joe P. Giangrosso, WD4JZG, P.O. Box 3075, Fort Walton Beach, FL 32548, tel. 904-863-2829.

†**Florida:** The Fort Myers ARC hamfest will be held at the Fort Myers National Guard Armory, Fort Myers, March 12. Gates open at 8 A.M. to 4 P.M. Swap tables and dealers at 7 A.M. Admission is $2. Swap tables, $6 plus admission; tailgaters, $4 plus admission; dealers $10. Information and reservations from David Fox, KA8CXQ, P.O. Box 051131, Tice, FL 33905. Please enclose s.a.s.e. Talk-in on 28/88.

Illinois: The Sterling/Rock Falls ARS 23rd annual hamfest will be held March 20 at the Sterling High School Fieldhouse, 1608 4th Ave., Sterling. Commercial distributors, dealers and a large flea market. Plenty of parking and space for self-contained RVs overnight. Concession stand available. Doors open at 7:30 A.M. Tickets in advance $2, at the door $2.50. Flea market tables requiring electricity and all commercial tables $5, all others $3. For advanced tickets, tables and information, contact Sue Peters, 511 8th Ave., Sterling, IL 61081 or call 815-625-9262. Talk-in on W9MEP 25/85.

Illinois: LAMARSFEST 1983 sponsored by the Libertyville and Mundelein ARS will be held Sunday, March 27 at the Lake County Fairgrounds, Rtes. 45 and 120, Grayslake. Commerical setup from 6:30 A.M., other from 7 A.M. Public admitted at 8 A.M. Tickets in advance $2, at the door $3. Tables (9 foot) at $5 each, choice locations first (reservations encouraged). Commercial exhibitors contact LAMARS for information. Parking, breakfast and lunch available. Talk-in on 63/03 or 94 simplex. For tickets, table reservations or exhibitor information, send s.a.s.e. to: LAMARS, P.O. Box 751, Libertyville, IL 60048.

†**Indiana:** The Randolph ARA 4th hamfest is Sunday, March 13 from 8 A.M. to 5 P.M., in the Winchester National Guard Armory. Dealers, flea market, prizes, food and drink, and programs all inside. Ticket donation $3, under 12 years free. Table space (by reservation only) $5 with table, $2.50 without. Setup on Saturday 6 to 8 P.M. and Sunday 6 to 8 A.M. Talk-in on 90/30, 224.90/223.30 and 50. For reservations and information, contact RARA, Box 203, Winchester, IN 47394 or Jake Life, W9VJX, tel. 317-584-9361.

Indiana: The Martinsville Hamfest will be held on March 13. Sponsored by the Morgan County ARC, it will be held indoors at the Morgan County 4-H Building & Fairgrounds. Admission is $4 at the door, $3 advance, children 11 and under free. Flea market with table $5, without table $3. Premium table $20. Tables available on first come basis, best spaces assigned first. Doors open to general public at 8 A.M.; vendor setup starts at 5 A.M. Talk-in on 66/06. For tickets, table reservations, and information, send s.a.s.e. to Aileen Scales, KA9MBK, 3142 Market Pl., Bloomington, IN 47401.

†**Kentucky:** The Elizabethtown, KY Hamfest, sponsored by the Lincoln Trail ARC, will be held on March 26 from 6 A.M. to 5 P.M. E.S. time. Advance admission $3, at the door $4. All indoors, heated or air conditioned, food available. Restaurants and motels in four mile area of hamfest. KY state ARRL spring meeting and forums. Talk-in on 38/98 and 52 simplex. For information and reservations contact M. D. Hill, KA4BYA, RR 2, Box 204, Cecilia, KY 42724, tel. 502-862-4388.

†**Maryland:** The Baltimore ARC, Inc. (BARC) will present the 1983 Greater Baltimore Hamboree and Computerfest on March 27 at the Maryland State Fairgrounds Exhibition Complex at Timonium. Indoor flea market and large dealers display area in two modern exhibit halls. Amateur radio, personal computer, and small business computer dealers featured. Guest speakers including Vic Clark, W4KFC, President of ARRL. Large hard surface outdoor tailgate area. Food service, parking. Fairgrounds are located east of I-83 exit 17, three miles north of I-695 north of Baltimore. Gates open at 8 A.M. Admission is $3, children under 12 free. Overnight accommodations available in immediate area. For additional information and table reservations, contact G B H & C, P.O. Box 95, Timonium, MD 21093-0095, tel. 301-561-1282. For a recorded announcement dial: 301 HAM-TALK.

†**Louisiana:** Acadiana ARA Hamfest '83 will be held at Carencro High School, March 12-13. Hours will be from 9 A.M. to 5 P.M. Saturday, and 9 A.M. to 1:30 P.M. Sunday. Commercial distributors, flea market, DX forums, food and beverages on location. Camping (self-contained only-no facilities). Activities for all of the family. Easy access and parking. For further information contact Richard Ipson, N5BYM, tel. 318-896-4492.

Michigan: The 21st annual Michigan Crossroads hamfest will be held at the Marshall High School, Marshall, on March 19. Sponsored by Southern Michigan ARS and Calhoun County Repeater Assn. Doors open at 7 A.M. for exhibitors, 8 A.M. for buyers and lookers. Plenty of parking and carry-in help available. Food service in cafeteria. Table space at $.50/foot. Advance tickets, $1.50, at the door, $2. For tables or tickets contact SMARS, P.O. Box 934, Battle Creek, MI 49016 or call Chuck Williams, tel. 616-964-3197.

Minnesota: The Rochester ARC and the Rochester Repeater Society will sponsor the 6th annual Rochester Area Hamfest (Minnesota), on Saturday, April 9. Doors will open at 8:30 A.M. at the John Adams Junior High School, 1525 NW 31 St., Rochester. Large indoor flea market for radio and electronic items, refreshments and plenty of parking. Talk-in on 22/82. For further information contact RARC, c/o WBØYEE, 2253 Nordic Ct. N.W., Rochester, MN 55901.

Missouri: The Jefferson Barracks ARC is holding their annual auction and hamfest on March 11 at the Carondelet Sunday Morning Athletic Club in South St. Louis. This is just off Hwy. 55, on Loughborough Ave., south of Carondelet Park. Doors open at 6 P.M., auction at 7:30 P.M. Talk-in on 94/34. For further information contact JBARC, 9400 Dana Ave., St. Louis, MO 63133.

New Hampshire: The I.R.S. flea market sponsored by the Interstate Repeater Society will be held at the Hudson Lion's Club Hall, Lions Ave., Hudson, on March 12 from 9 A.M. to 4 P.M. Admission is $1. Flea market, exhibitors, food concession. Talk-in on 25/85 and 52. For information write to the Interstate Repeater Society, P.O. Box 693, Derry, NH 03038.

New Hampshire: The 3rd annual hamfest-fleamarket sponsored by the Great Bay Radio Assn. will be held on Saturday, April 9, at the Somersworth Armory, Somersworth, from 9 A.M. to 3 P.M. Food and refreshments available. Parking. Entrance fee $1. For advance registrations and further information write Great Bay Radio Assn., P.O. Box 911, Dover, NH 03820.

†**New Jersey:** Shore Points ARC invites everyone to "Springfest '83" Saturday, March 12, from 9 A.M. to 3 P.M. at the Atlantic County 4-H Center, Rte. 50, Egg Harbor City (near Atlantic City). Buyers and sellers can make their deals inside 8000 square foot heated building with commercial power available and outside covered tailgating spaces. Admission $3 at the gate, $2.50 in advance; sellers $5 per space (bring own table); women and children free. Refreshments available. Talk-in on 146.985 and 52. Info and reservations: SPARC, P.O. Box 142, Absecon, NJ 08201.

New Jersey: The Irvington RAC hamfest is Sunday, March 13, from 9 A.M. to 4 P.M. at the P.A.L. Building, 285 Union Ave., Irvington. Take Garden State Pkwy. to Exit 143 North of 143A South. Talk-in on 34/94 or 52. Refreshments. Admission $1, tables $3. Reservations: contact Ed, WA2MYZ, 2133 Stanley Terr., Union, NJ 07083, evenings tel. 201-687-3240.

New Jersey: A ham radio flea market sponsored by the Chestnut Ridge Radio Club will be held on Saturday, March 19, at the Education Building, Saddle River Reformed Church, East Saddle River Rd. at Weiss Rd., Upper Saddle River. Tables $10 for the first, $5 for 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: The Delaware Valley Radio Assn. will hold its 11th annual flea market on Sunday, March 13 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, prizes, refreshments including breakfast at 7 A.M. Sellers bring own tables. Talk-in on 52 and 07/67. For further information write - D.V.R.A., P.O. Box 7024, West Trenton, NJ 08628 (s.a.s.e., please).

†**Ohio:** The Toledo Mobile Radio Assn., Inc. presents its 28th annual auction and hamfest, Sunday, March 20, at the Lucas County Recreation Center in Naumee. Hours are 8 A.M. to 5 P.M. Tickets are $2.50 in advance and $3 at the door. Tables are $10 in advance and $15 at the door. Auction, flea market, and other activities. For more info, write to J. Honisko, KB8YD, 1733 Parkway Dr., North Maumee, OH 43537, tel. 419-893-2296.

†**Ohio:** The Lake County ARA will present their fifth annual Lake County Hamfest and Computer Fest, Sunday, March 27 at Madison High School, Madison. Doors open for exhibitors at 5:30 A.M. and for the public at 8 A.M. to 4 P.M. Large indoor location. Admission is $2.50 advance and $3.50 at the door. Table and display space is $5 for 6 foot table, $6.50 for 8 foot table. Talk-in on 81/21. Information and reservations available by sending s.a.s.e. to Lake County Hamfest Committee, 37778 Lake Shore Blvd., Eastlake, OH 44094, tel. 216-953-9784.

†**Ohio:** The Teays ARC, Circleville, will hold its sixth annual "King of the Pumpkin Hamfest" on Sunday, March 20, from 8 A.M. to 4 P.M., at the Pickaway County Fairgrounds Coliseum. Large parking area, food. Tickets are $2 advance, $3 at the door. Talk-in on 52 and 78/18. Open for setup Saturday 4 P.M. Overnight security provided. For information contact Dan Grant, W8UCF, 22150 Hulse Rd., Circleville, OH 43113, tel. 614-474-6305 (s.a.s.e. preferred).

Ontario: The Durham Amateur Radio Flea Market, sponsored by the South Pickering ARC, will be held on April 9, from 8 A.M. to 2 P.M. (open to vendors at 6 A.M.) at the Ajax Recreation Centre, Ajax. Admission is $2. Talk-in on 147.72/147.12 and 147.975/147.375. For more information, contact Phil Washburn, VE3HAA, 34 Albery Crescent, Ajax, ON L1S 2Y3, tel. 416-683-3368.

Ontario: The Peel ARC flea market will be held on Saturday, March 12, from 9 A.M. to 2 P.M. at the Trinity Club, 1194 Matheson Blvd., Mississauga. Commercial displays, new and used parts and equipment, refreshments, parking. Admission $2, children under 12 free, flea market tables $2 each, maximum two, dealer tables $10 each, maximum four. Talk-in VE3PRC, 52 or 6.28/.88. Advance reservations on tables suggested — payment by check or money order to Peel Amateur Radio Club, P.O. Box 311, Brampton.

Oregon: The Walla Walla Valley RAC will hold its annual swapfest, Sunday, March 20, at the Milton-Freewater Community Bldg. Doors open 8 A.M. Large tables $5 each, payable at door — radio electronic gear only. Free admission for buyers. Antique

†ARRL Hamfest
*Convention/Travel Coordinator, ARRL

display, refreshment stand, and an auction at 1 P.M. Make your own deals, swap, sell or horsetrade. Here's your chance to buy or sell. Frequencies monitored: 52, 20/80, 28/88, 04/64 and 3960.

Oregon: The 3rd annual Salem Mini-Hamfair will be held again this year at Rickreal at the Polk County Fairgrounds on Saturday, March 26, from 10 A.M. to 6 P.M. Swap tables, commercial exhibits, seminars, registration tables for other area hamfairs. For more information contact WA7OWM, Lynn at 1629 Georgia S.E., Salem, OR 97302. This hamfair is cosponsored by the Oregon Coast Emergency Repeater Assn. and the Snow Peak Repeater Assn.

Pennsylvania: The Penn Wireless Assn. Inc. will hold its TRADEFEST '83 on Sunday, March 27 at the National Guard Armory, Southampton Rd. and Roosevelt Blvd. (Rte. 1), half mile south of PA Tpke. Exit 28. Sellers space (6 × 8) $5. Bring tables, limited number of power connections, $3. General admission $3. Refreshments, rest areas, and displays and surprises. Talk-in on 146.715 and 52. Contact Mark Pierson, KB3NE, 12517 Nanton Dr., Philadelphia, PA 19154.

Pennsylvania: The sixth annual hamfest of the Conemaugh Valley ARC will be held on Sunday, March 27 at the East Taylor Fire Hall, Rte. 271, 5 miles south of Rte. 22 (4 miles north of Johnstown). Hours are 8 A.M. to 4 P.M. Food and refreshments available. Talk-in on 34/94.

†**Pennsylvania:** The first annual southern Alleghenies Hamfest will take place April 10, from 8 A.M. to 4 P.M. at the Bedford County Fairgrounds, located near Bedford at Rtes. 30 and 220 (bypass). Sponsoring organizations are the Bedford ARC, Somerset ARC, Altoona (Horseshoe) ARC, Cumberland (MD) ARC, and Blue Knob Repeater Assn. Talk-in on 145.49 and 147.15. Admission $3. Large tables available for $5. Large heated building, demonstrations, food, dealers, displays, ARRL booth and more! For more information contact Tom Gutshall, W3BZN at 814-942-7334.

Texas: The Midland ARC will hold its annual St. Patrick's Swapfest beginning Saturday, March 19 at 8 A.M. to 6 P.M. and continuing on Sunday, March 20 at 8 A.M. to 3 P.M., at the Midland County Exhibit Building, east of Midland on Hwy. 80, north side. Refreshments. Pre-registration is $5, $6 at door. Tables $4 each. Talk-in on 16/76 and 01/61. For further information and reservations, please contact Midland ARC, P.O. Box 4401, Midland, TX 79704.

Texas: The MSC ARC, W5AC, Texas A&M University, College Station, will hold its annual hamfest on March 26 at the Zachry Engineering Center on the Texas A&M Campus. Technical seminars by faculty and distinguished Amateur Radio operators scheduled between 9 A.M. and 3 P.M. Tables may be loaded and tuned starting at 7 A.M. Xmtr hunt in afternoon, tours of W5AC shack conducted. Admission is free and tables are $4 each. Contact W5AC, Student Programs Office, Box J-1, College Station, TX 77844.

Washington: The Mike & Key ARC is holding its 2nd annual Electronics Flea Market on March 26-27 at Longacres Racetrack near Renton. Amateur and commercial tables. Admission is $1 on Saturday and 50¢ on Sunday. Buffet dinner Saturday night with guest speaker Chris Imlay, N3AKD, ARRL legal counsel. Reservations are required, so get them in early. To make table or dinner reservations, call 206-883-3012 or write Electronics Flea Market, P.O. Box 388, Redmond, WA 98052-0388. Reservations accepted through March 19.

Wisconsin: The Tri-County ARC will hold its annual hamfest on March 20, from 8 A.M. to 3 P.M., at the Jefferson County Fairgrounds, Jefferson. Tickets $2.50 in advance, $3 at the door. Tables $2.50 in advance and available at the door for $3.50. Parking, food. Talk-in on 52, 22/82 and 144.89/145.49. For more information, advance tickets, tables, send an s.a.s.e. to Horace Hilker, K9LJM, P.O. Box 204, 261 E. High St., Milton, WI 53563.

Wisconsin: The Madison Area Repeater Assn., Inc., (MARA) is pleased to announce its eleventh annual Madison Swapfest which will be held on Sunday, April 10, at the Dane County Exposition Center Forum Bldg., Madison. Doors open at 8 A.M. for commercial exhibitors and flea market sellers and at 9 A.M. for general public. Forum building has over 20,000 square feet of space for exhibitors and flea market and plenty of parking space. Hotel accommodations available within walking distance. A large variety of equipment and components for hams, computer hobbyists and experimenters. Pancake breakfast and Bar-B-Q lunch available. Admission $2.50 in advance, $3 at door, children 12 and under admitted free. Flea market tables $4 each in advance, $5 at door. Reserve early as tables were sold out last year. Talk-in on WR9ABT, 146.16/76. For reservations or more information, write to M.A.R.A., P.O. Box 3403, Madison, WI 53704. QST

Coming Conventions

March 19-20
Roanoke Divison, Charlotte, NC

March 26-27
Arkansas State, North Little Rock

March 26-27
Georgia State, Columbus

April 9-10
Missouri State, Kansas City

April 16-17
Midwest Division, So. Sioux City, NE

April 23-24
Mississippi State, Jackson

ARRL NATIONAL CONVENTIONS

October 7-9, 1983
Houston, Texas

July 20-22, 1984
New York, New York

September 27-29, 1985
Louisville, Kentucky

ROANOKE DIVISION CONVENTION March 19-20, 1983, Charlotte, North Carolina

ARRL President Vic Clark, W4KFC, will be an honored guest at the expanded Charlotte Hamfest and Computerfair, site of the 1983 Roanoke Division Convention. This year all forums have been moved to the second floor of the Charlotte Civic Center, giving a quieter environment for the forums and making additional flea-market space available on the main floor.

Again, 140 booths have been allocated to commercial exhibitors and indications are that, as in the past, most major manufacturers and dealers will exhibit their wares at Charlotte Hamfest and Computerfair. DXers will appreciate the fact that Don Search, W3AZD, the ARRL DXCC Coordinator, will be on hand to validate QSLs for DXCC credit. No need to spend money on postage, no need to risk losing your QSLs in the mail. Bring them to the Charlotte Hamfest, let Don check them over, then take them home with you.

Many interesting forums have been planned, including (unofficial) world-record-setting P42E with a slide presentation of the operation from Curacao, and a report by P. S. Rana, 9N1NFO, on the DXpedition to Katmandu, Nepal, as well as a report by John Kanode, N4MM, of the League's DX Committee.

Spouses and youngsters alike will enjoy a visit to Charlotte's year-old, hands-on science museum, Discovery Place, or to the Nature Museum, or to the Mint Museum of Art. Spouses might save enough to pay for the trip by shopping at Outlet Square.

The Reed Gold Mine, a short drive outside Charlotte, has been restored by the state and can be visited as well as the nearby museum on gold in N.C. You can try your hand at panning for gold if you wish.

Come and meet your friends. Keep abreast of what is new in the world of ham radio. All this and more are being offered at the 1983 Charlotte Hamfest and Computerfair/Roanoke Convention.

ARKANSAS STATE CONVENTION March 26-27, 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 March 26 and 27, 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 Ramada Inn, with guest speaker Larry Price, W4RA, ARRL Vice President. New equipment dealers, flea market, MARS coffee, DX program. Hours: 9 to 5 Saturday and 9 to 2 Sunday. Free admission. Talk-in on 146.34/94. Many awards. For full details on the 1983 All-Arkansas Hamfest, contact Ken Hazlett, N8BVV, 801 S. Rodney Parham Rd., Apt. 12-C, Little Rock, AR 72205.

GEORGIA STATE CONVENTION March 26-27, Columbus

The Columbus Amateur Radio Club welcomes you to the ARRL Georgia State Convention and 25th annual hamfest, to be held on Saturday and Sunday, March 26-27, at the Columbus Municipal Auditorium, Columbus.

Lots of outdoor flea market space, indoor tables $5 per table per day. Meetings and forums include ARRL Forum, ARES meeting and also Don Search, W3AZD, will be on hand to check QSL cards for DXCC. Be sure to bring completed paperwork. There will be a Wouff Hong ceremony (place and time to be announced at hamfest). Lots of activities.

Talk-in will be on the CARC repeater, 146.01-61; rag chew on 28/88. Ample hotel space nearby. Parking at Municipal Auditorium for *self-contained campers only*.

There is no registration fee. Donation tickets available at the door: 1 for $1, 6 for $5, 13 for $10. For more information, contact CARC, P.O. Box 6336, Columbus, GA 31906.

MISSOURI STATE CONVENTION April 9-10, Kansas City

The PHD Amateur Radio Association, Inc. of Liberty, Missouri, will sponsor the 1983 Missouri State ARRL Convention (14th Annual Northwest Missouri Hamfest) on Saturday and Sunday, April 9-10, in the Trade Mart Building at the Downtown Kansas City, Missouri Airport.

There will be a complete program of forums: ARRL, DX, 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. on 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 be David Sumner, K1ZZ, ARRL General Manager and Paul Grauer, W0FIR, Midwest Division Director, and others.

Registration $4; banquet tickets $10; 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 146.34/94. For information write to PHD Amateur Radio Association, Inc., P.O. Box 11, Liberty, MO 64068, or tel. 816-781-7313 or 816-452-9321. QST

Club Corner

Conducted By Sally O'Dell,* KB1O

KIDNAPPED?

Someone is missing. In fact, a whole bunch of people are missing. You could run down to the police station to file missing-persons reports — but that wouldn't help find them. Who are they? They are the youth in Amateur Radio. As a rule, there aren't as many as we need.

What happened to all the young people who used to experiment with their spark-gap radios in the '20s and '30s? They are not young people anymore. Today's youth seems to be more interested in computers and video games than they are in ham radio. Can you and your club do anything about it? All young people who have an interest in electronics are candidates for our exciting pastime. As an organized group, your club can tap this source of fresh ideas and enthusiasm by approaching these young people, now.

How do you find them?

Start an organized program to interest young people in your community, now. Both your club and the young people will share in the benefits. The youth will have a new hobby that will keep them busy and involved in a productive activity. Be aware that more than half of the people who start out with ham radio as a hobby end up with a career in a related field. Therefore, you'll not only help your club with increased membership and new ideas, you'll be helping these young people make an important lifetime decision. This may be the first step toward a lucrative career. Your club will gain new ideas, new bodies, new officer material and new *members*.

How do you go about it?

If your club really has the desire to tap this resource, you'll have to take Amateur Radio to the young people in your area — they won't come to you. Offer a demonstration to any Scout, 4-H, school or other youth groups that express an interest. Not all potential candidates will be found in youth groups. Try contacting your local schools and science classes. You may find interested young people who don't belong to any other organized group.

Your presentation might include OSCAR, a 2-meter fm contact, autopatch, slow-scan TV (without the "cute" pictures) or computer-to-computer communication. Decide what is best, based on the resources and interests of your members.

Be prepared when you start, however, to follow through. Be ready with a Novice class, or assist the advisor, sponsor or leader of the group if that person is to be the instructor. Contact the Training Branch at Hq. for ideas on preparing and teaching Novice classes. We have many materials available for instructors.

Finally, as a club, decide what you wish to accomplish. Make a list and add your own thoughts, or use the following: (1) Define the problem: Youth (the future of Amateur Radio) is missing from your club *and* the Service overall. (2) Talk about this problem at your monthly meeting. (3) Plan an ongoing program of presentations with effective visual displays. (4) Organize your members so everyone involved has a job in the presentation, or so you have teams available when the need arises. (5) Contact young people in your community (possibly through their advisors, sponsors or teachers). (6) Plan and schedule your classes (contact Hq. early). (7) Rehearse each presentation to be able to address unique problems beforehand. (8) Enjoy yourselves!!

[Editor's Note: Those of you interested in the Special Service Club program can incorporate these ideas into one of your programs. See December 1982 *QST*, p. 62.]

*Club Program Manager

Annual Report Forms

All affiliated clubs *must* complete Annual Report forms each year to remain actively affiliated. New forms are sent each year to all active (according to our records) clubs at the last known address. If the secretary moves or the post office box is closed, the mail is returned to us. Annual report forms for 1983 were sent to all actively affiliated clubs in December.

Remember: It is your club's responsibility to complete the forms each year. Why must you do this every year? We can't be sure that everything remains the same from year to year. Most clubs change officers, and many have a new mailing address each year. If you wish to remain an active club, you must keep us up to date on your club officers. Check with your club secretary today. Has *your* annual report been returned to Hq.?

ARRL Film Library

The ARRL Film Library now has the 16-mm color film, "Northern Lights" (27 minutes), available for distribution. The University of Alaska produced this film on the Aurora Borealis Phenomenon in 1975, and though it is not directly related to Amateur Radio, it does cover many things of interest to radio amateurs. Also available is the new ARRL film library programs list. Send for yours today.

For those clubs or individuals wishing to borrow the ARRL premier film, "QST, The World of Amateur Radio," it is available from your division director (vice director in the Atlantic, New England and Southeastern Divisions). The following people are contacts for the film in their divisions: Delta Division — Jim Buffington, ND5M, P.O. Drawer 1240, Aberdeen, MS 39730; Roanoke Division — Steve Jarrett, K4FJ, 8804 Camden St., Alexandria, VA 22308; Midwest Division — John Shoultys, WDØBNC, 235 N. Santa Fe, Salina, KS 67401. Check with them to book this film. ARRL Hq. does not handle it. To book other films or to receive the new programs list, contact Karl Townsend, ARRL Club and Training Dept., 225 Main St., Newington, CT 06111, tel. 203-666-1541, ext. 219.

Special Events

Conducted By Mark J. Wilson,* AA2Z

Swansea, Wales: BSC Port Talbot ARC will operate GB2SDD from 0000-2400Z *March 1* to celebrate St. David's Day, the national day of Wales. Operation on 80-10 meters. Special QSL for QSL to R. R. Jones, GW4HOQ, Bryn-Ynys, 13 Strawberry Pl., Morriston, Swansea, Wales.

La Paz County, Arizona: WB7UFG will operate *March 4-11* from Arizona's newest county. Phone operation around 28.700 and 21.400. Certificate available from WB7UFG, 3622 W. Bloomfield Rd., Phoenix, AZ 85029.

Fulton, Missouri: Callaway AR League will operate WØDD from 1500-2200Z *March 5-6* from the Winston Churchill Memorial at Westminster College to commemorate the 1946 "Iron Curtain" speech. Frequencies: 7.235 14.285 21.360. Special QSL for s.a.s.e. to CARL, P.O. Box 241, Fulton, MO 65251.

Notre Dame, Indiana: Notre Dame ARC will operate WBØDRH/9 *March 11-13*, putting the Univ. of Notre Dame on the air for the first time in its 141-year history. Operation 10 kHz up from lower General class band edges, phone and cw, 80-15 meters and 28.650. Certificate for large s.a.s.e. to WBØDRH *Callbook* address.

Wallingford, Vermont: Green Mountain Wireless Society will operate N1VT from 1400-2100Z *March 12* from the Paul P. Harris Memorial Building where the founder of Rotary International attended school. Frequencies: 7.235 and 21.360. Certificate for large s.a.s.e. and QSL (include QSO number) to Ted Lidstone, Wallingford Rotary Club, P.O. Box 456, Wallingford, VT 05773.

Morton, Illinois: Morton ARC members will be active from 0001Z *March 12* until 2400Z *March 13* to allow hams worldwide to qualify for the Worked All Morton award. Work five Morton-area stations for award. Operation on phone and cw, all bands, about 5 kHz up from lower General class band edges. Certificate for log information and large s.a.s.e. to Jim Jones, WD9AEU, 701 Columbus Ave., Morton, IL 61550.

Missoula, Montana: Hellgate ARC will operate KV7T from the visitor information center on the Nez Perce Indian Trail at the Idaho-Montana border from 1700-2300Z *March 12-13*. Operation in lower 20 kHz of General class 20, 15 and 10 meter phone bands. Certificate for large s.a.s.e. to HARC, Box 3811, Missoula, MT 59806.

Clinton, Ohio: Buckeye Belle members will celebrate their 22nd anniversary from 0000Z *March 18* until 0000Z *March 20*. Operation near low end of hf phone and cw bands. Certificate for QSL and s.a.s.e. to KA8MPH, 1241 Comet Rd., Clinton, OH 44216.

Stanford, California: Stanford Linear Accelerator ARC will operate WA6NUP from 1600Z *March 19* until 0200Z *March 20* and 1600Z *March 20* until 0200Z *March 21* to commemorate the 8th anniversary of the discovery of the Psi particle. Frequencies: 14.290 21.360 28.650. Certificate for large s.a.s.e. to SLAC ARC, Bin 20, Box 4349, Stanford, CA 94305.

Carrollton, Georgia: Southwire Employees ARC will operate *March 25* to commemorate Southwire's 33rd anniversary. Operation around 14.270 21.345 28.600 and in Novice bands. Special QSL card for s.a.s.e. Details will be given on the air.

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 April 15 to make the June issue.

*Assistant Communications Manager, ARRL

In Training

Conducted By Steve Pink,* KF1Y

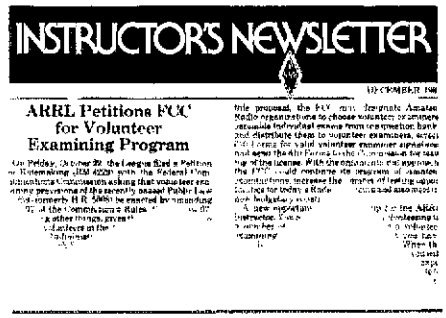
KEEPING THE RECORDS STRAIGHT

If you are an ARRL registered instructor, you should have recently received a copy of the *Instructor's Newsletter* (December 1982), edited by Steve Ewald, WA4CMS. A copy was mailed to every active (and inactive) instructor on our list: 6600 strong. This newsletter is the Training Branch's way of communicating with the ARRL instructor corps exclusively.

The latest issue contains detailed information on the League's volunteer examining petition (RM-4229) and a discussion of the role of the ARRL instructor in such a program. Many of the questions you may have about the League's proposal and possible FCC action are answered in these timely articles. Also appearing are articles on learning the code and keeping a code requirement for all classes of license, as well as an announcement for the annual Herb S. Brier Memorial Instructor of the Year Award.

Our newsletter is mailed to every instructor at the most current address we have. We've noticed, however, that a number of newsletters have come back to us as undeliverable, and others never reach their intended destination because our instructors have moved. Some of our records are more than six years old, and since we are a very mobile society, it's not surprising that many of you have failed to receive your issues. Usually the post office will not forward your newsletter, so you may be conducting your ARRL licensing classes without the benefit of the latest information from the Training Branch!

This year, Training Branch staffers WA4CMS, WB2TRN and yours truly, KF1Y, will update ARRL instructor records, but we will need your help. The most important piece of information we need in order


INSTRUCTOR'S NEWSLETTER

ARRL Petitions FCC for Volunteer Examining Program

to get the *Instructor's Newsletter* to you is your current address. If you once received the newsletter but did not receive the December 1982 issue, then we may not have your correct address. A simple postcard informing us of the change will do. If the mail runs smoothly, you'll receive the next issue.

Training Branch policy has been to send the *Instructor's Newsletter* to both active and inactive instructors. If you are active (that is, if you are presently teaching or about to teach a licensing class), we would appreciate this information from you also. Let us know what level of licensing class you are teaching, how many students you have or expect to have and the beginning and ending dates of your course. Even if you've been receiving the *Instructor's Newsletter* and your address is current, you'll benefit the League *and* your students by supplying us with this information. The Training Branch will be able to construct an accurate picture of the number and distribution of licensing classes across the country, enabling us to gauge our production of training materials (available at no or a nominal charge to ARRL instructors). In addition, your students will be eligible to receive League graduation materials, including op aids and charts, that will encourage them to get on the air and continue upgrading on the Amateur Radio ladder. Ultimately, the information you give us will benefit the growth of the Amateur Radio Service.

The ARRL Instructor and Volunteer Examining

At the time of this writing (mid-January), the rules about volunteer examining are in the process of being rewritten. All we can say with any certainty is that there will be change at the Novice *and* at higher levels of licenses. Most likely, the FCC will be going out of the exam business. (Of course, it never really was a business.) The Commission has proposed, in a recent Notice of Proposed Rule Making (NPRM) that the Novice mail-back examination procedure be eliminated in favor of one in which volunteer examiners compose their own Novice written exam from the Commission's syllabus.

The League has proposed something similar, except that under the League's proposal there would be a bank of questions, approved and published by the FCC, that the examiner would use to construct the exam. Questions for this bank would be solicited from the amateur community; either way, the instructor would be involved in question writing. The League's Rule Making petition (RM-4229) asks also that the amateur community submit questions to a large question bank for the *higher* written examination elements. The FCC should issue an NPRM in this matter soon, as agreed at the January 20 Commission meeting.

In the meantime, the Training Branch will update its instructor records nationwide. We encourage you to participate in these programs. Your help in supplying us with information about yourself and your classes will put the amateur community in a good starting position from which to begin a volunteer examination program. QST

*ARRL Training Program Manager

50 Years Ago

March 1933

☐ Administration officials are suggesting license fees as a new source of government income for a nation in depression. *QST*'s Editor argues strongly against any charge to amateurs.

☐ Electron-coupled oscillators are in vogue because of their relative stability, but with the disadvantage of limited power. W1KP of the Hq. staff found that an 860 tetrode works well in this circuit as a medium-power source of stable drive.

☐ West Coast VHFer Frank Jones presents some highly useful 2-meter antenna patterns for various combinations of reflectors and directors. He stresses the importance of careful element trimming and tuning.

☐ A flood of new tube designs from manufacturers gives us more choices in building gear. A new system of labeling is in use to keep things straight, e.g.: A 2A5 has a 2.5-V filament, is largely an Audio tube and houses 5 elements. W1DF helps further with a compilation of pin connections and socket diagrams of all standard receiving tubes (and a few others special for amateur use). The data take but one full *QST* page!

☐ Station licenses are now for three-year terms, matching that for the operator ticket. The Editor predicts that some day the two will be combined in a wallet-sized card.

☐ The QSL-forwarding service by Hq. has long been out of hand. The League announces a new bureau system, with one manager for each call district, for incoming cards only. SWL cards will no longer be handled.

☐ For the International Polar Year, a number of hams are spending the winter in near isolation atop Mt. Washington, working 56 Mc. Three inches of ice on outdoor antennas and winds up to 100 m.p.h. forced use of indoor antennas.

☐ The single-signal receiver described in *QST*'s of the past autumn has been built by a number of amateurs, but a few have encountered crystal-filter problems. Designer Jim Lamb now details some of the finer points of xtal selection and tuning procedures to improve performance.

☐ A longtime feature of *QST*, "Calls Heard," has outlived its time, since DX on 7 and 14 Mc. is now fairly common. Henceforth, listings will be limited to 160, 80 and 10-meter unusual intercepts plus, of course, v.h.f.

☐ Major General Carr, Chief Signal Officer, on Armistice Day transmitted a message of appreciation to amateurs via Army-Amateur Radio System stations.

25 Years Ago

March 1958

☐ W4YOT presents a crystal-controlled transmitter and superregenerative receiver for 10 meters, transistorized so it fits in a 4 × 5 × 2-inch plastic case for mobility. Only problem is with the antenna; an 8-foot length of wire draped about the operator works only passably.

☐ Lots of us have been discouraged from attempting v.h.f. because of nearby tall buildings or mountains. W6LWY says such obstacles can provide diffraction, which actually enhances signal strength between some points with no line of sight.

☐ W5TEV uses r.f. pickup from his transmitter to power a transistorized keying monitor feeding a speaker.

☐ Senator Hubert Humphrey has introduced a bill to explore a reciprocal-licensing agreement with Mexico.

☐ The new Racal (British) receiver employs an unusual tuning procedure that W1DX believes can be adapted for some amateur purposes. Harmonics from a 1-Mc. crystal are routed through filters and multiple mixers to a heterodyne with incoming signals over a continuous range from 1 to 30 Mc. with no switching.

☐ *QST* calls for volunteers in a program of monitoring satellite transmissions for the International Geophysical Year.

☐ Novice Dutch Uncle W1ICP takes us by the hand through some fundamentals of simple antennas and related transmission lines, as well as matching them to the transmitter output.

☐ W7PNO licked the high cost of metal unguyed towers by anchoring one 20-foot 4 × 4 timber vertically on the side of his house and rigging another (cost, $3.20 each!) alongside it, telescoping within steel retaining bands.

☐ KN6ZNQ finds a simple tape recorder highly useful in code practice; W1AW transmissions can be recorded and played back at different speeds to fit the student's need. Sending in synchronization with the tape also helps develop an "A-1" fist.

☐ A good bulletin can be a major step toward club success. W2QPQ points out some of the advantages and adds a few "how to" suggestions for starting your own.

☐ A series of pictures shows professional-looking construction of high-powered amplifiers, one by W2DB using grounded-cathode, and another by W9KPD using grounded-grid, both employing the PL-172 pentode. — *W1RW* QST

Public Service

Conducted By Robert J. Halprin,* K1XA

Hurricane Iwa

We just had the Simulated Emergency Test on October 16 and thought we knew our communications good and bad points. How little we really know until a real communications emergency happens! Hurricane Iwa (ee-vah) struck the Hawaiian Islands on Tuesday, November 23, 1982. Hardest hit were the islands of Niihau and Kauai (essentially in the hurricane's path) and the island of Oahu.

Portions of Oahu started losing power about 2 P.M. Tuesday, and the hurricane itself passed directly over Kauai Tuesday evening. All electrical power on that island was lost; the entire island was blacked-out. Approximately 95% of the electrical power on the island of Oahu was lost Tuesday evening, and communications were severely disrupted.

The only communications out of Kauai Tuesday night was an Amateur Radio station located at the EOC (emergency operations center) at Lake Lihue, the capital city of Kauai. This station was manned by KH6JIB, who was able to maintain a 2-meter link with Oahu and the civil defense operations center in Honolulu.

Hawaii's ARRL Emergency Coordinators responded to the call for emergency communications. Many ARES (Amateur Radio Emergency Service) members, under the direction of the ECs, spent hours and hours over several days providing emergency communications using generator or battery power and makeshift antennas. The major statewide frequency during the emergency was 7290 kHz, the Hawaii Emergency Net. Twenty, 15 and 10 meters were used to accommodate Welfare traffic to and from Hawaii, while 2-meter repeaters and simplex were used heavily for local communications.

Until one experiences the effects of a major storm such as hurricane Iwa, one might wonder why all radio amateurs wouldn't register their time and talent in ARES? Also, why wouldn't all ARES registrants participate in local tests, drills and the annual SET in October? At the very least, all radio amateurs should be acquainted with proper net procedures, discipline and proper traffic handling. — *Dean Manley, KH6B, ARRL Pacific Section Emergency Coordinator, and Army Curtis, AH6P, ARRL Pacific Section Manager*

Kauai County

With hurricane Iwa showing signs that it was going to pass close to Kauai, the civil defense emergency operations center (EOC) was activated early Tuesday. By mid-morning, amateur operators were activating a weather watch net on vhf, with the EOC amateur station taking up net control duties. The EOC station stayed in continuous operation until December 1.

Hurricane Iwa passed over Kauai Tuesday evening, devastating much of the county. Local Amateur Radio operators, who had conducted an SET just five weeks before, were ready for the real thing. In the storm's wake, Amateur Radio provided the only link with the outside world, while maintaining internal communication circuits in support of police, fire, the Air Force, the Army and civil defense.

Manning the EOC during the period of the storm's passage were KH6JIB and AH6AW. At least a dozen other hams stayed on vhf radio throughout this period from their homes or from emergency locations using their own equipment with battery power. They provided information to the EOC on the storm's passage, provided support in obtaining transportation for the evacuation of the Poipu Sheraton Hotel, obtained and relayed vital information to Kauai Veterans Hospital in connection with a medical emergency, and much more. Other amateurs involved were KH6JPT, KH6S, KH6FK, KH6E, KH6DLW, KH6DXO, KB3CQ, KH6TF, KH6JJC, WH6ASY, KH6FMT, AH6X, KH6QN, KH6HU, KH6TV, KH6JQO, KH6DRT, KH6DLU, NH6O KH6JEF, WH6ADA, AH6CG, KH6MY, KH6CZT, KH6FBQ, KH6K, WH6AGU, KH6JBH, KH6HG, and other amateurs whose calls were regretfully lost in the flurry of activity and paper.

By 5 P.M. Tuesday, virtually all commercial power on the island had been cut off because of wind and water damage. Telephone service was nil, all radio repeaters on the island were off the air and most external antennas had been blown down. The point had been reached where all off-island and virtually all on-island communications depended on Amateur Radio. Kauai EOC contact with the Honolulu EOC was being maintained through the Honolulu City Hall vhf repeater. Vhf Amateur Radio support of major on-island government service was established and maintained throughout the storm. To improve their individual communications capability, several amateurs reinstalled those antennas that were still repairable. Thus, reliable communications were maintained. Efforts to find additional usable frequencies and circuits for traffic handling resulted in contact being established with the Honolulu EOC through an additional Oahu repeater. Of great value to on-island communication was the Kokee repeater, which came back on the air Wednesday morning on emergency power. Aside from vhf circuits for on-island use, amateurs provided long-distance hf communications on statewide and nationwide emergency nets.

By Thursday, Thanksgiving Day, the Amateur Radio operation was establishing itself in a shift routine. The holiday made many more operators available, but by Friday most amateurs had to return to help with cleanup and repair at their places of employment. Manning the radio stations then became a little more difficult, but the necessity to provide communication was diminishing, so the manning was met by fewer available amateurs. Saturday saw several more operators removed from the roster when the Air National Guard was activated. A slight respite occurred Sunday, when a few operators had days off. This made possible the placing of an amateur at the police/army roadblock on the Poipu Road (this position was to satisfy an Army communications requirement between the roadblock and the EOC). Monday was highlighted by the return of the Kapaa repeater upon restoration of commercial power.

On Tuesday, another new requirement developed when a link was required between the Hanalei Fire Station and the EOC. Communications were established in early afternoon. By Wednesday morning, alternate or primary communication circuits had been established to support all required government services. The Amateur Radio communications support operation finally secured December 1.

It must be pointed out that the foresight, planning and equipment acquisition by civil defense as well as members of the Amateur Radio community was largely responsible for the success of the ham radio effort and the successful maintenance of essential government communications during the emergency. Special thanks are accorded the members of the Kauai Amateur Radio Club, which operates the Kapaa repeater and provided most of the radio operators with their personal radio equipment. Special thanks are also due to the Kukui Nuts ARC, which operates the Kokee repeater, and to the amateurs with no club affiliation who pitched in to help.

Leading this latter group are W7TS, who weathered the storm on Tuesday in the Hanalei Police Station, where he established and maintained Amateur Radio contact with the EOC, and KH6KB, who was among the first amateurs to establish hf contact with the statewide Hawaii Emergency Net. Also, Army and Air National Guard amateurs, who were activated by their units soon after the storm, put in countless hours of operating time on the Kokee repeater and other 2-meter frequencies in support of National Guard requirements.

Much has been learned from this experience that will aid us in future disasters. Particular emphasis will be placed on improving "alerting" of amateurs, predetermination of availability of shift work, enhancement of emergency power capabilities and increasing the availability of portable antennas. — *Bill Baisley, KH6S, ARRL EC Kauai County*

Hawaii County

On Tuesday, November 23, as the news reports, c.d. warnings and National Weather Service bulletins increased both in frequency and gravity, the Hawaiian Islands prepared for what was to be the state's greatest natural disaster in recent history. The hurricane struck with a fury beyond imagination.

At about 5:30 that evening, KH6B was alerted by the NWS office in Hilo, and responded to the request to provide emergency backup communication. Shortly after arriving at the weather station, he was on the air, taking check-ins for the Big Island Emergency Net on the Kulani repeater, 16/76, AH6P/R, and quickly established a liaison to the Hawaii

*Deputy Communications Manager, ARRL

Emergency Net on 7290 kHz, which had been in progress since early afternoon. The 2-meter net was soon joined by AH6P, AH6K, KH6TR and KH6GKR. KH6RY and KH6QM provided relief operation at NWS. Meanwhile, on 40 meters, the number of stations checking in began to mount as the reports of Iwa's fury trickled in from Kauai and Oahu. KH6CC reported calm conditions in Paauilo along the Hamakua coast, while AH6P and AH6K were experiencing moderate gusting conditions in Hilo and Pahoa. KH6LO and KH6NP indicated very high winds on Oahu. They both soon switched to emergency power, as most of Oahu lost its electrical service.

The storm seemed to pass very quickly, and at about 10:30 P.M. Wednesday the 40-meter net was put on watch status. Late reports indicated no serious injuries, but severe damage to buildings and utilities on Kauai and Oahu. Wednesday evening also brought more participants on the 40-meter net, as makeshift antennas were erected and power was restored to portions of Oahu. Activity increased as Welfare messages were passed from the stricken areas to the other islands and to the U.S. mainland.

Net activity was at a high level for the next four days, and there was no shortage of volunteers for net control and liaison duty. During the early phases of the operation, messages were passed informally, but as things calmed down a bit, very orderly and efficient procedures were maintained. One of the remarkable things about this communications emergency was that operations seemed smoother and better organized than during the drills.

Those of us who have been active in developing emergency plans over the past three or four years were rewarded beyond expectation in seeing the level of participation and cooperation of the local amateur community. As EC for Hawaii County, I wish to extend my personal gratitude to all the amateurs who participated, along with the many who just listened and made themselves available when needed. Mahalo! — *Dave Schroeder, AH6K, ARRL EC Hawaii County*

Maui County

The Maui Emergency Net was called up for severe weather standby alert, at about 11:35 A.M. November 23. Weather reports were relayed to NWS-Honolulu from NWS-Kahului when Honolulu lost their Teletype communications. Maui ARES aided the American Red Cross in relaying information to and from Kauai — mainly Welfare traffic.

Many Maui County amateurs actively participated in the Hawaii Emergency Net, and many more monitored local repeaters in case communications assistance was needed. Maui civil defense asked only that reports be telephoned in to them during the height of the storm. There were isolated power outages on Maui, but no breakdown of communications, so the Maui Emergency Net was on standby alert. Approximately 15 amateurs participated. — *Mel Fukunaga, KH6H, ARRL EC Maui County*

Honolulu County

KH6NP operated from his home at Kane' Ohe on the north shore of Oahu. A motor generator kept his station active throughout the communications emergency. Commercial power was restored three hours short of one week. Communications were conducted for the National Weather Service and the Red Cross over the Hawaii Emergency Net and the SKYWARN Net on 37/97, NH6S/R. — *Bob Ferguson, KH6NP, ARRL EC Honolulu County*

NATIONAL WEATHER ASSOCIATION AWARDS

The National Weather Association (NW) Awards Committee recently met and selected the NWA award winners for 1982. The annual NWA awards are designed to recognize outstanding efforts by NWA members, others of the professional meterological community, and those outside the community who provide valuable assistance to operational weather services. In all the award categories, the emphasis is on those achievements that relate to meteorological service. The award plaques were presented at the National Weather Association's annual banquet, held in November at College Station, Pennsylvania.

For the greatest contribution to operational meteorology by an organization not directly a part of the professional community, the NWA selected the Miami Valley FM Association, of Miami Valley, Ohio. The group's severe-weather-spotting activities were singled out as making the Dayton Weather Service Office success index for severe-thunderstom warnings almost four times as high as the national average. More important, the spotting activities of the group prevented a large number of needless warnings that would have been issued except for their on-the-scene reports. The Miami Valley FM Association was nominated by the National Weather Service Office in Vandalia, Ohio. — *Darell R. Whitehead, Lt. Col. USAF, Member NWA Awards Committee*

PRYOR OKLAHOMA, APRIL 1942

After Pearl Harbor, Amateur Radio was shut down for the duration of the war. But after 40 years, it is possible to mention the exception to that rule.

Like most college students, I immediately started making plans to drop out of college and go into the armed forces. I did so during the month of April (1942), and went home to spend a few weeks with my mother prior to being sworn into the Marines. On the 27th of April, a tornado wiped out most of the town of Pryor, Oklahoma; casualties were heavy.

The hams in Muskogee were contacted by the Red Cross and were asked to furnish emergency communications. We sent a message to the FCC asking permission to get on the air with a station in Pryor and one in Muskogee to move traffic out of the stricken area.

Permission was granted, and we handled all traffic out of Pryor for three days, all on 40-meter cw, because 40 was a cw band in those days. All traffic was given to Western Union for further transmission by landline. Equipment used at Pryor was a Hallicrafters SX-28 receiver, a homebrew crystal-controlled transmitter that used a HY 31Z in the output, a dipole antenna and power from a 500-W alternator that Muskogee radio club members had built by rewinding an old Dodge generator and a Briggs & Stratton washing machine engine.

A few days after the Pryor operation, I was inducted into the Marines and had other things to think of for some time. Now that I am retired and have time to worry about things, I obtained a copy of the article that appeared in the *Muskogee Daily Phoenix* on April 29, 1942. Here's some of what the article said:

> To give Pryor rapid communication with the outside world, after telephone and telegraph lines had been torn down by the tornado Monday afternoon, Muskogee amateur radio operators yesterday set up portable sets in Pryor after getting permission from the Federal Communications Commission.
>
> Because the United States is at war, all amateur operators have been kept off the air and it was necessary to get permission from the FCC before they could go into action at Pryor.
>
> A telegram to Washington, signed by Hugh Marsh, general chairman of the Red Cross, sent at 10:30 Monday night brought the following answer at 3:30 yesterday morning from T. J. Slowie, secretary of the Federal Communications Commission: "Permission granted in the seven megacycle band provided operation is under supervision of Red Cross. Advise commission for record purpose, exact frequency being used and other details concerning identity of this station.

The whole point is that, even in wartime, when Amateur Radio activity had been curtailed, the Red Cross and FCC thought our emergency services were valuable enough to cut through the red tape and authorize Amateur Radio operation during a disaster. Someday, we may be called upon to count our points to preserve our hobby. I think this one is worth counting and should be duly recorded in the appropriate archives. — *Byron W. Looney, K6FI (ex-W5JFY)*

PUBLIC SERVICE DIARY

☐ Near Pittsfield, Massachusetts — January 12. WB2IMD was westbound on the Massachusetts Turnpike when he came upon an overturned state police car alongside the highway. The trooper inside was dazed, but showed no other signs of injury. WB2IMD called in the situation over the Mt. Greylock repeater, K1FFK/R. N2AKR answered and contacted the police. The trooper was taken to a nearby hospital where she was examined and then released. (WB1HIH, SEC Western Massachusetts)

AMATEUR RADIO EMERGENCY SERVICE REPORT

☐ Calcasieu Parish, Louisiana — January 2. The Red Cross requested communications assistance in the search for persons stranded, and for an assessment of damage that resulted from recent flooding. Local amateurs assisted both the Red Cross and Sheriff's Department by establishing a radio link using the local WA5LHL 2-meter repeater. The status of 31 families was relayed to authorities via the link, and the Red Cross was able to assist those who were stranded. (AC5R, SEC Louisiana)

COMMUNICATIONS SERVICE OF THE MONTH

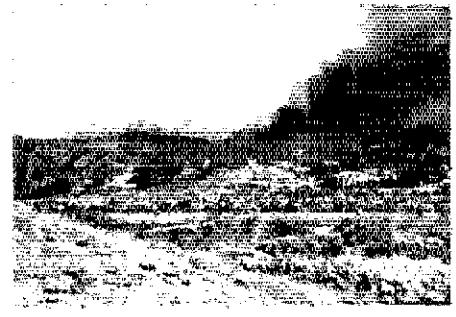
☐ Gypsum does burn, at least when the gypsum involved is the Gypsum Canyon area of Southern California, located approximately 8 miles northeast of Anaheim. The canyon is a tributary along the main stretch of the Santa Ana Canyon, which links the highly populated County of Orange on one end and the County of Riverside on the other.

The conflagration started about 9 on Saturday morning (October 9, 1982), fanned by the 40 to 60 mph winds that always prevail in Southern California in late September and early October. These winds are aptly named Santa Anas because they start on the High Desert near Victorville and travel through Riverside on their way to the sea via the Santa Ana Canyon.

North Orange County EC WB6GUC telephoned me the night before to let me know that he and his wife were planning an out-of-town trip. He said, ironically, "If anything comes down, call me on the phone." I took the number and assured him that if he was needed, he'd get a call. I also assured him that I'd mind the store.

At 8 on Saturday morning, I attended the monthly breakfast sponsored by the Anaheim Amateur Radio Association. The breakfast is always followed by a T-hunt at 10. After breakfast, my partner WB6ULU, and I set up the gear and prepared ourselves for some fun. Before we got into position to start, the first call of disaster came over the club's local repeater, KC6K/R (146.19/79). N6BMO called and urgently asked me to call the local chapter of the American Red Cross in Santa Ana. Fortunately, he was at the Red Cross attending a meeting when he learned that the Orange County Fire Department was Code Red and responding to the fire. They were also requesting Red Cross backup to establish first-aid stations and evacuation centers.

When I called the Red Cross Disaster Center, the Disaster Director filled me in and requested Amateur Radio communications at all sites. He needed operators at the Center and at four sites immediately. WB6ULU jumped in his truck and headed for the Red Cross. I secured the DF equipment and headed for the shack. I managed to mobilize six ARES members to the Red Cross Center and to the sites by using the telephone.



California's Gypsum Canyon was on fire, and area amateurs responded to the call for assistance. *(NB6N photo)*

Then the problem arose of scheduling relief operators in case the fire continued into the night and Sunday. I was contacted by KA6G, who suggested that a recruiting and assignment net be setup on the KC6K/R repeater. We also agreed that the net control *not* be at the Red Cross Disaster Center. So, net control was established at my station, at least for the first six hours. Meanwhile, the Red Cross set up emergency traffic nets to the sites on the 220-MHz repeater, W6LO/R and 146.58 simplex. This provided the isolation needed to conduct the Red Cross traffic without interruption by check-ins.

At about 4 P.M., I was relieved as the net control by N6BVU, who carried on scheduling until 7 P.M. The net was picked up by WB6JJS until midnight. He was then relieved by W6SGI, who minded the store until 7 A.M. Sunday. K6TWK picked it up and continued until 1 P.M. KE6LX went from 1 P.M. until midnight. We had received word at this time that containment of the fire was very close and that we would not need to schedule any more operators beyond midnight. What a welcome bit of news!

The highlights that came out of the disaster mainly focus on the cooperation and willingness to help from the many many groups of hams in the Southern California area. We received many offers of help and usage of repeaters from the Rio Hondo Amateur Club (W6GNS/R), the South Orange ARA (WD6AWP/R), the Western ARA (N6ME/R), the Disneyland ARC (WA6BIZ/R), and the Keller Peak Radio Group (WB6RSD/R), to name but a few. When we had trouble filling schedules for the last night hours, we received help from the Associated Radio Amateurs of Long Beach, the Fullerton Radio Club, the South Orange ARC, the Orange County ARA, the Western ARA, the Disneyland Club, the Interstate Electronics Corporation RC and the Anaheim ARA. Most of the volunteers were ARES members; those who weren't were anxious to join.

Another group activated was the U.S. Marine Corps at El Toro Marine Facility, with their heavy equipment battalion of bulldozers and other equipment. In support of them, the local RACES group was activated under the direction of WA6GPF. And out of the many groups came the 15 operators who manned the station at Red Cross Disaster Center.

Disasters such as floods and fires are dreaded by everyone, but it is reassuring to know that amateurs are ready and willing to help whenever disaster strikes. Many thanks go out to them. — *Ralph Swanson, WB6JBI, DEC Orange County* (This piece first appeared in *Worldradio News.*)

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ At deadline, SEC reports received for 1982 totaled 529. The same number of different sections reported this year (58) as last. Reports for the year increased from the total received for 1981 (440). Thirty SECs reported every month, an increase of 43% over last year (21). Including late reports, the following sections had 100% reporting (the number in parentheses shows how many consecutive years of complete reporting have occurred): AL (3), AB (5), AZ (1), CO (2), ENY (1), IL (1), IN (3), KS (2), KY (1), ME (2), MI (2), MN (1), NH (1), NLI (2), NFL (1), NTX (2), OH (5), OK (1), ON (1), SDG (12), SJV (5), SC (2), SFL (31), STX (1), TN (1), VA (1), WVA (7), WMA (3), WNY (1) and WPA (1). The SFL section continued its unbroken string, having reported for 31 straight years.

Nonreporters numbered 15, the same as 1982. These sections were: BC, EB, EMA, LAX, MB, MR, MDC, MT, NV, NM, ND, OR, PQ, WIN and WY.

For December, 39 SEC reports were received, denoting a total ARES membership of 22,974. Sections reporting were: AL, AK, AB, AZ, CO, DE, ENY, IL, IN, KS, KY, ME, MI, MN, MO, NE, NH, NLI, NFL, NTX, OH, OK, ON, OR, PAC, RI, SDG, SJV, SC, SD, SFL, STX, TN, VA, WA, WV, WMA, WNY and WPA.

NATIONAL TRAFFIC SYSTEM

The onrush of Christmas traffic in December caused many records to fall, and new ones to be set, on the various region and area nets. For example, EAN/c2, 2RN/c4, 4RN/c4 and ECN/c4 all set new records for traffic handled in the month of December. On CAN/c4, a new record for rate (number of messages handled per minute) was established. EAN/c4 had the second-highest month for traffic in history. Thanks to all the traffickers who made December 1982 a month to remember in NTS.

The 1982 Bill Shaw, WB2VEJ, Memorial Award for the outstanding station/operator in the Second Region was awarded to Harvey Hector, W2AHV.

Certificates: CAN/c4 — W5LQ W4DDK W9YCV KØGP WBØZEN WØEHI K4QCQ W4ZJY N5BT W5RB N5TC K5TL W9CXY W9EI W9JUJ W9QLW WØAM KØBM WØHI KØSI WØYLS. 2RN/c4 — KA2LEB WB2RBA W2HYM WB2ZJF WD2AFI KO2H AH2M. 4RN/c4 — NN4I WD4ALY K4MLC N4TE K4WJR WD4CNR WA4FKY W8BZY K4ZK W1NJM/4. 2RN/c2 — WA2HEB AH2M. 8RN/c2 — AF8V K8JDI KA8CPS KE8X N8DSU WD8LRT WB8DMF WB8MRL WB8MZZ WB8UBR K8OZ KA8GHF WB8WKQ WD8KFN WD8R1B K8KQJ KA8GJV KA8IAF KB8YS N8DTN N8DTZ W8RNQ WA3NU1 WB8VAZ WD8RHU. PAN/c2 — KØDJ KØOTU KØTIV K6DWA K6HAP K6OWA K6UYK K6ZCE K7GXZ K7KVV K7OVK KAØNJW KA6BNW KD7EY KBØMB KL7VY KM6I KM7Z KN6C KN7B KT6A KU6D KV5U NØACW NØCXI N6AED N6ANL N6G1W K6GKE N6GW N7AFZ N7CSP N7DNG N7DUN N7RG NI6A VE6CHK WØHXB WØUA W5JOV W6JGS W7AK W7DZX W7GHT W7SQT W7TGU W7VSE W9OBV WAØOYI WAØYNP WA6DSN WA6LVO WA7BZY WA7GYQ WA7IHS WA7WQE WBØLFR WBØMTA WBØNHA WB7FFV WB7OGA WB7TQF WB7WOW WDØAIT.

December Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	3277	105.7	1.742	97.8	
CAN	31	2504	80.7	1.321	100.0	
PAN*	62	2465	39.7	.840	100.0	
Region Nets						
1RN	57	864	15.2	.564	85.0	100.0
2RN	62	1254	20.2	.684	97.7	100.0
3RN	31	551	18.1	.523	98.4	96.8
4RN	62	1937	31.2	.820	82.9	100.0
RN5	31	1146	36.9	.662	98.4	100.0
RN6	55	1475	26.8	.570	83.9	100.0
RN7	91	1879	20.6	.961	84.4	100.0
8RN	62	946	15.3	.522	91.4	100.0
9RN						100.0
TEN	31	936	30.2	.547	91.4	100.0
ECN						90.3
TWN	62	621	10.0	.439	60.6	100.0
TCC						
TCC Eastern	177[1]	2240				
TCC Central	88[1]	1113				
TCC Pacific	118[1]	1733				
Cycle Four						
Area Nets						
EAN	31	5076	163.7	3.030	100.0	
CAN	31	2637	85.1	1.759	99.5	
PAN	31	2728	88.0	1.887	98.9	
Region Nets						
1RN	65	1477	22.7	.725	94.4	100.0
2RN	93	1779	19.1	.930	99.1	100.0
3RN	62	780	12.6	.672	98.9	100.0
4RN	62	1880	30.3	.930	92.6	100.0
RN5	62	2038	32.9	1.004	94.7	100.0
RN6	62	1568	25.3	.723	100.0	100.0
RN7	62	1358	21.9	.980	94.9	100.0
8RN	61	997	16.3	.596	95.0	100.0
9RN	62	1210	19.5	.647	99.0	98.4
TEN	62	710	11.5	.501	66.8	100.0
ECN	62	1010	16.3	.717	96.2	100.0
TWN	61	906	14.9	.536	97.1	96.8
TCC						
TCC Eastern	210[1]	2719				
TCC Central	83[1]	1014				
TCC Pacific	161[1]	2217				
Sections[2]	6728	62,198	9.2			
Summary	8265	119,253	14.4			
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 (260): APSN ATN (AB), AENB AEND AENH AENI AENK AENR AENW AENX AENY AENZ ATNM CATN ECAAN (AL), ATEN HARC (AZ), NCN NCTN SCN/V (CA), DTN NCC2MN SEN (DE), AIN ATB FAST FMSN FMTN FPON FPTN GN LCEN MCEN NFPN PBTN PEN PRVAN QFN QFNS SEFTN SVTN SWFTN TPTN (FL), CGVHFN GCN GSN GSSBN GTN (GA), ICN IGL ISB ITEN PM TLCN (IA), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 5ARES 6ARES 11ARES BARES CARN CCEN KNTN KPON KRN KSN KTN KYN MKPN MRN PAEWTN PAWN SEKEN TSTMN WTEN (KY), LAN (LA), AEB CMEN MPSN PTN SGN SPSN (ME), CI2MN EM2MN EMRI EMRIPN EMRISS HHTN NEEPN (MA/RI), CTN MEPN MMN MTN WRIN (MB), MACS MITN MNN QMN UPN (MI), MNWX MSN MPSN MSSN (MN), CMEN MEOW MON MOSSB WCMOARES (MO), APN (MR/NF), MTN (MS), BSN MN MSN (MT), CFARS CMN CNCTN JFK M2MEN PCTN RARS THEN (NC), CN CSN (NC/SC), MNARES MCHN NE75N NE160 NFMN NMPN NSN PVTN SBAN WNN (NE), GSFM GSPN NHN (NH), JSARS MCN/SJVN NJN NJPN NJSN NJVN OBTTN SOCTN TCETN (NJ), NSN (NV), BAVTN CDN CNYTN EPN HVN NLI NLIPN NLS NYPON NYS OCTEN SCVHFTN SDN STAR WDN (NY), BN BNR BRTN COARES HCARES MCTN NCTW NEON O6MN OSN OSSBN OSSN TATN (OH), OFON OLZ STN (OK), KTN OLN OPN OSN (ON), BSN LBLARES OARES OSN PTTN WCN (OR), CCAREC CCARES D3ARES D5ESN D6ARES EPA EPAEPTN NWPA2MN PTTN WARCVTN WPA WPA2MN WPAPTN (PA), PTN (PAC), BR2MN GPD2MN LC2MN SCSSBN YO2MN (SC), SDEMN SDEPN SDTIN SDWN (SD), TNCW TNPN TNVN TSRN (TN), BAREN HATN TEX TTN (TX), BUN DCEN UCN (UT), STARES SVEN VLN VN VSBN VSN VTN (VA), EWTN NTN NWSSB PSTS SCARES WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVAR WVFN WVN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

De W2CS: "December 1982 set a new TCC-Eastern/c4 record for traffic handled. All TCC ops in NTS are to be congratulated for an excellent job."

1	2	3	4	5
Cycle Two				
TCC Eastern	181	97.8	4459	2240
TCC Central	93	94.6	2226	1113
TCC Pacific	124	95.2	3467	1733
Summary	398	95.9	10,152	5086
Cycle Four				
TCC Eastern	226	92.9	5343	2719
TCC Central	88	94.3	1962	1014
TCC Pacific	178	90.4	4395	2217
Summary	492	92.5	11,700	5950

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (December) *Cycle Two* — Eastern Area (N2CER, Director) — N3ADU N1BHH WA4CCK N2CER KC3DW N2DWJ WB2EAG K1EIC WA2FJJ VE3GOL WB3GZU KO2H WA2HEB WB1HIH VE3HTL WB2IOJ WA4LJI WD8LRT AH2M WB2MCO WD8MIO W2MTA W8PMJ WB4PNY W1QYY AG2R W2RQ WA2SPL KB3UD AF8V K2VX AK1W WB8WKQ WA3WQP W2XD N2XJ W1XX KK2Y WB8YDZ WB2ZJF. Central Area (W9JUJ, Director) — N5AMK K5BNH N5BT N5CRU W5CTZ N5DFO WØFRC W9JUJ K5KJN KD5KQ KA4MZY W9NXG KA4SAA KB5TC WB9WGD WF4X WB5YDD. Pacific Area (WØHXB, Director) — NI6A KT6A NØACW N7AFZ WDØAIT VE6CHK N7CSP NØCXI KU6D KØDJ W7DZX WØEJD KA7FKT W7GHT N6GIW K6HAP WØHXB KM6I W5JOV KBØMB WBØMTA K6OWA W9OBV K7OVK WAØOYI KF7R W7TGU WB7TQF KV5U K6UYK W7VSE WA7WQE WB7WOW KM7Z. *Cycle Four* — Eastern Area (W2CS, Director) — W3ATQ VE3AWE W3BBN KI3C WA4CCK W2CS VE3CYR W1EFW K1EIR W2FR WD4FTK W2GKZ VE3GOL WB3GZU KO2H N4KB K2KIR K8KQJ AH2M WB8MTD N1NH W1NJM K8OZ W8PMJ WB4PNY W3PQ W1QYY K3RZR WA2SPL WB4UHC W4UQ AF8V VE1WF WB8WKQ KS6X W2XD N8XX N2YL K4ZK. Central Area (W5GHP, Director) — WØAM W9CXY KØEZ K5GM WØHI W5LQ W5RB N5TC W5TFB K5TL WB9UYU KB5W KB9X W4ZJY. Pacific Area (KØDJ, Director) — KT6A WDØAIT W7AK KN7B KØBN KCØD KØDJ W7DZX W6EOT W7EP W7GHT WA7GYQ K7HLR WØHXB K7KSA W7LCF W7LYA WB7NHR WØOGH W7VSE W6VZT VE7ZK.

Public Service Honor Roll December 1982

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points.

2532	296	206	179
N4EDQ	K7VW	W2AHV	WBØOGA
467	252	202	172
WØZWL	KA1GBS	KBØMB	WB7WOW
350	209	195	172
WØMZI	VE3KK	WD8LRT	WD4COL

158
VE3GOL
156
WA4PFK
155
KM9B
151
KA1BBU
148
KB5EK
147
WB3GZU
144
K4SCL
142
KR4V
141
KA3DLY
K6UYK
140
KC5NN
WB2IQJ
138
KA1DB
137
WA4QXT
W1EOF
134
WA3EHD
NI6A
132
WA2SPL
WB2IDS
K8KQJ
131
NP4L
KA1T
KA8CPS
130
WØOYH
WB2MCO
W2YJR
129
WF4X
KB5W
127
KC9CJ
126
N9DIH
124
AG2R
K5CXP
123
KA4GUS
WA2HEB
WA1TBY
122
WD9ESZ
WB2EAG
K3CR
119
WB4WYG
WB4AID
KA4AMC
W9YCV
W9TLU
AF8V
118
NN4I
WD4ALY
N2AKZ
KE6ZA
KS7I
116
WB4FDT
KA2KVZ
WB2ZCM
115
W4GPL
AA4AT
WB1HIH
N4FQD
W2XD
WB5YDD
114
KV5X
113
NG4J
KA5KRI
W2MTA
WB1GXZ
112
WD4AWN
N7DNG
111
K4ZK
W9DM
110
K4JST
WA7MEL
KAØJQG
KT6A
109
KB4WT
W9JUJ
W5DTR

K2ZM
WA4JDH
WA7LGN
108
WA4EIC
W6VOM
WD8MIO
WØKJZ
107
W7GHT
N2DWY
WB2OWO
W7VSE
WB7OEX
N8DSW
106
KA4SAA
K8OZ
W4ANK
WB2PKG
WB2ZJF
W2ZOJ
105
VE3HTL
K7GXZ
WB7TQF
N9BYK
N2CER
K9MX
104
WB3KUZ
W7EP
K3ZJJ
103
KB3LF
VE3HGJ
N7AFY
KK5B
W5KMF
WB8WKQ
102
KA4GFU
VE3DPO
KA8GHF
WB9IHH
101
KJ3E
N5AMK
WA5RVT
KCØOO
100
AK1W
KA6BNW
KUØG
99
NT4U
KB3UD
KE1L
K5OAF
K2ZVI
W2AET
KC2QQ
98
WB6QBZ
WB5LAT
97
KA4ASZ
WA1YNZ
WD4CNQ
WAØTFC
96
WB4TZR
WA3WIY
KA1AVU
N1BJW
W2TZO
KA5HDT
KA4AUR
95
W4SME
WB5GIC
W4CKS
WD8RHU
94
N6AWH
WA3DUM
WDØAIT
KA9HPQ
WB8MTD
93
W6NTN
KC5SF
N2XJ
KA5LLT
W2BIW
92
VE3GT
91
KB4OZ
KA3GJT
W7LG
KØDJ
NW4X
90
KB4LB
WA2ARC
89
NØBDG

VE5ADZ
WA4CCK
KD4PJ
W5CTZ
W5KLV
88
WA4EYU
KA4MTX
K4IWW
W6CPB
KD5FR
WA7GQO
87
N1ARI
KA3EJG
KAØCUF
K6AGD
N1BGW
N8DTZ
WB8SYA
86
KB5UL
KA1BHT
85
KF5HA
VE3BDM
N8GIW
K2VX
VE7BNI
W7GQO
KA7ELI
84
K7LCA
KA4IUM
WB4WII
WB2OHR
AC3N
W9NXG
83
W6RNL
VE5WM
KT6D
AG9G
KD9K
82
KF4U
W3VA
KD5P
N2BNB
VE2EDO
N7AKX
WA2SMZ
81
W1RWG
KA9IKR
W8GGX
KC2SW
80
WØFRC
N7AFZ
AI6E
WD5HOC
KA5AZK
N5DKW
K5HGX
K4ZN
WA4LXP
79
WØOGH
WB2GHN
KB2HM
78
WA8GMT
WA2FJJ
77
KA4BCM
NW4R
KE6NO
W1KK
76
KC3DW
KS2G
K6YD
N7BGW
75
KA4VXT
W3DKX
W4LXB
N7CSP
N8AUH
K1JHC
74
KA2GSX
WB5MMI
KA2BHR
73
W6IPL
N2BLX
WD9FRI
AK2E
72
K4VWK
WB4HRR
WB9WGD
71
WB6DOB

WA8HGH
K8JDI
70
WB8VAZ
KA2LEB
N2DPN
WB2QMP
N5BT
N3CKQ
69
WD4HBP
KB4PW
N3BKU
68
WD6EKR
WA2YBM
KB7FE
KC2HJ
N1AJJ
67
WA1VRL
WA3WQP
KM6I
WA6QCA
WD5GKH
KTØU
KØCY
W9JIJ
66
KB4OG
KA2NMA
KAØNCI
KØSI
KK9N
WBØHOX
WA5QFD
WA2KOJ
65
W6JTA
KD5GM
W2GJ
KF7R
WB8YDZ
64
KD4QZ
KX2L
N5AMH
WD8KBW
N2BDW
WØOUD
63
KD4TY
KE4DA
KD7G
WB5LBR
N9ATP
KC2PB
N3ADU
WA8DHB
K8GXV
62
KA4BBA
N3CJP
WB3FKP
WØKL
W4FMN
KØCNV
KT5Y
W9QLW
KA8MEB
KA3CDV
W4HON
61
N4ADI
WB4UHC
KCØCL
KG9B
N2BOP
W5SHN
WB8YTD
KØJCF
KA1EHR
W7LBK
W1AF
WB4NTW
60
NØCXI
KV8Q
WB8SIQ
KAØARP
N5ADU
58
KA8GGZ/T
57
KA2MBP/T
56
WD8ECM/N
48
N6EPG/T
45
N6FYV/T
41
KAØGBG/N
40
WB2PXD/T

Brass Pounders League
December 1982

A BPL Medallion (see April 1979 *QST*, page 77) has been awarded to the following amateur since last month's listing: WD8MIO.

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.

	2	3	4	5	6
N4EDQ	522	2459	922	2449	6352
W3CUL	620	1286	1492	126	3524
WB2IQJ	69	1567	1619	34	3289
WA2SPL	316	1134	1447	36	2933
KA9CPA	64	1420	307	949	2740
W5SHN	411	785	1322	61	2579
W9JUJ	3	1081	1087	8	2179
VE3KK	571	367	747	158	1843
K8NCV	33	798	806	25	1662
WA4JDH	23	798	782	8	1611
W7DZX	18	769	756	9	1552
NI6A	70	714	704	39	1527
VE3BSY	46	693	657	25	1421
WA1TBY	2	683	664	22	1371
WØACD	0	847	18	500	1365
WAØHJZ	29	764	52	477	1351
WB2EAG	7	637	576	21	1241
N4PL	145	432	567	77	1221
W3VR	281	396	509	31	1217
W1EOF	1	524	628	41	1194
K6UYK	134	544	458	55	1191
WB7OGA	281	385	416	81	1163
KT6A	4	631	475	26	1136
KBØMB	102	446	431	135	1114
VE3GOL	60	480	509	64	1113
WØWYX	26	649	109	324	1108
WB2IDS	78	450	454	68	1050
N1BBT	35	470	495	38	1038
WAØOYI	5	502	517	6	1030
N2CER	12	552	441	22	1027
W3ATQ	4	499	494	9	1006
WB8MZZ	17	453	529	4	1003
KB5W	19	496	429	28	972
WØFRC	43	427	470	21	961
N3ADU	1	478	454	2	937
W7VSE	3	475	440	13	931
VE3HGJ	88	384	430	23	925
WB3GZU	34	430	419	42	925
AF8V	18	422	445	23	908
N5AMH	73	381	452	0	906
KA1GBS	13	423	317	151	904
K4JST	27	420	446	9	902
K8OZ	3	446	429	10	888
WA4QXT	19	377	433	36	865
W8PMJ	2	451	400	0	853
WB8WKQ	3	412	422	16	853
W2MTA	1	467	371	7	846
K4EUK	123	298	361	61	843
WD8KFN	0	428	403	10	841
WF4X	9	388	405	36	838
WØZWL	0	487	4	345	836
KA1T	2	419	371	36	828
WAØAUX	44	252	511	15	822
WB8MTD	3	428	367	7	805
W4WGR	96	269	236	197	798
W6IPL	0	425	371	2	798
WB2OWO	31	370	344	48	793
WB7TQF	175	221	361	35	792
WØACH	31	363	391	3	788
KA8CPS	55	305	346	76	782
WB5YDD	6	385	342	45	778
AG2R	116	309	314	32	771
W7JMH	0	371	384	9	764
W2AET	0	371	399	3	763
AA4AT	8	365	351	28	752
W5CTZ	0	378	365	0	743
VE3HTL	7	353	364	16	740
KCØAS	34	558	118	22	732
K4ZK	1	345	373	10	729
WD8LRT	61	308	253	99	721
WA4PFK	51	372	232	60	715
WB4PNY	11	358	343	0	712
K4WJR	2	352	355	3	712
VE1WF	51	307	345	7	710
W7EP	0	355	312	25	692
WD4FTK	0	359	326	5	690
WØMZI	2	327	24	327	680
KB3UD	42	307	321	7	677
N7AFZ	75	253	315	26	669
ND5C	286	33	325	20	664
W5KLV	0	323	314	20	657
WA4CCK	0	307	340	5	652
WA2HEB	151	176	301	22	650
W9NXG	1	310	327	3	641
KC3DW	2	305	320	12	629
WB7WOW	32	258	287	51	628
WD4CNQ	7	331	284	6	628
W1EFW	38	260	302	26	626
WB1GXZ	61	207	337	17	622
KD4PJ	2	300	314	4	620
WD4ALY	0	336	267	17	620
N2DWY	41	240	322	14	617
KA1DB	12	300	236	69	617
W1UD	8	305	281	9	603
N5BT	21	281	295	5	602
WD4COL	59	258	212	71	600
WD8MIO	38	284	227	44	593
NN4I	15	281	275	22	593
WAØTFC	1	272	315	1	589
W2RQ	0	293	279	16	588
KR4V	15	249	268	55	587
NØCXI	5	263	314	5	587
K4SCL	8	270	275	33	586
WD4CNR	0	297	283	0	580
AA4FG	251	37	282	9	579
W7TGU	12	274	287	6	579
NØBQP	14	321	77	166	578
WD4AWN	1	301	249	23	573
W8GGX	4	252	280	23	559
WB8TDA	8	241	262	49	560
AK1W	1	272	278	4	555
KA2KVZ	45	230	264	15	554
KJ9J	6	315	184	44	549
K8JDI	28	248	263	7	546
W9FC	53	278	184	27	544
W1QYY	1	261	278	1	541
N7CSP	1	262	272	2	537
K3RZR	4	260	266	4	534
N5AMK	2	250	281	0	533
KF4HA	20	245	256	11	532
KB4WT	3	257	264	8	532
WA2FJJ	17	260	236	19	532
W9CXY	0	262	264	5	531
WA4LJI	12	242	270	7	531
AD7G	10	243	183	92	528
AC3N	12	247	256	4	521
KB3LF	9	248	252	16	525
N7AKX	36	168	248	8	520
W2AHV	23	205	167	125	520
WB5CIC	1	238	258	14	519
VE3CYR	0	268	245	5	518
WA2HSB	16	249	242	6	513
W4WXA	6	242	239	24	511
AI6E	44	210	226	26	506
KU4W	3	244	236	22	505
WB8UDR	0	247	257	0	504
WB2ZJF	7	240	235	22	504
WB4WII	0	262	233	7	502
Multioperator stations:					
W1TKZ	925	36	945	23	1929
WD4IIO	708	62	728	62	1560
K3CR	153	166	279	38	636
W1AF	23	251	266	17	557
BPL for 100 or more originations plus deliveries:					
WD5HOC	204				
W4ILE	215				
N5EFG	210				
WB4TZR	179				
WB4EXA	171				
WA1UMG	171				
WA1GHC	165				
K7EFA	161				
KI1I	160				
WD4MLQ	154				
WA4HXU	152				
KA1BBU	145				
WA4TWD	142				
N5DFO	140				
WD6BIY	135				
WD4GUZ	132				
WA3EHD	126				
KA4UFI	119				
K2QR	117				
KC5NN	111				
KB5EK	108				
KI1M	107				
KAØEPY	107				
WA2JQL	106				
WØIKT	105				
W7BKO	102				
KV8Q	100				
W4GPL (Nov.)	105				
Multioperator stations:					
N4EHM	234				
K7EFA	161				
WA1NPO	153				

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (December 1982)

1	2	3	4
Central Gulf Coast Hurricane	31	544	2566
Clearing House	31	415	440
Early Bird	31	1520	471
Empire Slow Speed	31	138	436
Golden Bear	31	701	2125
IMRA	27	809	1473
Mission Trail	31	702	1322
New England Novice	31	89	324
North American SSB Traffic	26	458	341
West Coast Slow Speed	31	139	430
20-Meter ISSB	30	2267	408
75-Meter ISSB	31	1379	1400
7290 Traffic	49	2123	4802

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

ARRL VHF/UHF Spring Sprints

What better way to familiarize yourself and others with the recently announced grid-square locators than a contest? With many of your v/uhf pals already knocking off new grid squares every day, here's a chance to concentrate your grid search. And you don't have to be a Bill Rodgers or Alberto Salazar to make a good showing. This hot steamin' deal runs for *six hours only* (6 P.M. till midnight *local time*). There is a separate sprint contest for each band, 50 through 1296 MHz, each held on a separate day. Weekdays are utilized to coincide with the traditional activity nights. The exchange is grid square locator. Signal reports are optional.

If all this grid talk is mumbo jumbo to you, don't go into grid current. Complete information on determining your grid-square designator appears in January 1983 *QST*, starting on page 49. This system is based on 2° × 1° grid squares used in the new ARRL VHF/UHF Century Club awards program announced in the January article.

Remember: Each Sprint contest is separate. If you enter more than one, you must use separate logs and summary sheets for each. Forms are available from ARRL Hq. for an s.a.s.e. So get your Nike shorts, Adidas shoes, Dave Wottle cap and your radio ready for v/uhf Spring Sprints.

GL de W1XX (FN31).

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies on 50, 144, 220, 432 and 1296 MHz.

2) **Contest Period:** There is a separate contest for each band. Each runs from 6 P.M. until midnight *local time* as follows: Monday, April 18 — 144 MHz; Tuesday, April 26 — 220 MHz; Wednesday, May 4 — 432 MHz; Thursday, May 12 — 1296 MHz; Saturday, May 21 — 50 MHz.

3) **Categories:** Single-operator only. One person performs all transmitting, receiving, spotting and logging functions.

4) **Exchange:** Grid-square locator (see Jan. 1983 *QST*, page 49). Example: W1AW in Newington, CT would send 59 FN31. Signal reports are optional.

5) **Scoring:** Count one point per valid QSO. Multiply QSO points by number of different grid squares worked for final score. Contests are separate; there is no accumulation of scores.

6) **Fm Restrictions:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted.

(B) Only these recognized simplex frequencies may be used: 144.90 to 145.10; 146.49, .55 and .58; and 147.42, .45, .48, .51, .54 and .57 MHz. This restriction prohibits use of all repeater frequencies, including 146.76 and .94. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters for the purpose of soliciting contacts.

(C) Use of the national calling frequency, 146.52 MHz, is prohibited. Contest entrants may not transmit on 146.52 MHz for the purpose of making or soliciting contest QSOs. The intent of this rule is to protect the national calling frequency from contest monopolization.

7) **Miscellaneous:**

(A) For a valid QSO to occur, call signs and grid-square locators must be exchanged and acknowledged.

(B) A station may be worked for credit only once per band, regardless of mode.

(C) Crossband QSOs do not count.

(D) Stations are allowed only one transmitted signal at any given time.

(E) A transmitter used to contact one or more stations may not be used subsequently under any other call sign during the contest (except for family stations for which more than one call sign is assigned to one location by FCC/DOC — and then for family members only).

8) **Reporting:**

(A) Entries for each contest must be postmarked by June 22, 1983.

(B) Contests are separate. Submit separate log and summary sheets for each contest entered.

(C) Logs *must* indicate time, call sign and complete exchange for each valid QSO. Multipliers must be clearly marked in the log each time worked. Dupe (cross check) sheets must be included with entries of more than 100 QSOs.

(D) All entrants are strongly urged to use the official entry forms, available from ARRL Hq. for an s.a.s.e.

9) **Conditions of Entry:**

(A) Each entrant agrees to be bound by the provisions as well as the intent of this announcement, the regulations of his or her licensing authority and the decisions of the ARRL Awards Committee.

(B) Disqualifications: For excessive duplicate QSOs and/or call sign/exchange errors. See January 1983 *QST*, page 85, for details.

Silent Keys

It is with deep regret that we record the passing of these amateurs:

W1BEH, Vernon S. Allen, East Greenwich, RI
KA1EFY, Warren Hartman, Danvers, MA
W1GSI, Henry Projansky, Miami Beach, FL
K1MZW, Rene J. Roberts, Holyoke, MA
K1NJT, Harold C. "Clint" Lawton, Providence, RI
W1PY, Dorrance G. Jerauld, Scituate, MA
W1SIB, Douglas T. Holman, Granby, MA
WA1TFN, Richard S. Platts, Millbury, MA
K1VME, Carolyn A. Rice, Worcester, MA
W2CIB, Milton M. Law, New York, NY
W2CTU, George F. Speer, Keansburg, NJ
W2DEE, Richard Franzen, Maple Shade, NJ
*W2ERZ, Herman Diebler, Totowa, NJ
W2LFP, Charles L. Wozowicz, Union, NJ
WA2MVM, Louis K. Roth, Canisteo, NY
W2PDW, Archie F. Smith, Baldwinsville, NY
WB2TKW, Lavere C. Doane, Riverhead, NY
W2UCR, Carmelo Cocozzelli, Dix Hills, NY
W2UIA, Keith L. Freeman, Sonoma, CA
W2WPY, Frank Cona, Webster, NY
K3COT, William E. Jacox, Jr., Butler, PA
W3IBI, Waide B. Nolf, Rew, PA
WD4DCW, Stanley M. Hirsch, Norfolk, VA
W4DMD, Charles E. Pratt, Orlando, FL
W4EG, Ernest W. Bisson, Seminole, FL
W4EVB, James W. Mayes, Titusville, FL
K4GWZ, Lawrence A. Witty, Sr., Orlando, FL
K4HTH, Charles R. Saum, Clifton Forge, VA
W4IX, Forrest B. Duncan, Tavares, FL
K4JCN, Shelton H. Collins, Seminole, FL
N4JY, William C. Clarkin, Altoona, FL
W4KUW, Billy Cobb, Clinton, TN
W4OWN, Donald D. Magers, Sarasota, FL
K4QPM, Horace G. Wiest, Jr., Lynchburg, VA
K4RZF, Andrew P. Jackson, Port St. Joe, FL
W4VXA, Lolen L. Drain, Waycross, GA
W5DVQ, Herschel S. Peake, Abilene, TX
W5EEH, Jack D. Webb, Denton, TX
W5FUD, Ralph W. Bradley, Dallas, TX
W5GJT, Fred E. Harrison, Beaumont, TX
K5ILE, Daniel G. Percifull, San Antonio, TX
KA5KEM, Oscar E. "Ed" Lunsford, Jr., Lewisville, TX
*W5NOT/K5TT, Thomas V. Terry, Houston, TX
*W5PTJ, C. L. "Larry" McCollum, Houston, TX
W5QWB, Lynne H. Hull, Mission, TX
W5UMR, George E. Downer, Austin, TX
K5WXT, Louis Arivello, Hitchcock, TX
K6AQL, Edwin W. Marshall, Napa, CA
W6BQL, Howard W. Triplett, Placerville, CA
WA6EMS, Wilbur N. Price, Santa Maria, CA
WA6EOE, Theodore O. "Ted" McCrea, Bodfish, CA
A16G, Donald M. Cowgill, Sacramento, CA
W6GGC, Walter A. Buckley, San Francisco, CA
W6GZH, Olive I. Bulton, Hayward, CA
W6HVZ, Raymond "Ray" Rousseau, Garden Grove, CA
W6IR, Charles M. Sheetz, Monterey Park, CA
W6JO, William "Bill" G. Watkins, Anaheim, CA
W6JTK, Clarence L. Harvey, Whittier, CA
WA6JWU, John A. Shay, Joshua Tree, CA
W6LQJ, Robert E. Morter, Ventura, CA
WB6MLY, Theodore "Ted" Dean Parker, Soquel, CA
W6OJW, B. W. "Bill" Southwell, Dixon, CA
K6PQP, Charles E. Sutton, Napa, CA
WA6SIA, Winton E. daPron, Bakersfield, CA
W6TCN, Mary E. Peffly, Atacadero, CA
WB6YKD, Myron "Mike" Ronne, Canoga Park, CA
K7AN, Willis M. Cowles, Portland, OR
WA7CMD, Newman M. Waltz, Everett, WA
K7DVE, Emery Stoy, Hoquiam, WA
K7EHN, Victor B. Novak, Ryderwood, WA
K7MRZ, Charles C. Goddard, Jr., Butte, MT
WB7TUO, Charles L. Utterback, Sequim, WA
W7XH, Lewis N. Parmley, Oak Harbor, WA
*W7ZMH, Charles L. Fair, Jr., Phoenix, AZ
W8BBB, Ronald E. Guentzler, Ada, OH
W8DAW, Russell B. Whitehurst, Bloomfield Hills, MI
W8FBK, Oswald K. Faubel, Ellenton, FL
W8FEY, Paul C. Woodland, Arlington, TX
K8IRW, Bernard M. Clawson, Greenville, MI
WD9BJP, George H. Orr, East Peoria, IL
K9CIQ, Cecil G. Gutshall, Elmwood, IL
WA9CMO, J. W. Nix, Rochester, IN
K9CXF, Joseph A. Boedeker, Alton, IL
W9DZW, Donald Cook, Drayton Place, MI
KA9IDV, Casmer J. Sikorski, Stevens Point, WI
W9IXF, Paul F. Kraft, Kenosha, WI
W9JOV, Joseph Skrljack, Clearwater, FL
K9LO, Lolo W. Maisel, Vernon Hills, IL
W9NZZ, John Stanley Surber, Peru, IN
K9PMG, William R. Quinn, Calumet City, IL
W9QGN, Lawrence J. McCann, Oglesby, IL
W9YYD, Edward S. Black, Jr., Tallula, IL
W9ZWX, Arthur R. Melvin, Fairbury, IL
WAØCKX, Philip G. Johnson, Lincoln, NE
WØCLP, Elwood L. Skafte, Duluth, MN
WØCTB, Victor M. Brown, Willow Springs, MO
WØEUX, Harvey D. Jehring, Sr., Pleasant Valley, IA
WØGBV, Freeman E. Lester, Rea, MO
KAØIAU, Archie B. Swelin, Minneapolis, MN
WØICV, Earl N. Johnson, Alma, KS
WØIWR, R. Claud Trieman, St. Louis, MO
WØMNN, Fred M. Berry, Leawood, KS
KBØRU, Robert V. "Bob" Peterson, New Ulm, MN
WBØVST, Robert E. Williamson, Chanute, KS

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgement 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*.

Results, Sixth ARRL International EME Competition

By Mark J. Wilson,* AA2Z

Late at night on October 9-10 and November 6-7 last year, hams from all parts of the world sat in their shacks in front of an array of sophisticated equipment listening to very weak signals picked up by their equally sophisticated antenna systems. These weak signals managed to survive the torturous trip to that great passive reflector — the moon — and return to earth to be heard by a small but growing band of EME enthusiasts actively engaged in the most recent running of the ARRL EME contest.

Last fall's event was a departure from the traditional spring EME contest, and by all accounts the change to the fall was the right thing to do. Conditions were excellent, although there are conflicting reports on which weekend was the better of the two. Several stations indicated on their logs that they would not have been able to get on if they didn't have the summer and early fall warm weather to build and develop antenna systems. And best of all, activity levels were very high; we received 109 logs for the fall contest, compared to 87 last spring. Average QSOs per entry were higher than ever before at 26.8 for single ops. All in all, this was probably the best EME contest yet.

The other difference between this contest and the others is that we've broken down the scores into several more categories. Single operators may now compete in single-band classes, as well as in multiband. This change left only nine single-op stations active on more than one band. HB9SV took top honors in this class, using 144 and 432 MHz to run up a very nice score.

The 144 MHz-only single-op class was the most popular, with 49 entries. WA1JXN/7 placed first in this competitive category with a score 77% better than in the spring 1982 event. Lance worked many small stations, including W5UWB who was running a single "Jr. Boomer" antenna. KI7D closely followed Lance, and W5UN, with a new (and big!) antenna, placed third. The continued rapid growth of 144-MHz EME made for many excellent scores on this band. Even smaller stations had their hands full. Using only four antennas the first weekend (and upgraded to six the second), K1FO worked a total of 46 stations without the use of skeds.

The competition on 432 MHz was very intense among heavyweights N9AB, I5MSH, F9FT and Z25JJ. All posted excellent scores that were above last spring's best. Of the 30 432-only stations sending logs, Andy, N9AB, came out on top with 68 QSOs, all made on random. A look at the table showing antennas used by the various top contenders shows that several different antennas can be successful. One big surprise for the 432 ops was the November 7 appearance of NP4B using 3-W (yes, 3!) output and the 1000-foot Arecibo Observatory dish antenna. Maybe this contest needs a QRP class . . . .

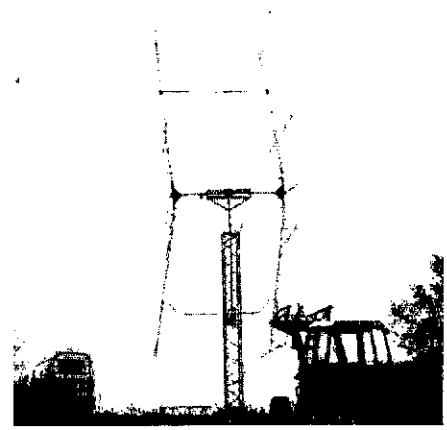
Only three stations submitted 1296-only scores, but the activity was there, as witnessed by leader SM6CKU's QSO total, which is 33% higher than in the spring. K2UYH reports that two new countries, OZ and OE, were active on this band.

Among the 14 multiops, WBØTEM, assisted by WBØPJB, again led the pack with an outstanding 539 kilopoints, a new record score for any class in this contest. Second place went to YU1AW, while K2UYH again placed third. The K2UYH score is excellent when you consider that they didn't make a single contact on 144 MHz and that they did work almost every available station on the bands they operated.

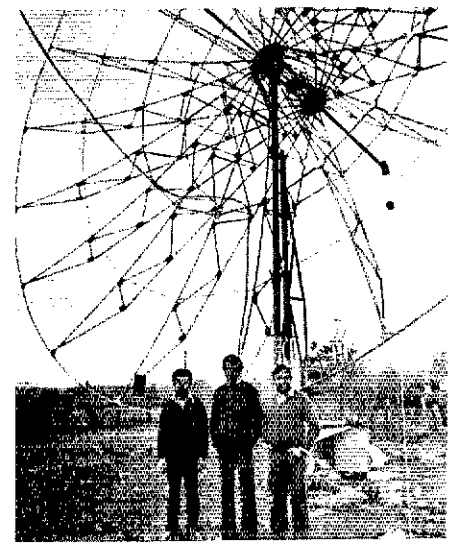
The fall EME contest was so successful that it will continue to be held at that time of year. Special thanks go the ARRL Ad Hoc Committee for VHF/UHF Contesting and WA1JXN, K1WHS, W1JR, K2UYH and F9FT for their valuable assistance in determining the best dates.

Antennas Used by Leading Stations

Class	*Call*	*Antenna*
Single Op Multiband	HB9SV	16 × 16-el Yagi (144) 16 × 21-el Yagi (432)
	N4GJV	16 × 3-el quad (144) 8 × 13-el Yagi (432)
	DL7YC	8 × 21-el Yagi (432) 2-meter dish (1296)
	G3LTF	20-foot dish (432 and 1296)
Single op 144 MHz only	WA1JXN	12 × 19-el Yagi
	KI7D	240-el collinear
	W5UN	16 × 26-foot boom quagi
	SM7BAE	(not specified)
	SM2GGF	8 × 15-el Yagi
Single op 432 MHz	N9AB	16 × 20-el quagi
	I5MSH	11-meter dish
	F9FT	16 × 21-el Yagi
	Z25JJ	32-foot dish
	OH6NU	16 × 21-el Yagi
Single op 1296 MHz	SM6CKU	8-meter dish
	VE7BBG	(not specified)
Multiop	WBØTEM	(not specified)
	YU1AW	12.2-meter dish (144 and 432) 7-meter dish (1296)
	K2UYH	28-foot dish (220, 432 and 1296)
	I2ODI	16 × 20-el Yagi (144)
	F6BSJ	8 × 16-el Yagi (144)
Commercial	K3NSS	84-foot dish (432)



A new design for 8 Yagis? No, just F6BSJ's array after 100-mph winds swept through the area!

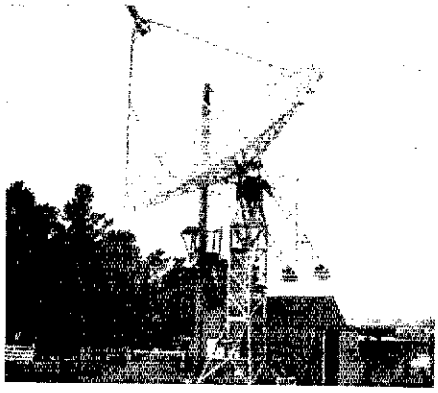


The YU1AW crew (left to right), YU1OAM, YU1BB and YU1AW, placed second in the multiop category using this 12.2-meter dish antenna.

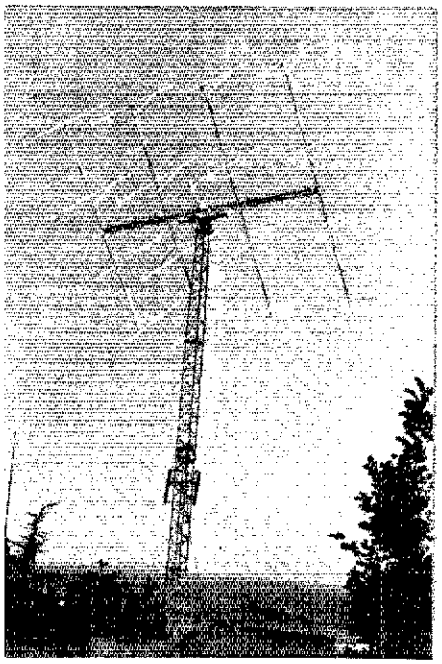
OH6NM (left) and OH6NU switched from 144 MHz to 432 MHz for this contest.

*Assistant Communications Manager, ARRL

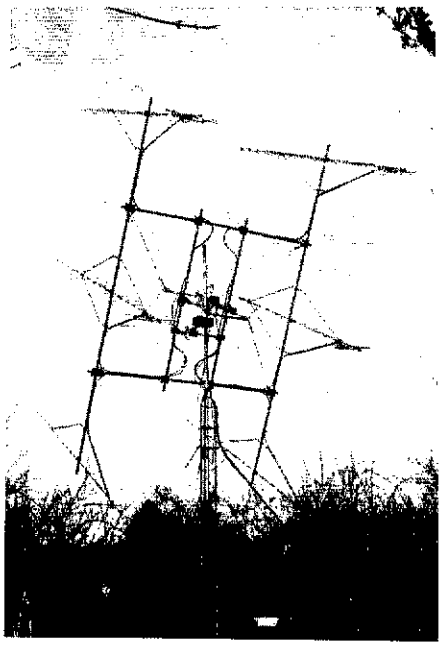
WBØTEM (left) and WBØPJB operated 144, 220 and 432 to win the multiop class.



ZL3AAD gave out several 1296-MHz contacts using this 20-foot dish.



That big 144-MHz signal from I2ODI emanated from this 16-Yagi array.



K1FO's array of six modified "Boomer" antennas played quite well during the second weekend. The phasing lines are made from RG-331/U (1/2-inch Alumifoam), and the array is fed with 7/8-inch air Heliax.® *(K1FO photo)*

SOAPBOX

We could not operate during the first session because of a vhf meeting. Our impression of the second weekend is very good (I2ODI). In 1980, '81 and '82, winter damage prevented me from being operational during the spring affairs. Fall definitely gives me time to repair winter damage. QRM below 432.012 was rough, but when I went above that I had no luck. It seems like the big guns have to lead the way in spreading the activity out (N2CB). We put up the station the week before the first weekend. Our results the first weekend were poor, so we worked the month before the second weekend and things were much better (EA3LL). Conditions the first weekend were superb! (WAØLSH). The Nov. 6 period was excellent. I2ODI was 30 dB out of the noise, and I was able to work nearly every station I could hear on random (KD9Z). Reduced my total receive system temperature to 50 K by installing a new, ultra-low-loss feed system. My echoes are consistently 6 to 12 dB out of the noise. I now know what the 16-Yagi and big-dish operators are hearing! (KL7WE). It would be interesting to give 100 points for a sked QSO and 200 points for random. Also, U.S. states should be broken down as multipliers (F6CJG). Being the only California station on 2 meters during the first weekend made me *very* popular (KY4Z/6). Let's have two contests every year (N4GJV).

FEEDBACK

Please refer to August 1982 *QST*, page 72, for the following corrections to the spring 1982 EME contest. The following entries were received too late to make the results. In the single-operator class, AF1T 100-5-1-1-A. In the multioperator class, I5MSH (plus 15s CTE, TDJ, UNA) 159,300-59-59-27-C; OE3XUA (OE1WWA, OE3s LI, ZK oprs) 68,200-35-15-10-A, 26-16-12-C; 16WJB (plus 16s OVO, YPK) 7000-17-10-7-A.

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

HB9SV	196,000-	24-	24-16-	A
		32-	32-19-	C
N4GJV	87,400-	21-	9-	6- A
		42-	24-17-	C
OL7YC	68,200-	28-	28-11-	C
		3-	3-	3- D
G3LTF	57,500-	17-	17-16-	C
		8-	8-	7- D
EA9QIF	41,800-	16-	16-13-	C
		6-	6-	6- D
VK5MC	41,400-	4-	4-	3- A
		15-	15-11-	C
		4-	4-	4- D
WB5LOA	36,000-	3-	3-	3- B
		4-	4-	4- C
		13-	13-11-	D
W1JR	24,000-	3-	3-	3- A
		6-	6-	5- B
		7-	7-	7- C
N6AMG	4900-	6-	6-	6- A
		1-	1-	1- B

144 MHz Only

WA1JXN/1	363,000-	120-	110-	33- A
K1TD	304,000-	95-	95-	32- A
W5UR	252,000-	84-	84-	30- A
SM7BAE	216,000-	75-	72-	30- A
SM2CGF	215,600-	80-	77-	28- A
WA8ONQ	176,700-	58-	57-	31- A
YU3USB	156,600-	58-	58-	27- A
WA4NJP	153,600-	75-	64-	24- A
OH7PI	140,400-	54-	54-	26- A
K6CJG	108,100-	47-	47-	23- A
K1FO	105,800-	53-	46-	23- A
SM6IVB	98,400-	41-	41-	24- A
WA9KRT	86,100-	23-	41-	21- A
OI5DT	58,900-	44-	31-	19- A
YT2MB	54,400-	32-	32-	17- A
K8BKQ	51,300-	27-	27-	19- A
SM6GVF	45,000-	25-	25-	18- A
K2QR	42,500-	31-	25-	17- A
KY4Z/6	38,400-	31-	24-	16- A
KR5P	36,500-	40-	23-	15- A
JA6DB	29,900-	23-	23-	13- A
W7HAH	26,600-	19-	19-	14- A
WAØLSH	25,200-	23-	18-	14- A
K9XY	22,400-	29-	16-	14- A
WA4LYS	20,400-	17-	17-	12- A
W7UOV	19,200-	24-	16-	12- A
WB8MHE	16,800-	14-	14-	12- A
K1MNS	16,500-	33-	15-	11- A
N7WS	16,500-	15-	15-	11- A
KB7N	15,800-	24-	14-	11- A
KD9Z	13,000-	13-	13-	10- A
WB8PAT	12,800-	40-	12-	10- A
WA4MVI	11,700-	13-	13-	9- A
WA2CSX	10,000-	10-	10-	10- A
UB5LIN	9800-	28-	11-	9- A
YU3IZV	9600-	12-	12-	8- A
W2CNS	9600-	12-	12-	8- A
SM5CPS	8000-	10-	10-	8- A
WA8ZHB	7200-	9-	9-	8- A
W8WN	5600-	8-	8-	7- A
W9BOZ	4200-	7-	7-	6- A
OH7RJ	3600-	6-	6-	6- A
WA9ALI	3400-	20-	7-	5- A
WB9GAS	3300-	7-	7-	5- A
W@RT	2500-	5-	5-	5- A
KJ8KR	1500-	5-	5-	3- A
K8BUK	1200-	4-	4-	3- A
WA4CQC	400-	2-	2-	2- A
G4OZU	100-	1-	1-	1- A

432 MHz Only

N9AB	197,200-	71-	68-	29- C
I5MSH (I5TDJ, oprs.)	179,700-	66-	64-	28- C
F9FT (F5SE, oprs.)	176,400-	67-	63-	28- C
225LJ	168,200-	58-	58-	29- C
OH6NU	140,000-	63-	50-	28- C
JA6CZD	137,800-	53-	51-	26- C
YU2RGG	112,800-	47-	47-	24- C
F2TU	88,800-	37-	37-	24- C
SM3AKW	85,800-	46-	39-	22- C
K5AZO	80,000-	32-	32-	25- C
W6ABN	74,800-	35-	34-	22- C
JA6BLC	47,500-	33-	25-	19- C
JA9BOR	45,200-	24-	24-	18- C
KL/WE	36,800-	33-	23-	16- C
OH6NM	33,600-	21-	21-	16- C
K8WW	33,000-	22-	22-	15- C
WB3ESS	30,600-	30-	19-	16- C
OJ6MK	30,000-	23-	20-	15- C
DK5AI	19,600-	39-	14-	14- C
W@RAP	19,500-	40-	15-	13- C
DL6WU	14,300-	22-	13-	11- C
W5UKQ	14,300-	20-	13-	11- C

1296 MHz Only

SM6CKU	23,400-	18-	18-	13- D
VE7BBG	18,200-	14-	14-	13- D
ZL3AAD	900-	3-	3-	3- D

Multioperator

WBØTEM (+WBØPJB)	539,000-	44-	44-	22- A
		9-	9-	8- B
		45-	45-	25- C
YU1AW (+YU1s BB,OAM)	408,900-	35-	27-	16- A
		60-	56-	27- C
		8-	4-	4- D
K2UYH (+WB2s (XP,UCV,W3HQT, WA3JUP)	406,700-	6-	6-	6- B
		60-	60-	29- C
		17-	17-	14- D
I2ODI (+I3s CSE,YXQ,I4BXN)	175,500-	67-	63-	27- A
F6BSJ (+F6BEG,FBOP)	148,200-	72-	57-	26- A
DF/VX	13,000-	13-	13-	10- C
WA4ZIK	13,000-	22-	13-	10- C
N2CB	11,000-	28-	11-	10- C
W1UHE	8000-	10-	10-	8- C
WA1FFC	4900-	41-	7-	7- C
K8UC (WB8YN, opr.)	4900-	3-	7-	7- C
DK1PZ	1600-	4-	4-	4- C
VK6ZU	1600-	7-	4-	4- C
OK1KIR (OK1s AEP,DAI,DAK,DCI, EK, oprs.)	1,300-	32-	20-	15- C
		16-	11-	8- D
OZ1EME (OZ2GX,OZ5IQ, oprs.)	24,000-	55-	30-	18- A
I2COR (+I2s TB1,YID,IW2s AMQ, ATM)	24,700-	18-	18-	12- C
		1-	1-	1- D
I6WJB (+I6YPK)	20,800-	16-	16-	13- A
EA3LL (+EA3s AEO,BEW,LL/2,RU)	16,500-	31-	15-	11- A
WA7JUO (+N7RPA)	11,000-	11-	11-	10- A
W4LY (KA4CKI,WB4EIY,KØRI, oprs.)	900-	3-	3-	3- A
W5UWB (+WA5YBK)	400-	3-	2-	2- A
F1HI (+F6DRO)	200-	14-	2-	2- A

Non-Amateur Equipment

K3NSS (WI2X,K3s AGK,LEO,KJ3T, W3PJM,KA9X,WAØLPR, oprs.)	183,600-	68-	68-	27- C
HP4B (+KP4I)	13,000-	16-	13-	10- C

SWL

JA9FY (26 stns- 144 MHz)	
DC5AL/P (11 stns- 144 MHz)	

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

MARCH

2

West Coast Qualifying Run, 10-35 wpm at 0500Z March 3 (9 P.M. PST March 2). W6OWP prime, W6ZRJ alternate. Frequencies are approximately 3590/7090 kHz. Underline one minute of the highest speed you copied, certify 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.

5-6

ARRL International DX Contest, phone, Dec. *QST*, page 94.

9

W1AW Qualifying Run, 10-35 wpm, at 0300Z March 10 (10 P.M. EST March 9). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See March 2 listing for more details.

12-13

YL ISSB QSO Party, cw, Feb. *QST*, page 94.

QCWA QSO Party, phone, Feb. *QST*, page 94.

Idaho QSO Party, Feb. *QST*, page 94.

Virginia QSO Party, Feb. *QST*, page 94.

Wisconsin QSO Party, Feb. *QST*, page 94.

IARS/CHC International Contest, cw, sponsored by the International ARS and the Certificate Hunters Club, from 0000Z March 12 until 2400Z March 13 (phone 0000Z March 19 until 2400Z March 20). Work stations once per band. No cross band, cross mode or repeater QSOs. Exchange signal report, membership number (if any) and state, province or country. Suggested frequencies: cw — 70 kHz up from low end; phone — 3.960 7.260 14.300 21.360 28.600. Count one point per QSO and one point per state, province or country worked. Multiply by number of IARS or CHC members worked. Mail entry by May 1 to Ted Melinosky, K1BV, 525 Foster St., South Windsor, CT 06074.

19-20

IARS/CHC International Contest, phone. See March 12-13 listing for details.

Bermuda Contest, sponsored by the Radio Society of Bermuda, from 0001Z March 19 until 2400Z March 20. 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. 80-10 meters, phone and cw. No cross-band or cross-mode QSOs. Exchange signal report and QTH (W stations send state; VE stations send province; U.K. stations send county; West German stations send DOK number; Bermuda stations send parish). W/VE stations work West German, U.K. and Bermuda stations only. West German and U.K. stations work W/VE and Bermuda stations only. Work stations once per band, regardless of mode. Count five points per QSO and multiply by number of VP9 stations worked per band. Logs must be received by May 31. Mail to RSB Contest Committee, Box 275, Hamilton 5, Bermuda.

Kentucky QSO Party, sponsored by the Western Kentucky DX Assn., from 2100Z March 19 until 0500Z March 20 and 1400-2200Z March 20. 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 — 1.815 and 50 kHz up from lower band edges; phone — 1.840 3.980 7.280 14.280 21.380 28.580; Novice — 3.725 7.125 21.125 28.125. Count 2 points per 1.8 MHz QSO, 1.5 points per cw QSO (except 1.8 MHz) and 1 point per phone QSO (except 1.8 MHz). KY stations multiply by total states, VE call areas and KY counties (max. 150) worked. Others multiply by total KY counties worked. Portables/mobiles add 300 bonus points to total score for each county operated from outside of home county (min. 10 QSOs from each county). Mail logs by May 1 (include large s.a.s.e. for results) to William Shipe, KD4PG, Rte. 1, Adairsville, KY 42202.

Tennessee QSO Party, sponsored by the Tennessee Council of ARCs, from 2100Z March 19 until 0500Z March 20 and 1400-2200Z March 20. 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. Stations must remain on a band or mode for 10 minutes after making a QSO. 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 mulitply 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 for each county operated from outside of home county (min. 10 QSOs from each county). Mail logs by May 1 (include large s.a.s.e. for results) to ORARC Contest Coordinator, P.O. Box 291, Oak Ridge, TN 37830.

Spring RTTY Contest, sponsored by the British Amateur Radio Teleprinter Group, from 0200Z March 19 until 0200Z March 21. Operate 30 hours maximum. Off times must be no less than three hours each and must be indicated on log. Single operator, mulitoperator and SWL categories. Work stations once per band. 3.5-30 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 Ted Double, G8CDW, 89, Linden Gardens, Enfield, Middlesex, England EN1 4DX.

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; 2100-2200/3.560; 2200-2300/14.060. Contact Christopher Page, G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex, BN4 3JW England for further details.

24

W1AW Qualifying Run, 10-35 wpm, at 1400Z (9 A.M. EST) March 24. See March 9 listing for more details.

26-27

CQ World Wide Prefix Contest, phone, sponsored by *CQ Magazine*, from 0000Z March 26 until 2400Z March 27. 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. Mulitoperator stations may operate entire 48 hours. SSB only, 1.8-30 MHz (excluding the WARC bands). Cw contest May 28-29. Categories: single op, all band and single band; QRP (5W 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 North American stations, contacts between stations in different countries on the NA continent count two points on 28, 21 and 14 MHz and four 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, H44, 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 (July 10 for cw) to Steve Bolia, N8BJQ, 7659 Stonesboro Dr., Huber Heights, OH 45424.

Spring VHF/UHF QSO Party, sponsored by the Ramapo Mountain ARC, from 2100Z March 26 until 0400Z March 28. Single-operator and multioperator classes. A complete exchange consists of call sign and section designator. A section is defined as a geographical area 1 degree in longitude by 1 degree in latitude, indentified by a 4- or 5-digit number indicating the next lowest degree of longitude and latitude. Example: WA2SNA (Oakland, NJ) at 74° 15' west and 41° 03' north, would use a section designator of 7441. Scoring: Each QSO has a different point value based on the distance between stations. To arrive at the point value, take the difference between your section lat/long and that of the station you work. Use the larger difference, plus 1. Example: WA2SNA in 7441 works W3XX in 7638. The difference between 74 and 76 (long) is 2; the difference between 41 and 38 (lat) is 3. Take the larger of the two numbers (3) plus 1 equals 4 points for that QSO. Each QSO may have a point value between 1 (for QSOs in your own section) and 10. Multiply by the number of different sections worked per band. Score each band separately. Then multiply the total for each band by the band multiplier (50 MHz, ×2; 144 MHz, × 1; 220 MHz, ×8; 432 MHz, × 4; 1296 MHz and above, × 16). Band score equals QSO points × sections × band multiplier. Final score equals the sum of the individual band scores. Use separate logs for each band. Summary information includes a breakdown by band of QSO points, multipliers and band score, as well as final score. Be sure to include your section designator, ARRL section and ARRL Division (see page 8 of any *QST*). Official entry forms (highly recommended) are available from the sponsor for an s.a.s.e. Mail logs by May 1 to Ramapo Mountain ARC, P.O. Box 364, Oakland, NJ 07436.

APRIL

5

West Coast Qualifying Run, 10-35 wpm, at 0500 April 6 (9 P.M. PST April 5). See March 2 listing for more details.

7

W1AW Qualifying Run, 10-35 wpm, at 0300Z April 8 (10 P.M. EST April 7). See March 9 listing for more details.

9-10

ARRL Morning Special

23-24

Helvetia Contest

24

W1AW Qualifying Run

*Assistant Communications Manager, ARRL

Section News

The ARRL Field Organization Forum

Coordinated By Jim Clary, WB9IHH

CANADIAN DIVISION

ALBERTA: SM, E. Roy Ellis, VE6XC — SM/SEC: VE6XC. ASM: VE6AMM. STM/NM/DEC (APSN & ATN): VE6ABC. EC: VE6AGH VE6AVV VE6FV VE6AMM VE6AHC VE6ABC VE6ASL VE6AFO. On Feb. 8, we are commencing a weekly (7 P.M. local 3750 kHz) "on the air" instruction in traffic handling. It will be geared to emergency networks and also to help in setting up a Trans-Canada Traffic System which is needed. Everyone welcome. New manual being sent out listing ARES members and local govt directors with the assistance of Prov. Govt. ARES members to follow up with a letter to the Director confirming their desire to be available if required. Traffic: VE6CHK 701, VE6ABC 72, VE6CCL 30, VE6SU 14, VE6XC 10, VE6AAT 6, VE6BLQ 4, VE6CAA 4, VE6XW 3, VE6YW 2.

BRITISH COLUMBIA: SM, H. Ernie Savage, VE7FB — Season Greetings traffic has been heavy on BCEN and Public Service nets. Net managers feel this was the busiest for years. VE7DIH's operation successful and he is home recuperating. VE7ZR in critical condition in hospital past several months. VE7DAR won the Nanaimo IC2AT. BCEN NCS VE7DYB was the pilot of the plane that was hijacked by prisoners. He settled the problem by fire extinguisher over the head. BCEN net manager is sporting a new Kenwood 930. BEST of 83 to You All. 73. Traffic: VE7ZK 225, 7FB 177, 7CDF 129, 7BNI 113, 7COA 37.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: AJE. SEC: HK. STM: RO. OO: FK. NMs: VJ ACX NM HW TE. Traffic in December was up as usual; thanks to the many newcomers who got involved in traffic handling. Best of the New Year to all. MEPN QNI 1266, QTC 85, sess. 31. CTN QNI 175, QTC 29, sess. 30. WRIN QNI 232, QTC nil, sess. 8. MMN QNI 424, QTC 32, sess. 31. MTN QNI 218, QTC 123, sess. 30. Traffic: VE4RO 217, VE4ACX 138, VE4AJE 110, VE4PG 106, VE4JA 84, VE4HK 41, VE400 40, VE4TE 33, VE4SSS 22, VE4FK 18, VE4NM 14, VE4AAU 13, VE4ADS 12, VE4AGS 12, VE4AIQ 8, VE4NE 8, VE4AFO 7, VE4CF 7, VE4CR 6, VE4TL 5, VE4LB 4, VE4PA 2, VE4WW 2, VE4AEE 1, VE4IW 1.

MARITIME/NEWFOUNDLAND: SM, D. R. Welling, VE1WF — New rptr, VE1SJR, 147.27/87, on air in Saint John. Fall Flea Market in Moncton was a success. LCARC has new club quarters ready. Looking for volunteers to fill positions in section; can use assistance from any field. Contact SM on nets for info. NEW SERVICE — for CRRL Members ONLY — AN OUTGOING QSL BUREAU will be operated from P.O. Box 113, Rothesay, N.B. E0G 2W0. The Bureau will operate under same rules as ARRL Outgoing QSL Bureau. CRRL announcement on this made in January. APN: 31 sess., QNI 206, tfc 237, time 614 mins. Traffic: VE1WF 710, VE1XF 428, VE1BXA 125, VE1LCR/RO 30, VE1BKM 25, VE1ALU 17, VO1AW 16, VE1BPM 11.

ONTARIO: SM, Larry Thivierge, VE3GT — SEC: VE3GV. STM: VE3GFN. NTS nets were very busy during the past holiday season with BPLs earned by the following: VE3GOL (26), VE3KK (17), VE3HGJ (5), VE3HTL (4), VE3CYR (2). Thanks to everyone, the various nets and the members of the KWARC Coffee Club, who helped out this year. The Seaway Valley Net and the Thousand Island Net are two new local 2-metre nets, managed by VE3GTF and VE3LBU respectively. VE3JLP, who manages to squeeze in a few QSOs when not involved in his many activities, is still looking for a phone patch sked with Lubbock, Texas. Section amateurs saddened to hear of the passing of VE3DOR. New appointments: OBS-VE3DZH; ORS-VE3KXB. VE3SB, an accomplished scuba diver, has been doing some flying with an old buddy. Interest is running high in the new VUCC awards program and the early receivers of *QST* were off to a head start. This should appeal to former OVS appointees. VE3NYB and VE3NDP are new members of the NPARC. New amateurs include VE3s. NQH NQI NZL and NZF, as the Ontario section amateur population hovers around 8,400. 1983 plans to be a year of progress for the Southern Ontario Repeater Team Inc. VE3NTJ, who recently received her ticket, is the sister of VE3HTL. VE3EYW continues to provide news items from Manitouwadge and reports that repeater VE3TOP is running well with good overall range but not too much activity from Elliot Lake. VE3HK is off to Zimbabwe on a three-year teaching assignment and hopes to be on the air from there. Traffic: VE3KK 1843, VE3GOL 1113, VE3HGJ 925, VE3HTL 740, VE3CYR 518, VE3AWE 441, VE3DPO 311, VE3KXB 264, VE3GFN 229, VE3GT 223, VE3FGU 205, VE3WM 174, VE3KCZ 153, VE3BZB 138, VE3AJN 135, VE3JSM 103, VE3EUI 102, VE3BDM 79, VE3LNN 71, VE3AYZ 65, VE3MCO 37, VE3EWD 30, VE3WV 20, VE3FPI 15, VE3EFX 14, VE3IFP 12, VE3KLX 5. (Nov.) VE3AWE 74, VE3LNN 22.

QUEBEC: SM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2PJ. NMs: VE2EDO VE2FSA. Hats off to the QSN ops, who handled the holidays traffic with no back log. This is my last "Section Activities" report as SCM. Next month I will report the "Section News" as your SM (Section Manager). Congrats to VE2GVP, a new call with the whitecaners. Encore cette annee le reseau du jour de l'an, sur VE2TA et anime par VE2BIN, a ete un succes. VE2ADA s'amuse bien avec Mousse. VE2AYH est tres heureux avec son nouveau TS130S. Traffic: VE2EDO 151, VE2FFE 117, VE2BP 82, VE2EC 64, VE2EKC 44, VE2FSA 16. (Nov.) VE2FFE 28.

SASKATCHEWAN: SCM, W. C. Munday, VE5WM — STM: VE5QY. SEC: VE5II. NMs: VE5HG VE5OI VE5WM VE5ADZ. Net reports: SATN 30 sess., 305 QNI, 54 QTC; SPN 31 sess., 1484 QNI, 74 QTC; PWXN 28 sess., 540 QNI, 3 QTC. Thanks to all stations that handled Yuletide message traffic. The oldest continuously functional Amateur Radio club in Canada, the Moose Jaw ARC, has an award certificate commemorating the 60th anniversary of the club. For further details see December 1982 *QST*, "Canadian Newsfronts." Traffic: VE5ADZ 213, VE5WM 154, VE5KS 70, VE5AEJ 68, VE5CS 64, VE5BAF 38, VE5UX 38, VE5OI 32, VE5AAT 23, VE5RN 16.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY WA3DUM W3DKX. Kent Co. ARC officers for 1983: KA3IDN, pres.; KA3HVU, v.p.; N3CYZ, secy.; WB3ILX, treas. Also their members upgrading were KA3HVU and KA3IJO. Congrats. KA3IJO is blind, and received his Novice in early '82 and now has his general. SARA having dinner party for members and families. Snow birds now taking annual migration and are checking in to DTN with good signals. Hope with holidays gone we will have more activity reported. DTN: QNI 389, QTC 65 in 23 sess. SEN: QNI 33, QTC 2 in 4 sess. NCC 2M (Dec.) Net QNI 27, QTC 1 in 4 sess. NCC 2M (Nov.) QNI 25, QTC 4 in 4 sess. Traffic: W3PQ 336, WA3WIY 142, W3QQ 125, WB3DUG 112, W3DKX 54, WA3DUM 34, WA3PWT 10, KA5DIJ 8, W3WD 5.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — SEC: WA3PZO. STM: KB3LF. DEC: AA3C K3QXC KB3QW KB3UD N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.	Mgr.
EPAEPTN	3917	6 P.M. Dy	590	506	31	WA3EHD
EPA	3610	7/10 P.M. Dy	598	487	61	AA3B
PTTN	3610	6:30 P.M. Dy	213	66	26	WB3EPU
PFN	3958	5 P.M. Dy	356	432	31	WA3WQP

Local and vhf nets reports (QNI/QTC/sess.): D3ARES 284/54/6; D5ESN 68/10/4; D6ARES 32/12/5; CAREC 22/3/5; WARCVTN 68/10/4; D3ARES for 1982 2558/311/53; D5ESN for 1982 895/165/56. New appointment: KA3EJG to OBS. BPL: KB3LF KB3UD WA3EHD. OO reports: W3FAF W3GOA W3KEK. OBS: K3EBZ W3AVJ W3CL W3VA WA3ENE WB3FVJ. PSHR: KA3DLY KA3EJG KA3GJT KB3LF KB3UD KE1L KE3U N3CJP W3GOA W3VA WA3EHD WA3WQP WB3FKP WB3KUZ WB3FYT. KB3UD and WA3EHD make BPL for first time. Congrats. Nice to have KB3FW back in nets again. W3KAG and WB8KPE reported for first time, welcome aboard. Upgrades: W3KOC KA3APT to Adv.; KA3GWG to Gen.; N3DXX KA3IGW to Tech. WB3HNK reports Lebanon Valley SRA Novice class graduated the following Novices: KA3KET KA3KEU KA3KES KA3KER KA3KEQ. KA3BMO reports KA3KDL new Novice in Reading. EPA welcomes KB3FW WF4R. EPAEPTN welcomes KA3GWG. PTTN welcomes KA3CHB. New gear: WB3FKP TI-99/4A. WB3KUZ Vic20. N3ARQ DS3100ASR. WA3WQP issued PFN net certificates to KA2FFC N3AIW. Warminster ARC finished fall classes in Dec. and graduated Novice class (12 students). WB3FYT reports Computer Mail box now on 146.10/70 RTTY rptr in Wilkes Barre. N3BAY advises Pike Co. ARES has new 2M Super Station master ant at 169 ft. Beginning Jan. 1st this office will be known as the Section Manager (SM). This will place broader responsibilities and authority to delegate important responsibilities to members of this Section. I have openings for the following appointments: Official Observer/Radio Frequency Interference Coordinator (OO/RFI Coor); Affiliated Club Coordinator (ACC); Public Information Officer (PIO); State Government Liaison (SGL); Technical Coordinator (TC); Bulletin Manager (BM). Members of ARRL who are interested in any of these appointments contact this office. Traffic: KB3UD 677, KB3LF 525, WA3EHD 472, WA3WQP 405, W3IPX 306, KE1L 255, WB3KUZ 245, KA3DLY 241, KA3GJT 187, AA3B 172, W3VA 156, W3KAG 131, N3CD 129, W3AQN 102, KA3BQS 92, KB3JW 70, KE3U 68, N3COY 63, WB8KPE 63, KA3EJG 57, W3TWV 37, WB3FKP 34, W3ADE 31, N3BFL 30, N3CJP 27, KB3XO 25, KB3FW 23, N3BAY 22, WB3FVJ 18, W3FAF 14, WA3CKA 10, W3PTM 9, WB3FYT 8, W3HK 7, W3CL 6, K3YD 5, N3BHF 4, K3QXC 3, N3CMC 3, KC3AK 2, N3AKQ 2, WB3CAI 2, W3AVJ 1, K3EBZ 1. (Nov.) KE3U 12.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — STM: WB3GZU. SEC: WA3TAI. Congrats to W3IK for his new volunteer job as Deputy Director, K. of C. in Maryland. He is still an OO and misses the FMTs. KK3F's problem how to put up a full size antenna on less than a half wave lot? KB3WL keeps K3QWO alerted as to snow in the mountains. W3FZV finds lots of traffic along with everybody else. KC3DW joins WB3GZU in the BPL. Congrats to you. WB3BFK has connections with MARS. W3DOI is into computers. KB3AP keeps MARCO skeds. W3LDD is still chasing DX. W3UT provides the back up for the cw ops. N3OA lives on an island. N4DR is highly pleased with the new band and new rig. KB3NL had a practical Xmas — no ham gear. W3CVE is still chasing SOWP members. WB3GZU, despite the heavy workload, had a big traffic month. W3ZNW is doing all right with RTTY. KA3R says business is picking up — he is an OO! KC3D is trying the cw net and liking it. W3CDQ has heard on a two-meter rptr! After 45 years, KJ3E replaces his bug with a keyer. WA3FYZ is still mobile! WB3KJT had his best ever month, and the new rig perking very good. KA3CDQ redid the garage into a FB radio shack. W3OYY opines December was like old times. W3RUN credits KA3HAM for his assistance with the BARC education program. All the ops at Dundalk Marine, WMH, are hams — N3IT K3FT and W3RUN. Antietam ARS: WA3EOP, pres.; KA3JWE, v.p.; WA3JPZ, secy.; K8RYA, treas.; KA7ITP, activities; W3AAA, FAR rep. Elkton: KA3DRO, pres.; WB3ISS, v.p./treas.; KD3B, secy.; K3UAV, trustee; WA3MMX, director. Anne Arundel ARC: WA3KCY, pres.; WA2FMT, v.p.; KA6JJK, secy.; KA3ERP, treas.; N3FN K3CN W3AAE, board. FAR is still looking for a permanent secretary. The Montgomery Co. RACES/ARES bulletin summarizes 1982 activities. Net/Manager. Sessions/QTC/QNI avg. WC 2-Mtr/KC3DW 4/4/19. MDC PON/W3OYY 5/28/24. WR PON/WB3BFK 21/229/17.8. MDD/W3PQ 62/418/816. MEPN/WB3GZU 30/352/30.5. Brass: W3FA W3FZV W3QQ. 100% W3DKX K3CRW KB3WL. Others N3AGM KA3ARH WB3BFK W3FA W3LDD K3ONU. Traffic: WB3GZU 925, KC3DW 629, W3FA 383, KJ3E 294, W3CVE 232, KB3WL 128, W3UT 127, W3FZV 119, WB3KJT 91, KB3AP 85, N3QA 64, KK3F 63, WB3BFK 53, KC3D 32, W3DQI 31, W3LDD 22, N4DR 17, W3ZNW 8, KB3NL 2. (Nov.) N4DR 7.

SOUTHERN NEW JERSEY: SCM, Bill Luebkemann, WB2LCC — SEC: W2HOB. STM: N2CER. December was, as the below totals will bear out, its usually busy self in 1982. With several people making BPL in our section (a record, I think), we really have something to be proud of. On the ARES front we are still looking for ECs for several counties, something we should NOT be proud of. Can you help? Contact W2HOB for info in this area. It is with some regret that I must use these last few lines to announce my resignation from the SCM job after over four years of fun and enjoyment. With an ever increasing burden to spend more time doing the Lord's work, I have had to severely limit my hobby and business activities. I am, however, looking forward to many new and infinitely more exciting things in my future as I grow closer to Jesus. Our new SM, effective January 25, is Ted Wood, N2CER. His extensive background in traffic handling and public service work, his ability and willingness to travel to and fro between different club meetings in the section, his eagerness and the fact that he is retired and has the time, are all helpful factors in his selection as my replacement. Page 8 of this issue shows his complete name and address. Please give him the support and show him the kindness that you all have toward me. And thanks for the opportunity to serve you for so long! Traffic: WB2IQJ 3289, N2CER 1027, WA2HEB 650, WB2ZJF 504, WB2PKG 150, WB2PXD 126, WB2JCE 100, KC2PB 94, KM2E 41, KA2KTH 25, WA2TWK 23, KA2GSL 6.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZOJ. ASM: W2GLH. LOs: WA2AIV N2APB KA2AYZ N2BED KA2BHR N2BLX N2BQV W2BYO KA2CMQ WA2CAM WB3CUF K2CWD WA2DHB K2DHR K2DUR KB2DP N2EH KC2EU W2EWO W2FEY W2FR W2GJ WB2HLY WA2HSB WB2JWD K2KIR WA2KOJ K2LKH WB2MVX KA2MYD WA2NAC WB2NAO WA2OEP WA2OVT WA2PUU KC2QQ WB2QZL KC2SJ WA2VAM K2VTT KB2XI. BPL: W2AET W2MTA WA2FJJ WA2HSB WB2IDS WB2OWO K2QR.

Net	Freq.	Time/Day	QNI	QSP	QND
NARASEN	75/15	0930/S	69	0	4
NYS/1*	7077	1000/M-S	245	237	27
NYSCN	3677	1000/Sn	36	19	4
THIN	3913	1600/Sn	55	0	3
NYPON*	3913	1700/Dy	732	869	31
NYSPTEN	3925	1800/Dy	746	178	31
ESS	3590	1800/Dy	436	138	31
OCTEN*	34/94	1830/Dy	620	131	31
Q Net	31/91	1830/Dy	395	7	31
STAR/E*	99/39	1830/Dy	68	26	24
WDN/E*	04/64	1830/Dy	631	304	31
NYS/4*	3677	1900/Dy	426	444	31
JCARCN	10/70	2000/Dy	359	10	25
OARCN	25/85	2000/Wed	106	0	5
VHF THIN	04/64	2000/Tue	61	0	4
WNYECN	3955	2000/3Sn	(ARES)		
BRVRAN	055/655	2100/Dy	405	9	31
CNYTN*	90/30	2115/Dy	424	207	31
STAR/L*	325/925	2130/Dy	71	82	26
WDN/L*	04/64	2130/Dy	706	382	31
NYS/5*	3677	2200/Dy	358	482	31

*National Traffic System net. PSHR: W2AET KA2BHR N2BLX WA2FJJ W2GJ KC2HJ WB2IDS WA2KOJ W2MTA WB2OWO KC2QQ WA2SMZ KC2SW W2ZOJ. Appts: KK2Y KG2D W2ZOJ-ORS: WA2PUU KC2SJ-NM; WA2PUU-EC. THANKS to K2KQC for many years of service as NM NYPON, KC2SJ took over reins 1983. NOVICE CLASSES: Oswegatchie ARC-WA2NAN; Syracuse RAGS-WA2GWN; Champlain Valley ARC-WA2BDW; FB all, more ELMERs and ELMAs needed in WNY. Club Officers: Rome-KC2RN KA2NIL WA2YES KA2JXA; ARATS-WB2WUB KA2HBO K2LRL; BARA-KF2X N2BLX WB2GHH N2CFN; Champlain Valley-WA2BDW KA2MOS WD2AKF KA2MOO; LARS-WA2MYG WA2ZUG; NYPON-KC2SJ WB2IDS WB2TDN W2UYE; NYSPTEN-WB2HKU WB2SON K2VTT KD2V. COMMS: RAGS Sports Council Champs and Tourneys; STARS operation Jingle Bells; Oswegatchie ARC Fort Drum "telephone blackout". HAMFESTS: Owego STARC May 7; Rochester State Convention May 20/21. K2QR reports ten EME stations WNY. Mike Farad Net (Nov.) 225-42-26. Traffic: WB2IDS 1050, W2MTA 846, WB2OWO 793, W2AET 763, WA2FJJ 532, WA2HSB 513, W2FR 449, WB2QIX 335, W2ZOJ 285, KO2H 268, K2QR 233, N2BLX 230, KB3RG 202, KG2D 192, KC2SJ 188, KK2Y 183, WA2SMZ 168, KC2QQ 161, W2GJ 151, WB2RBA 148, WA2KOJ 146, KA2BHR 145, KC2SW 108, AP2K 100, KA2BCH 98, N2DZF 62, K2IUT 60, WA2AIV 59, N2ABA 53, WA2RXO 49, KA2BCE 47, KA2DBD 47, N2ARD 43, KA2DQA 36, K2RN 36, WB2PID 34, WB2NAO 30, W2HYM 29, N2CBZ 27, WA2OEP 27, W2PHQ 18, KB2YU 12, KA2OCQ 9, K2VR 2. (Nov.) VE2FMQ 100, KA2BHR 39.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — STM: AC3N. SEC: AB3Q. NMs: WA3UNX N3ADU W3MML W3NEM. DECs: WB3JDI KB3OO KN3ZAN WB3EFQ WB3KJH WA3ZNP N3ADU.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	392	352	31	3585	7:00 P/D
WPAPTN	745	364	31	3983	6:15 P/D
WPA2MTN	488	184	31	146.28/88	8:00 P/D
NWPA2MTN	467	39	27	146.04/64	9:00 P/D

Two more amateurs are Silent Keys, KB3IA (ex-W3JIO/W3NFX) and W3CRA who held DXCC #1; our sympathies to their families. New Novices are KA3KGY KA3KGK KA3KEP. New Tech N3CZZ. Advanced KC3ET was WA3UFI. New call N3CZA (was KN3SAS). New officers for 1983: *Washington Am. Com.-W3CYO, pres.*; AD3T, secy./v.p.; KA3JQE, treas. Foothills RC-WB3AMR, pres.; WA3HOL, v.p.; KA3EGE, secy.; KA3DFK, treas.; KA3HZS, mbr at large. This is the last report under the old ARRL section plan. As of January 1, we are adopting the new ARRL Field Organization structure. It should be

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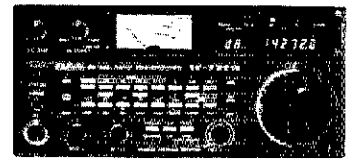

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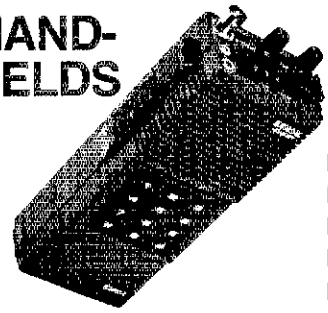

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BP-3, 250 ma, 8.4V batt	**$29.50**	**DC-1**, DC op pack	**$17.50**
BP-4, alkaline batt. case	**$12.50**	**Leather case**	**$34.95**
BP-5, 425 ma, 10.8V batt	**$49.50**		

IC-25A 2 METER FM TRANSCEIVER

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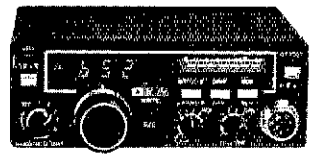

IC-290H 2 METER FM/SSB/CW TRANSCEIVER

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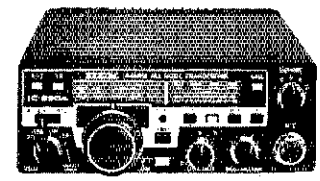

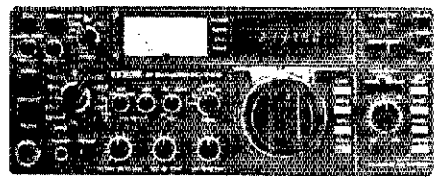

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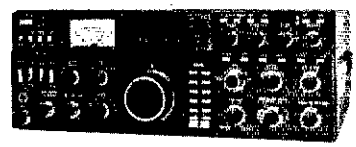

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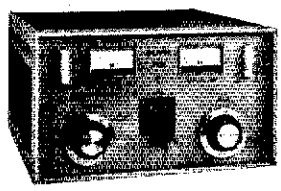

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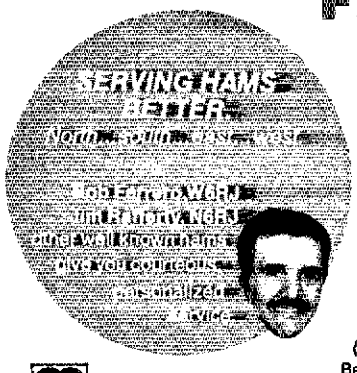

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much better after we get enough volunteers to take some of the needed positions as outlined in previous *QST* articles. Operators are needed for NTS section nets and and ARES. Some of the less populated areas do have some, but we cannot get their help in delivering traffic. We do have a station at the Amer. Red Cross Hqtrs, both hf and vhf equipment, as well as at the West Penn Hosp. Life flight at Ally Gen. Hosp. also is on the list. BPL: N3ADU K3CR AC3N. Traffic: N3ADU 937, K3CR 636, AC3N 521, W3OKN 491, KA3CDV 162, N3CKQ 156, WA3QNT 144, WA3UNX 138, K3IC 110, W3NGO 93, W3EGK 90, W3IQD 79, W3RUL 79, N3FM 73, W3SMV 73, K3SMB 72, N3BKU 67, KF3V 58, WB3JDI 52, KB3NV 47, W3SN 36, WN3VAW 36, W3KUN 35, K3LTV 34, W3KMZ 32, W3MML 31, K3NPW 27, W3TTN 27, KA3HDL 26, K3TUA 25, K3VQV 22, W3KYN 20, K3HCT 15, W3ZX 11, N3CYV 9, N3KB 6, W3LOD 6, KB3BG 4, AB3X 4. (Nov.) N3WS 12, WN3VAW 10, KF3V 3.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. ASM: K9ORP.

Net	Freq.	Times/Day	QNI	QTC	Sess.
ILN	3690	0030/0230 Dy (Z)	485	405	59
IPN	3915	2230 Dy (Z)	834	257	31
NCPN	3915	0700 Dy (L)	499	149	27
NCPN	7270	1215 Dy (L)	163	150	26
IEN	3940	1500 Sn (Z)	114	13	4
ITN	3705	1900 Dy (L)	264	103	31

CAND IL 100% stns W9HOT WB9CJB WB9WGD W9NXG, K9AXS reports QNI of 59 and QTC of 4 in 4 sess. of the W9VEY Memorial Net. Christian Co. ARES Net had 4 sess. de W9HLX. Total reporting stations for IL 43. W4MJT & KD9K ran Operation SANTA CLAUS from Graham Hospital in Canton via 2M on DEc 24. Congrats to K9MX for article published in *ARMOR* magazine, and for product review in *73*. WB9YVE reports several weather nets in a most unusual month in the Midwest for this time of year (understatement . . . see last month's column) and also tells of WB9YUD's election as president of Okaw Valley ARC for 1983. AF9M and WD9BBI finished first Batingbrook ARS Advanced & Extra Class with 4 of 10 participants upgraded so far. BBI also operated Hamfester's ARC W9AH on SKN celebrating its 50th anniv. QSL info on pg. 78 Jan. *QST*. K9DQU provided an amateur station on the 8th floor of the Chicago Loop Carson's store for the Chicago Morse Telegraph Club. WB9CWE, EC for Logan Co., tells of WB9QMO & W9LHS's activity during the flooding. KEEP UP THE GOOD WORK . . . Public service is what its all about! SPECIAL CONGRATS: TO WA9MRU for joining the presitigious DXCC, and to W9NXG for earning BPL! As can be seen from the top of the column, some new section-level appts have been made. K9ZDN as Bulletin Mgr; KB9X as STM; K9MX, "Spike" as OO/RFI Coord. Regardless of their area of appointment these hardworking guys are all in a sense Asst. SMs, and we'll all be working together for better service to members and to the public! YOU CAN HELP! If you are not already an appointee consult *Operating an Amateur Radio Station* for brief "job descriptions" and see which one might be right for you! Any suggestions for ACC or PIO? These very important section-level appts have yet to be made. Contact anyone on the masthead of this column if you have suggestions. Congrats to KA9NWO for her appt as ITN NM, and to K9AZS for becoming an ORS. BMPG department: ECs, please remember that the CD-210 should be sent to the SM while the 212 goes to the SEC. All appointees are reminded that either a CD-210 or a radio message CONTAINING THE SAME INFORMATION is needed by the SM by the nets at the 5th or the mail of the 6th EACH AND EVERY MONTH for inclusion in *QST*. Remember to send in CD-157 or a note to the SM indicating any outstanding service or achievements in the Section. Traffic: W9NXG 641, W9JJJ 411, W9HOT 366, W9DK 280, KB9X 276, K9MX 244, K9AZS 239, WB9WGD 223, KD9K 203, W9TLU 199, W9HLX 144, K9EHP 126, KA9NWO 95, KN9BAM 90, WD9IBH 74, N9DIX 61, WA9SHE 51, W9KR 33, W9LNQ 32, KA9NBH 22, WD9CJB 16, WD9HZF 15, K9DQU 11, W9SSP 11, WB9YAS 8, WA9RUM 6, K9ORP 2.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZQE. STM: W9JUJ. SOOC: KJ9G. SGLC: WA9BVS. SRC: N9WB. SAAC: K9TUS. SCC: W9OBF. STC: WD9ADB. SPRC: K9DIY. SDXC: N9MM. SOBC: KC9TA. NMs: ITN-W9QYY; OIN-KJ9J; ICN-KA9CZD; VHF-W9PMT; IWN-N9BHT; IPN-KO9F; I6SSB-WD9HQJ.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2300	2292	660	2585	62
OIN	3656	1430/0100/0400	881	652	2511	92
ICN	3708	0100	—	—	—	—
IPN	3910	2130	1209	303	1293	31
IWN	3910	1310	2840	—	553	31
6SSB50150		0100	418	7	2505	31

Hoosier vhf nets: QNI 8201, QTC 395, QTR 10, 196, Bulletins 36 for 31 nets. D9RN 100% 729 messages in 1850 minutes for 62 nets. IN stns W9URQ W9JUJ K9CGS KB9NR KJ9J 9RN 100% 1162 messages in 1792 minutes. IN stns W9JUJ W9OLW W9EI WB9UYU WA9QCF WD9GXW N9AEI N9HZ K9WWJ KK9K KI9R KJ9J. CAND 2504 messages in 31 sess. D9RN 100%. IN stns KJ9J W9JUJ K9DCX W9URQ K9CGS. Appts: OBS-W9CNE K9PQP OO-KA9FFO; ORS-KA9LAU WD9EXI KO9F; NM-IPN-KO9F. ECs-WA9NOH, Newton Co.; WB9UNL, Whitley Co.; WA9BLA, Dearborn Co.; KG9K, Johnson Co.; N9CBC, Wells Co.; K9TUS, Section Affiliated Club Coordinator, reports 75% response to his initial questionnaire to affiliated clubs. My goal is 20 Special Service Clubs in Indiana. KC9TA Section Official Bulletin Coordinator is looking for RTTY stations. Our goal is an RTTY station as OBS for every net. We have high hopes for an effective Indiana RTTY network. The Indiana section ARES net will be held the last Sunday of each month following the 2300 ITN. K9KTH and K9PQP have started District ARES nets. Thanks to K9DCX for getting the Kokomo group together. Also to KJ9J for the dinner meeting in South Bend and the forum arrangements for the hamfest. It was a great weekend. W9JUJ made a fine talk on service messages. I wish to thank KC9QE and KA9DTN for their very special handling of a priority message to a lady with no phone and a RR address. It's called doing the impossible. I would like to congratulate all those new club presidents for your willingness to serve. Now let us know who you are and how to reach you. We plan to make a very special effort to work with you this year. Traffic: W9JUJ 2179, KJ9J 549, W9EC 544, WB9UYU 460, W9URQ 362, W9QLW 295, N9AEI 230, KM9B 202, W9QYY 165, WA9YIF 159, K9DCX 155, KB9HH 149, K9WWJ 148, K9FZX 141, WB9MIK 131, W9EI 128, W9UMH 123,

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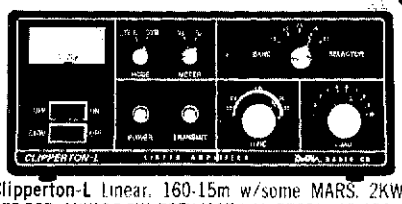
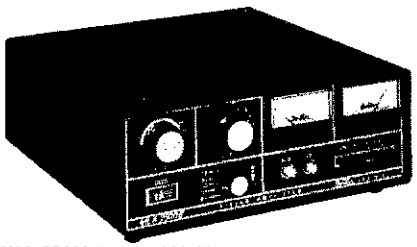
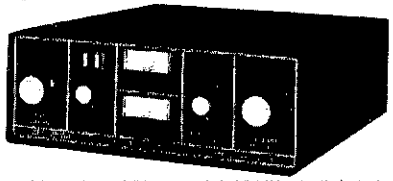


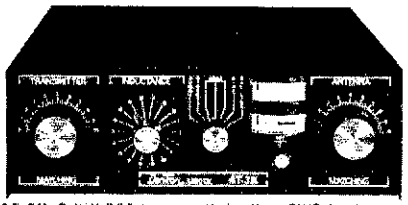
Clipperton-L Linear. 160-15m w/some MARS. 2KW PEP SSB, 1KW DC CW, RTTY/SSTV. (4) 572B's, 65-150w drive. Size. 6"h × 14½"w × 14½"d; Weight 42 lb.
Regular $699 - ***Closeout $599.95***



MLA-2500B Linear. 160-15m with some MARS. 2KW PEP SSB, 1KW DC CW, RTTY/SSTV. (2) 8875's. 60-135w drive. Size: 5"h × 14"d × 14"d; Weight 47 lbs
Regular $1299 - ***Closeout $799.95***



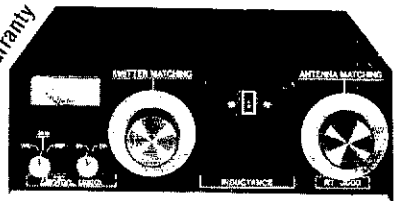
MT-3000A 3 KW PEP tuner. 1.8-30 MHz; built-in balun & dummy load. Tunes coax, wires and balanced line. Size: 5½"h × 14"w × 14"d; Weight 18 lbs
Regular $399 - ***Closeout $329.95***



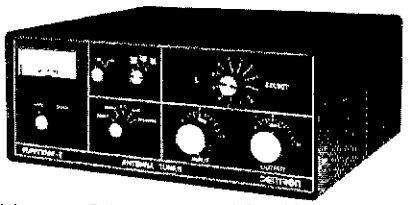
AT-3K 3 KW PEP tuner with built-in SWR bridge and separate forward and reflected meters. 1.8 to 30 MHz; tunes coax, long wires and balanced line with optional balun. Size: 4"w × 12"d × 13½"d; Weight 12 lbs.
Regular $259.50 - ***Closeout $199.95***

Big Dummy 50 ohm, non-inductive oil-filled dummy load. Rated at 1 KW CW for 10 minutes, 2 KW PEP SSB for 10 minutes @ 50% duty cycle. VSWR 1.5:1 or better, 0-30 Mhz. One gallon of xfmr oil included. 7½"h × 6¾"d. 8½ lbs..... **$29.50**

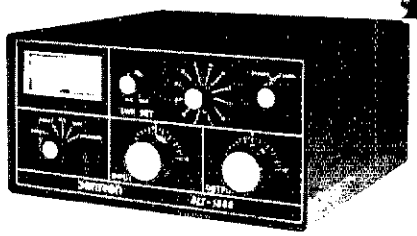
BL-1 Balun **$39.95** when purchased with tuner .. $29.95



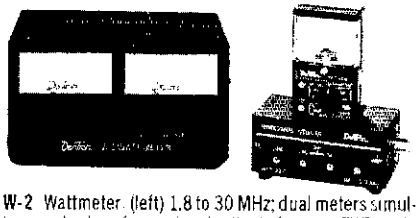
RT-3000 Roller inductor tuner. 3 KW PEP, 1.8-30 MHz continuous. Tunes coax and wire antennas or balanced line with optional BL-1 balun. Vernier dial, wattmeter. Size: 4"h × 12"w × 13"d; Weight 10 lbs.
Regular $299 - ***Closeout $229.95***



Clipperton-T Antenna tuner. 1.8 to 30 Mhz continuous, tunes coax, wires or balanced line. 1.2 KW PEP; 1 KW CW; Size: 11"w × 4¾"d × 12"d; Weight 14 lbs.
Regular $299.50 - ***Sale Price $259.95***



GLT-1000 Antenna Tuner. 1.8 to 30 Mhz continuous. Tunes coax, balanced line; 1.2 KW PEP; 1 KW CW; Size. 11"w × 4¾"d × 12"d; Weight 18 lbs.
Regular $198.50 - ***Sale Price $179.95***

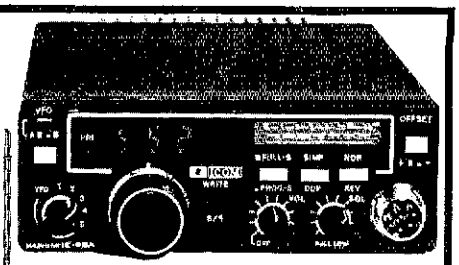


W-2 Wattmeter. (left) 1.8 to 30 MHz; dual meters simultaneously show forward and reflected power. FWD scale 200/2000w, REF. scale - 200w. 5% accuracy, Sensor box remotes up to 4' away. 3½" × 7"w × 6"d.
Regular $129.50 - ***Closeout $89.95***

W2-PEP Same as **W2** above, but reads PEP (peak) or average power. REF scale reads 50/500w, has push-button functions w/LED indicators & requires 117vac.
Regular $159.50 - ***Closeout $99.95***

Multi-PS-10 (right) 10 K Ohm/V VOM and 20/200w RF wattmeter/SWR bridge. 3.5 to 150 Mhz, 2½" scale.
Originally $49 - ***Closeout $24.95***

HF-ACS Power supply/speaker. Originally for HF-200A SSB Xcvr, but very useful as a utility supply. 117/234 vac; two outputs - 13.8vdc regulated @ 2A & 18vdc unregulated (unloaded) or 13.5vdc @ 16A. In cabinet with speaker. (Originally $129).....**Closeout $49.95**



ICOM IC-25A w/touchtone mic.
2m FM xcvr; **1982 model** w/red LEDS... **Sale $289.95**

Shakespeare Antenna Bargains

5600-1 2m trunk mount mobile antenna. Fiberglass, base loaded ⅝-wave gain, 500w. Mounts in ¾" hole or trunk lip without drilling. 20' of coax & PL-259. (Regular $35).. **$12.95** each; (2) for **$19.95**

5600-3 2m magnetic mount mobile antenna. Fiberglass base loaded, ⅝-wave gain, 500 watts. Attaches to any compatible metal surface. With 20' of coax & PL-259. (Regular $36).. **$19.95** each; (2) for **$29.95**

5701 2m Economy ground plane antenna. Quickly installed, base or portable. Fiberglass, base loaded, ¼ wave gain design. 100 watts. Mounts on 1¼"-1½" mast, accepts RG-58 coax. Mounting hardware included. (Regular $29)..... **Sale $19.95**

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Model		Reg.	NOW
18-940	2m trunk/roof mt antenna.....	$ 31.00	12.95
18-950	220 trunk/roof mt antenna.....	31.00	12.95
18-951	220 magnet mount antenna	37.00	16.95

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SUPER STICK II: (2) antennas for the price of (1)! Get a telescoping 5/8 whip for DX and a 4½" stubby Rubber Duck for convenience. Fully extended the 5/8 is 54½" long and provides a substantial improvement over a regular Duck. Collapsed it's 10" and performs like a regular Duck; extended to 14" it's similar to 1/4-wave.

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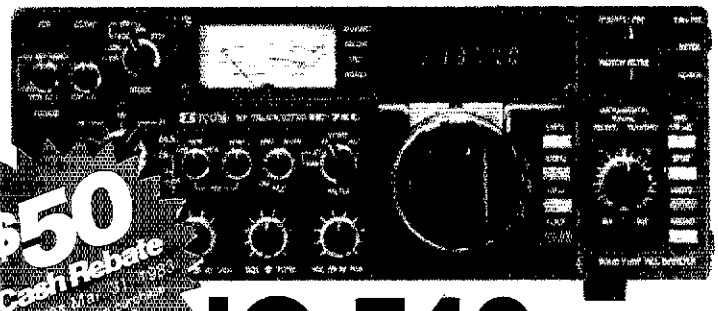

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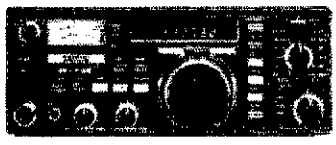

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WISCONSIN: SCM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1215Z QNI 1325, QTC 1480 WB9YPY. BEN 3985 1800Z QNI 693, QTC 284 WB9ESM. WSBN 3985 2300Z QNI 1177, QTC 532 WD9ESZ. WNN 3723 0000Z QNI 261, QTC 60 KA9HPQ. WSSN 3645 003Z QNI 220, QTC 58 N9BYK. WIN-E 3662 0100Z QNI 389, QTC 267 W9YCV. WIN-L 3662 0400Z QNI 340, QTC 176 K9LGU. XPO 3925 1831Z QNI 358, QTC 28 WA9GYF. NWTN 34/.94 0030Z QNI 484, QTC 37 WB9YPY. Gr. Bay .72/.12 Wed. 0245Z QNI 13 WB9NRK. WCWTN .31/.91 0030Z QNI 450, QTC 47 N9AUG. New Novices Sheboygan area KA9NVB KA9NVE KA9NSK KA9NPV KA9NPS KA9NVL KA9NVM KA9NTT. WA9OAK KC9MF KA9GMF have Extra. WA9TGL is now KQ9Y. WB9ZBE has 100 YL countries. KC9MF-DXCC 102 countries on phone. KC9Q-DXCC endorsement 200 countries mixed mode. KC9A 5-Band DXCC. MARA Christmas party was a success. WB9ROD is now N9DEC. Milwaukee Radio ARC Christmas party was a success as was Tri-Country Christmas party. Tri-County swaptest March 20 Eau Claire ARC officers: N9AIX, pres.; W9MEO, v.p.; W9BAR, secy., KB9BC, treas. Sorry to report WB9JYR is on the sick list, get well! N9DFZ is now KC9VM. W9CXY & KA9CPA made BPL. N9CFR & K9KBE are Advanced. K9VDD is now in Las Vegas. WNN certificates to KA9NOT & KA9NKQ. KA9KUA & WA9VYE have General. WIN-L report for November QNI 324 QTC 116. New appointees for ARRL restructuring are: Official Observer Coordinator-WD9ESZ; Affiliated Club Coordinator-WA9POV; Public Information Officer; K9ZZ. State Government Liaison-WB9NYG. Traffic: KA9CPA 2740, W9CXY 531, WD9ESZ 430, KC9KQ 387, W9YCV 362, K9GDF 275, WA9WYS 264, WB9YPY 252. W9UCL 217, K9FHI 178, KA9KLZ 178, KC9CJ 164, W9DND 162, N9DIH 153, N9BYK 142, WD9FRI 122, K9AKG 98, AG9G 97, KA9HPQ 96, W9SO 93, W9CBE 85, WB9ICH 74, W9OT 74, KA9IKR 66, KA9BHL 63, K9JPS 62, N9AUG 61, N9AZI 61, W9LDO 58, N9ATP 56, WB9NRK 54, W9IHW 53, KA9OBP 53, K9LGU 49, W9SFL 48, K9UTQ 42, WB9JGA 41, KG9B 38, K9HDF 35, WB9JSW 34, N9BCX 32, KB9GO 32, W9UW 31, N9BDL 30, WA9ZTY 28, N9DCF 27, WD9BKT 26, WB9WNA 26, N9CP 25, KA9GYD 23, WA9GYF 21, KA9NOT 20, WA9DXW 18, W9FDY 18, K9RTB 16, KB9NG 33, KA9IHR 10, WB9TOC 10, KB9FM 8. (Nov.) WA9ZTY 29, KA9IHR 17.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — STM: ADØS. SEC: KNØJ. I hope all had a super holiday season (computers are in!). THE DULUTH HAMFEST will be held May 7, Holiday Inn. Try to make it. Look for the Robbinsdale Hamfest in Feb. The St. Paul RC has some good programs at their meetings; check them out & join. Congrats to: KAØLKN KAØKDE KAØMQE on new Tech tickets; KAØGNN WDØGUY KAØNGT KAØIVQ on General tickets; WBØGBU KAØNQR KCØYQ on Advanced tickets; and KWØB for his Extra Class. Our prayers to the families of WBØAVQ WDØHXU who became Silent Keys. Let's see more checkins to all the Minnesota nets. WE NEED YOU and you will enjoy helping others. What a nice winter so far (+35 sure better than −104). CU on the nets. 73 ADØS.

Net	Mgr.	Time	Freq.	QNI	QTC
PICO	WØHZU	8:00A	3925	2903	2597
MSPN/E	KCØT	5:30P	3929	1230	281
MSPN/N	KAØJUX	12:05P	3945	645	182
MNWX	WAØONE	6:15P	3929	639	453
MSN-1	WØDM	5:30P	3680	279	212
MSN-2	KAØEPY	10:00P	3680	217	97
MSSN	WBØWXU	7:00P	3710	97	9

Traffic: KBØMB 1114, WAØTFC 589, KAØEPY 309, WØHZU 232, W9DM 229, KAØJUX 183, KAØARP 167, NØCLS 162, KAØIAQ 162, WAØONE 107, KTØU 95, WBØHOX 93, WDØHDD 85, WØDFX 80, KØOGI 69, WDØAHO 56, KTØR 53, ADØS 53, KØJCF 52, KBØRW 50, KØCSE 46, NØDUQ 22, KN9U 22, WBØWXU 22, WBØUKI 21, WDØBGS 10, NØDFR 10, NØJP 10, KAØJQO 9, KAØMZJ 5, WØKYG 4, KCØTG 3, WAØCEL 2, KNØJ 1, KAØNRU 1.

NORTH DAKOTA: SCM, Dean R. Summers, KQØC — MARA moving Minot rptr to Surrey, ND. It should have good coverage from that site. Hawks Nest, Carrington now on 07/67. WBØSJG NØDDS KØALL now all recovered. RRRA meets every 3rd. Tues. 0130Z at Cass Co. Emer. Svc. in Fargo. RRRA new officers: KNØA & WØZQJ, co-pres. WØFZJ, secy.; WØLHS, treas. KAØAWS moving back to Cheyenne in June. Goose River Net 5 sess., 70 QNI, 1 QTC. NDYLWX 17 sess., 146 QNI, 119 QTC. DATA 28 sess., 360 QNI, 45 QTC.

NDYLWX	3.9965	1330Z Dy
Goose River	1.990	1400Z Sn.
Data	3.9965	2330Z Dy
NDSN	7.145	2300Z S

Traffic: KAØFSM 147, WØCDO 58.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — ASM: WØKJZ. Charles Mix Co. EC WBØOMF busily helping out directly those stranded by our severe winter storms. WØYMB, EC for Walworth Co., reports significant organization and planning for area emergency communications. Signal Hill ARC newly elected: WBØKWE, pres.; KCØYT, v.p.; KØJV, secy.; NØDYC, treas. Please jump in anytime on the SDTIN. NTS TEN DTEN liaison stations were WØKJZ KØFRE WBØKWX KCØOO WAØAOY KAØANF and NØABE. Would you help them out? SD WX net 944 QTC, 1026 QNI; SD Eve Phone net 86 QTC, 1340 QNI; SD Indep NJQ net 50 QTC, 651 QNI; SD Traffic Inform. net 33 QTC, 162 QNI; SD EMG net 6 QTC, 140 QNI. BPL: WØZWL WØMZI. PSHR: WØZWL WØMZI WØKJZ KCØOO. Traffic: WØZWL 836, WØMZI 680, WAØVRE 221, WØKJZ 170, KØFRE 165, KCØOO 164, WØHOJ 161, KØAIE 106, WØDVB 72, WAØUEN 72, KAØANF 36, NØABE 34, WBØOMF 32, KCØAF 31, WØRWE 29, W7UDB 27, WØYMU 27, WAØAOY 26, WBØPAI 26, WBØ4DG 26, NØCFS 25, NØDCM 23, WBØHTT 23, WBØMZB 23, WBØZMW 23, WBØRXF 22, KØZBJ 22, WAØBZD 18, KØRVD 16, WBØSSC 13, NØCDX 11, WØVQC 10, WBØYQT 6.

DELTA DIVISION

ARKANSAS: SM, Dale Temple, W5RXU — SEC: WB5IGF. When you read last month's Ark. activities concerning the tornadoes and floods little did we know what Dec. would bring. Dec. 23 tornadoes came down near

Introducing a great new line of Viewstar components.

These quality engineered passive components have been designed by engineers who, like you are highly demanding amateur radio operators. Only the best components and state-of-the-art technology have been used to build them.

VS 1500A Transmatch *$379.95
This Transmatch is designed to match virtually any receiver, transmitter or transceiver in the 160 to 10 meter range, (1.8 to 30MHz) with up to 1500 watts RF power to almost any antenna. A 1:4 balun is built in for connection to balanced lines. Circuit uses the series parallel capacitor connection for improved harmonic attenuation. Units use the highest quality ceramic roller inductors and switches.

VS 300A Transmatch
This unit contains high quality components and is designed for lower power equipment up to 300 watts. It will match any receiver, transmitter or transceiver in the 160 to 10 meter range, (1.8 to 30MHz) with up to 300 watts RF power to almost any antenna. A 1:4 balun is provided for connection to balanced lines.

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This unit eliminates spurious conduction from transmitters operating below 30 MHz. It effectively eliminates 2nd and 3rd harmonics appearing in the TV bands when operating on 10, 15 and 20 meters providing excellent attenuation to TV frequencies above 36 MHz.

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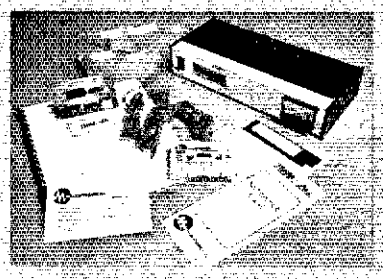

TERMINALL is a hardware and software system that converts your personal computer into a state of the art communications terminal. Terminall features simple connections to your computer and radio plus sophisticated and reliable software.

Simplicity

TERMINALL was designed from the outset to be easy to connect to your radio and easy to use. Plug into your receiver headphone jack and copy Morse Code or radioteletype (RTTY). Plug into your CW key jack and send Morse Code. Attach a microphone connector and send Baudot or ASCII RTTY using audio tones (AFSK). That's all there is to hooking it up.

The software is loaded into your computer from disk or cassette. Enter your callsign and the time and you will start receiving immediately. No settings or adjustments are necessary to receive Morse Code, it's fully automatic -and it works! You may type your message while receiving or transmitting.

You will be on the air, receiving and transmitting in any mode, in minutes. As we said, TERMINALL is simple.

More for your money.

■ TERMINALL has the RTTY terminal unit - demod and AFSK - built in. This results in a lower total cost.

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■ **Built in, separate, multi-stage, active filter RTTY and CW demodulators.** No phase lock loops. RTTY demodulator has 170 and either 425 or 850 Hz shift, keyboard selectable - and uses either the panel meter or scope outputs for easy tuning. Copy the weak ones. Copy the noisy ones. Copy the fading ones.

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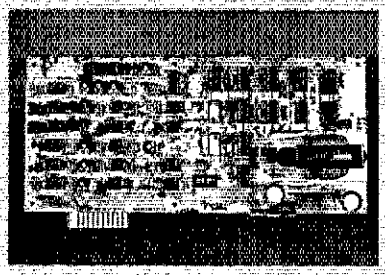

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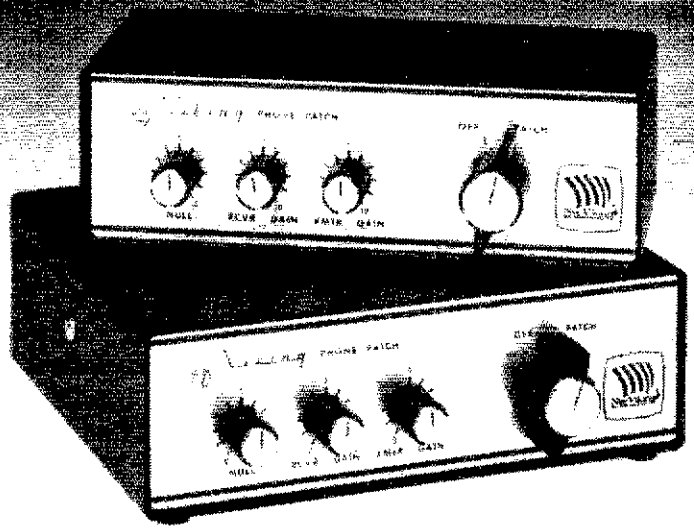

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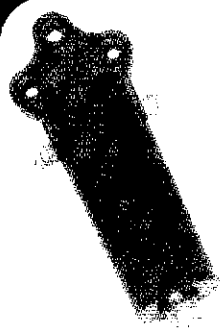

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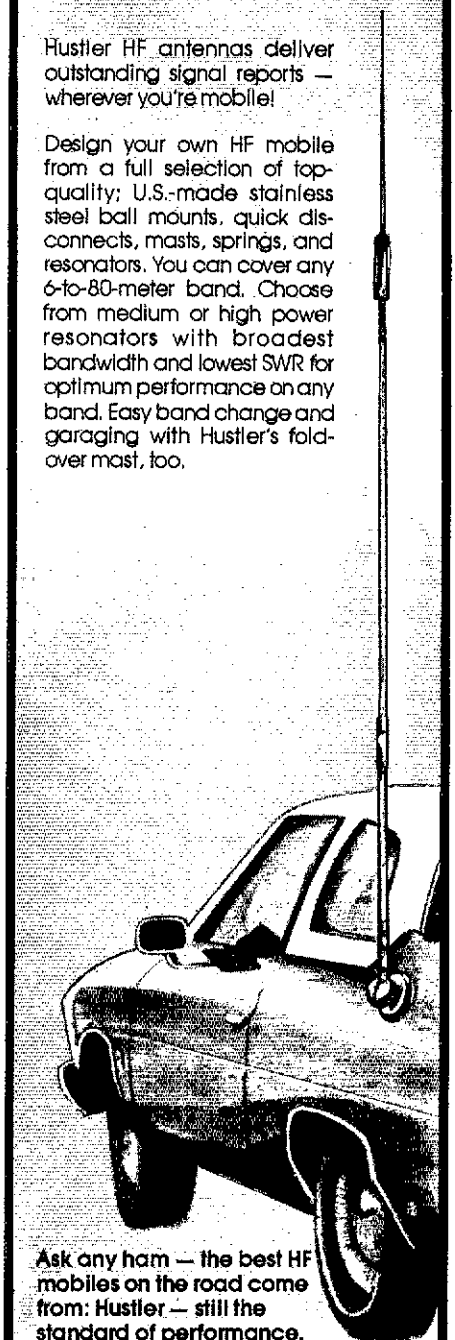

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Donaldson and slammed into Malvern, continuing north to Little Rock and leaving the state around Boro. The final count of messages handled is around 1800. Don't yet know how many hams involved but will by next month. Nets: Mockingbird Net 39. Razorback Net 155. OZK 13. AR Phone Net 37. KC5JH and W5FD are reputed to be only packet operators in Ark?? True? K5DW listed in "Who's Who in America." Congrats. AR represented 97% on DRN5 and 100% CAND. Traffic: AE5L 499, W5TUM 206, K5MCM 114, W4AZJ 106, W5QFU 67, W5UAU 10.

LOUISIANA: SM, John Meyer, N5JM — ASM: KC5SF. STM: W5GHP. SEC: AC5R. Down New Orleans way the OOTC has a new prexy, W5CB who takes over from W5CJO; fellow officers are W5FMO, v.p. and K5KR secy/treas. Spring Novice classes will be over soon in Shreveport, Lake Charles and New Orleans with more than 50 prospective grads waiting to tap a key for their first QSO. Congrats to both students and instructors. Severe flooding in Lake Charles and Monroe in December caused wide spread problems for both areas: WA4MUW, DEC for the L.C. area, activated the ARES team with 27 amateurs assisting the needy communications-wise. W5TVW WD5IAA WA5UUD and WA5UFH are just a few who are enjoying computerized cw and RTTY QSOs. The Lafayette hamfest will be March 12 & 13th at the Carencro High School; talk-in 22/82 or 81/21

Net	Freq. (kHz)	Time	NM
LAN	3615	Dy 7 & 10 P.M.	KC5SF
LTN	3910	Dy 6:30 P.M.	N5ANH
LSN	3703	M-F 7:30 P.M.	WD5CWK
LRN	3587.5	Sn 6:30 P.M.	W5GHP
LEN	3910	M 8 P.M.	AC5R
CCTN	146.01/61	M-F 6:45 P.M.	GNOARC

Traffic: W5LO 485, KC5SF 412, KA5HDT 332, K5TL 259, W5GHP 222, K5TTC 100, W5TVW 91, WA5TOA 59, AC5R 58, WB5LBR 56, WD5JFY 52, WD5HQC 36, N5ANH 35, WD5CWK 20, WD5IAA 19, WA5WJZ 18, KA5FLF 13, WB5QDJ 10, N5IFY 7. (Nov.) WD5HQC 14.

MISSISSIPI: SM, Paul Kemp, KW5T — SEC: N5DDV. STM: KB5W. VHF Coord.: KB9TN. New officers for the Vicksburg RC are: WB5ADC WB5OWY WB5YKR N5EZX KA5HNP. RTTY becoming more popular with AD5O N5DSK AE5H & KW5T now on. Need to consider a state RTTY Net. Time to begin thinking about upcoming hamfest season. April 1 W4WLF will be Section Manager for MS. Thanks for your support. RN5 (KB5W) sess. 62, QTC 2038. DRN5 (WB5YDD) sess. 31, QTC 1146. MTN (K5OAF) sess. 31, QNI 177, QTC 105. MSBN (N5DSK) sess. 31, QNI 2539, QTC 108. MN (WB5RMW) sess. 31, QNI 510, QTC 5. CAND (W5KLV) sess. 31, QTC 2504. MSN sess. 21, QNI 102, QTC 18. RACES/ARES sess. 3, QNI 52. GSEN (KB5W) QNI 427, QTC 38. CAEN (KA5AGD) sess. 4, QNI 107, QTC 4. Traffic: KB5W 972, N5AMK 533, K5OAF 307, KT5Z 195, KD5P 182, N5EZQ 148, WD5JXT 83, W5WZ 53, W5HKW 46, W5LSG 24.

TENNESSEE: SM, John C. Brown, NO4Q — ACC: WA4GLS. SGL: W4WHN. SEC: K4TKQ. STM: K4YOL. The new hamfest season is about on us. Your advanced notices of the coming affair needs to be getting out to your section officials so that they will give the needed support for the occasion. W4KUW became a Silent Key and will be missed on the frequencies. Those clubs that are planning to change their status to Special Service Clubs need to begin the proposed program and request the application forms from the Affiliated Club Coordinator (ACC). This is a continuing commitment by a club once this status is attained. The reports of new licenses and upgrades are still rolling. Look for several new and different calls in all classes. The 4th call area is still well ahead of the others in the new calls. We did not have any nominations for the cw honor roll this month. What happened with all the activity? NV4Z has been appointed NM for the Tri-State Info. 2M net in the Memphis area. Sure she will do FB job. Section traffic last month was: LF-sess. 70, QNI 3814, QTC 167; CW-sess. 49, QNI 324, QTC 184; VHF-sess. 81, QNI 2050, QTC 511; RTTY sess. 30, QNI 2050, QTC 511; RTTY sess. 30, QNI 187, QTC 11. Efforts are under way for an RN5 RTTY net. Those that have the time at 1630 UTC and are so inclined, the DRN5 has a new session on 7280 ±, and the STM has openings on the schedule. This is the first time in many months that there were no BPL awards. Come on and send in your activity. Traffic: NG4J 251, W4DDK 197, W4ZJY 180, KA4BSG 92, W4TYV 80, K4WOP 51, WD4GYT 43, K4YOL 37, W4MRD 35, W4PMP 33, NN4S 25, W4FLW 22, NM4W 16, W4DPI 15, KE4OL 15, W4EWR 14, KE4LS 14, W4PSN 14, W4RUW 13, K4UMW 9, KE4XA 8, KI4V 7, WA4RMP 5, KE4EO 4, WA4GLS 4, WA4HKU 4, KE4WO 4, NQ4W 2. (Nov.) K4YOL 17.

GREAT LAKES DIVISION

KENTUCKY: SM, Dave Vest, KZ4G — STM: KA4GFU. SEC: KA4MIC. (*NTS)

Net	QNI	QTC	Net	QNI	QTC
KRN*	514	53	MKPN*	1230	219
KTN*	1365	142	KNTN*	360	144
KYN*	246	160	KSN*	231	142

Highest QNI 1982: KTN; Highest QTC: MKPN. ARES Nets reporting 13, total QNI 1686, QTC 374. Highest QNI and QTC 1982: TSTMN. THANKS . . . New pres. Harlan Co. ARC: KA4JMZ. CONGRATS! HAMFESTS: Elizabethtown on March 26, Paducah on April 10. Y'ALL COME. KU4A reports active. OBS reporting: WA4AGH, PSHR: KA4BCM KA4GFU KA4MTX KB4OZ KA4SAA KD4TY. CAN-D: 100% D-9RN: 100%. 9RN: 100%. Fred Jones' "Possum Breakfast" Dec. 21 on KRN "ENJOYED" by all. Traffic: KA4SAA 409, WD4IYI 175, KA4GFU 164, KA4MZY 121, KC4WN 119, NW4P 118, WD4RWU 113, KB4OZ 97, KA4BCM 90, W4WQV 87, K4MHL 81, KZ4G 79, WB4APC 67, W4YZU 60, K4HOE 57, WA4YPQ 56, WA4AVV 53, KA4MTX 45, KS4V 44, WA4EFG 38, WA4EBN 35, WD4CQF 34, WD4BSC 33, WA4GHQ 29, WA4NOG 26, WD4IYH 22, W4PKX 19, KD4TY 14, WD4CJQ 13, K4AXE 12, NN4H 12, KA4SKV 12, KA4MAP 10, WD4IXS 8, WB4AUN 7, KA4GBZ 7, N4GD 6, K4AVX 1. (Nov.) WB4AUN 9.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. DECs: K8BTH N8CUH WD8IXZ WD8MBB W8VWY. NMs: WA8DHB N8DSW K8LNE K8KMQ K8KQJ W8QHB W8SCW KV8U W8YIQ KA2JU.

Net	Freq.	Time/Day	QNI	Tfc	Sess.	Mgr.
QMN*	3663	1800 Dy**	1424	587	93	KV8U
MITN*	3953	1900 Dy	778	507	31	K8KQJ
GLETN	3932	2100 Dy	1379	246	31	WD8IBY
MACS*	3953	1100 Dy**	700	243	31	K8LNE
MNN*	3722	1730 Dy**	409	178	62	N8DSW
UPN*	3922	1700 Dy	702	168	35	WA8DHB
TASYL	3922	1900 M	20	4	4	KM8E
WSSBN	3935	1900 Dy	—	—	—	WB8SUR

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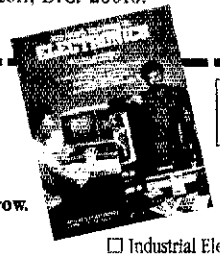

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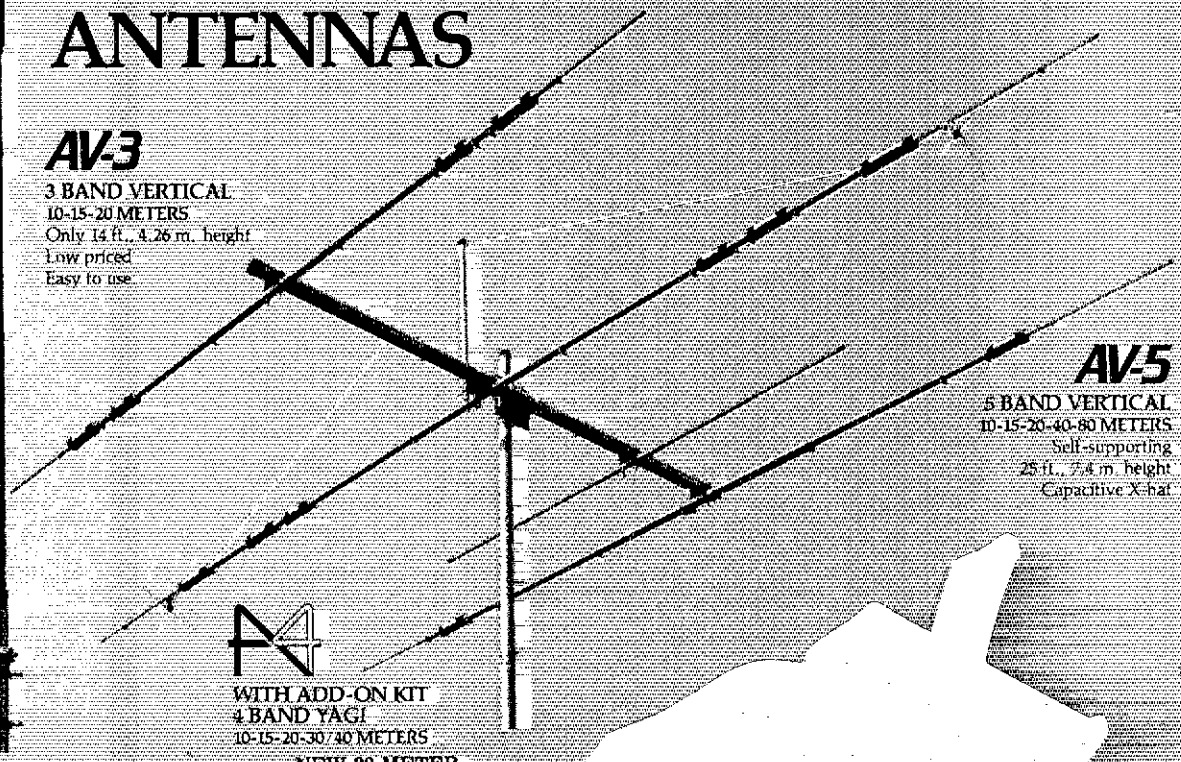

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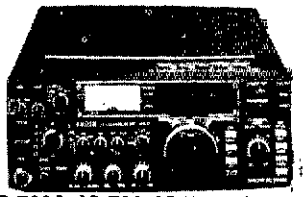
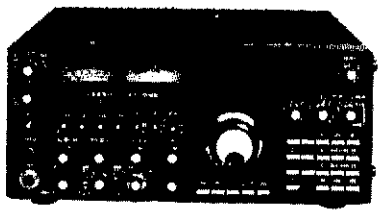
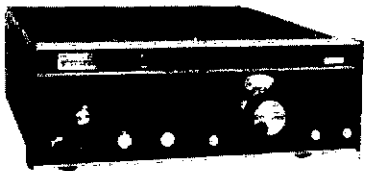


ICOM

IC-R70, IC-720A, IC-730, IC-740, IC-25A, IC-251A, IC-2KL, IC-451A, IC-290H, IC-45A



YAESU

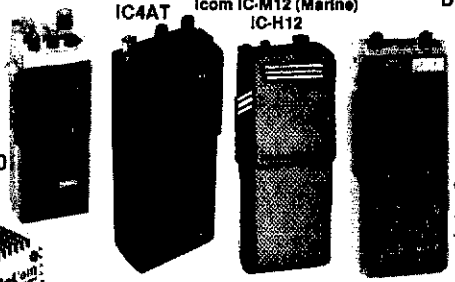


FT-ONE, FT-980R FT-102, FT-101ZD, FT-707, FT-230R, FT-77, FT-726 FT-480R, FT-720RU, FT-290R, FRG-7700, FT-625RD

YAESU FT-208R FT-708R

ICOM IC2AT IC3AT IC4AT

Land-Mobile H/T Wilson Mini-Com II Yaesu FTC-2203, FT-4703 Icom IC-M12 (Marine) IC-H12



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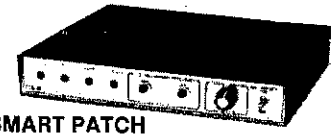

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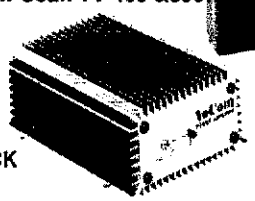
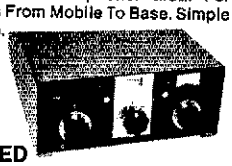


SANTEC ST-144/UP ST-440/UP



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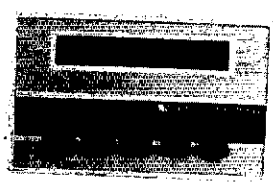

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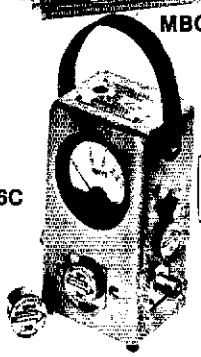

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MEN	3930	0900 Sn	—	—	—	WB8ZGP

*NTS nets. Times local. **QMN late net, 2200; MNN late net, 2000; MACS Sn 1300. Vhf nets 9 rpts, QNI 541, ttc 30, sess. 36, WD8RHU mgr. ARES net Sn, 3932, 1730. Traffic Workshop Sn, 3953, 1600. 3932 is MI emer. freq. By the time you read this, the expanded Field Organization program in MI should be well under way. Let me here introduce you to the new section leadership people. (The SEC and STM posts remain the same in personnel and essentially in function, except that I have delegated to them the responsibility of making field appointments in their respective jurisdictions.) Official Observer/RFI Coordinator: James Hessler, K8JH. Affiliated Club Coordinator (ACC): Stanley Briggs, K8SB. Public Information Officer (PIO): Mary Jane (Kelly) McGleish, WA8PII. State Government Liaison (SGL): David Wise, N8CNY. Technical Coordinator (TC): George Race, WB8BGY. Bulletin Manager (BM): Lee Onkka, KC8DN. These people all have well-proven leadership abilities, and they have one very vital thing in common: enthusiasm. For Amateur Radio, for the ARRL, and for the programs they will be heading up. Where applicable, the new leaders will be making their own appointments, but I will continue to keep complete records in my files. I will also continue to take the monthly traffic and PSHR reports and issue BPL awards. There will be some changes in this column, to bring it more in line with the new structure and with the new name, "Section News." I plan to list accumulated net activity and individual traffic totals quarterly, with the columns in between devoted to other matters — a more "in depth" coverage of MI amateur news. I invite your comments on this — and, as always, your news. BPL: AF8V WB8WKQ WB8MTD KA8CPS WD8LRT. Traffic: AF8V 908, WB8WKQ 853, WB8MTD 805, KA8CPS 782, WD8LRT 721, K8KQJ 356, N8DSW 319, W8QHB 250, N8DTZ 240, WB8YDZ 229, WD8RHU 186, WA8DHB 156, K8XE 136, KRGXV 125, N8BNC 99, WD8EIB 95, WB8SYA 87, W8BEZ 84, N8DVZ 83, K8KMQ 82, WD8MJB 73, KA8NCR 71, K8QCP 63, WB8TTA 63, W8SCW 62, WD8ECM 61, W8VIZ 52, WB8ITT 49, W8IHX 41, WD8OEP 40, W8YIQ 39, K8LNE 38, WD8IXZ 32, W8CUP 30, W8LDS 30, K8UPE 29, N8CNY 26, N8BBY 26, W8TBP 26, KT8G 25, W8RNQ 25, W8URM 25, N8DNC 24, WD8JRT 23, KI8Q 22, KV8U 22, WB8YRY 22, WA8EFK 21, W8JXJ 21, KC8DN 20, N8EGK 20, KC8DU 19, WA8AXF 18, WB8DJS 18, WB8HPZ 17, KA8EKQ 15, K8ZJU 15, KA9JFM 13, WB8POL 13, W8LOU 11, WD8IYA 10, KS8P 9, WB8HSN 8, KA8JBK 8, KN8I 6, K8IFE 6, KF8M 6, K8DD 5, KB8TD 5, WB8YWA 5, WA8QAF 4, W8YY 1. (Nov.) KC8K 70.

OHIO: SM, Allan L. Severson, AB8P — ASM: WB8MOK. SEC: K8AN. STM: K8OZ. NMs: WA8BUW WA8DYX W8EK WA8GMT KF8J WD8KFN WB8YTD.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	451	546	60	6:45/10 P.M.	3.577
BNR	233	117	31	6:00 P.M.	3.605
ONN	—	—	—	6:30 P.M.	3.708
OSN	256	202	31	6:10 P.M.	3.577
OSSBN	2871	2261	931	10:30 A.M. 4:15 & 6:45 P.M.	3.9725
OSSN	188	148	31	6:45 A.M.	3.577
O8MN	—	—	—	9:00 P.M.	50.160

I'm glad to report another great traffic month for this section. I received 100 reports, which resulted in a total count of 15,087 and an astonishing 10 BPL qualifiers. Well done to all! And special congrats to COARES and W8BKO of the Columbus area who have to be our 1982 public service champions. They had 45 events plus two Red Cross emergency calls. If your group is outstandingly active also, please let me know. Club elections: NOARES: K8US, pres.; AI8V, v.p.; WD8CSP, secy.; WD8NZR, treas. Cleve. Wireless Assn.: W8SDV, pres.; AF8C, v.p.; W8LYD, secy./treas. OH-KY-IN ARS: WD4OFJ, pres.; K8DHK, v.p.; K8THT, treas.; WD8JAJ, rec. secy.; N8CGM, corr. secy. Congrats all! Upgrades: to Extra-K8KBJ KC8HJ N8EFK. Further congrats.

Local Nets	QNI	QTC	Sess.
BARF	203	57	29
BRTN	292	252	31
COARES	109	5	4
IE Net	50	4	5
Medina Co.	295	61	31
NCTW	48	32	18
NEON	193	63	30
RARA	97	1	5
TATN	350	701	31
TSRAC	1144	82	44
VWCEN	40	3	4

Traffic: K8NCV 1662, WB8MZZ 1003, K8OZ 868, W8PMJ 853, WD8KFN 841, WD8MIO 593, W8GGX 569, K8JDI 546, WB8UBR 504, W8QZK 440, WA8HGH 401, WA8GMT 315, KV8Q 261, WB8DMF 258, WD8IKC 258, WB8JGW 241, WD8ODV 236, WD8RIB 197, KF8J 185, KA8IUK 180, AB8P 176, N8BQK 168, WA8SSI 167, KA8MEB 166, WA8QYJ 160, K8JE 157, WD8NEC 157, K8DL 156, W8WEG 152, KW8X 133, K8YUW 130, N8AUH 129, WD8KBW 123, KA8ICB 122, WB8QHU 113, N8CWU 101, KK8L 101, N2NS 100, N8AKS 95, KA8HUZ 90, KC8JV 90, WB8SIQ 83, KA8DJZ 82, W8CXM 78, KA8IAF 77, WD8JAJ 76, K3RC 66, WB8MRL 65, WB8YTD 65, W8UPD 59, W8MVE 57, W8FUP 55, W8TXV 53, N8CJS 52, KB8YS 52, N8JR 49, WD8MLN 48, K8AN 44, KA8GGZ 42, WB8VOA 40, K8VOY 38, W8BHL 36, N8CGM 35, K8CKY 32, N8EES 30, WD8RGS 30, WD8RZG 30, WD9HDZ 27, W8MOK 27, K8TVG 27, WA8TWM 27, KB8VE 27, WB8HHZ 26, N8NJO 26, WD8RGP 26, WA8HED 23, WB8KWD 23, WD8DOS 21, WD8NED 21, W8EK 20, W8RG 20, KA8GMS 18, KA8LNA 13, WB8AWM 12, W8DYF 12, N8CW 11, WA8ZID 11, WB8NHV 10, WB8PIY 10, W8LZE 9, KA8DGO 8, WD8IQJ 8, W8OQL 8, K8CMR 6, WB8KKI 6, N8AJU 4, W8EKI 4, WB8NTR 3, KA8PHB 1, WB8QHV 1. (Nov.) WB8YUS 7, WB8NTR 5. (Oct.) K8NCV 654, K8OZ 648, WD8MIO 519, W8PMJ 414, WD8KFN 342, WB8MZZ 313, W8HGH 301, AB8P 249, K8AN 242, N8DSU 241, N8EES 219, WD8RIB 208, K8YUW 184, N8BQK 182, N8AUH 178, KV8Q 170, WD8KBW 167, W8GGX 149, W8EK 146, K8DL 127, K8JDI 113, WB8JGW 110, W8ENI 102, W8QZK 95, WB8UBR 95, W8UPD 82, WB8DMF 76, W8WEG 70, N8CSL 65, WD8NEC 65, N2NS 64, KA8GGZ 60, WD8ODV 60, WB8QHU 60, WD8IKC 59, KA8GJV 55, WD8MLN 51, K3RC 49, KA8KJZ 46, WB8YTD 44, WA8SSI 42, KA8IUK 40, WB8QHV 40, W8TXV 40, N8CWU 37, W8KKK 34, WD8JAW 33, W8OQL 33, N8DMN 32, WA8TWM 32, KG8P 31.

HUDSON DIVISION:

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — SEC: KB2KW. STM: WA2SPL. NM: cw-N2APB WB2EAG W2WSS; HF-AG2X KA2Q KC2SJ; VHF-WB2ZCM N2BDW KV2U K2ZVI. New officers for 83:

NEW! Service and Diagnostic Department

Amp Supply is now offering complete amplifier repair service. For a total charge of **$39.00** we will repair or diagnose the problem on any amateur amplifier. If it takes 10 minutes or 10 hours the Amp Supply service repair charge is **$39.00**. The only additional charge will be parts needed for repair.

Home-brewers; take advantage of this same diagnostic service on your projects. Send us your home-brew amplifier and for **$39.00** we will explicitly instruct you (in writing) about any modification or redesign needed to bring your amp up to specs.

Units must be shipped prepaid to Amp Supply. After receipt, Amp Supply will respond in writing for authorization to proceed with repair.

The ASP Halon Fire Extinguisher

The ASP Halon Fire Extinguisher, safely extinguishes all types of fires without leaving residue, is non-corrosive, 3 times as effective as CO_2, and will not cause damage to sensitive electronic equipment, such as ham gear or computers. Halon 1301 was chosen by N.A.S.A. for its on-board extinguishing system on the Space Shuttle, and is the only extinguisher required by the FAA on every commercial airliner in the U.S. Shouldn't you protect your investment with the safest fire extinguisher available for electronic equipment?

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2 year factory warranty **$29.50**

Building An Amplifier?

Electrolytic Capacitor

EC-125	125uf 500 volt DC	$ 3.95

Diodes

D-3-A	High voltage supply diodes 1KV, 3A	$ 1.00
DZ-8.5-Z	Zener 8.2 volt 50 watt	$ 5.50

Switches

SB-6	6 position 4 section 2KW PEP ceramic switch ..... with tuned input switching voltage use with 3-500, 4-400, 572B	$21.50
SB-5	5 position 1 section use with 811's or sweep tubes	$ 9.50
BD-6	Planetary Ball Drive for variable caps 6:1 ratio ¼ shaft	$ 4.25

Tuned Input

ATI-6	Complete PC board tuned input board with 6 toroidal coils, 12 trimmer capacitors 6-DPDT relays and coax fully assembled tuneable 1.8 - 30 mhz matches any amplifier 6¼" x 3¼", 12 VDC	$79.50

Tubes

3-500Z	EIMAC	$94.50
811A		$14.50
572B		$46.50
3-1000Z	EIMAC	$365.00
8877	EIMAC ...	$455.00
813		$40.00

Coils

TIC-1	Toroidal tuned input coils specify frequency..	$ 2.00
FTC-1	Final Tank Coil for 3-500's, 4-400's, 8877, 572B etc 2KW 160-40 MTR	$16.50
FTC-2	Tank Coil 20-10 MTR	$5.50
B&W 850 A, or 852	Tank Coil and Switch ...	$72.00
B&W3902-1	Cyclometer Counter – tuning for roller inductor or vacuum variable	$44.50

VARIABLE CAPACITORS

Plate

A-250-75	250pf 3.5-KV	$21.50
A-225-120	225pf 4.5-KV	$23.50
A-232-45	250pf 2.2-KV	$19.25

Loading

A-1100-53	1100pf 3 section 1.2KW..	$12.25
A-1000-32	1000pf 2.5KW	$35.50
A-800-32	800pf 2.5KW	$26.00

Plate Chokes

PC-811-1A	Use with 4x811A or Sweep tubes	$ 5.25
PC-500-2A	Use with 3-500, 4-400 etc.	$ 8.25
PC-1000-2A	Use with 3-1000, 4-1000, 8777 etc.	$10.00

Filiment Choke

FC-30-A	30 amp choke on Ferrite Core ...	$ 8.50

Plate Caps

PC-500-1	Aluminum Heat Sink use with 3-500 etc.	$ 6.50
PC-811-1	Use with 811A, 572B .	$ 1.50
PC-8877-1	Aluminum Heat Sink For 8874, 8875, 8877, 3-1000, 572, specify tube .	$ 7.50

Sockets

SC-500-1	Johnson 122-0275-001 use with 3-500, 4-400 etc.	$14.50
SC-811-1	Socket for 811A, 572B	$ 1.00
SC-1000-1	Socket 3-1000, 4-1000...	$35.00
SAF-500	3-500 air flow socket	$35.00
SC-8877	8877 socket	$14.50
TR-8877	8877 teflon tube ring..	$19.50

Antenna change over relay 2KW

RL-2P-1	2PDT 12VDC	$ 5.25
RL-3P-1	3PDT 12VDC .	$ 7.50

Meters

M-1000-P	Dual scale 0-3000VDC, 0-1 amp w/shunt & voltage resistors	$17.95
M-2000-W	Dual scale wattmeter 0-200 watt 0-2000 watt	$19.95
M-5000-VDC	5000-VDC Meter	$19.95
M-500	0-500 MA	$17.95
M-1A	0-1 AMP	$17.95
M-2A	0-2 AMP	$18.95
M-3000	0-3000 volt DC	$17.95

Ceramic Loading & Coupling Capacitors

CC-1000	1000pf 5KV	$ 5.95
CC- 500	500pf 5KV	$ 5.95
CC- 200	200pf 5KV	$ 5.95
CC- 100	100pf 5KV	$ 5.95

Roller Inductor

RI-28	28uh ceramic w/siler roller	$39.50

Transformers — Filament

X-5-15	5 VCT @ 15 Amp	$24.50
X-5-30	5 VCT @ 30 Amp	$29.50
X-6-16	6.3 VCT @ 16 Amp	$24.50
X-7.5-21	7.5 VCT @ 21 Amp	$34.50
X-10-15	10 VCT @ 15 Amp	$29.50
X-10-20	10 VCT @ 20 Amp	$39.50
X-20-15	20 VCT @ 15 Amp	$49.50

Combination Plate, Filament, and Relay Control Voltage

X-500	Single 3-500 amplifier XFMR	$69.50
X-500-2	Pair 3-500 amplifier XFMR	$108.00
X-811A	Four 811A amplifier XFMR ...	$59.50
X-572B	Four 572B amplifier XFMR	$69.50
X-6MJ6	Four Sweep tube amplifier XFMR	$52.50
X-8877	Single 8877 amplifier XFMR	$109.50
XH-4K	Ultimate Hypersil 4KW PEP Plate XFMR.	$230.00

Replacement Transformers

	Clipperton L	$87.50
	GLA-1000, 1000B .	$57.50

Amplifier Power Supply

APS-1 3000 volt power supply complete 3000 volt DC @ 1 Amp and 12 VDC @ 2 Amps – includes power transformer 117/234 AC 50/60 Hz, electrolytic capacitors, diodes, bleeder resistors, PC board. Completely assembled, chassis and cabinet not included $149.50

Amplifier kits available from Amp Supply:

LK-811A	4 811A 10-80 Meter	$ 277.50
LK-572B	4 572B 10-160 Meter	$ 399.50
LK-500Z-2	2 3-500Z 10-160 Meter ..	$ 444.50
LK-8877	1 8877 10-160 Meter	$1200.00
LK-30M	4 6MJ6 30 Meter	$ 199.50
LK-1000Z	3 1000Z 10-80 Meter	$1260.00
Econo-Amp	4 6MJ6 any band-mono band specify frequency	$ 200.00

Kits include all necessary parts to build a linear; tuned input, metering, power supply and transformer. Cabinets and chassis sold separately.

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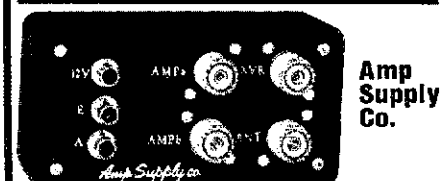
AL-80 Linear Amplifier. Covers 1.8-21.5 MHz amateur plus MARS. 1200+w PEP SSB, 1000w CW/RTTY SSTV; QSK full break-in. (1) 3-500Z (included). Tuned input, 65w drive. 120vac @ 20A/240vac @ 10A. 12"w×6¼"h×11¾"d, 43 lbs. (Regular $699.50) ..... **Sale $599.95**

SPR-8/MC-8 Speech Processor with Microphone. Boosts average SSB output power and readability. Connects to microphone input; no modifications. In/out switch & level control. 9-15vdc, with 9v battery. 4"w×2½"h×4¾"d. Regular $119.50 ..... **Sale $108.95**

RCS-8 Remote Coaxial RF Switch. Switch mounts outside - control at operating position. One coax line feeds 5 antennas, unused positions grounded. 50 or 75 ohms; 2000w PEP; good to 150 Mhz. Requires 6 conductor cable. Regular $129.50 ... **Sale $116.95**



Amp Supply Co.

QSK-1 Full Break-in Amplifier Module. Installs between a QSK full-break-in transceiver and conventional, relay controlled linear amplifier. Receive signals between transmitted keying pulses with linear in operation. No modifications to transceiver or linear..... **$59.50**

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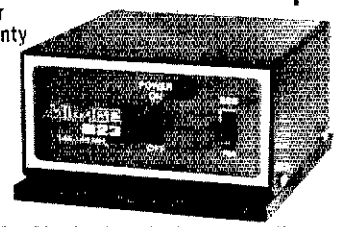


B23 2m 30w Amplifier for low power HT's, etc. All-mode, 100mw-5w drive; 2w in-30w out. 4"w×2¼"h×4¾"d, 1¼ lbs. 13.6vdc/5A (Reg. $89.95) **Sale $79.95**

C22 As above, but for 220MHz All-mode, 500mw-5w drive; 2w in-20w out. (Regular $89.95) ... **Sale $79.95**

D24 Same as B23 except for 440 MHz. All mode, 2w in/40w out. (Regular $199.95) ..... **Sale $179.95**

D24N As above, but with low-loss Type-N coaxial connectors (Regular $208.95)..... **Sale $187.95**

B108 2m 80w amplifier with built-in 10db gain/2.5db NF Receive Preamp. All mode, 500mw-15w drive; 10w in/80w out. Int/ext. relay keying. 5¾"w×3"h×8"d, 3 lbs. 13.6vdc/12A. (Reg. $179.95)..... **Sale $159.95**

B1016 Same features as B108, except rated 160w. 500mw-15w drive; 10w in-160w out 5½"w×3"h×12"d, 5 lbs. 13.6vdc/20-25A. (Reg. $279.95)..... **Sale $249.95**

B3016 Same as B1016 but 15-45w drive, 30w in-160w out. 13.6vdc/20-25A. (Reg. $239.95) **Sale $199.95**

C106 Same as B108, except 60w for 220 MHz. All-mode, 10w in-60w out. (Reg. $199.95)... **Sale $179.95**

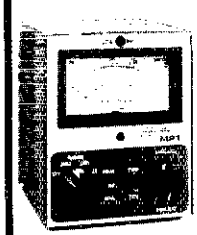
C1012 Same features as C106, except rated 10w in 120w out; 2w in - 45w out. 5½"w×3"h×12"d, 5 lbs. 13.6vdc/20-25A. (Regular $289.95)..... **Sale $259.95**

D1010 100w 430-450 Mhz UHF Amplifier. All-mode, 300mw-15w drive; 10w in-100w out. 5½"w×3"h×12"d, 5 lbs. 13.8vdc/20 A. (Regular $319.95) **Sale $289.95**

Model **D1010N** (with Type N connectors) ... add $9.00

RC1 Amplifier remote control w/18' cable. Duplicates all switches. 1¼"×3¼" ×2½" **$24.95**

MIRAGE Wattmeters



MP1 for 1.8-30 Mhz. Peak/Average. 25, 200 & 2000w fwd & rev power scales & VSWR scale. 1-2w VSWR sensitivity. Remote coupler, requires 9v batt. or ext. AC adaptor. 5¾"h×4½"w×5¾"d, 3 lbs. Reg. $119.95 · **Sale $99.95**

MP2 VHF Wattmeter. Same as MP-1, except 50-200 MHz; 50, 500 & 1500w scales & VSWR Reg. $119.95 · **Sale $99.95**

ETO Alpha Linears

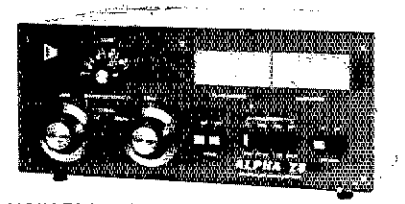
ALPHA 76A Manually tuned, covers 160-15m, 1.8-2.0, 3-22 MHz & WARC bands. 2.5 KW PEP SSB input, 1 KW average. CCS - No Time Limit. (2) 8874's - 60w CW, 110w PEP SSB drive. 1.5KVA transformer, forced air cooling. 7½"h×17"w×14¾"d, 65 lbs ..... **Sale Price $1449**

76A with Lightweight Hipersil® xfmr ..... **$100** extra

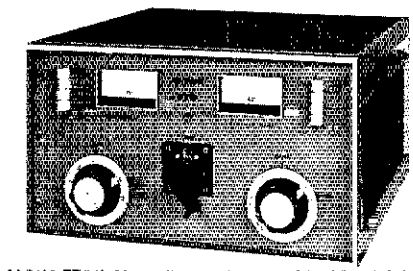
ALPHA 76PA Identical to 76A except uses (3) 8874 tubes. For extended FSK/SSTV.. **Sale Price $1749**

ALPHA 76CA Same as 76PA, but uses 2.4KVA Hipersil® extra-duty transformer ..... **Sale Price $1949**

ALPHA 374A Adds "No-Tune-up" convenience to the basic 76A chassis. Provides instant bandswitching on the popular amateur bands & full coverage manual tuning on 1.8-2.0 & 3-22 MHz ranges ..... **Sale Price $1869**



ALPHA 78 Combines the best features of all other ALPHA amplifiers. (3) 8874's, QSK, 2.4KVA Hipersil® transformer and "No Tune-up" convenience on 160-15m. 7½"h×17"w×14¾"d, 65 lbs .....**Sale Price $2499**



ALPHA 77DX Manually tuned, covers 160-15m, 1.8-2.0, 3-22 Mhz & WARC bands. DC plate input: 3 KW PEP or continuous carrier - No Time Limit. Single 8877 requires 100 watts drive for 2 KW input nominal. Vacuum relay QSK-T/R system, air cooled, 120/240v encapsulated 4+ KVA Hypersil® transformer, vacuum variable. 11"h×19½"w×22"d, 103 lbs; Air Frt ...**Sale Price $3895**

77DX *Drop shipped from factory*..... **3795**

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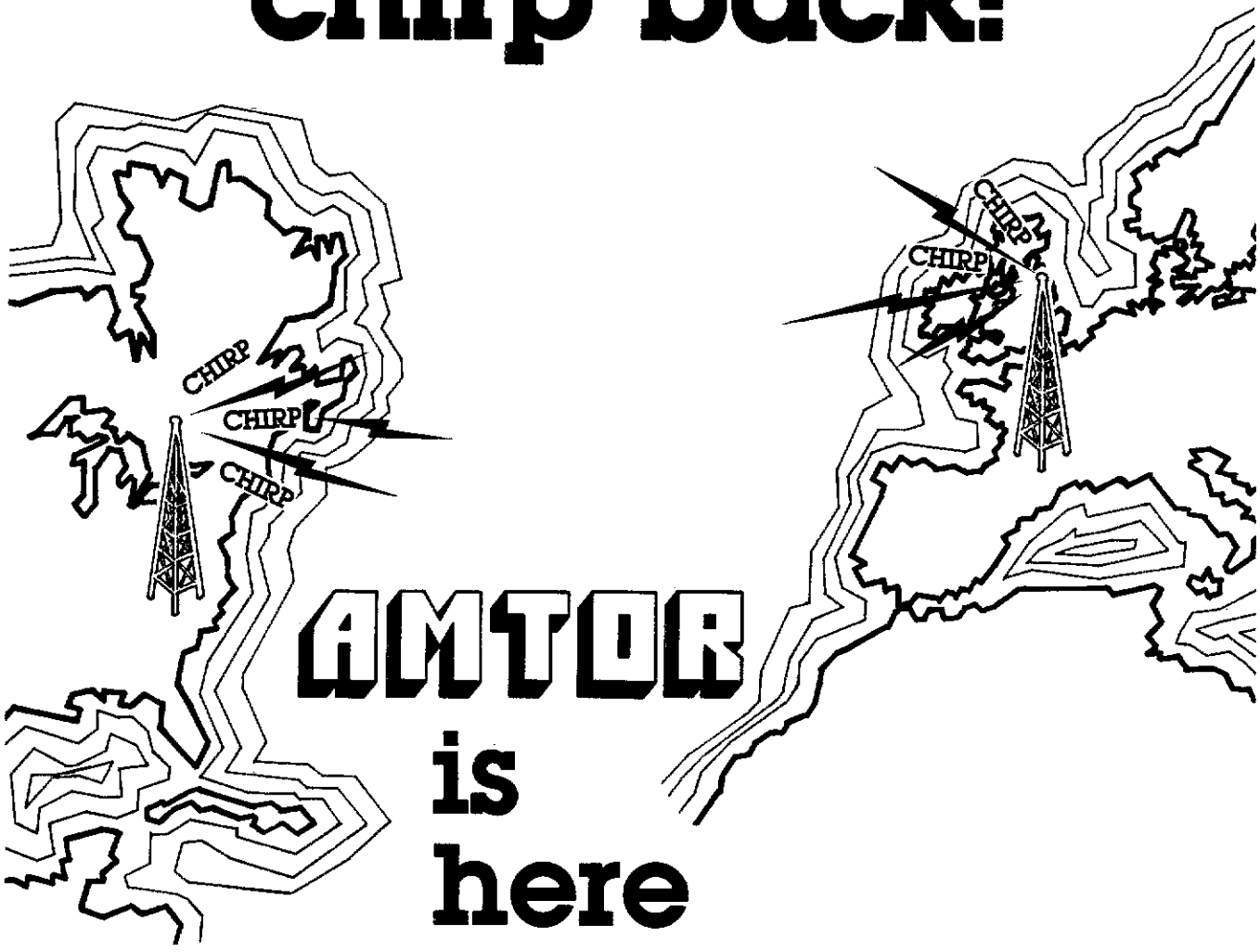

AMTOR is here

Been wondering what those "chirp-chirp" signals were around 14075? They're AMTOR, AMateur Teleprinting Over Radio. European hams have been enjoying the benefits of error free RTTY for sometime. (It's a must for commercial Maritime traffic.) Now, U.S. Amateurs are on the threshold of a new era of RTTY.

Old problems of QRM, QRN, & QSB are gone! If a propagation path exists, AMTOR will get the message thru — with no "hits" — "newspaper" perfect copy!

Two modes are available; AMTOR mode A transmits a three character block specially coded so that the receiving station can recognize an error. The three character block is repeated until the receiving station confirms reception by replying with the proper control code signal. Flawless print is possible with this "hand-shake" style operation.

Mode B, "FEC" or Forward Error Correction, is actually a time diversity mode where text is repeated and intermixed in the transmission. The receiving station unscrambles it and prints the clear text. This "broadcast" mode allows more than two stations to communicate. It's more effective than conventional Baudot or ASCII, but not as reliable as AMTOR mode A.

The actual DATA transfer in either AMTOR mode is nominally equivalent to conventional RTTY at 50 baud, or 66 WPM.

A receive only "Listen" mode is also available for reception of mode A data by a station not directly involved in the "hand-shake" communication.

Start with a new AMTOR ACT-1, ATR-6800, or update your present system.

Microlog is ready with AMTOR! Give us a "chirp" at Microlog Corporation, 18713 Mooney Drive, Gaithersburg, MD 20879. TEL (301) 258-8400. TELEX 908153

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Overlook Mt.-N2EK, pres.; KA2KVZ, v.p.; K2HA, treas.; WA2SYJ, secy.; Poughkeepsie-N2YL, pres.; N2BZP, v.p.; WA3AFS-secy.; F2YS/W2, treas.; Albany-KB2CR, pres.; W2XM, v.p., KA2EBI, secy.; KA2DDQ, treas.; WA2PGI WA2YBM K2QF N2AIF, dirs. AARA has new members W2LXP N2DQY; Silent Key W4OSW. Rip Van Winkle-new ham KA2QYJ who passed Tech before Novice came in mail! ESS had active month. ENY Staff Net 2nd and 4th Tuesday 10:20 P.M. on 3902. NYS/M 10 A.M. can use more check-ins; QNI 82, 1789-impressive for 1st year. SDN reports 82 total QNI-3131. Congrats to KC2SJ, new NM for NYPON. Congrats to WA2AWG, new EC Putnam and thanks to N2BDW. Congrats to AG2X new NM of EPN and many thanks to WB2MCO! W2PKY has resigned as EC Schenectady after many years of service. W2XL reported Ulster RACES Net active during month. Indian Point Drill-March 9th! BPL: WB2EAG WA2JOL KA2KVZ WA2SPL. PSHR: WA2SPL WB2MCO W2YJR WB2EAG KA2KVZ WB2ZCM K2ZM K2ZVI W2BIW WB2OHR AK2E WA2YBM N2BDW KA2MBP. Traffic: WA2SPL 2933, WB2EAG 1241, KA2KVZ 554, WB2MCO 485, WA2JBO 417, WA2JQL 357, K2ZM 254, W2BIW 241, WB2ZCM 130, K2ZVI 124, W2PKY 116, WA2YBM 92, W2YJR 83, WA2FSR 70, AA2Y 70, AK2E 65, WB2QHR 60, N2BDW 55, KA2MBP 52, KC2T 49, K2MI 48, AG2X 37, N2BFG 31, N2CPX 27, KB2KW 27, W2SWA 20, WB2SON 18, KC2TF 14, K2HNW 7, N2CSX 6. (Nov.) WB2AXF 5.

NEW YORK CITY — LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE.

NLI CW*	3630	1900/2200	W2LWB
NLIPN	3928	1815	KS2G
SCVHF	4.77/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
LIMARC	6.25/85	2100 F	N2BZL
ESS	3590	1800	W2WSS
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. K2LS now has his 5BDXCC and his youngest daughter, Sherree, is now KA2QLI. Congratulations to W2AHV on making BPL. The students at JHS 22, club station WB2JKJ, received a letter from Pres. Reagan supporting their use of Amateur Radio while learning English. Hall of Science ARC held a 10th anniv on-the-air event the weekend of Jan. 15/16. New Novice at Rockaway Beach JHS taught by KE2N is KA2QWA. K2JFE received his DLD-500 award from Germany, and he also became a member of QCWA. NLI cw net welcomes K2MT and WA2GCL. K2MT will also be helping out with the Nassau VHF Net. Officers for Grumman ARC are: K2DQD, pres.; KC2DH, v.p.; WB2ODT, secy.; K2MC, treas.; K2UAT WB2VEX W2ZZE KA2DFI W2III, board mbr.; W2ZVJ, trustee. KA2QOI is now upgraded to Tech; new call is N2DYE. KC2DH WB2VEX K2HPG and WA2TSN earned their WAG award. K2JFE is home from the hospital and doing well. WA2PMW now has 11 states worked on 432 MHz. K2LJH has been promoted to Marketing Mgr at RHG Labs. KS2G is interested in forming a VIC-20 computer users group. High QNI for NLIPN in 1982 was AH2M with 321 QNI. Congrats. NLIPN welcomes WA2SLH. KA2FFC being heard via a new 80M dipole, thanks to WA2ARC and W2TZO. W2DBQ is starting his 54th year of traffic handling. Officers for Radio Central are: K2PWG, pres.; KA2ELW, v.p.; WB2QYN, treas.; N2AWM, rec. secy.; WB2FXN, corr. secy. Suffolk Co. ARC welcomed new members KA2GOG KA2MCT KA2IRF KA2BPD and N2BKJ. Traffic: W2AHV 520, N2AKZ 306, W2TZO 214, WA2ARC 170, W2DBQ 88, W2GKZ 84, K2GCE 72, KS2G 55, KA2NMA 52, K2IZ 24, W2GP 17. (Nov.) W2GKZ 95, KS2G 31.

NORTHERN NEW JERSEY: SM, Curtis R. Williams, W5DTR-SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. NMs: W2CC AG2R N2BNB KA2GSX KA2HNQ WB2IOJ KY2D W2PSU.

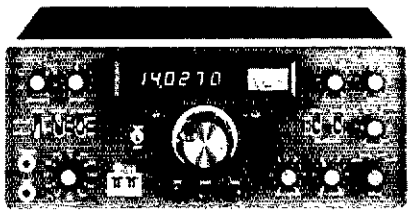
Net	Freq.	Time	Sess.	QNI	QSP
NJM	7063	1000 Dy	---	---	---
NJPN	3950	1800 Dy 0900 Sn	35	588	451
NJSN	3735	1830 Dy	31	263	102
NJN/E	3695	1900 Dy	31	472	440
TCETN	147.255	1930 Dy	31	242	98
OBTN	147.12	2000 Dy	31	576	216
NJN/L	3695	2200 Dy	31	322	330
NJVN	49/49	2230 Dy	---	---	---
NJRTTY	147.51	Autostart			

New section leaders under the restructure are: N2BOP, Bulletin Manager; W2CC, RFI/OO Coordinator; W2KB, State Government Liaison; WB2NQV, Public Information Officer. The positions of Technical Coordinator and Affiliated Club Coordinator remain open. Congrats to WB2NQV and WA2MTT on being named directors, and to W2CC on being named secretary of the Hudson AR Council. Please submit any items for this "Section News" column to W5DTR (see page 8 for address). The Flemington Hamfest will be held Saturday, April 9. Congrats to KY2D (WA8ZNH) on his new call and appointment as net manager of OBTTN, and to WD2ABG and N2DWY (KA2OJN) on upgrading to General. W4BXI was recently elected pres. of ATG-ARC in Basking Ridge. New officers for the Ramapo Mountain ARC are K2BJG WA2JSW KA2NDZ and W2WCE. KX2L has been exploring Amateur TV. AD7I has received FCC permission to run tests of an unattended microprocessor controlled station on hf. New officers for the Raritan Bay RA are K2FD N2BIL K2YSR and W2TIN. Congrats to KA2QWK on upgrading to Tech, to W2HEN on Extra, and to WA2CWA on Advanced. KA2FXB has been appointed Official Relay Station. Your local and state nets need your support. Can you spare a few minutes to be NCS or a liaison once a week? Congrats to AG2R to making BPL the third time and earning a BPL medallion. N2DWY and W2RQ also earned BPL awards. PSHR: AG2R W2XD W5DTR N2DWY N2XJ K2VX N2BNB WB2GHN KB2HM KA2GSX WB2QMP N2DPN KA2LEB KX2L N2BOP. Traffic: AG2R 771, N2DWY 617, W2RQ 588, W2XD 426, N2XJ 206, WB2KLF 179, KA2LEB 162, KB2HM 130, KY2D 117, N2BNB 115, K2VX 95, KX2L 94, W5DTR 93, WB2QMP 86, N2DPN 82, WB2GHN 77, W2ZEP 75, KB2WI 68, KA2GSX 53, N2BOP 48, KA2FXB 31, W2GC 28, W2UH 24, N2DPV 23, N2DXP 12, KC2MM 12, KA2QWK 9, WA2FZJ 8. (Nov.) N2SWY 68.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — ASM: WØRPK. SEC: WA4VWV. STM: KØGP. NMs: WØYLS WAØAVW WAØAUX KQØI. Now is the time to send me your "Iowa ARRL Amateur of the Year" nomination, which will be presented at the ARRL Midwest Convention in SooCy April 15-17. Many good programs! with gigantic flea market and very good speakers. See you there. New officers in Fairfield are: NØCBB KØHYH KØLK ADØE. New

SAVE $500 • TEN-TEC • SAVE $109



TEN-TEC Model 546 OMNI/Series-C All solid-state, 200w SSB/CW HF Transceiver. 9 HF bands, 160-10m including 10, 18 & 24.5 Mhz & 10 MHz WWV; 40 KHz VFO overrun. Instant band change, no tune-up. Digital readout, six 0.43" LEDs - read to 100 Hz. 8-pole 2.4 KHz SSB filter and audio active filter. Select standard SSB filter, optional 1.8 KHz SSB filter or optional CW filter plus 450 Hz or 150 Hz of audio filtering. 50 dB notch filter, ± 500 Hz & ± 4 KHz offset tuning, QSK CW break-in, VOX or PTT, adj. ALC, S/SWR meter, sidetone, built-in spkr. 13.8vdc @ 18A; 5½"h × 14½"w × 14"d, 14½ lbs.

Regular $1289 - ***Sale Price $789.00***

Common OMNI-C/ARGOSY accessories:

215PC Ceramic microphone w/coil cord		$39.00
217 500 Hz 8-pole CW filt. *(Reg. $59)*	SALE	54.95
218 1.8 KHz 8 pole SSB filt. *(Reg. $59)*	SALE	54.95
219 250 Hz 6-pole CW filter *(Reg. $59)*	SALE	54.95
234 Speech Processor (Reg. $139)	SALE	124.95
214 Electret microphone		45.00

OMNI-C accessories:

280 18A power supply *(Reg. $169)*	SALE	$154.95
255 Deluxe ps w/speaker *(Reg. $199)*	SALE	179.95
243 Remote VFO *(Regular $189)*	SALE	169.95
1140 DC circuit breaker		10.00
645 Dual paddle keyer (Reg. $85)	SALE	79.95

ARGOSY accessories:

225 9A power supply *(Regular $129)*	SALE	$119.95
220 2.4 KHz 8 pole SSB filt. *(Reg. $59)*	SALE	54.95
222 Mobile mount		25.00
223A Noise blanker		34.00
224 Audio CW filter		34.00
226 25 KHz crystal calibrator		39.00
670 Single paddle keyer		39.00
1125 DC circuit breaker w/cable		18.00

TEN-TEC Model 525 ARGOSY All solid-state, 10/100 watt SSB/CW HF Transceiver. 6 HF bands 80-10m, including 30 meter band & 10 MHz WWV; 40 kHz VFO overrun on each band edge. Instant band change, broadbanded, no receiver front end or final tuning. Analog dial accurate to ± 2 kHz. 4-pole 2.5 KHz crystal SSB filter, sensitivity 0.3 uV for 10 db S + N/N ratio. Meter shows forward/reverse power, SWR & received signal strength. Offset tuning ± 3 KHz, notch filter, QSK CW break-in & PTT on SSB, sidetone, adjustable ALC. Requires 13.8vdc @ 9A. 4½"h × 9"w × 15"d. 12½ lbs.

Regular $579 - ***Sale Price $469.95***

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(704) 376-4162

Novices in DSM are KAØPGE KAØPFR KAØPGG KAØPGH & KAØPGF. Thanks to the Ames club for their hospitality at club meetings. Boy Scout award of Silver Beaver to WAØYTD. New calls are KCØYX KWØQ & KCØZA. New Bulletin Manager is KØIIR; State Gov. Liaison is AKØQ. New Extra Class to NØBGI & WBØBHF.

Net	Freq.	UTC	Dys	QNI	QTC	Sess.
TLCN	3500	0030-0400	Dy	385	276	61
75M Phone	3970	0000-1830	M-S	2072	297	56
ITEN	3970	2230	Sn	85	17	4
PM Net	3978	2130	M-F	169	16	23

It is time to be getting ready for the foul weather season. Contact your local EC of DEC and offer your help. Weather Bureau is available for programs. Keep reports coming. Where is spring? Traffic: WAØAUX 822, WØSS 377, WØYLS 188, KØGP 187, WBØFWB 181, KØCY 147, WBØJFF 127, KAØADF 132, KCØSC 116, KAØJQG 115, WDØHND 91, WBØCPR 61, KØØI 60, KAØLUZ 53, KAØJPN 46, WBØAVW 41, WDØEOD 36, WØFG 32, WØBW 27, KEØY 20, KA9GBG 16, KØZQ 15, KØEVC 14, KAØMHJ 12, NØEHV 10, KBØOZ 9, WDØDCF 3.

KANSAS: SM, Robert M. Summers, KØBXF — I hope everyone had a very Merry Christmas and a happy holiday following. All the new rigs should be on the air by now and the activity peaking upwards. WØFRC has been appointed Asst. New Mgr for the SSB nets, and is planning a few training sessions for the future. A chance for all to get to know how to handle traffic more smoothly. New reports: KSBN QNI 1286, QTC 308; KPN 390/50; KWN 1001/642; KMWN (Morning Wx Net) QNI 636, QTC 544; CSTN 2020/212; QKS 385/737; QKS-SS 39/4. WØKL reported a quiet Nov. followed by emergency operations, blizzard in western Kansas Dec 27-29. Congrats to WØKL on being elected chmn of the Ottawa ARS. Also to KAØIJD, v. chmn and to KAØLAJ, secy./treas. It is probably past time to start thinking about those Novice classes this coming year. In the event your club has not set a date yet, think about pushing the matter at your next meeting. I notice the BEARSØ at Wichita are also holding on-the-air code practice 10 meters 28.155 MHz. How many other clubs are doing the same? In the coming months I hope to have all the new slots filled, giving the new life to the ARRL plan of action. To date the response to acceptance has been slow. Traffic: WØFRC 961, WBØZEN 290, WØAM 245, WØHI 198, WØOYH 190, KAØCUF 125, WØQMT 115, WØKL 109, KSØU 107, KØBXF 104, WØFIR 100, ACØE 74, WAØLBB 69, WØFDJ 57, WØCHJ 51, NØBDG 30, WØPB 20, KØGSC 13, WØRBO 10, WØNYG 4, KAØE 2. (Nov.) WØHI 198, WØFIR 90, WBØYLP 23, WØKL 18, KØGSC 3.

NEBRASKA: SM, Reynolds Davis, KØGND — We have an excellent ARRL leadership team for 83: Section Traffic Manager-Shirley Rice, KAØBCB; Section Emergency Coord.-Jim Sanford, NØAIH; Affiliated Club Coord.-Keith Erickson, KØGNW; Technical Coordinator-Chuck Conner, KØNG; State Government Liaison: Bob Mitchell, WBØRJJ; Off. Observer/RFI Coord: Joe Eisenberg, WAØWRI. Also appointed: ORS-WAØBOK KØDKM WØGEQ. OOs-KØJFN KCØOG. Net Mgrs: KAØCGF WBØEVS WØEXK WBØGMQ WBØGWR WAØHBS WØHTA KAØIOM WØIRZ WBØITC WØNIK WBØTED; ECs-AJØA NØAJQ NØAZF WAØBOK WDØBQM WBØDCD NØDHP KAØELI KAØGKT WBØGQM KØGND WAØHFH KØJFN WAØOQX WBØPPF KCØR KEØT KBØVY. If you want to help ARRL in NE, please contact me for info. Traffic: KØDKM 233, WØNIK 28, WØHOP 27, WØZNI 24, KAØBCB 18, WBØGMQ 12, WAØOQX 9, KAØIOM 9, WBØGWR 8, WØERW 8.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — STM: K1EIC. SEC: K1WGO. OO/RFI: KA1ML. BM: WA1DWE. ACC: N1AZF. SGL: K1AH. PIO: WB1AIU. Tech: W1HAD.

Net	Freq.	Local Time	QTC	QNI	NM
CN	3640	1900/2200	422	445	K1EIR
CPN	3965	1800/1000 Sn	254	169	W1OD
NVTN	28/88	2130	271	83	WA1ELA
WCN	78/18	2030	412	145	WB1GXZ
RTN	13/73	2100	342	70	WB1ESJ

Upgrades: Extra-KC2QF N1BFS N3AQJ W1RGP; Adv: KA1GRD; Gen.-WB2JNN; Tech-KA1IAO; Nov-KA1JKA KA1JOX KA1JPA (ex-JØDI/ARRL). Welcome to new section ACC N1AZF. W1FD is MARC's recipient of the Adolph Goodsell Memorial Award (ELMER). K1IN has a new tower up and is busy running patches. W1ASD has become a Silent Key. WB1GXZ is the new NM of WCN. A BIG TNX to W1DPR for a job well done. BPL: W1EFW WB1GXZ. Packet radio is developing quite an interest at ECARA. W1PV & KA1FJR gave a fine presentation at the Dec. SARA Meeting on AMSAT/satellite comm. Remember that Field Day is just a few short months away. The planning should begin now for a good time. Users of the W1-buro are reminded to send s.a.s.e.s. and to keep the buro informed of any call/address changes. It is recommended that money not be sent. A new section DX club is now forming. Contact KB1BE or WB1CBY for details. Hope that W1FD is feeling better. WB1FYN & N1CJB have been busy getting ready for 10 Gigs activity in the spring. The ops of Murphy's Marauders again have made impressive scores in the ARRL DX CW & Phone Contests and the Midnight Special tool MARS club has presented awards to KA1CCY KA1DXP K1CCM K1PL for Meritorious Service, and to AK1N KA1KXL WA1ZEK Certificates of Merit. The ECARA newsletter states that over 60% of its members now use a computer in conjunction with their ham activities. New ECARA officers: KB1H, pres.; WA1DCP, v.p.; WA1DWE, secy.; WB1DXZ, treas.; W1HSL, trustee. What is your club doing to support Amateur Radio training? 73. Traffic: W1EFW 626, WB1GXZ 622, WB9IHH 469, WB2PJU 300, K3ZJJ 175, K1AQE 173, KA1BHT 147, KA1EGE 132, K1UQE 116, W1BDN 93, WB1ESJ 90, KA1XG 68, KA1KD 47, K1EUW 38, W1CUH 6, K1PLR 5, K1XA 5, N2BQA 1.

EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: WA1BLG. ASCM: K9HI.

Net	Mgr.	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	N1GQ	3.658	1900/2200/Dy	495	802
EMRIPN	KA1ON	3.949	1730/Dy	312	445
NEEPN	K1BZD	3.945	0830/Sn	58	21
HHTN	K1BSQ	04/64	2230/Dy	514	582
CI2MN	N1BYG	045/645	1930/Dy	170	282

The volunteer examiner program will be with us before we know it. For once the FCC is jumping right on something, and we had better be prepared for it. It seems the only thing remaining to iron out is whether the volunteer examiners will be required to pick questions from a large group of FCC-approved questions or whether they will be able to make up their own. I support the plan which has the examiner pick the questions from a large pool of questions. I'm sure many potential examiners are more than qualified to make up questions

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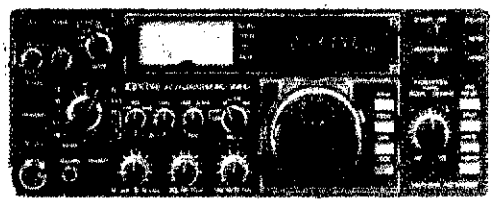
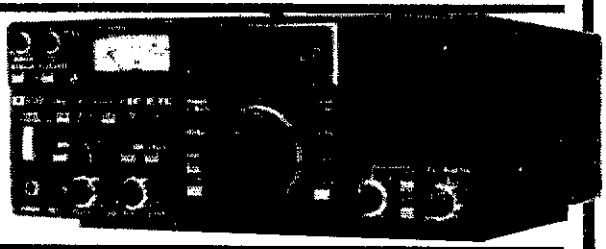


NEW IC-740

contains all of the most asked-for features, in the most advanced solidstate HF base station on the amateur market...performing to the delight of the most discerning operator. Study the front panel controls of the ICOM IC-740. You will see that it has all of the functions to give maximum versatility to tailor the receiver and transmitter performance to each individual operator's requirements.

NEW IC-R70

Features: squelch on sideband, adjustable width noise blanker, adjustable speed AGC, passband tuning as standard, and adjustable notch filter as standard. Other features are high stability, synthesized tuning and 3 tuning speeds, optional AM/FM mode, variable CW filter widths, dial lock, two VFO's with data transfer, plus many others. Also, the IC-R70 will operate transceive with the IC-720A.



NEW IC-290H

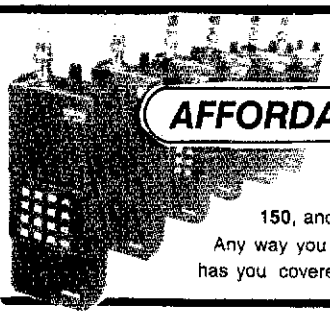
The IC-290H features a powerful 25 watt output and a highly sunlight readable green readout, in the same compact package as the IC-290A. Other features and styling of the IC-290H are the same as the previous model - the IC-290A.

FEATURES

- 5 memories - store your most worked frequencies.
- Call channel - your favorite frequency instantly available
- 5/KHz FM tuning or 1KHz/100Hz tuning on SSB.
- FM/USB/LSB/CW modes.
- Programmable offsets.
- Priority channel - monitors 2 frequencies.
- Scanning of memories or band.

IC-2KL 160 - 15 meter solid state linear amplifier. For use with the IC-701, IC-720A, or IC-730, 500 watt CW out. Includes matching power supply.

CALL TODAY & SAVE



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The **IC-730** is truly a superior grade transceiver at an affordable price.

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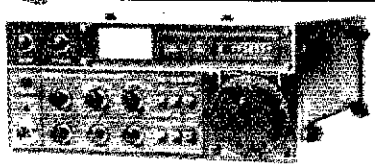
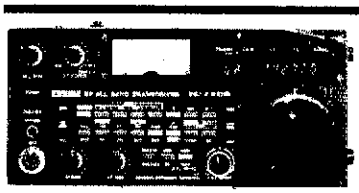
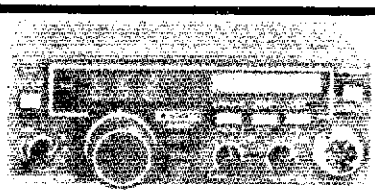


The **IC-251A** has excellent sensitivity and crystal filters having an exceptional shape factor giving good selectivity. Includes AC Power Supply.



ICOM's **IC-720A** is a superior quality HF transceiver. Whether you are a radio amateur, a shortwave listener, or a mariner, you will find the **IC-720A** has features that no other transceiver offers in such a small compact size.



The **IC-25A** is truly a step forward in 2-meter transceivers and its compact size and affordable price makes it the best buy in 2-meter HF mobile.

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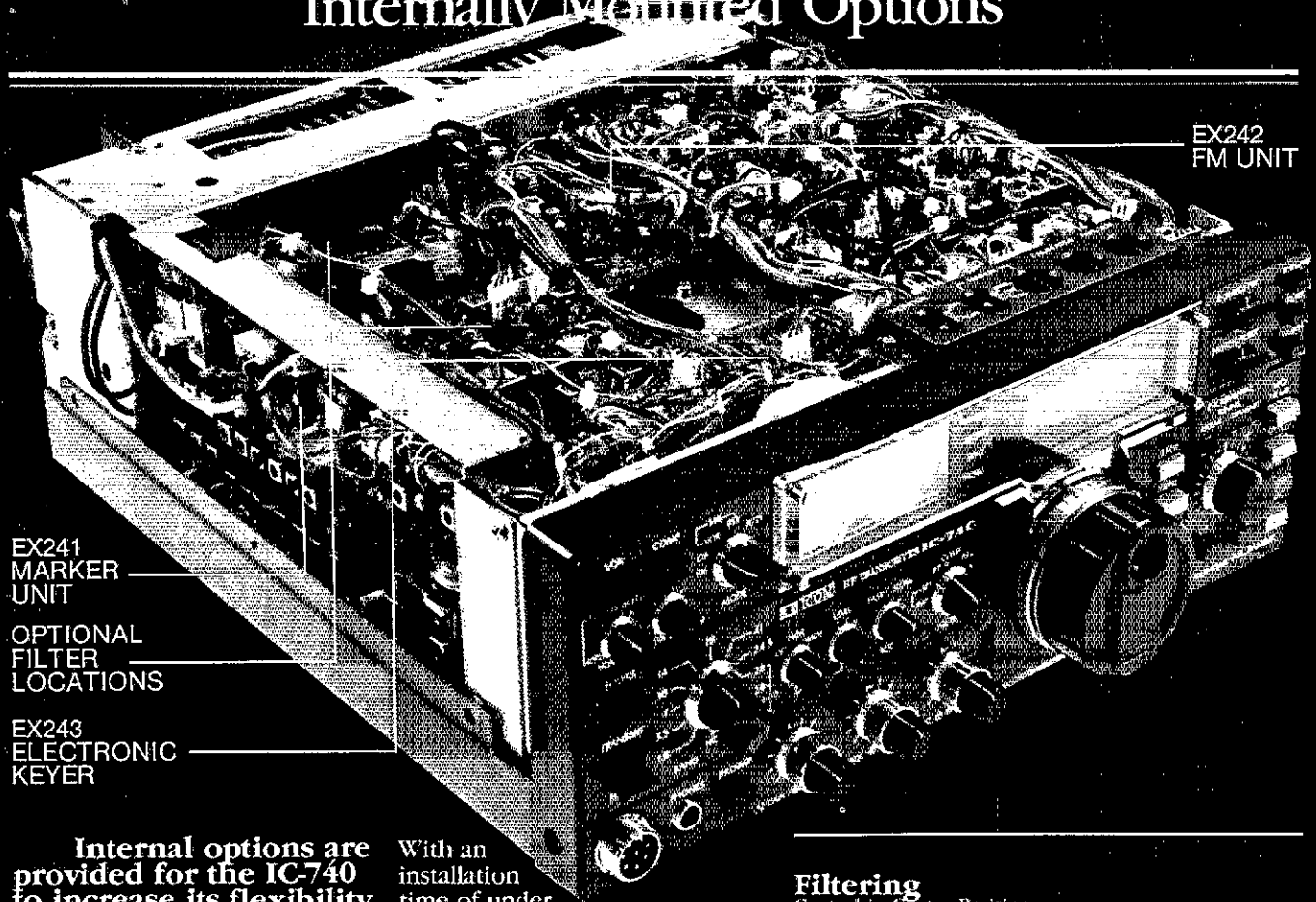
IC-740

Internally Mounted Options



Internal options are provided for the IC-740 to increase its flexibility.

The internal power supply, the EX238, gives the IC-740 portability and also makes a clean looking shack.

With an installation time of under 30 minutes and clear instructions, the IC-EX238 can be installed easily. The EX238 works from either 110 or 220 VAC 50/60 Hz.

The EX242 FM unit allows transmission and reception of FM signals on 10 meters.

A marker unit, EX241, gives clear frequency marking signals at 25 or 100 KHz, selectable by top panel switches.

With the installation of the **EX243 electronic keyer and optional filters,** the IC-740 becomes a compact, complete CW station.

Filtering
Control in Center Position

	Modes Of Use	-6dB Bandwidth	-60dB Bandwidth
Standard Filtering IF Shift Mode	CW/RTTY/SSB	2.4	4.5
Standard Filtering PBT Mode	CW/RTTY/SSB	2.2	3.6
Optional FL44 with Standard PBT Filter	CW/RTTY/SSB	2.2	3.0

Optional Filters

	Use	Center Frequency	-6dB Bandwidth	-60dB Bandwidth
FL44	SSB/CW/RTTY	455.0KHz	2.4KHz	4.2KHz
FL45	CW/RTTY	9.0115MHz	500Hz	1.6KHz
FL54	CW/RTTY	9.0115MHz	270Hz	1.1KHz
FL52	CW/RTTY	455.0KHz	500Hz	820Hz
FL53	CW/RTTY	455.0KHz	250Hz	480Hz

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.

IC-740

Extensive Versatility for the Serious Operator

The ICOM IC-740 offers features found only on the best amateur equipment and performance second to none.

Dynamic Range. The IC-740 is built to withstand strong adjacent signals and still maintain sensitivity and distortion-free output of the desired signal in its passband. With a dynamic range of over **100 dBm** and an intercept point of **+18dBm,** the IC-740 receiver is a true performer. The IC-740 receiver is also **crunch proof,** and unlike many receivers that have good receiver specifications, it does not collapse under the presence of an RF field.

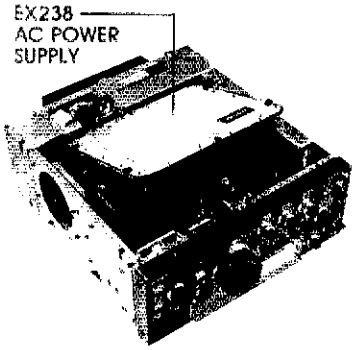
Other outstanding features that are a must for a modern, high-performance amateur receiver are included in the IC-740:

Passband Tuning, adding an additional filtering element to the receiver passband plus giving control of the actual width of the IF stages of the receiver... variable from 2.4 kHz to 700 kHz in SSB, CW or RTTY.

Variable AGC, a two speed AGC with an OFF position allows proper selection of AGC speed **regardless** of mode, VOX or CW breakin. The OFF position makes the IC-740 easily adaptable to frequency converters.

A **Noise Blanker** that really works with both wide and narrow pulse widths and a threshold control to give the optiumum blanking with minimum of signal distortion.

And...the IC-740 has an optional **Internal Power Supply** giving 160-10 meter transceive coverage in **one** package.



These and other fine receiver features plus ICOM's renowned transmitter audio make the IC-740 the **finest amateur transceiver** around today.

$50 Cash Rebate

$50.00 for the purchase of an IC-740.

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IC-720A + IC-R70

The "plus" is the New IC-7072 Transceiver Unit

Now you can add ICOM's most versatile HF general coverage receiver to your IC-720(A). Combine the portability and operating convenience of the IC-720(A), with its long list of standard features...and the IC-R70, ICOM's latest general coverage receiver, into one transceiver by using the new IC-7072 transceiver unit.

Check ths list of features that will be added to your IC-720(A) receiving system:

Audio Monitor. Monitor your own transmitted audio and check SSB audio quality/CW keying characteristics.

Selectable AGC With Off Position. Perfect for use with transverters.

2 Position Noise Blanker. Very effective, virtually eliminates impulse noise

500Hz CW Filter Standard. 250Hz (FL63) optional 8-pole filter.

3 Stage Preamp/Off (Direct)/Attenuator Control. Controls input to ICOM's Direct Feed Mixer receiving system.

Squelch Control. Effective in all modes allowing only signals above a certain strength to be heard.

Audio Tone Control. For easier listening/less fatigue.

Record Jack. Allows connection of a tape recorder to record both sides of a QSO. Unaffected by the volume or monitor control. Also may be used to drive an RTTY decoder.

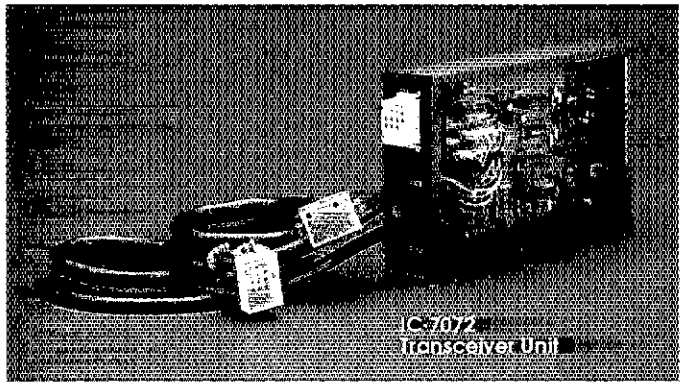
Notch Filter. Deep IF notch eliminates annoying hetrodynes from interfering adjacent signals.

Large Front Mount Speaker. Full 3 watts of audio.

Expanded Range Pass Band Tuning. For greater adjacent signal rejection in the AM mode.

Option for FM Reception. Useful for 10 meter FM.

Excellent, Clear Reception. With the R70's advance receiving system with the first IF at 70MHz, and with the lowest synthesizer noise level available — better than receivers costing much more.



Bring all of these advanced features to your IC-720(A) shack with the R70 and the IC-7072 transceiver unit. The plug-in IC-7072 transceiver unit slaves the CPU of the IC-720(A) to the IC-R70 microprocessor. This allows the tuning knob and selector buttons of the IC-R70 to control the IC-720(A).

Included with the IC-7072 are cables for the mute line control on the IC-R70 and a coax line to patch the IC-720(A) antenna into the IC-R70. An accessory connector on the IC-7072 is provided for attachment of "ICOM System" accessories such as the IC-2KL linear amplifier or IC-AT500 automatic antenna tuner or both.

Now your base station can have the most advanced ham/general coverage receiver available and the crisp transmitted audio of the IC-720(A) with RF speech processor. And yet, the 12 volt operated IC-720(A) may be taken mobile or portable for the ultimate in a ham band transceiver...and you still have general coverage reception...at both places!

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.**

All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions.

ICOM IC-730

ICOM's Go-Anywhere HF Rig for Everyone's Pocketbook

Compact.

Only 3.7 in (H) x 9.5 in (W) x 10.8 in (D) will fit into most mobile operations (compact car, airplane, boat, or suitcase)

Affordable.

Priced right to meet your budget as your main HF rig or as a second rig for mobile/portable operation.

Convenient.

- Unique tuning speed selection for quick and precise QSY, choice of 1 KHz, 100 Hz or 10 Hz tuning.
- Electronic dial lock, deactivates tuning knob for lock on, stay on frequency operation.
- One memory per band, for storage of your favorite frequency on each band.
- Dual VFO system built in standard at no extra cost.

Full Featured.

- 200W PEP input—powerful punch on SSB/CW (40 W out on AM)
- Receiver preamp built-in • VOX built-in
- Noise blanker (selectable time constant) standard
- Large RIT knob for easy mobile operation
- Amateur band coverage 10-80M including the new WARC bands
- Speech processor—built-in, standard (no extra cost)
- IF shift slide tuning standard (pass band tuning optional)
- Fully solid state for lower current drain
- Automatic protection circuit for finals under high SWR conditions
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- Up/down tuning from optional microphone
- Handheld microphone standard (no extra cost)
- Optional mobile mount available

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themselves, but with a large pool to choose from the consistency of difficulty from one part of the country to another will be maintained. Next to integrity, this is probably the most important characteristic that we want as we enter this program. And enter it we will sooner than you think. I predict that it will be in place by summer and hopefully it will mark a new era of growth for Amateur Radio. In the meantime, the ARRL is asking the FCC to delay action on any no-code license for 18 months. This is because the last thing we need is a new license class to administer when we are trying to get used to a new examination process. So get your club thinking about lining up volunteers as examiners for the higher classes of license. Remember if the FCC approves the League's ideas, you will need three examiners, one of which will probably have to hold an Extra Class license. Getting back to the no-code license that the FCC is pushing, my impression in talking to clubs is that there is nowhere near as much opposition to it as you would expect as long as the new licensees are restricted to 220 MHz and above. What do you think? It's important, so drop me a line with your thoughts. The Wellesley ARC put on their yearly Natick Mall message center, handling 925 messages. WA1DFL running the Swap and Shop Net on 19/79 Sundays at 9 P.M. Middlesex club had a Christmas pizza party. Billerica club had an interesting talk on packet radio by K1OJH. WA1KUG gave talk on micros at the Framingham Club. Traffic: W1TKZ 1929, WA1TBY 1371, N1BBT 1038, KA1GBS 904, KA1DB 617, WB8TDA 560, W1AF 557, WA4STO 446, K1BZD 442, KI1I 395, WA1GHC 336, WA1UMG 342, KA1BBU 333, WA1NPO 308, N1BYS 315, N1BGW 288, N1AJJ 223, KA1GEK 220, WA1DXT 166, KA1MI 128, KA1AE 120, W1CE 117, W1MJ 116, WA1LFM 94, KA1DJV 61, N1CKM 57, KE1U 57, K1GN 54, W1DMH 40, WA1FNM 31, K1LCQ 13, KA1ON 10, W1ATX 7.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG. STM: AK1W. Portland Amateur Wireless Assn elected officers for 1983: KA1GQR, pres.; KA1AIF, v.p.; KA1ZX, secy.; K1ME, treas.

Net	Sess.	QNI	QTC	NM
SGN	27	1018	365	K1GUP
PTN	56	551	361	AC1G/N1BJW
CMEN	10	219	46	W1WCI
AEN	5	79	3	WA1YNZ
RACES	4	47	5	W1RWG

PSHR: AK1W WA1YNZ KA1AVU N1BJW W1RWG. Traffic: AK1W 555, WB1BYR 213, KL7IJG 185, N1BLZ 162, KA1AVU 158, N1BJW 154, KA1TJ 119, W1ISO 108, W1JTH 93, W1RWG 83, WB1EIL 74, WA1ZJL 74, KA1GCW 68, W1BMX 59, W1WCI 56, WA1YNZ 45, N1BOF 40, N1BUN 39, W1AHM 33, WA1JHT 31, K1PV 30, KA1ENL 28, W1KX 17, W1VEH 16, KA1EIW 15, KA1BPJ 14, W1CTR 12, W1GCB 12, W1OTQ 12, K1WQI 8, N1BME 7, KA1ENM 4, KA1SO 2.

NEW HAMPSHIRE: SCM, Robert C. Mitchell, W1NH — STM: W1TN. SEC: AK1E. NMs: N1NH K1OSM W1VTP. Another year gone. How time flies. New Great Bay club meeting place is the District Court Building in Dover. Their Fleafest '83 date is April 9th. See you there. K1ZIT now Extra. WB1EPK now Advanced. W1QYY and K1IM made BPL. Nashua club's 83 board: WB1BRE KA1HLG N1BAD K1HI N1BEN K1OSM. Antenna for 2 meters at 80 feet, W1NH will be more active. Latest *Callbook* NH hams: 542 Novices, 466 Techs, 826 Generals, 575 Advanced, and 240 Extras. Not much news this month. Guess everybody busy with the holiday season. Traffic: W1QYY 541, K1IM 410, W1TN 374, W1VTP 247, N1NH 235, K1YMH 187, KA1BJ 160, WB1CFP 146, K1OSM 142, W1MHX 89, WA1YZN 68, W1ALE 66, W1CUE 48, N1ALM 47, N1AKS 36, K1UQX 32, AK1E 29, KA1GJI 28, K1ACL 28, KA1FKM 22, K6UXO 21, KB1A 19, K1PQV 17, N1BSM 8, KA1DSC 8, K1ZJY 6, N1CCF 5, KA1JMG 3, W1NH 3, WA1PEL 2, K1NH 1.

RHODE ISLAND: SCM, Gordon F. Fox, W1YNE — SEC: KA1EHR. WA1OSL, NM-RIEM2MTN, reports 23 sess., 155 QNI, 72 QTC. W1EOF has set all-time traffic record for RI; see below. New officers at Sub Sig: KB1EO, pres.; KA1RM, v.p.; N1AXV, secy.; N1BJY, treas.; KA1PL, CE. Tnx to AE1S for rpts. Effective Jan 1, all facets of the new Field Organization are in operation in RI. Many leadership positions are open to amateurs who would invest some time and effort to make the hobby better. Contact me anytime for info. Traffic: W1EOF 1194, KA1EHR 80, WA1CSO 73, KA1FPP 70, AE1S 40, N1BEE 27, W1YNE 11, KA1HHM 3.

VERMONT: SCM, Bob Scott, W1RNA — SEC: WB1ABQ. STM: N1ARI. This is my last report as SCM-VT. I thank all of you who have contributed your support to this office and to the ARRL. All reports and queries that have come to me will now go to WB1ABQ, who became the Section Manager Jan. 1st '83, and who will operate under the set-up as noted in June '82 QST. VSB 31/578/245; VT FM 31/189/119; VTN 30/77/84; GMN 27/464/44; Carrier 27/476/30; VPN 4/58/6; RFD 4/78/24. Those interested in *strictly a hf fone tfc net*, contact WB1ABQ or N1ARI. WB1ABQ has been off hf lately owing to having two rigs go West. The W1KOO 34/94 rptr has been ailing, badly at times. Repairs should be done by the time this comes out. Traffic: AE1T 317, K1BQB 268, N1AIR 188, W1KRV 99, KA1GID 91, WB1ABQ 72, KA1BSZ 6.

WESTERN MASSACHUSETTS: SM, William J. Hall, W1JP — 1982 ended with a flurry of events. The Mt. Greylock issue was finally resolved in our favor. A new rptr, KA1JJM/Blanford, joined the ARES network. NM KA1T achieved BPL status with a healthy total of 826, as did W1UD with 603. Congrats to both! WA1YYW supported the fone end by checking into FRN 27 times in December. We also sadly witnessed the passing of K1MZW who became Silent Key. Your SCM metamorphosed to SM and began to line up fills for five vacant appt. slots. The U. Mass ARA, W1PUO, has new Omni-C rig and has been QNI in WMN and recent SS. The club is now affiliated with NoBARC. In the Worcester area, the Montachusett ARA has already established its FD Committee and specific club ground rules for the event. (Now, that's organizing!) On a lighter note, SEC WB1HIH reports joining a road race to do "one lap for the tower." He had an HT strapped to his belt, and an "emergency radio unit" sign pinned to his shirt. Took him 1 hr, 22 min. to do the 5½ mile route. BPL: KA1T W1UD. PSHR: KA1T WB1HIH W1KK K1JHC. Traffic: KA1T 828, W1UD 603, WB1HIH 270, W1ZPB 116, WA1YYW 108, KA1CDG 81, K1JV 67, KB1W 66, WA1OPN 53, W1KK 50, K1JHC 42, W1JP 29, WB1HKN 11.

NORTHWESTERN DIVISION

ALASKA: SM, Richard Henry, AL7O — SEC: KL7LO. STM: WL7H. ACC: AL7AC. Congrats to the following for upgrading: AL7CV KL7HFQ to Extra; KL7SE KL7SK to General. The North Pole club has issued fifty "WANAPO" certs so the award is off to a good start. The Matanuska Valley group reporting a good Xmas party and successful traffic handling endeavors. Traffic: KL7IRT 140, KL7LO 137, AL7O 108, AL7AC 37.

IDAHO: SM, Dennis L. Hall, KK7X — A very Happy New Year to you all for 1983! Congrats to W0YXB on his election as FARM Net Manager for 1983. *January finds* WA7BDD in a Spokane Hospital with pneumonia. Hope all is back to normal by this printing. All our best wishes are with you. Presented North Idaho ARA their ARRL charter and welcomed them to the ARRL organization. Congrats to W7QGP on her reelection as Northwestern Director. January finds me changing from SCM to Section Manager. Believe the ARRL restructuring plan if supported by the members will bring many changes for the better. With the change comes added responsibilities which I hope can be divided among responsible amateurs in Idaho.

Net	Freq.	Time	Sess.	QNI	QTC
FARM	3935	6:00 P.M. Dy	30	1659	55
CD	3990	8:10 A.M. M-F	23	831	22
IMN	3635	8:00 P.M. M-F	23	189	23

Traffic: W7GHT 764, W7JMH 52.

MONTANA: SCM, Les Belyea, N7AIK — More club election results. Capitol City ARC: N7DKL, pres.; KA7MAI, v.p.; KA7MAH, secy./treas. Beartooth ARC: N7DYX, pres.; W7TTC, v.p.; WA7KKP, secy.; WB7NFK, treas. Anaconda ARC: WB7QBQ, pres.; KA7HIG, v.p.; N7DPK, secy.; K7YNZ, treas. K7ABV from Great Falls has made a tremendous accomplishment in the fact that he has received a QSL card from BY1PK, giving him a country total of 339. You can not possibly get more than that. Congrats! If you would like a current Montana rptr list, s.a.s.e. to K6PP. The Lower Yellowstone ARC held a monthly meeting at the home of WB7QZE. It just happened to be on the day of his 25th wedding anniversary. KB7Q is keeping busy working the world on 2 meters via moonbounce. Skydiver KB7SE has taken up flying; flyer KD7Q has taken up skydiving. How about that? BPL: W7TGU. PSHR: W7TGU W7LBK WA7GQO KF7R.

Net	Sess.	QNI	QTC	Mgr.
BSN	13	328	23	WB7UTJ
IMN	23	189	100	K7JV
MTN	23	843	161	K7TQM
MSN	3	46	0	KB7SE

Traffic: W7TGU 579, KF7R 320, K7EFA 161, WA7GQO 134, N7AIK 48, W7LBK 44.

OREGON: SM: William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. With the reorganization in the section, this column will undergo a few changes. The section traffic nets will no longer be listed here, but will continue to be listed in the "Public Service" pages. Positions are still open for Bulletin Manager (BM) and Technical Coordinator (TC). Anyone interested in more information on either position contact the Section Mgr. Additionally, please keep information coming to Section Mgr. concerning people and activities within the section. Traffic/net stations send info to STM. The sixth of the month is deadline for submissions. UPGRADES: Tech-KA7OFM N7EPE; Gen-N7DOB; Extra-KC7XF; Novice-KA7OOW. AL7W assigned as Asst. DEC for Portland Metro area. KC7YS is a brand new GRANDPA. CONGRATS!! OTVARC had a large turnout for an outstanding Christmas party. Good food, good door prizes, and good company. W7LNE had surgery and is recovering. KC7YC headed south to VA hospital for surgery, and we hope speedy return to Douglas Co. Portland ARC officers are: KA7AHF, pres.; W7RBE, v.p.; WA7SDY, secy.; W7WI, treas. Good luck for a good year. Eugene ARC held special events station to celebrate 50-year affiliation with League. Traffic: W7VSE 931, WA7LGN 290, W7ZB 250, WB7OEX 246, KA7ELI 129, W7KYC 104, KA7AID 91, KI7Y 62, N7BGW 54, KT7X 33, AL7W 21, W7LNE 16.

WASHINGTON: SM, Joe Winter, WA7RWK — ASM: KD7G. SEC: K7SH. STM: W7GB.

Net	Freq.	Time(Z)	QNI	QTC	Sess.	Mgr.
WSN	3590	0245/0545	653	466	61	N7CSP
WARTS	3970	0200	2909	498	31	W7SFT
NTN	3970	2000	961	68	31	W7VL
NTN (Nov.)			733	46	30	
NWSSBN	3945	0230	687	54	30	W7JGM
EWTN	146.64	0130/0530	83	76	49	WA7CBN
PSTS	145.33	0130/0630	191	165	62	W7IEU
SCARES	147.18	0330 W	9	1	4	KA7AML

Yakima ARC elects '83 officers: KA7DWH, pres.; KA7KSN, v.p.; WB7VLD, secy./treas. KC7PH & K7KPI teaching Novice course. KA7LMW teaching theory for upgrades. K7VAS & W7GSN involved in successful 5-day search for 2 lost boys. Used 90/30 & 25/85 rptrs. Central Wash. St. Hamfest (Yakima) May 14-15. No. Sea. ARC elects for '83. K7KPC, pres.; KB7RR, v.p.; WA7SVB, treas. KA7HVA, secy. Their Annual Dinner was well attended. Low. COL. ARA elects. WB7UUP, pres.; KA7HWE, v.p.; WB7PEI, treas.; N7CFA, secy. WWDXC elects '83 officers: K7WA, pres.; KR7G, v.p.; WA7RVA, secy.; W7BQG, treas. WWDXC expresses their concern to the DXAC over operating practices of the St. Peter & St. Paul Rocks DXpedition. Inland Emp. VHF RA "Rept'r", '83 Swap fest cancelled in lieu of NW '83 Conv. in Spokane on July 8-10. KA7CSP is mgr. WB7QVH teaches Novice course. WA7IPG's rptr moved to 147.92/32, and is open for RTTY & phone. Clark Co. ARC elects for '83: KC7T, pres.; KA7HND, v.p.; WA7ZHT, secy.; N7ASX, treas. AE7P teaches special Novice class. CCARES does well in an emerg. exer. conducted by Clark-Skamania Dept. of E.M. Radio Clb of Tac's new ofcrs are WA7ZZA, pres.; WB7RAX, v.p.; N7DVS, secy.; N7DRT, treas. W7PGY is awarded Honorary Membership of R.C.T. Chehalis Valley ARS is very active, and is busy "fixing up" the new club quarters, and recruiting mbrs and expecting to reach 60 in '83. "That's the spirit." Radio Ams of Skagit Co. new ofcr's are KA7ACY, pres.; N7DTF, v.p.; KW7F, secy./treas.; WB7DPZ, Rpt'r trustee. Some mbrs help in the Camano Is. flood emerg. Remember the Walla Walla Swapfest Mar 20th Milton Freewater. A semi-truck and car accident occurred ahead of KA7LMW on I-90 near Cle Elum blocking this major highway. KA7LMW alerted WSP via 146.07/67 and then heard N7CXI at the end of the several mile tfc. jam. The two were able to clear a lane to allow WSP & emerg. vec's to reach the scene. Later that day KA7LMW helped with 3 more accidents. Congrats guys. Help me help

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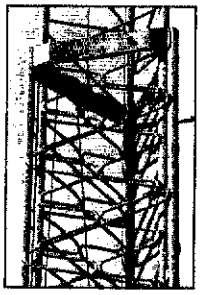
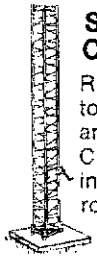
TOWER OF STRENGTH



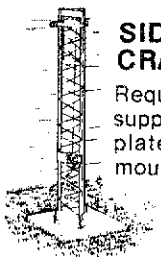
Rugged Hy-Gain antenna crank-up towers are made as no others. All steel construction and galvanizing after welding meets ASTM material standards. Giant welding fixtures assure straight and true alignment of tower sections for close tolerance crank-up guide systems. Diamond web bracing, 2.5 times the strength of ordinary "W" bracing, adds strength where tower sections meet. Open-end tubular steel legs are galvanized inside and out and permit unrestricted moisture drainage. It all adds up to long lasting, massive tower strength for antenna loads of up to 16 sq. ft. at 60 mph.

		Tower Sections	Height Extended	Height Retracted	Width at Base	Antenna Windload Limit	Weight
SELF-SUPPORTING	HG-52SS	3	52 ft. 15.8 m	21 ft. 6.4 m	16.44 in. 417.6 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	455 lbs. 206 kg
	HG-37SS	2	37 ft. 11.3 m	20.5 ft. 6.2 m	13.75 in. 349.3 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	265 lbs. 120 kg
	HG-54HD	3	54 ft. 16.5 m	21.5 ft. 6.6 m	19.53 in. 496.1 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	575 lbs. 261 kg
	HG-70HD	4	70 ft. 21.3 m	21.5 ft. 6.6 m	22.63 in. 574.7 mm	16 sq. ft.-60 mph 1.5 sq. m-96 km/h	1100 lbs. 499 kg
SIDE-SUPPORTED	HG-33MT2	4	33 ft. 10.1 m	11.5 ft. 3.5 m	13.75 in. 349.3 mm	8.5 sq. ft.-50 mph .79 sq. m-80 km/h	210 lbs. 95 kg
	HG-50MT2	3	50 ft. 15.2 m	21 ft. 6.4 m	11.5 in. 292.1 mm	6.0 sq. ft.-50 mph .56 sq. m-80 km/h	290 lbs. 132 kg
	HG-35MT2	2	35 ft. 10.7 m	20.5 ft. 6.2 m	9.25 in. 235 mm	9.5 sq. ft.-50 mph .88 sq. m-80 km/h	187 lbs. 85 kg



SELF-SUPPORTING CRANK-UP TOWERS

Require no guying and conform to EIA, Uniform Building Code and Los Angeles license 1095. Complete with hinged base, installation steelwork, pre-drilled rotator plate and manual winch.



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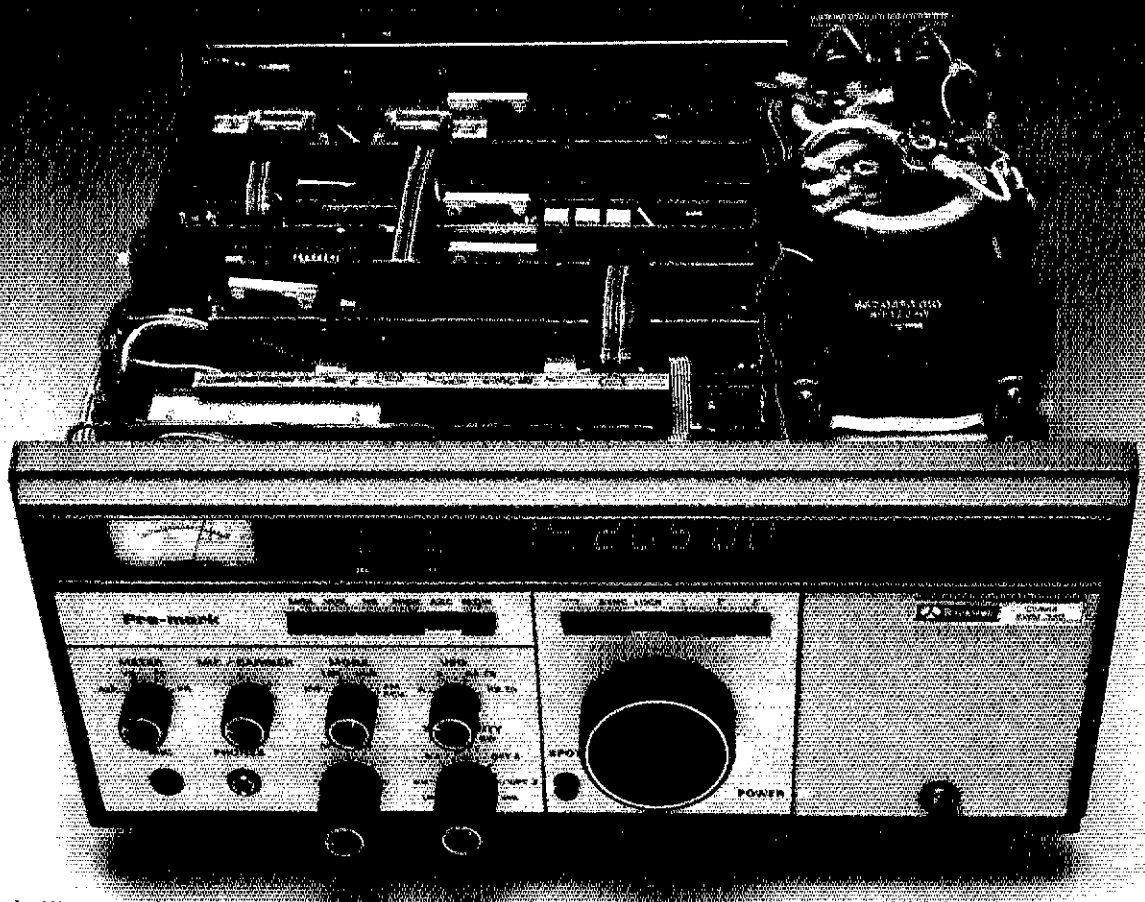
The real beauty of the Collins KWM-380 is behind the panel, not on it.



At Collins, we know serious amateurs won't settle for less than professional performance. So we build every KWM-380 to commercial rather than amateur standards. For example, our PC boards are connected by ribbon cables with gold-plated pinfield connectors. The boards themselves are all glass epoxy, and virtually unaffected by temperature and humidity which cause intermittents in the more commonly used phenolic boards.

Once built, every KWM-380 undergoes 24-hour burn-in, then is aligned and tested to meet or exceed every spec on the data sheet. Which makes us very confident about warranting your KWM-380 for one full year.

The result is a radio with superior performance and lasting quality, not front-panel glitter. Frequency stability is just one example of its beauty: typically, drift is as low as 10-12 Hz per hour for normal ham shack environments. Other companies haven't matched our performance because they don't match our quality behind the panel.

Add some real beauty to your station. See the KWM-380 at your nearest authorized dealer. Collins Telecommunications Products Division, Defense Electronics Operations, Rockwell International, Cedar Rapids, IA 52498. Phone (319) 395-5963. Telex: 464-435.

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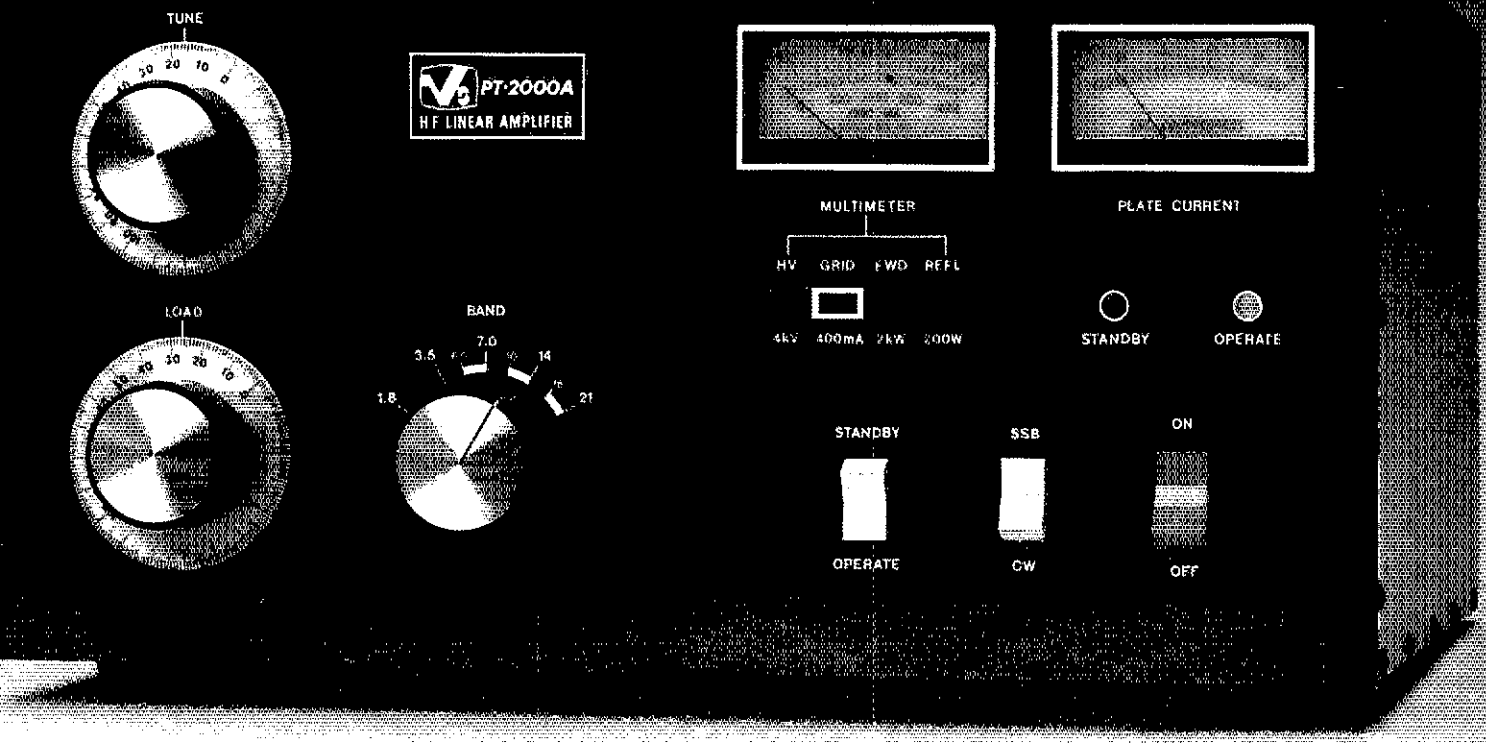

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FEATURES

esigned for SSB, CW, RTTY, AM or ATV peration on the amateur bands between 1.8 Hz and 21 MHz.* (Including WARC bands d MARS operation.) May be customer odified to cover the 28 MHz band. Please nsult the factory.

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st heating high performance 3-500Z triodes sure rapid turn-on time.

ontinuous duty squirrel cage blower plus tional muffin fan for extreme extended use.

e Pi-L circuit features;

- Heavy duty, 7KV rotary switch with silver plated contacts.

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b) A high quality, dual section 6KV plate tuning capacitor which maintains constant Q from 1.8 to 30 MHz*

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Pi network input for each band.

The power supply features a special heavy duty (30 lb.) continuous rated 1100 VA power transformer, a separate filament transformer and computer grade filter capacitors for maximum realiability.

Power transformer transient protected.

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SSB/CW switch for optimum efficiency in all modes of operation.

Vernier tuning for smooth and accurate settings on all bands.

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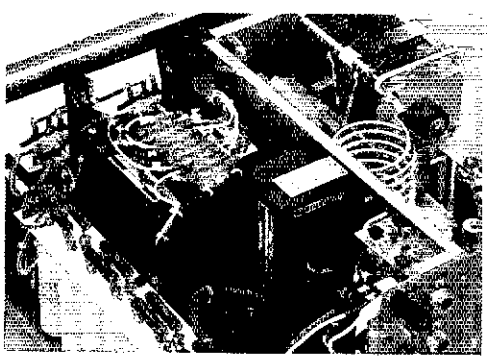

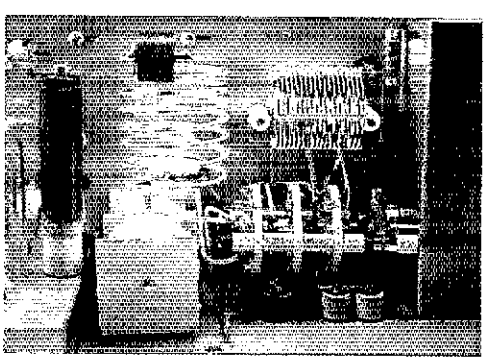

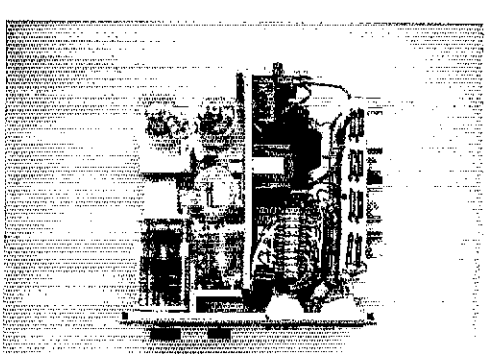

The ultimate team...the new Drake "Twins"

The TR7A and R7A offer performance and versatility for those who demand the ultimate!

TR7A Transceiver

• **CONTINUOUS FREQUENCY COVERAGE** — 1.5 to 30 MHz full receive coverage. The optional AUX7 provides 0 to 1.5 MHz receive plus transmit coverage of 1.8 to 30 MHz, for future Amateur bands, MARS, Embassy, Government or Commercial frequencies (proper authorization required).

• **Full Passband Tuning (PBT)** enhances use of high rejection 8-pole crystal filters.

New! Both 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity are standard, plus provisions for two additional filters. These 8-pole crystal filters in conjunction with careful mechanical/electrical design result in realizable ultimate rejection in excess of 100 dB.

New! The very effective NB7 Noise Blanker is now standard.

New! Built in lightning protection avoids damage to solid-state components from lightning induced transients.

New! Mic audio available on rear panel to facilitate phone patch connection.

• **State-of-the-art design** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provided a no tune-up, broadband, high dynamic range transceiver.

R7A Receiver

• **CONTINUOUS NO COMPROMISE 0 to 30 MHz frequency coverage.**

• **Full passband tuning (PBT).**

New! NB7A Noise Blanker supplied as standard.

• **State-of-the-Art features** of the TR7A, plus added flexibility with a low noise 10 dB rf amplifier.

New! Standard ultimate selectivity choices include the supplied 2.3 kHz ssb and 500 Hz cw crystal filters, and 9 kHz a-m selectivity. Capability for three accessory crystal filters plus the two supplied, including 300 Hz, 1.8 kHz, 4 kHz, and 6 kHz. The 4 kHz filter, when used with the R7A's Synchro-Phase a-m detector, provides a-m reception with greater frequency response within a narrower bandwidth than conventional a-m detection, and sideband selection to minimize interference potential.

• **Front panel pushbutton control** of rf preamp, a-m/ssb detector, speaker ON/OFF switch, i-f notch filter, reference-derived calibrator signal, three agc release times (plus AGC OFF), integral 150 MHz frequency counter/digital readout for external use, and Receiver Incremental Tuning (RIT).

The "Twins" System

• **FREQUENCY FLEXIBILITY.** The TR7A/R7A combination offers the operator, particularly the DX'er or Contester, frequency control agility not available in any other system. The "Twins" offer the only system capable of no-compromise DSR (Dual Simultaneous Receive). Most transceivers allow some external receiver control, but the "Twins" provide instant transfer of transmit frequency control to the R7A VFO. The operator can listen to either or both receiver's audio, and instantly determine his transmitting frequency by appropriate use of the TR7A's RCT control (Receiver Controlled Transmit). DSR is implemented by mixing the two audio signals in the R7A

• **ALTERNATE ANTENNA CAPABILITY.** The R7A's Antenna Power Splitter enhances the DSR feature by allowing the use of an additional antenna (ALTERNATE) besides the MAIN antenna connected to the TR7A (the transmitting antenna). All possible splits between the two antennas and the two system receivers are possible.

Specifications, availability and prices subject to change without notice or obligation.

DRAKE

See your Drake dealer or write for additional information.

COMING SOON: New RV75 Synthesized VFO Compatible with TR5 and 7-Line Xcvrs/Rcvrs

• **Frequency Synthesized** for crystal-controlled stability • **VRTO (Variable Rate Tuning Oscillator*)** adjusts tuning rate as function of tuning speed. • **Resolution to 10 Hz** • **Three programmable fixed frequencies** for MARS, etc. • **Split or Transceive** operation with main transceiver PTO or RV75

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* Patent pending

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American made RF Amplifiers and Watt/SWR Meters of exceptional value and performance.

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2 METERS-ALL MODE

B23 2W in=30W out $89.95
(useable in: 100 mW-5W)

B108 10W in=80W out $179.95
(1W=15W, 2W=30W) RX preamp

B1016 10W in=160W out $279.95
(1W=35W, 2W=90W) RX preamp

B3016 30W in=160W out $239.95
(useable in: 15-45W) RX preamp
(10W=100W)

220 MHz ALL MODE

C106 10W in=60W out $199.95
(1W=15W, 2W=30W) RX preamp

C1012 10W in=120W out $289.95
(2W=45W, 5W=90W) RX preamp

C22 2W in=20W out $89.95
(useable in: 200mW-5W)

RC-1 AMPLIFIER REMOTE CONTROL $24.95
Duplicates all switches, 18' cable

WATT/SWR METERS

- peak or average reading
- direct SWR reading

MP-1 (HF) 1.8-30 MHz
MP-2 (VHF) 50-200 MHz
$119.95

430-450 MHz ALL MODE

D24 2W in=40W out $199.95
(1W=25W)

D1010 10W in=100W out
(1W=25W, 2W=50W) $319.95

Available at local dealers throughout the world.

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The inside story on TEN-TEC's CORSAIR.

All solid-state broadband design.

All 9 HF bands—160-10M. All bands ready to go.

Full output at 100% duty cycle, *all* bands, *any* mode, even RTTY and SSTV. 200 W. input.

Triple Conversion Receiver with switchable RF Preamp. for sensitivity of 0.25 μV on all bands with dynamic range of 90 dB or better. 3rd order intercept +15 dBm.

Variable Bandwidth ***plus*** **Passband Tuning.** Narrow the bandwidth or move the passband anywhere in 2.4 kHz bandwidth. Standard 12 pole filter; optional filter converts to 16 pole performance.

Dual-range, triple-mode, Offset Tuning receiver, transmitter, or both—±1 kHz or ±4 kHz.

Variable Notch Filter—adjustable frequency, better than 50 dB depth.

Speech Processor—clipper/compressor design with up to 10 dB processing.

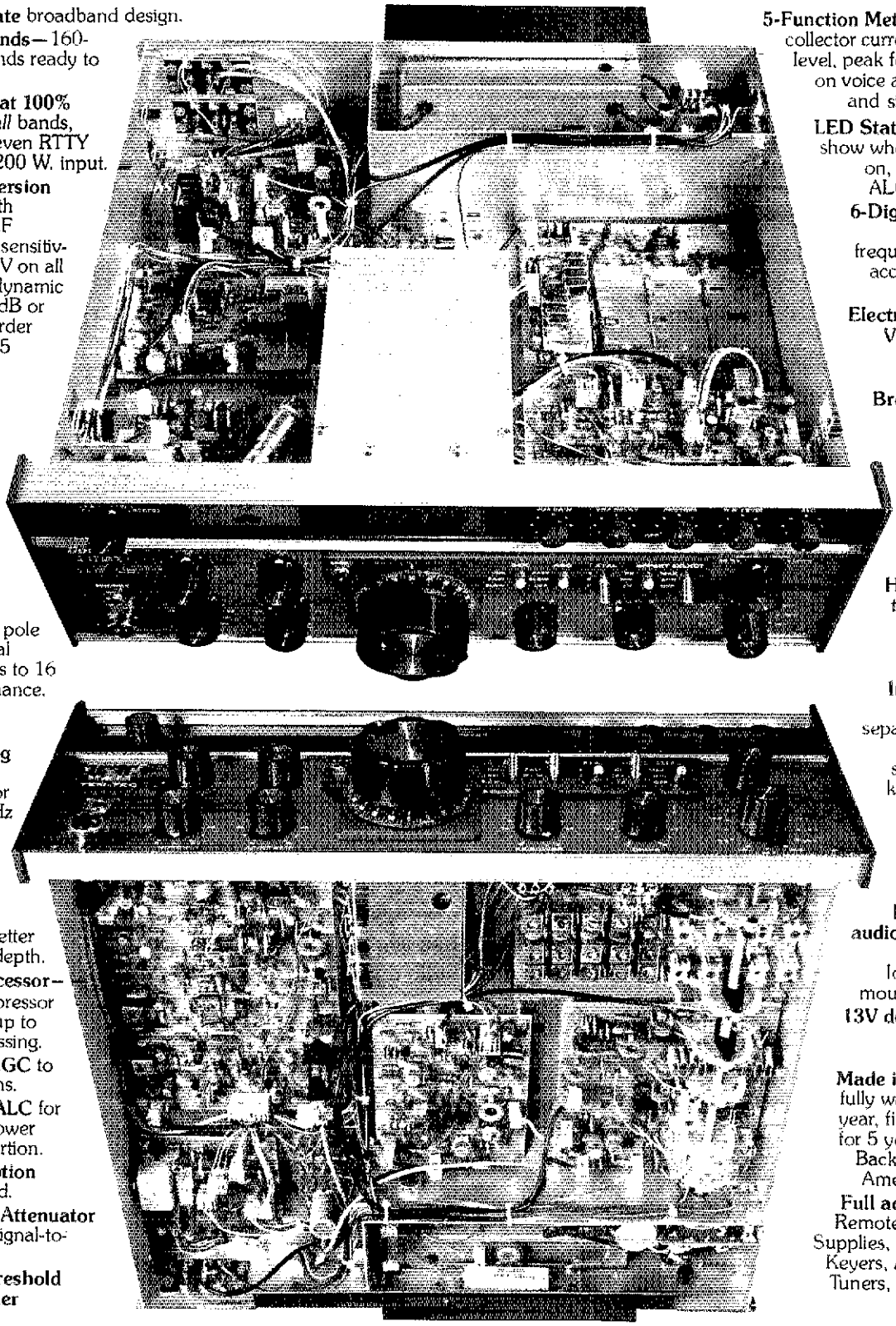
Fast/Slow AGC to suit conditions.

Adjustable ALC for maximum power without distortion.

WWV Reception 10 MHz band.

Headphone Attenuator to enhance signal-to-noise ratio.

Variable Threshold Noise Blanker



5-Function Meter—monitors collector current, processor level, peak forward power on voice and cw, SWR, and signal strength.

LED Status Indicators show when RF amp. is on, Processor on, ALC, and Offset.

6-Digit Readout—with LSI true frequency counter, accurate on both sidebands.

Electret Polarizing Voltage at Mic. Jack.

Full or Semi Break-in for cw.

CW Signal Spotter—easier to use, just match tones instead of zerobeat.

High Articulation Keying—3.5 msec rise-decay time.

Complete Interfacing for accessories—separate rec. ant., QSK linear, separate VFO, keyer, speaker, ant. relay, RTTY, Phone Patch, remote band switching.

Less than 2% audio distortion—compression loaded bottom mounted speaker.

13V dc design—for easy mobile operation.

Made in the USA—fully warranted for 1 year, final transistors for 5 years, pro rata. Backed by reliable American service.

Full accessory line: Remote VFO, Power Supplies, Microphones, Keyers, Antennas and Tuners, SSB and CW Filters.

CORSAIR—a new level of achievement in amateur radio design, with every feature for effortless, effective operation. Try CORSAIR at your TEN-TEC dealer—you'll discover what easy operating is all about. And what a remarkable value CORSAIR represents.

See your TEN-TEC dealer or write for full information.

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SEVIERVILLE, TENNESSEE 37862

others. Advise me of your Hamfests-swap meets and other activities four months in advance, if possible, for this column. '83 ofcrs. for Evergreen ARS: W7KQI, pres.; WB7QVQ, v.p.; KA7LNE, secy.; WB7UGF, treas.; K7RBT, activities coord. Traffic: W7DZX 1552, WB7OGA 1163, WB7TOF 792, N7AFZ 669, WB7WOW 628, N7CSP 537, K7GXZ 382, N7DNG 330, W7HNA 311, W7LG 298, N7AFY 296, KS7I 285, N7DDP 209, N7ANE 178, WA7BDD 171, W7GB 163, K7CTP 134, KR7F 76, KD7G 69, W7IEU 49, W7APS 35, K7BFL 18, K7RBT 17, K7OXL 9, WA7OJI 1.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG — ASMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. STM: NI6A. W6ZF sends the West Cost Bulletin the first and third Monday of each month on 3540 kHz at 8 P.M. PST; lots of late news from the national & international scene gathered by W6ZF from the many sources he has developed during his 65 years as an amateur. HARC members KA6s PBL OPJ VRO TNV & VRM all upgraded to Tech on the same day! FB! All four of their Novice class students passed their tests and are awaiting licenses. SBARA officers for 1983 are: KQ6A, pres.; KA6BOI, v.p.; KB6TQ, secy.; WD6AIA, treas. WD6GKN raffles, KA6PNL, activities. EBARC 1983 officers are: N6DIG, pres.; N8XP, 1st v.p.; W6AGD, 2nd v.p.; N6HNU, 3rd v.p.; WD6FRP, secy.; NI6A, treas. LARK members KD6QM AA6F KB6BD AD6X & KD6DT helped N6DUQ pour 5 yards of concrete for the latter's new tower! Traffic: NI6A 1527, W6VOM 342, K6APW 293, K6AGD 238, WB6DDB 167, WB6UZX 32, N6RO 4. (Nov.) WB6DOB 79. (Oct.) WB6DOB 112.

NEVADA: SM, William JD Marshall-Gratrix, KA7Q — STM: W7BS. SNARS members were kept busy and were a tremendous help in providing emergency communications for some recent cross country automobile racing activities. WB5VDV in Elko says that the 28/88 rptr combination used in the area has been replaced by 25/85. Regret to report that N7AKX, our most prolific traffic handler, has been very ill. He is now on the mend, but will off the air for several weeks as of mid-January. Nevada Sagebrush Net meets weeknights on 3906 kHz at 1900 PST (0300Z). 1982 completes W7CX's sixty-third year as a ham. He has been 5CE, and is also W6CW. Traffic: N7AKX 520, W7BS 238, W7BKQ 213, W7CX 8.

PACIFIC: SM, Army Curtis, AH6P — Aloha and hafa adai to all of the Pacific. The holidays have just ended as this is being written, and slowly life is getting back to normal. Hurricane Iwa's impact is still being felt as cleanup continues on Kauai and parts of Oahu. KH6IJ visited Hilo during the holidays. Nice to see him again. KH6HIJ on the mainland for most of December. PTN is being handled by KH6PU and NH6K while he's gone. KH6B just published the second edition of the Big Island Ham Directory; very nice work. Maybe the other island could put something like this together also. WH6APV is new Tech. on Maui at age 15. WH6ARF is trying hard to get on the air from Pahoa. Traffic: KH6B 158, KH6S 26, KH6H 21, KH6JJP 21, KH6HIJ 19, KH6LO 16.

SACRAMENTO VALLEY: SM, Norman Wilson, N6JV — SEC: N6AUB. ASCM: KI6T. New officers for the Nevada Co. ARC are: K6CTU, pres.; K6HB, v.p.; K6CQR, secy.; KA6REE, treas. In the flatlands, the Sacramento ARC have elected: N6AAD, pres.; N6DRU, v.p.; K6FO, treas.; WA6YZD, secy.; W6SI, trustee; K6LKS K8GZS WA6NWE, dirs. Up river the Yuba-Sutter ARC elected: WD6CEM, pres.; KA6LIJ, v.p.; KA6UBI, secy.; KE6LW, treas. Congrats to KE6NO and N6EPG on again making Public Service Honor Roll. KA6UYR passed his General exam. KA6s UBF UBG UBH UBI UBJ UBK and UBL, all of Live Oak, are all new Tech. class ticket holders. Traffic: KE6NO 216, N6EPG 12, W6RBT 2, N6JV 1.

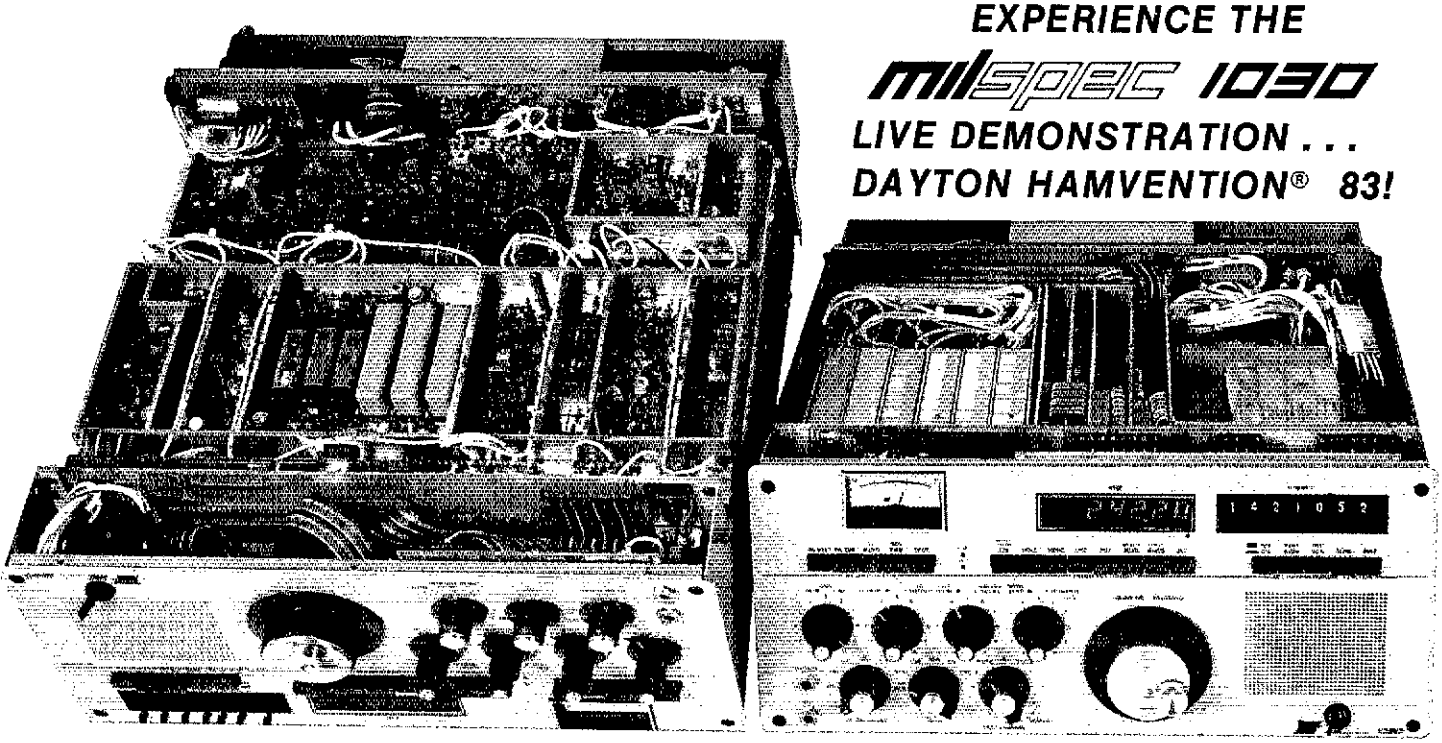
SAN FRANCISCO: SM, Robert Smith, NA6T — SEC: N6BLN. STM: K6TP. The new Section Formation will require filling some new section appointments. See *QST* and let the Station Manager know if you would like to participate. K6ANP es AE6H have been on 75 meters working DX lately. N1AL is new pres. of SCRA-gud luck! SFRC members might be moving meeting location. See the meetings and express your opinions about the locations. New QSL cards are done for W6PW, and the antennas are taking shape. Westlink is on FM radio in San Francisco area. Listen at 5:20 P.M. each Tuesday on KPOO (89.5 MHz). Sorry to Hear that W6GGC is a Silent Key. The GOLDEN GARBAGE CAN will be missed. He was SCM in the SF section, president of the SFRC, helped at the Conventions, helped in emergency communications, and was a 100% radio amateur. 73 from all of us. Traffic: W6IPL 798, W6NL 446, K6TWJ 382, WD6BIY 307, N6FYV 276, K6TP 221, KB6LO 126, W6RNL 114, NA6T 22, WA6QXV 14, WB6RTE 12, W6GGR 8.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N8AWH. ASMs: W6TRP K6YK NF6K. New officers of the Tulare Co. ARC: WD6CNV, pres.; WB6VGL, v.p.; KJ6P, secy.; WB6WCA, treas. The club meets the 4th annual Thursday at the Courthouse in Visalia. New officers of the Kern Co. ARC are: KH6GBX/6, pres.; WD6BUK, v.p.; WA6RXF, secy.; W6FBT, treas. The club meets the 1st and 3rd Fridays in Bakersfield. WA6SIA and W6MYP are SILENT KEYS. AH6CO (ex-W6PSQ) visited over the holidays. N6BVI is Extra. KA6OMB is Advanced. K6LGK is General. KA6WBX and KA6VTA are Tech. KA6WWT is Novice. N6HWR and N6HWN upgraded. KA6SKD is N6HCB. WA6HDA is KD5SY. KA6ETD is KF6IH. N6DXU is KF6IK. KA6VTA is N6HWO. WB6EHH has an R390 rcvr and a truss. K6ICK has a TS520. WA6SHP has a FT208R. WB6NSZ has a TS530S. WA6HMB has a TR9130. WA6JDB joined the NCDXC. KA6CZR KA6CXR W6SBE K6LRJ KB6DJ WB6LSC WD6GRW KE6RN K6YK and WB6UMT are active in RTTY in the north SJV. WA6OEC K6LRJ and WB6SUP are into computer cw/RTTY. The International DX Convention is April 22-24 is Visalia. The Fresno Hamfest is May 20-22 in Fresno. Traffic: N6AWH 310, WA6YAB 38, W6DPD 30, WD6FRS 10, W6SX 8, K9YBM 5.

SANTA CLARA VALLEY: SM, Ross Forbes, WB6GFJ — STM: W6ZRJ. SEC: KA6R. This month will be the last chance for you to let your SM know what you would like to have brought up at the ARRL Board of Directors meeting. Drop me a note, or give me a call so I can let our Director know what is on your mind. I am learning that many of our members are talking among themselves about ideas, and possible changes they would like to see, but no one is passing those ideas on to me. It is impossible for me to guess what is on your mind. Each member has a responsibility to pass on your ideas to the SM, so that I can bring them up to your Director. As communicators, we all need to improve our efforts a little. ALL Decs should be checking into the Section ARES net on Wednesday at 7 P.M. on 145.45,

THE FIRST...
FULLY SYNTHESIZED* HF TRANSCEIVER.

EXPERIENCE THE
milspec 1030
LIVE DEMONSTRATION . . .
DAYTON HAMVENTION® 83!



The Signal One Corporation continues its leadership with the introduction of the Milspec 1030, ***A NEW CONCEPT IN SYNTHESIZER TECHNOLOGY. COMBINING THE ENTIRE DIGITAL FREQUENCY CONTROL SYSTEM, INCLUDING PASSBAND TUNING AND BFO FREQUENCIES, WITH THE MAIN TUNING, FREQUENCY PRESET AND REMOTE COMPUTER CONTROL . . .*** we have achieved an ultra fast, real time frequency controlled, high performance, military grade, fully synthesized communications system that will out perform any HF transceiver ever offered in the amateur and commercial market.

Featuring:

●**Fully Synthesized General Frequency Coverage:** 10 kHz — 30 MHz in 1kHz,100 Hz or 10 Hz steps; tunable with encoder or thumbwheel preset, stability of 1 Hz/C°

●**Lever Switch Frequency Pre-Set:** Provides instantaneous band change,sets to within 10 Hz;automatically returns to Tuning A/B. The fastest and most convenient method of frequency entry and recall with additional digital display and memory, **TUNING C**, make this superior to keyboard systems.

●**New Synthesizer Technique:** 120 dB/Hz phase noise close to carrier; extensive CMOS circuitry used for improved spectral purity and great reduction of digital noise—a problem that plagues other HF transceivers causing unwanted mixing products—that insures weak signals will not be covered by internally generated noise due to adjacent strong signals.

●**Real Time Frequency Acquisition:** Not multiplexed; unique synthesizer design allows frequency jumps of 30 MHz in 10 milliseconds, useful in military surveillance applications that demand ultrafast synthesizer switching.

●**Remote Control and Programability:** Permits transceiver use in computer based communication systems. (Optional interface req.)

●**Unequaled Receiver Dynamic Range and Front End Selectivity:** + 20 dBm, 3rd. order intercept point and .25 uV sensitivity offer the best immunity to strong signal overload currently available to the commercial and amateur market. Specially developed high level monolithic, double quad balanced mixers combined with low synthesizer phase noise and up-conversion to 40.455 MHz 1st I-F thru 8 pole Crystal Cross Mod. Filter with a ± 4 kHz bandwidth, designed for low intermodulation distortion products, makes this performance possible.

●**Synthesized Passband Tuning:** 1st. and 2nd. I-F tune in 10 Hz steps over ± 5 kHz range with respect to 1st. and 2nd. I-F filter passbands, a unique dual passband feature for maximum interference rejection. Controlled by tuning A/B.

●**Collins/Rockwell® Mechanical Filters:** For maximum selectivity and ultimate rejection performance. Demanded in most military/commercial applications. 2.1 kHz (USB/LSB), each selected for optimum performance on SSB, cascaded with front end VHF 8 pole crystal filter, active I.F. notch filter, passband tuning and noise blanker deliver 16 pole, 1.4:1 performance (6/60 dB) and add up to the most powerful anti-QRM system available.

●**Noise Blanker:** Pre I-F blanker with adjustable threshold and 80 dB dynamic range; gating effectively placed in receiver RF path and triggered by pulsed noise such as over-the-horizon radar.

●**I-F Notch Filter:** Active 300 Hz notch in 2nd. I-F. Adjustable ± 1.5 kHz with 40 db rejection. Receiver AGC not affected by notched-signal.

●**High Power Transmit System:** Motorola® high power final amplifiers with 150 watt CW/SSB output or 200 watt option.

●**RF Speech Processing:** Clipped transmit RF signal is passed through mechanical and crystal filters for unequaled SSB talk power and elimination of unwanted intermodulation distortion products. This is a preferred process and considered superior to audio type processors.

●**QSK CW Full Break-In:** Vacuum relays and 200 Hz filter offer a superb full break in CW System

●**Construction:** All circuit boards, including synthesizer modules, plug-in, ribbon cable interconnection and Minisert® sockets for transistor and IC replacement insure ease in self servicing; military and computer grade components used exclusively.

RECEIVER PERFORMANCE

Sensitivity: .25 uV (—118 dBm or better) for 10 dB S/N ratio at antenna input 1.6-30 MHz (2.1 kHz width in SSB).

Selectivity: 1st I-F; 40 455 MHz ± 4kHz @ -6 dB, 1 dB ripple, 8 pole crystal filter.

2nd. I-F; 455 kHz mechanical filters, @ 3 dB

Standard:	Optional:	
USB 2.1 kHz	CW2 375 Hz	AM 5.8 kHz
LSB 2.1 kHz	CW2 200 Hz	AFSK/LSB 300 Hz
CW1 1.9 kHz	(extra steep skirts) (CF high tone pair)	

Mixers: Specially developed, high-level, monolithic double balanced mixers with hot carrier diodes used in first and second mixer stages.

Intermodulation Distortion: (typical) 3rd. order input intercept point + 20 dBm for separated signals of 20 kHz; 2nd. order IMD is —80 dB

Cross Modulation: Unmodulated wanted signal of 100 uV together with a modulated (30% at 1 kHz) unwanted signal of 100 mV spaced 30 kHz apart produces 10% Cross Mod.

Blocking: Attenuation of a wanted AF signal of 50 uV and caused by an unmodulated unwanted signal of 1V spaced 30 kHz apart then produces 3 dB blocking.

IF and Rejection: 80 dB

Synthesizer Phase Noise: Mean S/N ratio of 1st. L.O. (typical, reference to 1 Hz bandwidth); 90 dB measurement 1 kHz from carrier; 135 dB measurement 20 kHz from carrier.

TRANSMIT PERFORMANCE

Power Amplifier: Solid state, broadband 1.6 — 30 MHz 150 W or 200 W (high power option) CW/PEP output keydown all bands and modes. Automatic power cutback under excessive VSWR conditions. Heavy duty Hypersil® transformer for exceptional regulation and power. For continuous full power "key down" operation, blower option required.

Third Order Intermodulation Distortion: 25 dB below each of two tones at full PEP output.

Unwanted Signal Suppression: Carrier: —50 dB min; undesired sidebands, 1 kHz —55 dB min, harmonic (all: —40 dB 10 log of mean power output, mixer products: —50 min

GENERAL

Frequency Coverage: 10 kHz to 29.9999 MHz receive; 10 kHz to 1.6 MHz at reduced sensitivity; 1.6 to 29.9999 MHz transmit

Frequency Control: Memory provides **split tuning A/B** — using opto-electrical shaft encoder tuning in increments of 1 kHz 100 Hz and 10 Hz (180 kHz, 18 kHz, and 1800 Hz/360° respectively), selectable with front panel push buttons. **Tuning C** — preset frequency settable to 10 Hz with front panel lever switch; frequency entered by set button,display and BCD registers updated.

Memory: — frequencies stored in any of 9 memories recalled for Tuning A/B frequencies with read push buttons; frequencies from Tuning A/B or C entered into memories with Auto Write or Write push button.

Stability: 1 ppm/month, 1 Hz/C°; 1 ppm after 15 min. warm-up at 25°C typical. For more demanding requirements, high stability reference oscillator option available — will meet military and commercial standards for specialized data transmissions

Modes: USB, LSB, CW, AFSK, AM — receive USB, LSB, CW AFSK/LSB — transmit

Remote Computer Control: via rear panel 60 pin connector

1. BCD (1-2-4-8) 12 V CMOS parallel command for.
   A. Frequency / handshake
   B. Mode detection
   C. Bandpass tuning
   D. BFO tuning
2. Pulse input to drive shaft encoder counters
3. AGC output
4. Receiver mute command

Power Supply: Built-in heavy duty AC/DC supply. 115/230V ± 5%,-50 to 400 Hz. 12 to 15 VDC at 40 AMPS max., negative ground. 120 W max. in receive, 600W peak at full transmit input. Thermal and current overload protection.

Size: 16.2" wide, 7.8" high, 17.8" deep **Weight:** 50 lbs.

Specifications are subject to change without notice or obligation.

**Introductory price — $4995.00*

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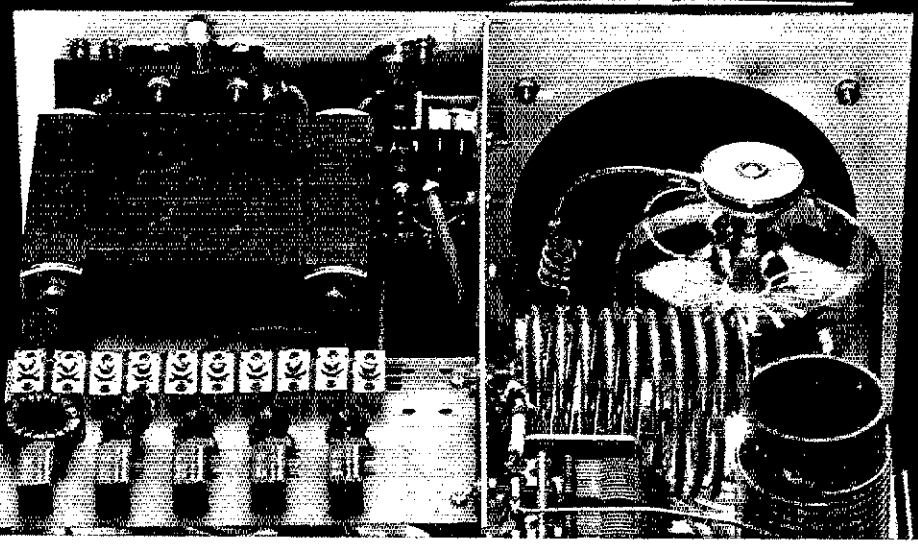
NOW AVAILABLE! *PAYNE RADIO* 615-384-2224 and *MADISON ELECTRONICS* 713-658-0268

Ameritron's AL-80 is so Affordable it's Indispensable!



Performance is what an amplifier is all about, and at less than 60¢ per watt, how can you afford *not* to own an AL-80? The AL-80 delivers 1200 + watts SSB, 1000 watts, CW, RTTY and SSTV input and includes FULL BREAK-IN on 160 - 10 meters.*

There is no other 1200 watt linear on the market today selling for $699.50 to offer full break-in and all WARC bands and a one (1) year limited warranty.

We designed the AL-80 around a single 3-500Z because of its durability, power output and years of proven reliability. It's a workhorse, and we know whether you are competing in a contest or rag chewing, your station's dependability is essential.

At Ameritron we build reliability into all our products. The SPR-8 Studio Processor gives you studio-quality sound in a natural way. The RCS-8 Remote Coax Switch allows you to *instantly* switch up to 5 different antennas, using a single coax, without leaving the comfort of your shack.

Shouldn't your equipment give you performance and economy? Shouldn't it be built by Ameritron?

Buy the Ameritron Line from Dealers across the country. Write us for a catalog.

*10 meters included on export models, or may be modified by licensed amateurs.

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with 146.895 as backup. Don't forget to monitor the ARES simplex frequency of 145.695. WB6GFJ WB6IZF and K6FS met with NWS officials about SKYWARN. W6RFF is repairing his antennas as winds turned them 45 degrees. Welcome to K4UVT to SCV! W6YBV KE6ZA and W6PRI all busy with traffic duties. W6CF still busy with new computer. New CCRC editor is W6NVD. New members of NPSARC include WA7LZO and KA3KAO. W6OAT spent Christmas as 9N1OAT and worked many in SCV. Many clubs are looking for help from their members as NCS during their club nets. Traffic: W6YBV 468, W6PHT 157, KE6ZA 109, W6PRI 92, W6RFF 43, W6OII 38, WD6EKR 36, W6ZRJ 16, W6ASH 12, W6CF 2. (Nov.) W6RFF 32.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Ian Black, WD4CNR —

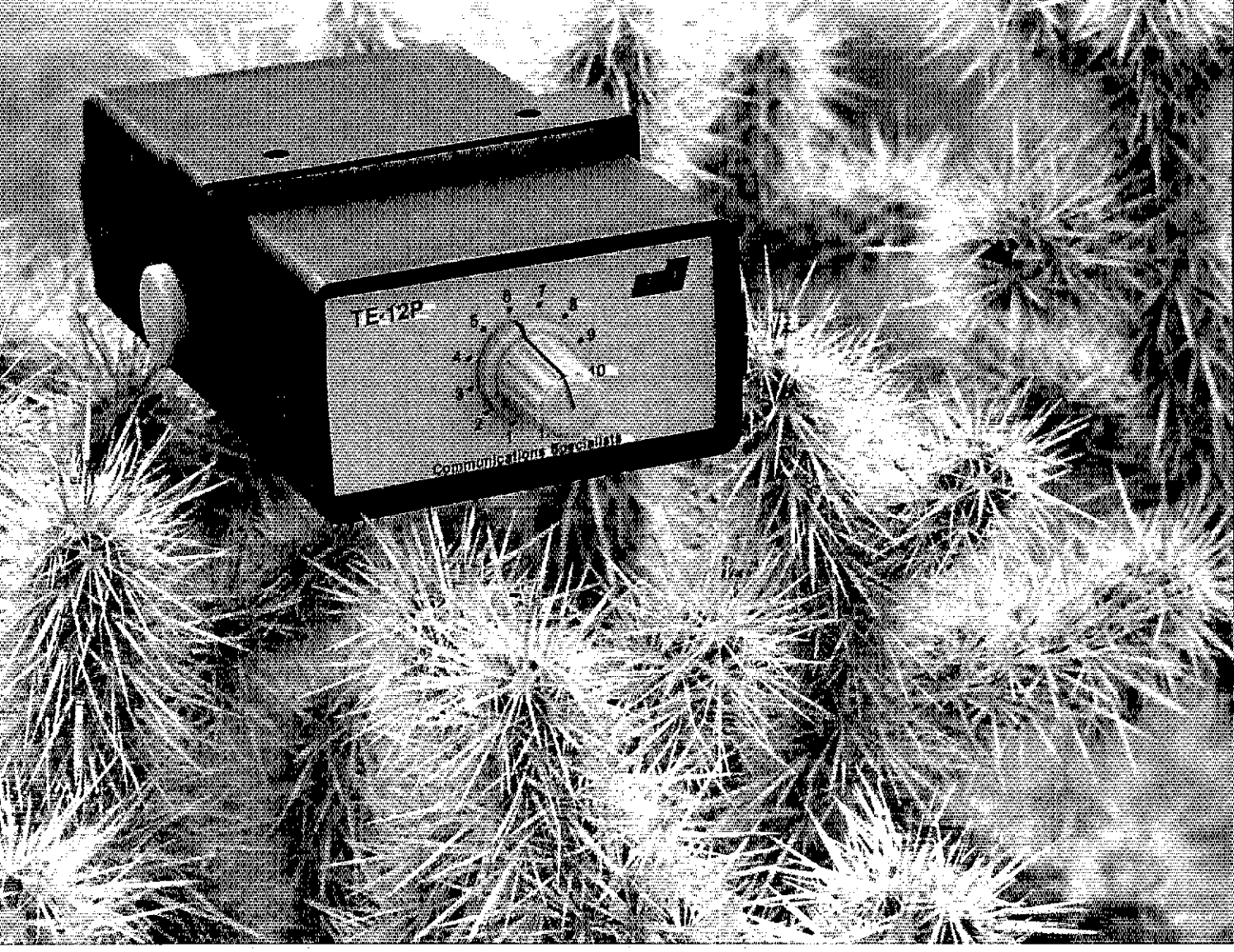
Net	Time	QNI	QTC	Sess.	Mgr.
CMN	1245	621	674	31	W4EAT
JFKN	2330	1059	780	31	WB4WII
THEN	0030	981	353	31	WA4OBR
CNE/L	0000/0300	798	928	62	AB4S
CSN (Novice)	2300	220	91	31	NJ4L

About a week after Dec 12, I was reminded of the story of the guy who got seasick. At first he was afraid he was gonna die — then he was afraid he wasn't. Our plan for handling out-of-state tfc in one time element in the evening worked well. Dual mode reps were there and except for a few extra heavy sessions; the tfc moved out of the section smoothly. Maybe too smoothly — the cw sessions of 4RN and EAN sounded like a DX pile up. Like my sea sick friend, I didn't think it could get worse, but the tfc just kept on coming. Many thanks to all the troops but most of all to the liaisons that were there each session. To name all the active QSPers would take the rest of the column, but those dual mode guys deserve special mention: W4GRO WA4FKY N4ESX AB4S KU4W and W4EAT, all heros this month. By the power invested in me by the Great White Father in Newington, I hereby declare you all eligible to wear your straight keys on a leather thong around your necks. I included W4EAT here for his work from CN and CMN. He just about doubled his cw speed this month. But KU4W gives us the tagline for all this; he says not to forget there's always two other people involved — the one he gets it from and the one he gives it to. So, hats off to all who helped this season. Efforts still going to get an up-to-date list of clubs in the section. If you're not sure your club is on it, contact Rae Everhart, K4SWN. He is our Affiliated Club Coordinator, and wants to hear from you. Traffic: WD4CNQ 828, KD4PJ 620, WD4CNR 578, KU4W 505, WB4WII 502, N4EHM 484, AB4S 472, W4EAT 405, KZ4A 278, WD4LRG 256, K4IWW 209, K4NLK 198, W8JUP 185, WA4SRD 162, W4GRO 161, WD4EIQ 160, W4FMN 159, WB4YZF 154, KA4KJI 153, WA4OBR 142, WB4N 141, KC4AM 115, NT4K 103, WD4HTE 88, WB4CYN 82, KA4DHP 81, N4GGI 73, WB4HRR 70, NE4J 65, KA4LKF 45, N4UE 40, KA4UBN 35, W4RVE 28, W2JDB 27, WD4JFR 27, N4EHF 26, KA4ATK 18, WD4LOO 16, W4TWD 16, WD4DCY 14, W4WXZ 14, WD4JFR 10, K4FTB 7, K4SWN 3.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — KA4WQU damage assessing as volunteer for Red Cross in Arkansas and Louisiana flooding. K4WJR returns to the airwaves and earns BPL for traffic handling. K4ZN missed BPL by a hair. League Planning Meeting for Roanoke Division will be held in Myrtle Beach May 7 & 8. Grand Strand ARC will host the event. This is the opportunity for you to bring your ideas, comments and concerns directly to officials of the League and Board of Directors. You should insist your club send representatives to this very important meeting. Nov./Dec. reports: SCSSB 2867/334; SCNT 732/217; Blue Ridge 3495/87; Greater Pee Dee 2031/262; Western Carolina 686/50; Anderson 687/17; York 386/45; Lancaster 276/13; Carolina State Line 93/7; Newberry 113/7; Laurens 57/0. Traffic: K4WJR 851, K4ZN 839, W4FMZ 350, KA4AUR 334, W4ANK 309, W4NTO 295, W8IKT 254, KA4LRM 147, WB4UDK 106, WA4MIY 103, K4FRX 90, K4ZB 90, KE4WC 66, KE4QZ 64, WD4FJP 45, W4PAB 32, W4DRF 31, WA4JWS 30, WD4NMF 25.

VIRGINIA: SM, Phil Sager, WB4FDT — STM: WD4ALY. SEC: WB4UHC. Chief OO: W4HU. Chief OBS: K3RZR. December was an incredible traffic month. Over 13,000 message points were earned by Virginia amateurs during the month, with over 1000 being earned by W3ATQ alone. *Thirteen* Virginia amateurs made BPL during the month. These were W3ATQ K4JST AA4AT WB4PNY WD4FTK WA4CCK WD4ALY NN4I KR4V K3RZR KB4WT WA4LJI and KA4UFI. *Seventeen* Virginia amateurs made the PSHR list this month. These were KR4V WD4ALY NN4I WB4FDT AA4AT K4JST KB4WT K3RZR NT4U WA4CCK, KA4IUM W4LXB K4VWK KB4PW WA1VRL KB4OG and WB4UHC. Thirty four Virginia amateurs earned over 100 traffic points this month. KA4IUM is the new Net Manager of the Virginia Late Net, and NN4I is the new Net Manager of the Virginia Sideband Net. The Virginia Noontime Traffic Net no longer meets at Noon. It now meets at one P.M. and has changed its name to the Virginia Traffic Net. A new 220 rptr is now on the air near Lynchburg. The rptr is owned by WB4DBB and operates on 223.34/224.94. WB4KIT was given a surprise birthday party at a VARA club meeting. The Roanoke Valley ARC awarded its "Ham of the Year" award to N4FHL. K4AET is ex-W4JOT/W3FBL, and has been licensed for 53 years! WB4CVY, who was one of the most active members of the cw nets between 1968-73, is active again. W4ZYT has also been heard on the cw nets again after a ten-year absence. NT4U and WB4FDT have the same troubles. Their XYLs are forcing them to move their hamshacks into the garage to make room for new babies. K4EAM moving to New Mexico. Remember the VA QSO Party March 12-13. Details in *QST*. WB4RDV, another active net member and net manager from the early 1970s, is again active with a new Ten-Tec Corsair. The K4KDJ crew at VPI is planning to originate over 1000 messages for Valentines Day. Traffic: W3ATQ 1006, K4JST 902, AA4AT 752, WB4PNY 712, WD4FTK 690, WA4CCK 652, WD4ALY 620, NN4I 593, KR4V 587, K3RZR 534, KB4WT 532, WA4LJI 531, NT4U 370, W3BBN 345, WB4FDT 323, N4TE 310, KA4IUM 299, K4AET 292, KA4UFI 259, WB4KIT 231, W3BBQ 224, KB4OG 221, WA4LTO 219, WB4FLT 191, W4UQ 185, K4JM 173, W4YQ 157, KB4PW 138, W4HIR 133, WD4CNG 124, KC4HN 117, KA3DTE 113, W4NWM 111, WD4OCW 100, K4VWK 89, W4PVA 76, WB4UHC 74, NT4S 73, N4HAK 61, WB4ZNB 58, KA4ZTB 51, N4EBU 50, WB4DQZ 44, W4LXB 43, NW4O 39, KA4JXZ 35, W4CFV 33, WA1VRL 31, K8JH 31, KI4W 22, K4MLC 20, NC4B 20, WA4TVS 20, N4FNT 17, WB4MAE 16, W4KXE 7, KA4ZGX 7, N4BJX 6, N3RC 5, W4TZC 5, W4DM 4, N4LE 4, N4YE 2, WD4KQJ 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC:



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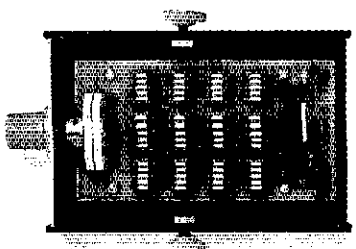

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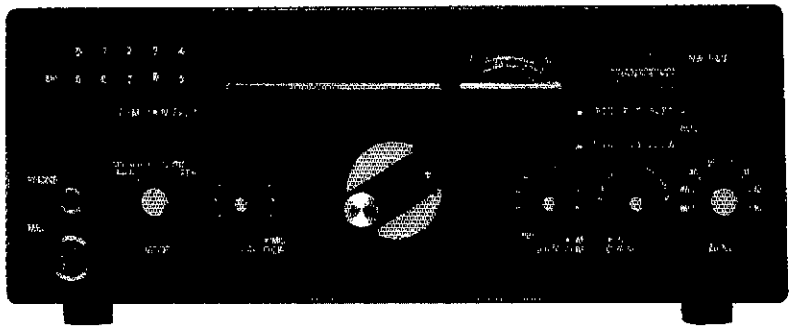

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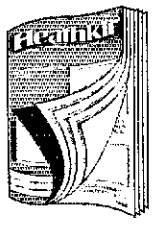

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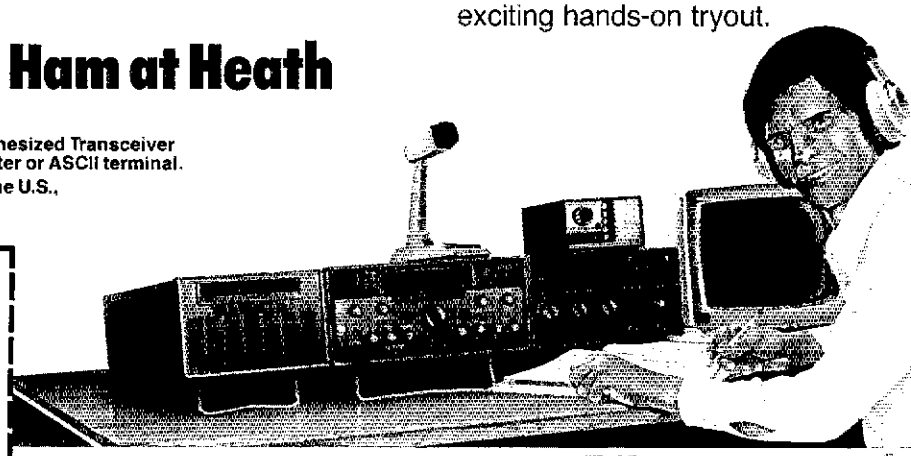

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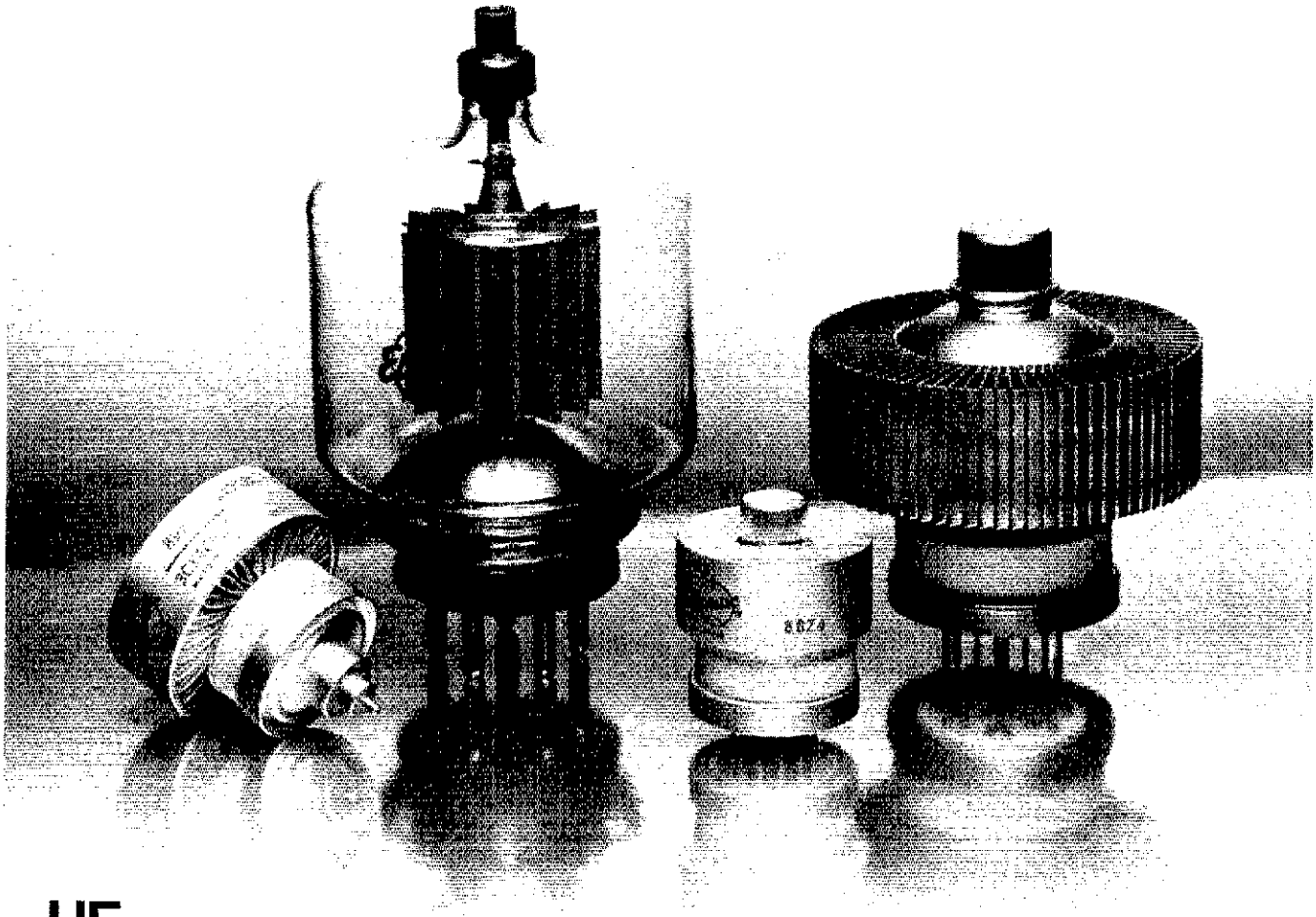

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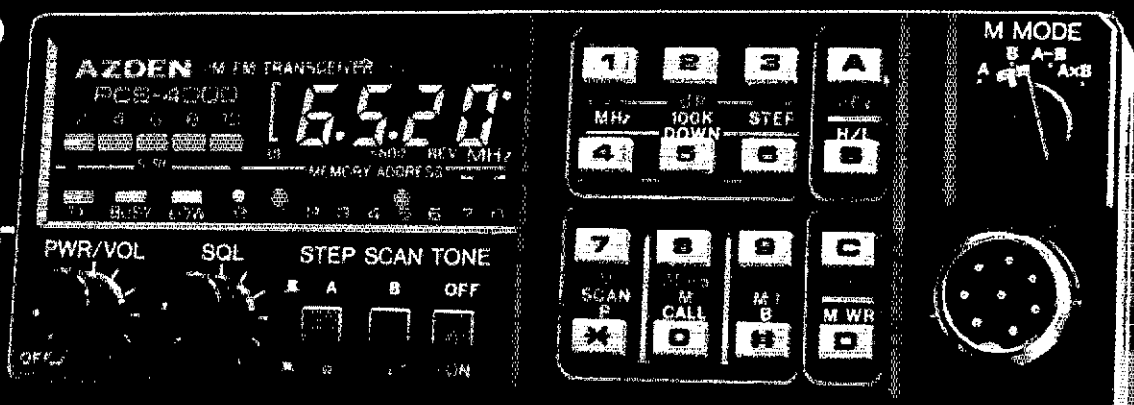

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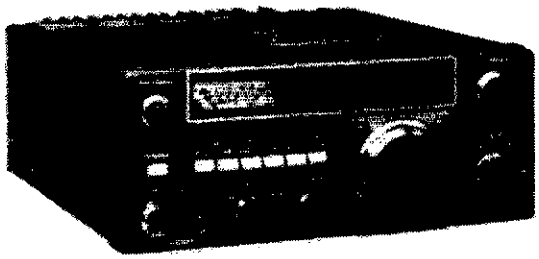

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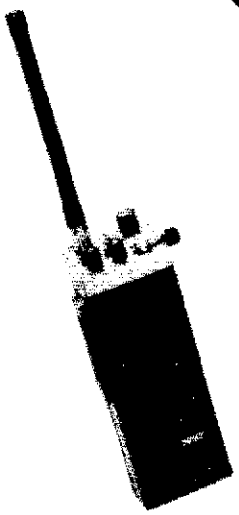

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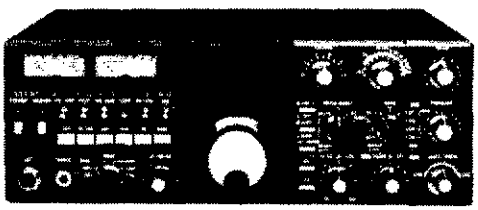

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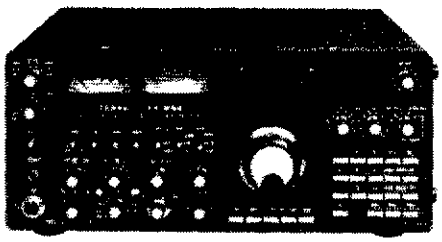

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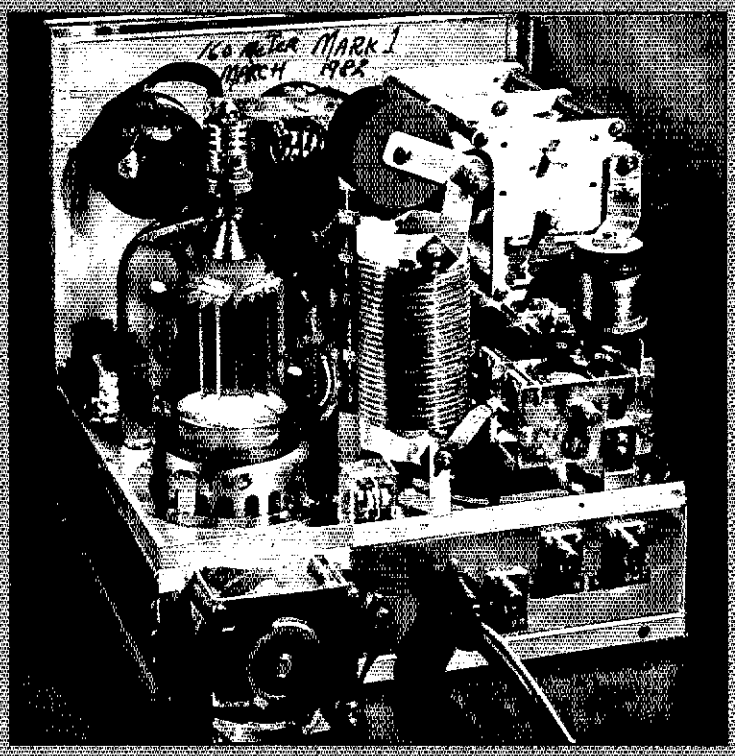

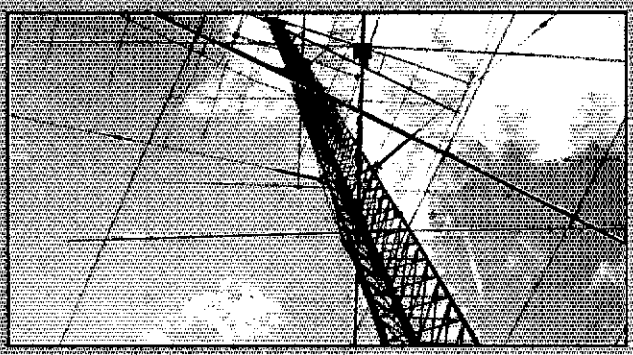

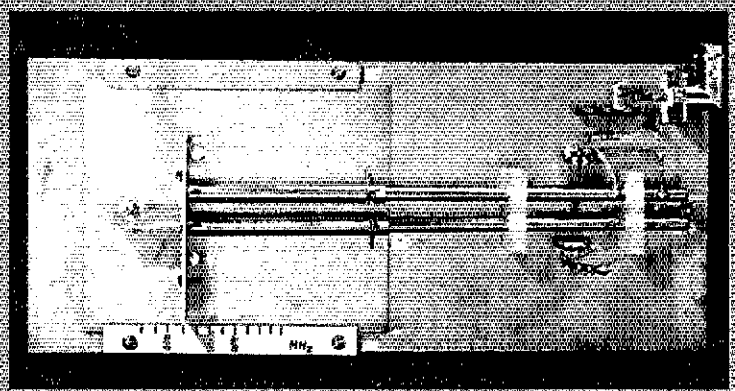

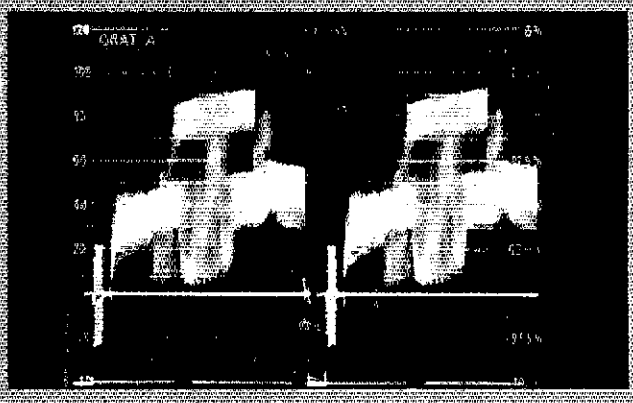

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K8QEW. STM: KD8G. Rpt. Coord: WD4KHL. K8KXE helped with comms. for St. Mary's running club on 12/19. New officers for ORS: KA8DKJ, pres.; WB8EKG, v.p.; WA8DOY, secy.; W8MHR, treas.; WB8VAZ, act. KA3HFU is new EC for Jeff. Co. N8EMC is on air with TS52OS. WA8CRW was selected Ham of the Year by PARC. W4KFC was speaker at KARC's annual dinner. WV Hillbilly net 34 msgs. WVFN 258, WVN 101, KFC 2, WVMD 55. Traffic: KA8GHF 242, W8JWX 239, KD8G 182, KA8HCT 105, WA3NUI 68, W8HZA 67, N9AJC 60, WA8KCJ 43, K8QEW 38, K8KT 26, W8FZP 25, WB8VAZ 25, KC8CR 21, W8CAL 19, WB8UDY 17, WB8ZMX 11, WA8YLW 9, WB8ZTV 9, K8JQ 8, WD8DHC 8.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Lawrence E. Steimel, WØACD — SEC: K3PUR. STM: WDØAIT. With the new Field Organization getting underway in the section, it is hoped that all appointments will be filled within the near future. Thanks to the many active amateurs for their help during the Xmas snow storm in eastern Colorado. There were too many people to list all calls, so just a big THANKS to everyone. With Spring, comes many amateur activities as swapfests, picnics, along with the severe weather watch, which has been highly praised by the National Weather Service and general public. Next month I will try to list as many as possible of the swapfests and other amateur activities. I want to thank the Amateurs from around Grand Junction and Delta for their hospitality during my visit there in Dec. During 1983, I hope to make visits to other areas of the section. If there are special functions for which you may want to include ARRL representation, please let me know. Thanks to the many traffic handlers that are making monthly reports; great work! There are still more of you not reporting tho. In Dec., we had seven make BPL. Thanks. Nets: CWN-sess. 31, QNI 257, QTC 310, QNF 1008. HNN-sess. 31, QNI 1946, QTC 168, INF. 357, QNF 1644. Traffic: WØACD 1365, WAØHJZ 1351, WØWYX 1108, WAØOYI 1030, WØACH 788, NØCXI 587, NØBQP 578, KØDJ 446, WDØAIT 356, KBØZ 206, KAØNLI 110, KØTIV 91, WØLQ 82, KØCNV 60, NØACW 43, WØFFW 31, WØGW 22. (Nov.) NØCXI 193, NØACW 51.

NEW MEXICO: SM, Joe T. Knight, W5PDY — STM: KV5U. DEC: KB5XD. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 3583 at 1930 local and handled 303 msgs with 250 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC and handled 111 msgs with 1225 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 101 msgs with 1174 checkins. Yucca 2-Mtr Net 78/18 & 93/33 handled 10 msgs with 686 checkins. Caravan Club 2 Mtr. Net 66/06 handled 9 msgs with 109 checkins. Extreme winter wx hard on rptrs. 99/39, 37/97 (Capillo), 145.23 and other have been down. Most are back in operation now. WA2FLX visiting from NY. Morning wx reports much appreciation by the wx bureau. Traffic: W5JOV 365, ND5T 326, W5DAD 226, K5DUV 168, W5ENI 89, WA5MIY 16.

UTAH: SCM, Leonard M. Norman, W7PBV — STM: W7OCX. SEC: WB7BZJ. Beehive Net 7272 meets daily 1230 local. WB7BZJ is NM; K7CKF K7LKH WA7KHE WA7MEL and WB7UJP are liaison to TWN. WA7HHE antenna change from a dipole to a sloper increased his 80M signal several dB. W6GMB/7 presented the W. D'Orr Couzzens award to KA7EVV for his outstanding radio amateur activities in club and public service. Utah Code Net 3710 meets daily 1930 local. WA7JJL is NM, and WB7UJP is asst mgr, with KN7U liaison to NTS. UCN monthly breakfast enjoyed by W7PBV K7HLR WA7DBY WA7JJL WA7KHE WA7MEL WB5TJP/7 WB7UJP KA7GJY KA7LPI KA7MNN KN7U KO7H, yl's harmonics and honored guest W6UK/9. Novice class being conducted by WA7HHE. UARC President, WB7DPA handled the gavel over to KB7HM, incoming president, at the annual Christmas party, which was well attended with XYLs, dancing followed a nice dinner. KA7IMV new Army MARS NCS. Traffic: WA7KHE 200, WA7MEL 145, WA7JJL 131, W7OCX 52, WB7UJP 50, KN7U 42, K7CKF 34, W7RO 30, W7PBV 18, WA7HHE 2.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: WØOGH. Effective 1-1-83 WB7EIN has resigned as SEC. I would like to thank him for a job well done. W7TVK has been appointed SEC. He has a very good background in emergency communications and will provide excellent leadership in the SEC position. Congrats to WB7DNJ who upgraded to General. WB7NHR reports the Wyo. Cowboy Net held 27 sessions with 871 QNI & 45 QTC. WAØPFJ reports the Wyo. Jackalope Net held 27 sessions with 718 QNI & 7 QTC. Don't forget the Wyo. hamfest the 3rd weekend in July, and WIMU hamfest August 6-7. Both promise a good time for all. Traffic: WB7NHR 390, WØOGH 212, K7SLM 54, W7SQT 24, W7SDA 8.

SOUTHEASTERN DIVISION

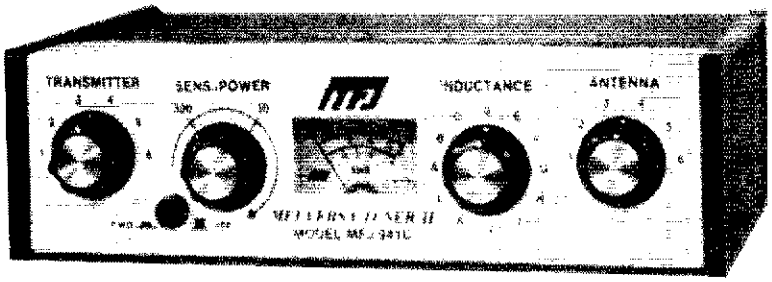
ALABAMA: SCM, H. H. Wheeler, W4IBU — ASCMs: WA4RNP KA4WVU. SEC: N4DMA. STM: WA4PIZ. Jan. 1 was a black day in Flat Rock and in the rest of Alabama. In my opinion, there was not sufficient funds made available to implement the Section Manager concept as proposed. Funding would have been required for the SM and eight appointees to conduct their business on behalf of the League. The funding offered was 75 cents per each of the 1200 members as reported by ARRL, which indicated a drop of over 300 members this past year. The frugality that would have been imposed would have made it impractical for the SM and the eight appointees to be effective in their activities. I have, therefore, declined the SM position until such time as the funding is more in line with the area to cover in Alabama which is 26.09 times greater than some other sections. I do not feel it justified to ask appointees to assume out-of-pocket expenses to perform a voluntary job!!! CAND represented 100% by W4CKS. RNS represented 100% by W4CKS N4FQD WA4JDH WA4LXP WA4PIZ KZ4S WA4UCT NW4X & WA4PIZ. DRNS represented 100% by WB4IXA W4CKS WA4JDH W4IBU W4FNH W4WJF N4FQD KC4GS NW4X W4NCG K4LYY & KD4KT. Traffic: WA4JDH 1611, W4CKS 292, N4FQD 256, W4IBU 132, WA4LXP 81, NW4X 58, KB8GT 40, WA4HRV 32, WD4DHI 32, KA4IJT 28, WA4JPK 20, W4WJF 19, K4HJX 16, WB4IXA 11, W4DGH 9, KY4H 9, WB4TVY 8, KA4AOZ 8.

GEORGIA: SM, Eddy Kosobucki, K4JNL — Jan. 1 brought into existence the LRPC's new expanded Field Organization for each of the ARRL sections. I now assume the title of Section Mgr, and my staff is now increased. During my years as you SCM you have always given me full cooperation and this I have appreciated. Recently the TV networks have started using the motto

MFJ ANTENNA TUNERS 16 MODELS

MFJ-941C 300 Watt Versa Tuner II

Has SWR/Wattmeter, Antenna Switch, Balun. Matches everything 1.8-30 MHz: dipoles, vees, random wires, verticals, mobile whips, beams, balanced lines, coax lines.



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Fastest selling MFJ tuner . . . because it has the most wanted features at the best price.

Matches everything from 1.8-30MHz: dipoles, inverted vees, random wires, verticals, mobile whips, beams, balanced and coax lines.

Run up to 300 watts RF power output.

SWR and dual range wattmeter (300 & 30 watts full scale, forward/reflected power). Sensitive meter measures SWR to 5 watts.

Flexible antenna switch selects 2 coax lines, direct or through tuner, random wire/balanced line, or tuner bypass for dummy load.

12 position efficient airwound inductor for lower losses, more watts out.

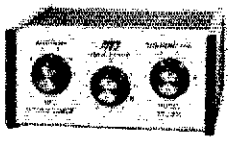
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

Works with all solid state or tube rigs.

Easy to use, anywhere. Measures 8x2x6", has SO-239 connectors, 5-way binding posts, finished in eggshell white with walnut-grained sides.

4 Other 300W Models: MFJ-940B, $79.95 (+$4), like 941C less balun. **MFJ-945, $79.95** (+$4), like 941C less antenna switch. **MFJ-944, $79.95** (+$4), like 945, less SWR/Wattmeter, **MFJ-943, $69.95** (+$4), like 944, less antenna switch. Optional mobile bracket for 941C, 940B, 945, 944, $3.00.

MFJ-900 VERSA TUNER



MFJ-900 **$49.95 (+$4)**

Matches coax, random wires 1.8-30 MHz.

Handles up to 200 watts output; efficient airwound inductor gives more watts out. 5x2x6"

Use any transceiver, solid-state or tube.

Operate all bands with one antenna.

2 OTHER 200W MODELS:

MFJ-901, $59.95 (+$4), like 900 but includes 4:1 balun for use with balanced lines.

MFJ-16010, $39.95 (+$4), for random wires only. Great for apartment, motel, camping, operation. Tunes 1.8-30 MHz.

MFJ-949B VERSA TUNER II

MFJ-949B **$139.95 (+$4)**

MFJ's best 300 watt Versa Tuner II.

Matches everything from 1.8-30 MHz, coax, randoms, balanced lines, up to 300W output, solid-state or tubes.

Tunes out SWR on dipoles, vees, long wires, verticals, whips, beams, quads.

Built-in 4:1 balun. 300W, 50-ohm dummy load. SWR meter and 2-range wattmeter (300W & 30W).

6 position antenna switch on front panel, 12 position air-wound inductor; coax connectors, binding posts, black and beige case 10x3x7".

MFJ-962 VERSA TUNER III

MFJ-962 **$229.95 (+$10)**

Run up to 1.5 KW PEP, match any feed line from 1.8-30 MHz.

Built-in SWR/Wattmeter has 2000 and 200 watt ranges, forward and reflected.

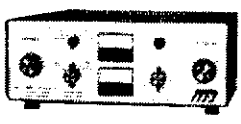
6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

4:1 balun. 250 pf 6KV cap. 12 pos. inductor. Ceramic switches. Black cabinet, panel.

ANOTHER 1.5 KW MODEL: MFJ-961, $189.95 (+$10), similar but less SWR/Wattmeter.

MFJ-10, 3 foot coax with connectors, $4.95.

MFJ-984 VERSA TUNER IV



MFJ-984 **$329.95 (+$10)**

Up to 3 KW PEP and it matches any feedline, 1.8-30 MHz, coax, balanced or random.

10 amp RF ammeter assures max. power at min. SWR. SWR/Wattmeter, for./ref., 2000/200W.

18 position dual inductor, ceramic switch.

7 pos. ant. switch. 250 pf 6KV cap. 5x14x14".

300 watt dummy load. 4:1 ferrite balun.

3 MORE 3 KW MODELS: MFJ-981, $239.95 (+$10), like 984 less ant. switch, ammeter. **MFJ-982, $239.95** (+$10), like 984 less ammeter, SWR/Wattmeter. **MFJ-980, $209.95** (+$10), like 982 less ant. switch.

MFJ-989 VERSA TUNER V

MFJ-989 **$329.95 (+$10)**

New smaller size matches new smaller rigs — only 10-3/4Wx4-1/2Hx14-7/8D".

3 KW PEP. 250 pf 6KV caps. Matches coax, balanced lines, random wires 1.8-30 MHz.

Roller inductor, 3-digit turns counter plus spinner knob for precise inductance control to get that SWR down.

Built-in 300 watt, 50 ohm dummy load.

Built-in 4:1 ferrite balun.

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"LET'S ALL WORK TOGETHER," so we can put this great country of ours forward. With many of the new programs which now are available to the radio amateurs we can make many new strides to enhance the future of this great hobby. As of Dec. 31 the Georgia section was comprised of almost 8000 hams, 1906 of which are ARRL members. Since the gains we made at WARC and the passing of the HR 3239 legislation we now can look at a very optimistic future. The time and efforts given by many dedicated amateurs and the ARRL have brought this about. I am hoping that during 1983 all of you devoted League members will make the effort to encourage at least one of your friends to join the ARRL. Explain to them that we all need to keep working together. Tell them of the many new programs & challenges we have brought forth. As I assume my new duties as your SM my work load increases about threefold, but with your cooperation and the fine staff I have chosen we can really put the Georgia section forward. I become a staff member of the Division Director. Your problems, complaints or recommendations now come to my attention so please write me. Listed below is the staff I have chosen so please note the categories they are responsible for.

Assistant Section Manager (ASM)	K4VHC
Section Emergency Coordinator (SEC)	WB4HXE
Section Traffic Manager (STM)	W4WXA
Affiliated Club Coordinator (ACC)	WA4ABY
Public Information Officer (PIO)	WA4PNY
State Government Liaison (SGL)	W4BTZ
Technical Coordinator (TC)	K4UDR

As of this writing the OO/RFI Coordinator & Bulletin Manager have not been chosen. Traffic: W4WXA 511, WB4NTW 182, N4BIM 175, W4PIM 135, K4NM 130, N4DOM 81, K4JNL 67, W4YWY 49, KA4ATM 48, W4REI 31, K4EV 24, WA8NJA 22, W4HON 19, W4FIZ 16, W4BIA 15, K4BAI 8, WB4RUJ 6, AK4T 4.

NORTHERN FLORIDA: SM: Billy Williams, N4UF — SEC: W4UEA. STM: WF4X. ACC: N4ADI. New officers of Lake Monroe ARS are: AB6I, pres.; KA4KZU, v.p.; KA4ASI secy./treas.; K4TTO W0RAO, board mbrs. Beaches ARS has new weekly emergency net on Mon. at 1930 local on 146.85 simplex. New rptr in that area is 144.75/145.35 MHz. The Sky High Radio Big Sun Hamfest held in Feb. Halifax QCWA now has 60 members and growing. KF4EU upgraded antenna system and put in new crank up tower. Also busy with OO work. New officers for Gulf Coast ARC are KE8O, pres.; WB8ONY, v.p.; KB4VQ, secy.; W4OHU N4AYH K4FMJ N4PCU, dir. KZ4L elected as dir. of OPARC. Hernando Co. ARA busy with message origination and publicuty displays. New meeting place for that group is Evergreen Woods on Hwy 50 west. Winner of the 1982 TARS "Tars & Feathers Award" (Ham of the Year) is WA4DSW. Also honored for their club work was WB4VFS K4AQQ KA4YOD KA4DBZ and KN4Y. KC4N teaching new upgrading class. 1983 officers for the Santa Rosa ARA are KC4XB, pres.; WA4PUP, v.p.; WD4MEX, secy./treas.; WD4BRT NJ4I N4ICV, trustees. Criteria for the new Special Service Club (SSC) category of affiliation are being developed and will be announced shortly. Clubs wishing to apply can contact our Affiliated Club Coordinator, N4ADI. RANGE Computer Net is active each Monday at 2100 local on the 16/76 rptr. WA4B has computer RTTY "Mailbox" on 3630 and 145.76 MHz. Seminole VHF Traffic Net has been busy at 1930 local on LMARS rptr. KB4LB is NM and WD4HBP Asst. NM. W4UEA is looking for OES appointees especially those who have wide area vhf coverage. He is trying to refine an emergency comm system which can pass bulletins and messages using only 2 meters. Traffic: N4EDO 6362, WD4IIO 1560, N4PL 1221, WA4QXT 865, WF4X 838, W4WGR 798, AA4FG 579, KF4HA 532, WB4TZR 491, WB4ADL 471, W4MGO 459, W4ILE 430, KB4LB 379, NY4E 364, WB4EXA 363, WD4HBP 359, WB4GHU 358, WD4MLQ 328, KB9LT 322, WD4GUZ 297, WA4EYU 293, NA4F 186, WD4FI 172, KF4U 155, NF4O 138, N4ADI 146, KA4VXT 129, N4GDT 117, NS4C 97, WB4DTS 97, WB4FJY 74, KB4T 70, K4RNG 68, N3BRT 64, WD4RIQ 63, KD4KK 63, KD4QZ 59, W4GUJ 52, WD4ORO 50, NQ4P 43, WD4HUZ 42, K4DHX 40, KF4EU 31, KA4ETX 30, N4EC 28, W4DTV 25, WB4AWG 19, W3IDO 19, WA4STZ 19, N4UF 18, KA4RVO 18, KA4DCD 16, WB4YQP 15, N4ESM 13, KE4PQ 12, W4LUW 8, KA4RBY 8, KF4GY 5, WA4HBH 5, N4BQE 4, WB4HMT 4, KA4RMH 2. (Nov.) KB4T 77. (Oct.) KE4PO 20.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: KB4OW. STM: K4ZK. Effective January 1, the change was made from SCM to Section Manager, although it will be a few months before all appointments are made. This reorganization of the ARRL Field Organization means greater responsibilities, but I know I will have your help and cooperation. The busy holiday season has just ended and I have never seen the traffic flow more smoothly. It was particularly good to see the number of stations volunteering as Florida alternates for the region nets. There were eleven BPLs reported this month: W3CUL YE3BSY W3VR K4EUK K4ZK WA4PFK WD4COL K4SCL WD4AWN WA4TWD and WA4HXU. Some of the new club presidents for 1983 are: WB4KOB, Broward ARC; WB4ETJ, Clearwater ARS; WB4HDX, Indian River ARC; KA4ZLS, Motorola; WB4CKY, Hollywood ARC; WA4YLB, Fellowship ARC; WB4OUK, Fort Myers ARC; NZ4H, Lakeland RA. W4ROA reported that the WA4LZR Motorola rptr was used to coordinate communication with the Ft. Lauderdale Police, Chamber of Commerce and Jaycees for the annual Ft. Lauderdale Christmas parade. Participants during the eight hours of communication included KA4ZLS NCS, WB4YUC WD5EZY WA2CMW W8NID WA4KXY KN2D K4XF K3OAT N4GPW WA4BZJ KE4QP WB4BFS WA4LVA and W4ROA. NW4R in Lakeland reports that Polk ARC provided communications for the Bartow Marathon December 11, including KD4BO NC6, WB2NVJ WA4HJM K4GOX and NW4R. NW4R also said that NR4T asst. EC, organized hams in the Winter Haven area to provide communications for the 1st Winter Haven Boat Parade through the Chain of Lakes. Participants were WB4S W4QG KD4BO ND4VG KE4NA WA4OTW and WA4VJE. The Chamber of Commerce of both cities greatly appreciated the help of Amateur Radio and so stated. W4JM said he is having fun on 30 meters and is working on a new antenna. Congrats to KB5W, the new manager of RN5/Cy 4. He reported that in November, Florida was represented 100% by WB4GHU K4ZK K4IA W4KIX KA4ASZ W4NFK and WA4PFK. KB5W also said that representation was 93.5% in December by KA4ASZ W4DL WB4GHU WA4HDH K4IA W4KIX N4KB WA4PFK KF4U and K4ZK. W5KLV reported via VE3BSY that Florida was also represented 100% in December on CAN/Cy 2 by WF4X N4GDT and VE3BSY. WB5YDD, DRN5 manager, reports

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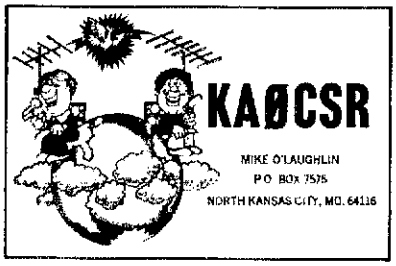

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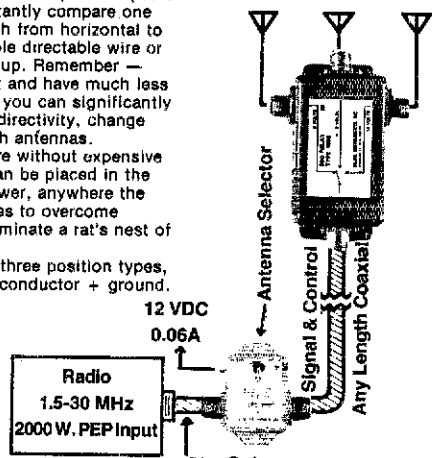

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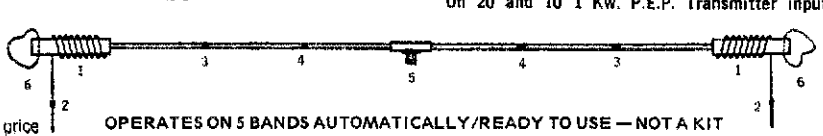

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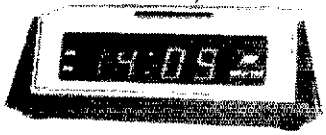

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Florida had 97% representation in December, with VE3BSY of SFla as one of the Florida reps. The Broward hamfest was held in December at Port Everglades. The unexpected arrival of a cruise ship caused some rescheduling of meeting places on Saturday. There was an ARRL Forum Sunday chaired by W4RH and assisted by W4WYR and K1CE. WD4KPG and KM4G stopped by my QTH New Years Day. WD4KPG had a trunkload of corn, which was delicious! 73 de WA4PFK. Traffic: W3CUL 3524, VE3BSY 1421, W3VR 1217, K4EUK 843, K4ZK 729, WA4PFK 715, WD4COL 600, K4SCL 556, WD4AWN 573, WA4EIC 468, WA4TWD 361, WB4AID 349, W4NFK 347, W4YCL 330, KA4GUS 319, KE4O 315, WA4HXU 309, NC4H 282, WB4WYG 249, KE4DA 241, W1NJM 236, W4SME 226, WD4CHO 217, W4DL 213, KA4ASZ 199, KC4FL 193, W4GPL 188, W8BZY 177, N4KB 174, KA4AMC 168, N4ET 150, KM4Y 150, K4IA 124, WB4MPJ 116, W4ESH 113, K7LCA 104, K1SSH 92, KA4NXF 91, KA4FZI 88, WD9AEP 82, WA4GYR 81, WA4C 80, NW4R 70, W4PKP 65, NJ4O 63, KA4VAW 63, W1DLP 62, WA4NBE 62, W4UIO 62, WA4RLV 60, W4SMK 59, AA4BN 55, W3TLV 53, KC4OT 50, KA9AKY 48, W4KLY 44, N4CMW 33, WA4LQO 33, K4FQU 33, KA4YHS 32, KA4BBA 30, WB4GCK 30, WB2OUK 27, W4IRA 24, W4LVA 23, K4KKP 20, KB4KB 20, W4ROA 20, WA2UKE 16, K4EUD 13, W4WYR 12, WB4GJH 11, W3IJR 9, KA8CXQ 9, W3IJC 9, N4FL 7, K4JLL 6, KA2IFZ 5, W4JM 4, WB8SNT 4, WB4LPX 4, K9ALX 3, WB4HYB 3, N4FNY 3, KA4GDU 3, K4IRT 2, NX4X 2, W9FPO 2, WD4PPA 2, W4MFD 2, W4LUU 2, N4GQR 2, KF4JA 2, KA4RWV 1, WA4PIL 1, KA4YHE 1, K3NMR 1, WB9NHV 1, K4OVC 1. (Nov.) W4GPL 296.

SOUTHWESTERN DIVISION:

ARIZONA: SM, Erich J. Holzer, N7EH — STM: W7EP. NMs: WA7KQE WA7FDN. December has drawn 1982 to a close. We hope all had an enjoyable holiday season. As the year ended, the section entered 1983 along with the new ARRL Field Organization. I sure can use your help. If you are interested please contact me. One of the major accomplishments of 1982 was the expansion of the number of ARES organizations. I extend my thanks to those volunteers who made it possible. Many clubs reported participating in spreading some Christmas cheer with their holiday parties. The CCARC reports that it is preparing for their participation in the upcoming Special Olympics in Flagstaff. The So. AZ DX Assn. is preparing for the AZ QSO Party in Feb. The section's traffic handlers report they survived the holiday traffic crunch. A fine job was done by all. Does your club forward a copy of its newsletter to me? Find out. If they don't, let them know that I would appreciate receiving one. I need to receive activity reports and club newsletters by the 6th of the month. The OPRC officers for 1983 are: N7BXX, pres.; N7DZN, v.p.; WA6NNC, secy.; N7BUP, treas.; K7KYW KA7NUM N7CLC KA7LNJ W0YOY, directors. TRA 1983 officers are: WB7TWM, pres.; K7KYW, v.p.; K7SEC, secy.; N7EH, treas.; AG7H K7CRN, directors. PSHR: W7EP W5KMF KB7FE. BPL: W7EP. ATEN: QNI 1042, QTC 425. Traffic: W7EP 692, W5KMF 330, KB7FE 207, W7LVB 159, W7AMM 148, W6GMO 131, K6LL 89, K7NMQ 59, WA6ZVN 55, N7CQY 38, KA7JNU 38, WA7KQE 25, N7CVT 21, WA7NXL 12, KE KE7W 10, N7EH 5, W7DQS 2. (Nov.) K7KVV 147.

LOS ANGELES: SM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. With Jan. 1 here, a new beginning at the section level now starts. Henceforth all matters doing with emergency communications will be handled by N6UK. Anyone wishing an EC DEC or OES appointment or information about ARES should address all correspondence to John Walsh N6UK, 1260 E. Sierra Madre, Glendora, CA 91746, or telephone 213-335-0035. From now on all traffic reports must be sent to STM W6INH. He will make all ORS appointments and handle all matters doing with traffic for this section. BPL and PHSR reports also will all be done by W6INH. For those interested in traffic send requests for information to Gene Violino, W6INH, 2839 Canada Blvd., Glendale, CA 91208. Congrats to NF6D, who Ron has consented to be Affiliated Club Coordinator. All club newsletter editors please note and send your clubs newsletter monthly to him instead of me. He will write a monthly report to me outlining your important events. NF6D was also elected vice chairman for the L.A. Council of Radio Clubs. Address all club matters to Ron Fish NF6D, P.O. Box 6371, Woodland Hills, CA 91365. Tele. 213-883-5031. K6YQ was elected chairman to the council. Thanks to WB6NCF for his new appointment as OBS. Monthly counts for Dec. may be late, W6INH was busy getting ready to retire for his second time. He promised me he will get them in on time starting February. OO counts: K6KA 80, K6CL 7, KD6NL 5, WB6CGZ 5. Traffic: K6UYK 1191, AD7G 528, KT6D 181, W6INH 168, WA6OCM 162, AD6A 65, W6CK 38, W6NKE 29.

ORANGE: SM, Fried Heyn, WA6WZO — ASM: WA6WZN. SEC: W6UBQ. STM: WA6QCA. SCM as of Jan 1st under the reorganization has become Section Manager (SM), and will hold all new Section level positions until Feb 1st. Congrats to WA6WZN on being elected SM, with her term starting April 1st. Congrats to WA6PHX on appointment as EC for Riverside RACES Dist #4 with WB6FRB staying active as AEC/OES. Congrats to AEC KA6HII on OES appointment; he has aided many thru his monitoring of 146.94 (– .6) K6BDI/R. Congrats to N6BAW appointed EC in charge of Orange Co. Govt Public Services; he has been responsible for the ARES "Save a Life Net" in which their first exercise on New Years Eve was supported by the following: N6BAW WB6GCT N6ATF N6AUI KA6UKM WA6BLI WB6ARK W6RE KA6SAB WA6PHX KA6MPB WA6BHR N6DEF WA6FIE N6FRW N6DXD KA6RUX N6AYA WA6TBH N6TAO WA6HFH W1PBE KF6AL NM6X N6FOS WB6JBI N6HKH WB6ULU WA6LRL. Astronaut W0ORE will be banquet speaker at the SW ARRL convention in Anaheim Sept 3rd. New club officers for 1983 — Bishop ARC: KA6JGF, pres.; KA6WYK, secy.; KA6HII, treas. Orange Co. Council ARC: KA6NLY, chmn.; KA6HNY, v. chmn.; WA6FAH, secy.; WB6ULU, treas. LA Area Council ARC: K6YQ, chmn.; NF6D, v. chmn.; W6LPJ XYL, secy./treas.; United RAC: KC6W, pres.; KE6B, v.p.; WB6HEU, secy.; WA6GYG, treas.; Lee de Forest RC (Hemet): KD6GX, pres.; W6NBJ, v.p.; WA6PHX, secy/treas.; Sun City ARC: KF6HZ, pres.; KA6ROR secy/treas. Palomar ARC: N6DYO, pres.; N6GZI, v.p.; WB6TBQ, secy.; W6OLQ, treas.; So Ca DX Club: K6SMF, pres.; K5KI, v.p.; W6UY, treas.; N6AW, secy. Victor Valley ARC: W6RLC, pres.; K4KUN, v.p.; WA6YBG, secy.; KA6OAS, treas. Catalina RA reports change in callsign from WH6AAA to AA6DP/R (147.69/.09). Coachella Valley ARC reports new RTTY net on K6AN/R 146.94 (– .6) Wednesdays 7 P.M. Congrats to AI6E for BPL and PSHR.

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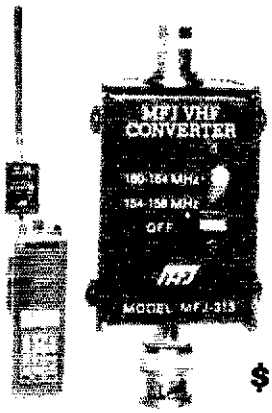

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SCN/V (FM)	146.045/645	9 P.M. Dy	470	190
SCN/SB (FM)	144.58/.18	9 P.M. Dy	558	818

Traffic: AI6E 506, W6NTN 374, KA6BNW 277, K6XI 131, W6CPB 107, K6CZE 64, KA6HJK 58, AE6N 24, W6RE 11, WA6WZO 3, KA6WSI 2.

SAN DIEGO: SM, Arthur R. Smith, W6INI — STM: N6GW. SEC: W6INI. ECs: WD6CSS N6CQW WA6EYX W6INI WA6LAW WA2NNT. Realignment of the San Diego section is underway in accordance with the new Field Organization. (See June 82 QST, page 52.) It will take several months for complete implementation. An earthquake drill on Dec. 15 involved a total of 60 ARES and RACES operators. The drill's purpose was to train the top levels of management in government agencies. ARES provided communications for the City of San Diego, American Red Cross, and San Diego Co. Emergency Medical Service. RACES operators provided inter-EOC communications between the county EOC and those of the incorporated cities. Success of the San Diego Xmas parade was due in great part to KM6S who organized a group of ARES operators. AA6EE has entered the DXCC ranks with 104 countries on cw confirmed. Congrats! In December, the North County Tfc Net met 30 times & handled 374 messages. New ARES members: KA5HIS KA6NSX KA6WTV. Traffic: KT5A 1136, KU6D 486, KM6I 407, KB6AI 235, K6OCW 128, K6HAP 106, N6AT 65, W6HUJ 29, WA6IIK 24, N6GW 7.

SANTA BARBARA: SM: Robert N. Dyruff, W6POU! — 1982 Year in Review! Silent Keys: WA6TMQ W6KPS. More contributions by more amateurs in all fields than ever! Lic. classes as Elmer pgms. by Affil. Clubs in Vent. & SBar Counties. VCARC, SBARC, satellite held annual tests. Significant increase in publ. svc. comms and emerg. comms in all areas espec. SLO Co. Poinsettia alone covered 18 events. Club/Assn. pres/boards/officers/editors informed, educated, fostered Amateur Radio in best tradition. ARRL appointed officials increased to incl: OBS-W6ZRR K6SZS W1UUQ W6POE; OO-W6PN; DEC: K6DZT W6RIC; ECs: W6MSG WB6IIY KA6Q N6AJA WD6BNH WB6RVA WB6QKF KQ6I; Asst ECs over 25; NM-W6HWK WL7ACO KA6JWK K6YD WD6ETK. VHF Sctn Tfc Net set new records. Computer data comms made gains thru W1UUQ N6MA WA6UEO. Tfc ops on CW *and* phone nets incl: N6BKK N6MA N6WP K6YD W6JTA W6ZRR W6JGS N6FTQ. Emerg. comms expanded as public es private agencies opened doors to ARES/RACES support during fires, floods, drills viz: NWS-Skywarn SLO/SBar; CDF-SLO, Morro Bay, Cambria, Paso Robles, PG&E; Santa Maria, Lompoc es hospitals, SBar City and County OES, Carpinteria, SBar Amer. Red Cross, schools/UCSB, hospitals; Vent. Co. RACES, Fire, Amer. Red Cross, hospitals and others. Contributions to ARRL incl. $125 in photocopying by WB6HOZ. Individual contr. of time, equipment, service by rptr owners/trustees, editors, membership chairpersons were too numerous to mention. Newsletters incl: VCARC, SMRA, Poinsettia, CVARC, Simi Settlers, SBARC, Satellite, Paso Robles, Condor, Santa Ynez. Good Year! Sctn distinguished by excell. CATVI work by WB6GVO. Tnx to all! Traffic: K6YD 149, W6JTA 52, K06ZM 8.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM: WA5QFD. SEC: W5GPO. STM: W5VMP. NMs: K5UPN KA5LLT AA5J WD5JYI AE5I. I would like all to know our District Emergency Coordinators (DEC) here in N TX. These folks are responsible for emergency preparedness over a large area, and plan and coordinate ARES activities. They need your full support and participation. W5TOC, Big Spring area; WB5DUQ, Lubbock area; N5OX, Childress area; WD5AFP, Brownwood area; WA5DTC, Cedar Ck. Lake area; N0AJP, Waco area; K5SQA, San Angelo area, K5IID, Midland-Odessa; WA5KZA, Paris area; W5MVJ, Panhandle; WB5LAT, Graham area; AE5I, Abilene area; K5YUT, Nacogdoches area; K5MWC, D/FW Metroplex; WA5UTA, Wichita Falls area. We need a volunteer in the Tyler-Longview area to replace K5HSZ, who has stepped down as DEC in District 16. Thanks for your years of public service work! The above gentlemen can put you in touch with your local EC and get you signed up in ARES in time for the Spring storm season. Congrats to K5UPN, new NM for the Texas Tfc. Net, and to KA5LLT, new NM for the D/FW Metro. Tfc. Net. A new club out Odessa way — the West Texas DX Assn. Contact K5IID for details. The West Texas ARC of Odessa plans to build a new clubhouse this year; and have trained about 25 new hams in their last 3 classes! New officers for KC Club of Ft. Worth: N6BXZ/pres. N5DUV/Sec.-Treas. WB6RYJ/Educ. K5AVA/Pub. Serv. WD5CWS/Emer./F.D. W5YUO/RFI KA5IQE/Maint./Equip. and KD5BI/Editor. BPL: N5BT KC5NN WB5CIC. PSHR: KA5AZK N5DKW N5BT WA5QFD KD5FR KA5LLT K5HGX WB5LAT KC5NN KB5UL N5ADU KK5B WB5CIC. Best wishes to you all for a happy and prosperous 1983! Traffic: N5BT 602, WB5CIC 519, KA5AZK 341, KC5NN 273, KK5B 223, KB5UL 218, K5HGX 116, KA5LLT 77, W5PBN 64, WB5LAT 62, K5SOR 61, N5ADU 60, KD5FR 60, N5DKW 56, K5PC 17, W5CUE 4.

OKLAHOMA: A/SCM, Raymond L. Miller, W5REC — OK section converts to new Field Organization concept early — it's a good move!! Congrats to new club officers: Altus ARC-KA5MPK KA6RTX; Enid ARC-KD5JS WD5HUT KA5DTV; Great Plains ARC-W0PGD K0CIO WB0QCW NC5C N5CCV; Shawnee ARC-KD5NX N5CGZ W5TQZ; Wheatstraw ARC-KA5FUU WA5DUO WA5PFK K5GGL; South Canadian ARS-K5KDR KA5MIZ KA5EFJ WD5GTC. Welcome to the Central Oklahoma Computer Organization (COCO) and chairman N5ABL and their officers and to all other officers that the news has not gotten in yet. New TRO *Signal* editors, KC5F and XYL, are wished the best of luck. Thanks to former editors N5DWZ and K5KW. K5ENA doing fine job as EC for Tulsa Co. Last heard, the Lawton Hamfest will be April 16-17. W5ZTN reports that K5EZE was 100% check-in on OPEN for 1982!! Congrats! WA5IMO and northeast OK hams did a fine job during the December tornadoes. WHERE IS OKALHOMA'S MISSING LINK?? I'll bet the repeater "wizards" will find it!! Traffic: W5REC 407, KD5OE 379, W5RB 320, KV5X 271, WB5ELG 263, KB5EK 234, W5AS 219, K5CXP 143, WD5IFB 109, WB5EAY 98, W5VXU 77, WA5OUV 74, KB5XI 71, KC5OU 55, WD5EAA 51, WD5JCE 48, W5SUG 39, WA5ZOO 37, W1GOM 29, W5VLW 26, W5VOR 25, K5CAY 23, WA5OGC 22, N5EO 12, N0IN 9, KD5KV 4, WB5LSW 3, W5JJ 2.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — ASM/STM: N5TC. SEC: WA5RVT. OO reporting: K5DL (Nov. & Dec.). BPL: W5SHN N5AMH WB5YDD W5CTZ ND5C W5KLV N5EFG N5DFO WD5HOC. ORS N5CRU

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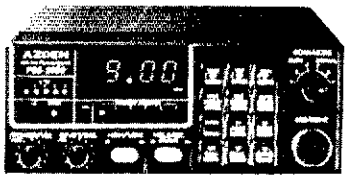

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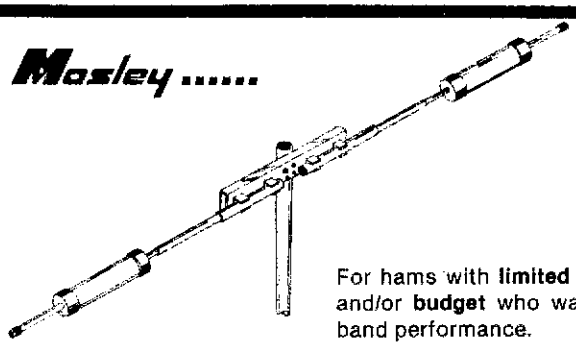

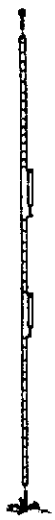

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WILLIAMS RADIO SALES
600 LAKEDALE ROAD DEPT. S
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MFJ DUMMY LOADS

Tune up fast into 50 ohm resistive load. Extend life of finals.

Includes high quality transformer oil.

$34.95

New MFJ-250 VERSALOAD Kilowatt Dummy Load lets you tune up fast. Extends life of transmitter finals. Reduces on-the-air QRM.

Run 1 KW CW or 2 KW PEP for 10 minutes, ½ KW CW or 1 KW PEP for 20 minutes. Continous duty with 200 watts CW or 400 watts PEP. Complete with derating curve.

Quality 50 ohm non-inductive resistor.

Oil cooled. Includes high quality, industrial grade transformer oil (contains no PCB).

Low VSWR to 400 MHz: Under 1.2:1, 0-30 MHz. 1.5:1, 30-300 MHz. 2:1, 300-400 MHz.

Ideal for testing HF and VHF transmitters.

SO-239 coax connector. Vented for safety. Removable vent cap. Has carrying handle. 7-1/2 in. high, 6-5/8 in. diameter.

MFJ "Dry" 300 W and 1 KW Dummy Loads.

$64.95 MFJ-262

$26.95 MFJ-260

Air cooled, non-inductive 50 ohm resistor in perforated metal housing with SO-239 connectors. Full load for 30 seconds, derating curves to 5 minutes. **MFJ-260** (300 W). **SWR: 1.1:1 to 30** MHz, 1.5:1 for 30-160 MHz. 2½x2½x7 in. **MFJ-262** (1 KW). SWR 1.5:1 for 30 MHz. 3x3x13 inches.

MFJ HF SWR/Wattmeter

$29.95 MFJ-816

New MFJ-816 low cost HF SWR/Wattmeter for 1.8 to 30 MHz range. **Torodial** current pickup gives uniform sensitivity over entire HF frequency. **Read SWR**, forward and reflected power in 2 ranges (30 and 300 watts) on two color scale. SO-239 coax connectors. 4-1/2x2-3/8x2-7/8 in.

Order from MFJ and try it. If not delighted, return it within 30 days for refund (less shipping).

One year unconditional guarantee.

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Write for free catalog.

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MFJ ENTERPRISES, INCORPORATED
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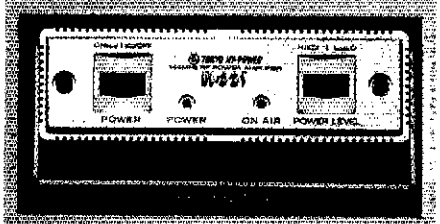
handled urgent wx tfc between Maritime Mobile in Lower Baja and NOAA Wx Svc. "Heavy winds with 150 boats in area and 60 on beach. Storm moving in." CAND Mgr W5KLV reports DRN5 represented 100% by STX stations WB5YDD W5URN W5TFB KD5KQ W5KLV N5CRU N5DFO N5AMH KB5TC N5TC WB5TWW K5QEW. Ex-N5DAA upgraded to Extra; new call ND5C. Congrats! DRN5 Mgr WB5YDD reports Southern Texas represented 100% by WB5ATP KD5GM K5KJN N5DRK W5KLV N5AMH N5CRU W5URN W5CTZ KD5KQ WA5RVT KB5TC W5VLT N5DFO K5WOB K5QEW W5SHN WB5YTT WB5YDD. KA5HBS, President of Magic Valley Radio Amateurs in McAllen, helped Courage Center find an "Elmer" for a blind aspiring amateur in La Joya; WA0UZT, Texas winter resident, is now holding regular sessions. Traffic: W5SHN 2579, N5AMH 906, WB5YDD 778, W5CTZ 743, ND5C (N5DAA) 664, W5KLV 657, W5TFB 435, N5EFG 420, N5DFO 382, WD5HOC 315, KH6SU/5 130, KB5NX 127, KA5KRI 107, N5CRU 90, WB5MMI 73, KD5GM 58, WB5EFJ 56, W5KR 53, W5BGE 50, WD5GKH 26, WA5RVT 25, KD5JX 8, K5RVF 2.



HL-32V VHF AMPLIFIER — The first of our super compact amplifiers for use with handheld radios. For VHF operations, this unit produces up to 25W output with drive from your 0.5W to 3W handheld. Low insertion loss on receive and selectable power level design provide low VSWR to the transceiver.

Excellent for mobile use in snuggly fitted smaller cars, this little beauty can be stowed under the seat, out of sight and out of mind.

The HL-32V operates linear mode for SSB or FM (switch selected), and the best news of all: the price is only $89.95 Suggested Retail!

Meets or exceeds FCC specifications

TOKYO HY-POWER LABS, INC.

For catalog, send your QSL card to
Encomm, Inc.
Department Q-32
2000 Avenue G, Suite 800, Plano, Texas 75074

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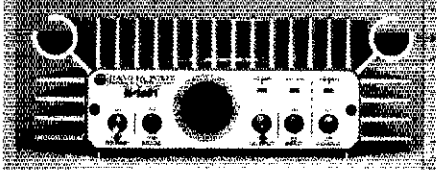

HL-160V VHF AMPLIFIER — This is our big 160W 2 meter linear amplifier which can work with a radio of 10W or even 3W output. This setup is achieved with a pair of rugged VHF R.F. transistors, using highly reliable one-board construction, and with the HL-160V's built-in 12db MOS-FET preamp.

The HL-160V has convenient front panel controls and select switches, LED indicators and a very reliable RF wattmeter. This big amp works SSB, CW, FM and AM modes, and it has a true coaxial relay on the output side.

When you need the power, the HL-160V is the power you need. $349.95 Suggested Retail.

Meets or exceeds FCC specifications

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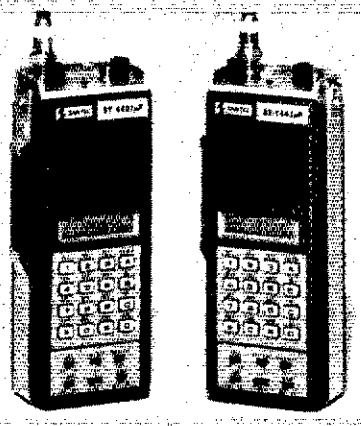

ST-440/μP / ST-144/μP

Only SANTEC packs this much radio into your hands! Get the very most for both bands! ☐ Wide band operation from 142-149.995 VHF (2 meters) and from 440-449.975 UHF (440) ☐ 10 memories with stored offset and/or frequency and with single-button recall ☐ Three output power levels of 3 W high, 1 W medium and 100 mW low (all approx.) ☐ Programmable bandscan with 3 different modes of scan and 2 end limits ☐ Low, low "quiet time" standby of < 10 ma ☐ Display of full 6 digits plus memory channel number and ± offset in use ☐ Full 16 Key Touchtone® pad for repeater control and auto patch ☐ 500 mAHr NiCd battery pack ☐ Priority Scan which always checks Memory no. 1 ☐ 24 hour clock for time checks **anytime**, even if the radio is off, transmitting or monitoring your favorite frequency ☐ Capacity for changing batteries without losing memory data or clock function ☐ Full 2 year extended service plan, which is more than you get from anyone else!

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For complete specifications and list of dealers, send your QSL card to
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Many SANTEC Dealers are offering exceptional bargains on SANTEC products right now! Get yours today!

ST-440/μP, 440	**Now 337.33**
ST-144/μP, 2 meter	**Now 326.66**
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Leather Case ST-LC	29.95
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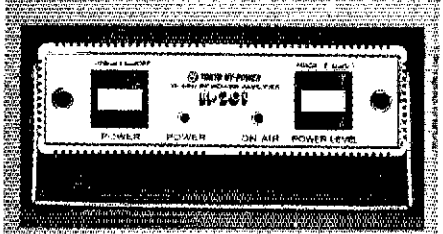
6-Pin Ext. Speaker Mic Connector ST-EMC	6.95

SANTEC products are distributed and serviced by **Encomm, Inc.**, the leading independent importer of quality amateur radio communications equipment.



HL-20U UHF AMPLIFIER — This is another super compact from THL, and it's beautiful, with the controls on the brushed metal face panel to make operations as easy as touch and go.

The ultra-compact HL-20U is a basic amplifier for all UHF handheld radios, and it can accept input levels from 200mW to 3W, to provide a big 20W output signal. Fixed antenuator design allows for full output from as low as 200mW drive.

Your UHF handheld operations have never experienced anything like this surprising little amplifier. $119.95 Suggested Retail.

TOKYO HY-POWER LABS, INC.

For catalog, send your QSL card to
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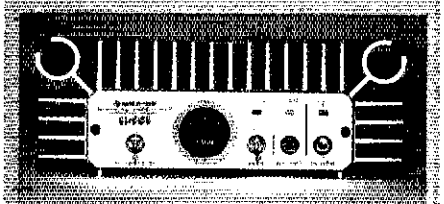

HL-90U UHF AMPLIFIER — Our new 80W output big-power UHF amp, with GAS-FET preamp and drive requirements as low as 10W, is designed for the 70cm amateur band.

It features stable and powerful amplification along with excellent linearity, which is especially effective on SSB. With its built-in receiver preamp, the HL-90U enables you to enjoy more comfortable DX QSO's. Accurate output power can be read with the built-in precision directional coupler, and power can be reduced by one half by the power level switch.

The HL-90U works FM, SSB, and CW, it provides a remote control terminal, and it comes to you for $389.95 Suggested Retail.

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CES
125 Freq counter $ 49 m
COLLINS
75S-1 Ham Rcvr $225 mwfcv
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75S-3B Ham Rcvr 375 mf
75S-3B Rcvr (round) 475 mf
51S-1 SW Rcvr (round) 995 v
32S-1 Transmitter 225 mwfv
32S-3 Transmitter 375 mfc
312B-4 Station control 199 m
KWM-2 Xcvr 450 wf
516F-2* AC supply 149 mwfcv
*Not sold separately
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Cricket 2 Keyer $ 29 m
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RT-3000 Tuner $169 m
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GLA-1000 Linear 239 m
Clipperton L Linear 469 f
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HF-ACS 10A 12v ps 39 m
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R-4 Ham Rcvr $149 m
R-4A Ham Rcvr 175 mv
R-4B Ham Rcvr 249 fve
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*Sold with Receivers only
FL-250 Filter 35 m
FL-500 Filter 35 m
SC-6 6m rcv conv 59 mf
TC-6 6m xmit conv 149 f
R-7/4 filters SW Rcvr 1099 f
R-7A SW Rcvr (like new) 1099 m
2NT Transmitter 79 w
T-4X Transmitter 175 wc
T-4XB Transmitter 249 fe
T-4XC Transmitter 299 fe
TR-3 Xcvr 199 m
TR-4 Xcvr 249 all
TR-4C Xcvr 329 mwfe
TR-4CW Xcvr 399 m
RV-4 Remote VFO 69 f
AC-3 AC supply 59 mwce
AC-4 AC supply 89 wcve
DC-3 DC supply 39 w
TR-7 Xcvr 849 mc
TR-7 w/fan Xcvr 869 wf
TR-7/NB/fan Xcvr 929 m
TR-7/NB/500 Hz filter 929 w
TR-7/2 CW filters 899 m
TR-7/fan/NB/2 filts/AUX 989 w
PS-7 Power supply 199 mfc
PS-75 Power supply 119 m
MS-7 Speaker 29 f
RV-7 Remote VFO 129 mw
SL-300 Filter 35 w
WV-4 VHF wattmeter 49 m
CS-7 Remote ant switch 139 w
L-4B Linear 695 e
AC-10 AC supply 19 f
Theta 7000E Terminal 469 mv
ENCOMM
HT-1200 2m FM HT $189 m
HAL
AKB-1 RTTY keyboard $ 99 m
ST-5000 (H) Demod 159 me
ST-6000 Demod/keyer 469 m
RVD-1002 Video conv 189 mf
DS-3000KSR Term vers 3 795 m
ST-6 Demodulator (rack) 189 f
HENRY RADIO
PS-1220B 13.8v 20A ps $ 89 w
ICOM
IC-701 Xcvr w/ps $599 v
IC-701 Xcvr 499 w
IC-701PS AC ps 99 wc
IC-720A Xcvr 869 wv
IC-730 Xcvr 549 m
IC-730 w/FL-30 filter 589 m
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R-70 SW Rcvr (like new) 549 e
IC-551 10w 6m Xcvr 299 f
IC-505 6m portable 299 e
IC-211 2m Xcvr 389 m
IC-230 2m FM Xcvr 89 m
IC-245 2m FM Xcvr 149 mc
IC-255A 2m FM Xcvr 189 m
IC-280 2m FM Xcvr 169 mv
IC-20L 2m amplifier 59 f
IC-3PA AC supply/spkr 35 m
KDK
2016 2m FM Xcvr $169 f
KLM
2-25B 2m 2/25w amp $ 49 m
10-40B 2m 10/40w 59 m
Echo 70 432 SSB Xcvr 259 m
KANTRONICS
Field Day Reader $169 f
Field Day 2 Reader 199 m
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S-599 Speaker 15 m
T-599D Transmitter 299 m
TS-120S Xcvr 399 mwv
TS-120S/CW filter 429 m
TS-130S Xcvr 469 fe
PS-30 Power supply 99 mfv
SP-120 Speaker 25 wf
TS-180S Xcvr 499 v
TS-180S/DFC Xcvr 599 f
VFO-180 Remote VFO 99 m
TS-520 Xcvr 449 e
TS-520S Xcvr 449 mf
TS-520SE Xcvr 449 f
TS-520SE/CW filter 479 m
DG-5 Digital display 99 me
TS-820/DG-1 Dig Xcvr 549 mv
TS-820S Xcvr 569 mv
VFO-820 Remote VFO 129 m
TS-830S Xcvr 699 mc
VFO-230 Digital VFO 199 c
MC-50 Desk microphone 29 m
TL-922 Linear (air) 869 m
R-1000 SW receiver 299 fe
R-820 Ham receiver 659 mv
TS-600 6m Xcvr 449 mw
TR-7400A 2m FM Xcvr 179 wfv
TR-7500 2m FM Xcvr 129 c
RM-76 Microprocessor 59 we
TR-7730/TTP mic 2m FM 239 mf
TR-7800 2m FM Xcvr 229 f
TR-7850 2m FM Xcvr 269 me
TR-8300 440 FM Xcvr 169 v
PS-6 AC supply 29 c
KPS-7 7A power supply 59 f
TR-2400 2m FM HT 199 mwe
ST-1 Desk charger 59 e
BC-5 Mobile charger 25 w
MFJ
481 Memory keyer $ 49 m
408 Keyer 45 f
950 Rec ant tuner 39 w
MACROTRONICS
TA-650 Interface/Apple $249 m
MICROLOG
AKB-1 Keyboard $149 e
AVR-2 Demodulator 249 mve
MIRAGE
B-108 2m FM amp $129 w
NPC
LR-16 10A power supply $ 79 m
NYE VIKING
MB-II-2 Ant tuner $239 m
SSK-1K Keyer 69 m
046-001 Phone patch 39 f
046-003 Patch w/spkr 49 mfe
PANASONIC
RF-2600 SW receiver $149 e
RF-2900 SW receiver 169 m
RF-6300 SW receiver 369 w
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STANDARD
C-7800 440 FM Xcvr $249 m
SWAN/CUBIC
P-1215 AC supply $ 19 m
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Astro 102BX Xcvr 499 m
Astro 103 Xcvr 699 m
PSU-6 AC supply 129 mf
PSU-6A AC supply 129 m
270 Cygnet Xcvr 229 wf
350 Xcvr 169 f
350C Xcvr 269 f
500 Xcvr 229 f
HF-700S Xcvr 269 fc
750CW/SS-16 Xcvr 369 m
250C 6m Xcvr 199 mwv
117X Basic AC supply 69 w
117XC AC ps/spkr 99 mwv
PSU-3 AC supply 99 c
14X DC module 39 w
512 DC supply 19 m
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802 2m 10/80w amp $ 59 c
TEMPO
2020 Xcvr $399 w
Tempo One Xcvr 249 m
AC One AC supply 89 m
TEN-TEC
570 Century 21 Xcvr $239 e
509 Argonaut Xcvr 269 m
206A Calibrator 19 v
208 Ext CW filter 19 m
208A Ext CW filter 19 m
210 AC supply 19 fv
525 Argosy Xcvr 349 e
225 AC supply 89 e
544 Dig Xcvr 349 w
580 Delta Xcvr 549 wf
546 Omni D series B 499 w
546 Omni D series C 649 we
252M/O AC ps/meter 89 f
262G AC ps/VOX/spkr 89 w
280 Power supply 99 e
255 Deluxe supply 129 w
243 Remote VFO 119 e
234 Speech processor 89 mw
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FT-101EE Xcvr 469 mwfe
FT-101EE/CW filter 499 m
FT-101EX/speech proc 469 w
FT-101EX/DC/CW filter 499 m
FV-101B Remote VFO 99 e
YC-601 Dig display 99 e
FT-101ZD Dig Xcvr 549 m
FV-101Z Remote VFO 99 wc
SP-101PB Spkr/patch 49 e
FT-301 Digital Xcvr 399 m
FT-301AD Digital Xcvr 449 m
FP-301 AC supply 99 m
ERB Ext relay box 19 m
FT-901DM Xcvr 659 mcv
FT-902DM Xcvr 869 m
FV-901DM Remote VFO 269 v
YO-901P Scope/pan 349 f
FTV-901R 2m Xvtr 269 v
FT-10/M non-WARC Xcvr 569 m
FT-107M/DMS non-WARC 599 w
FP-107 Internal ps 99 m
FP-107E External ps 99 w
FTV-107R Xvtr w/6m 189 m
FT-707 Xcvr 499 mw
FP-707 Power supply 99 mw
FC-707 Ant tuner 89 m
FC-102 Ant tuner 199 f
FT-ONE Xcvr 1799 m
YD-844A Desk mic 19 fe
FRG-7 SW receiver 189 m
FRG-7000 SW Rcvr 279 e
FRG-7700 SW Rcvr 329 f
FRG-7700/MU-7700 429 fv
FRV-7700A VHF rcv conv 89 mwf
FTV-250 2m Xvtr 149 m
FT-680R 6m Xcvr 349 v
FT-221 2m Xcvr 299 f
FT-221R 2m Xcvr 349 m
FT-227R 2m FM Xcvr 129 we
FT-230R/TTP mic 2m FM 239 mf
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FT-208R 2m FM HT 219 m
YC-500S Counter 99 w

1-26-83

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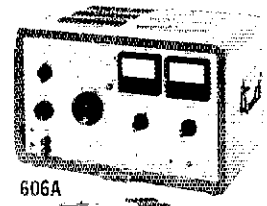
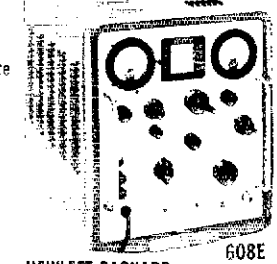


606A



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HEWLETT-PACKARD
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608D 10-420MHz sig gen 695
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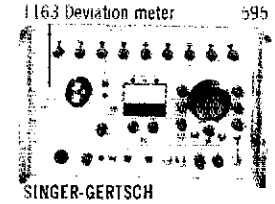
11710 10Khz-11Mhz down converter: 8640B 895
IFR
FM/AM-1000 Service mon 4895
RADIO SPECIALITY MFG.
1163 Deviation meter 595



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OAM-1 AM module for FM-10C 395

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(1) This list was prepared from an inventory taken on the date shown. The letters after the prices indicate in which store the equipment was located at that time. The quantities vary. In some cases there are several of an item, others, only one. Due to the lead and distribution time of this publication, some of the items may have already been sold by the time you see this ad. However, due to the number of trades we are involved in each day, some items are in stock that are not listed. (2) We reserve the right to sell certain power supplies and accessories only with matching transmitters or transceivers, depending on our stock situation (3) Sometimes used gear is serviced after we receive your order. Please allow for a few days delay in shipping your order. (4) No trades on used gear. (5) Used gear policies do not apply to New Equipment special, Closeouts etc.

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w = Wickliffe, OH 44092; 28940 Euclid Ave	(216) 585-7388	1-800-321-3594	1-800-362-0290
f = Orlando, FL 32803; 621 Commonwealth Ave	(305) 894-3238	1-800-327-1917	1-800-432-9424
c = Clearwater, FL 33575; 1898 Drew Street	(813) 461-4267		
v = Las Vegas, NV 89106; 1072 N. Rancho Drive	(702) 647-3114	1-800-634-6227	
e = Chicago, IL Erickson Communications (Associate)	(312) 631-5181	1-800-621-5802	

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(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a Sunday, the Ham-ad deadline is the previous Friday.

(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 permited in *QST* advertising.

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The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or character 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.

CERTIFICATE for proven two-way radio contacts with amateurs in all ten USA areas. Award suitable for framing and proven achievments added upon request. SASE brings TAD data sheet. W6LS 2814 Empire, Burbank, CA 91504.

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 nonprofit 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.

FOX-TANGO Club Newsletters for Yaesu Owners. Back issue (1980/1981) looseleaf sets $6 each, both for $10 while they last. Fox Tango Club, Box 15744, W. Palm Beach, FL 33416.

YAESU Owners — Join your International Fox-Tango Club — now ending its eleventh year. Calendar year dues still only $8 US, $9 Canada, $12 airmail elsewhere. Don't miss out — get top-rated FT Newsletters packed with modifications monthly, catalog of past modifications, free advertisements, technical consultation, FT Net (Saturdays, 1700Z, 14.325 MHz), more. 1982 or 1983 sets $8 each; both $15. Send dues to FT Club, Box 15944, W. Palm Beach, FL 33416.

W.A.R.A. Warren, Ohio Hamfest has been set for August 21, 1983.

ROCHESTER Hamfest - Atlantic Division/New York State Convention Saturday, May 21, Monroe County Fairgrounds. Hotel headquarters, Rochester Marriott Thruway. More info? Write or call Rochester Hamfest, 300 White Spruce Blvd., Rochester, NY 14623 716-424-7184.

ARRL ILLINOIS State Convention and Starved Rock Radio Club Hamfest, June 5, Princeton, IL. Help us celebrate 50 years in Ham Radio. SASE for information. Write W9MKS, R.R. #1, Oglesby, IL 61348. Fone 815-667-4614.

CANTON, Ohio Auction, March 26, 1983, Nimishillen Grange, Easton Street, N.E., from 5 P.M. For general information call Herb Bushong, WD8IPE, 216-488-2920. Free Parking. Flea market table space, $2. Admission to auction, $2. Talk-in 147.12/72.

ARRL Publications/Supply Order

☐ THE 1983 RADIO AMATEUR'S HANDBOOK The standard manual of Amateur Radio Communications.

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☐ TUNE IN THE WORLD WITH HAM RADIO All the beginner needs to know to obtain the Novice license. Package includes text and code practice cassette. $8.50

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☐ ARRL CODE KIT Two 60 min. cassettes and booklet to get you from 5 to 13 wpm quickly! $8.00

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☐ FM AND REPEATERS FOR THE RADIO AMATEUR $5.00 US, $5.50 Elsewhere

☐ HINTS AND KINKS Vol XI The best from QST. $4.00 U.S., $4.50 Elsewhere

☐ HIRAM PERCY MAXIM $4.95

☐ LICENSE MANUAL Complete text of amateur regulations, FCC exam syllabus, radio theory for Technician through Extra. $4.00 US, $4.50 Elsewhere

☐ ARRL OPERATING MANUAL Definitive source of good operating practices applied to over a dozen most popular Amateur Radio activities. $5.00 US, $5.50 Elsewhere

☐ OSCARLOCATOR PACKAGE - locators for Oscars 7 and 8, tops on using ham satellites, full color $7.00 U.S. $8.00 elsewhere

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☐ TECH. & GENERAL $2.50 US, $3.00 Elsewhere

☐ ADV. & EXTRA $3.00 US, $3.50 Elsewhere

☐ RADIO FREQUENCY INTERFERENCE $3.00 US, $3.50 Elsewhere

☐ REPEATER DIRECTORY 1982 edition. $2.00 US, 5 or more $1.75 each

☐ SOLID STATE DESIGN FOR THE RADIO AMATEUR Practical circuits and theory. $7.00 US, $8.00 Elsewhere

☐ 200 METERS & DOWN History of Amateur Radio up through the mid-'30's. $4.00

☐ UNDERSTANDING AMATEUR RADIO Written for the beginner. Contains theory and how-to-build-it info. $5.00 US, $5.50 Elsewhere

☐ WEEKEND PROJECTS FOR THE RADIO AMATEUR Easy to build projects from QST. $3.00 US, $3.50 Elsewhere

RSGB PUBLICATIONS

☐ RSGB RADIO COMMUNICATIONS HANDBOOK 5th Ed. in one paperback volume, 778 pages $22.00

☐ VHF - UHF MANUAL $17.50

☐ AMATEUR RADIO TECHNIQUES $12.50

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☐ HF ANTENNAS for all LOCATIONS $12.00

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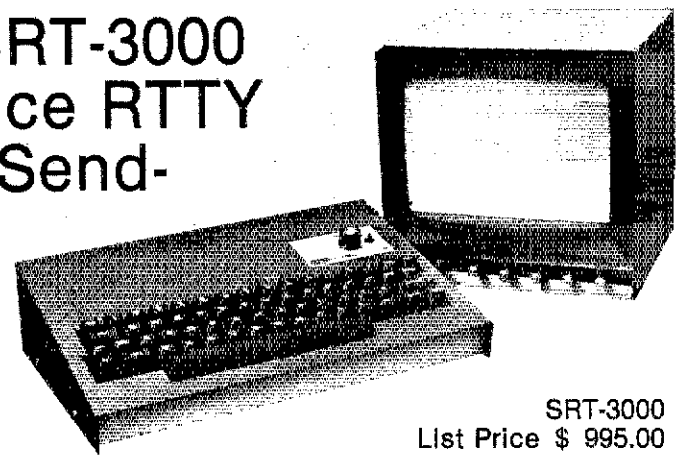

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EDITORS, Secretaries - computer club program for labels, phone and dues lists. 150 members in memory. Program list and instructions $9.95. Ulta Electronics, N8BBR, 1122 16th Street, Bay City, MI 48706.

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TRAVEL-PAK QSL Kit — Converts Post Cars, Photos to QSLs. Stamp brings circular. Samco, Box 203, Wynantskill, NY 12198.

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QSLs by W6BA "customized" $19.75 per 1000. Star Route 2, Box 241, 29 Palms, CA 92277.

LOW COST QSLs samples s.a.s.e. Koepke, 6 Katherine Road, Albany, NY 12205.

NEW KID on block — for QSL free samples write Kings Grove Press, Box 9, Ellerslie, MD 21529. Also custom printing, instructions included. Stamp appreciated.

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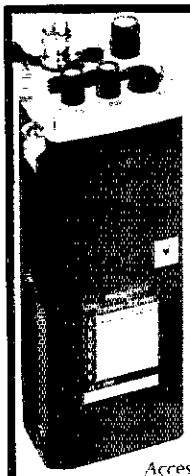
QSL samples 40¢. Pioneer Press, 3241 Normandy Lane, Green Bay, WI 54303.



YAESU

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450 MHz Hand-held with factory installed 16-button tone pad. Six crystal channels within a 3 mHz (tx) or 5 mHz (rx) spread; 430 to 450 MHz. 2.5w or 200mw output. NiCad pack, wall charger, flex antenna, case, strap, earphone & 446.0 mHz crystals. 7¼"h × 2⅜"w × 2¼"d, 1 lb..... *Regular $325*

Closeout - $189.95

Crystal Certificates: (2/channel required) are **$5.00** each when purchased **WITH** FT-404R/TTP; purchased later, **$8.00** each.

Accessories - FT-404R/TTP:

NC-1A 15-hr drop-in charger	**Sale**	$44.95
NC-3A Drop-in chgr/AC adaptor	**Sale**	79.95
FBA-1 Battery sleeve for NC-1A/3A		8.00
FNB-2 Extra NiCad battery pack		29.00
NC-9B Extra 15-hr wall charger		10.00
PA-2 Mobile DC-DC adaptor & charger		39.00
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FTS-32E 32 tone CTCSS encoder		40.00
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LCC-3 Leather carrying case		38.00
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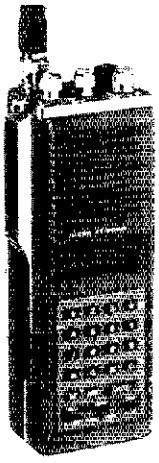

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Hand-Helds. **(208R)** 144-148 MHz, 2.5w; **(708R)** 430-450 MHz, 1w. Keyboard entry, all frequencies and splits for non-standard repeaters. 4-bit CPU, LCD display, Up/Down scan, priority, memory scan, memory back-up, 16 tone DTMF encoder. Flex antenna, Ni-Cd & wall charger.

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NC-8 15/4-hr desk chgr/AC ps	89.95
LCC-8 Leather carrying case	35.00
FBA-2 Battery sleeve	6.25
FNB-2 Extra battery	29.00
NC-9B Extra wall charger	10.00
SSY-32/FTS-32 32-tone encoder	33.00
TS-32/FTS-32AE Enc./decoder	75.00
MMB-10 mobile bracket	15.00
PA-2 Mobile adapter & chgr	39.00
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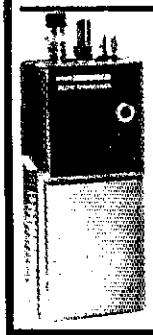

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Compact, 2m hand-held FM Transceiver. 144-148 Mhz, 1 watt, 6 channels with 18 channel capability (6 simplex, 6 at +600 KHz, 6 at -600 KHz), 1 channel installed (146.52 simplex). Only one crystal per channel. Complete with flexible rubber antenna, ncad battery pack & charger. 2¼"w × 6⅛"h × 1¾"d, 16 oz

Closeout Price.. $119.95

Crystal Certificates..... each $5.00

With 90-Day AES Warranty

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The following are NEW Closeouts. Most are Factory Sealed, but some may have been on Display or Demo. All carry New Warranties, most are in Milwaukee.

Model	Reg.	NOW
TS-180S w/DFC HF transceiver	$ 1149	699.95
AT-180 Antenna tuner/meter, switch	179.95	149.95
VFO-180 External VFO for TS-180	179.95	129.95
SP-180 Speaker w/audio filters	69.95	49.95
DF-180 Digital frequency control	164.95	99.95
TS-520SE HF transceiver	629.95	569.95
BS-5 Panadaptor kit for TS-520	79.00	49.95
DK-520 Adaptor kit; DG-5/plain TS-520	20.00	5.00
VFO-820 External VFO for TS-820	175.00	149.95
TV-502S 2 meter transverter	299.00	199.95
TV-506 6 meter transverter	279.00	179.95
AT-120 Antenna tuner	99.95	79.95
AT-200 Antenna tuner	159.00	139.95
YG-88A 6 Khz filter for R-820	59.95	39.95
VFO-700S VFO for TS-700S	135.00	69.95
SP-70 Speaker for TS-600/700	33.00	24.95
VOX-3 External VOX unit for TS-600/700	25.00	19.95
RSK-7 Rptr subband kit, TS-700/S	14.00	9.95
FM-599 NBFM filter for R-599		24.95
AM-599 AM filter for R-599		24.95
CC-69 6 meter converter for R-599		24.95
MB-1A Mobile mount for TR-2200	13.00	5.95
TR-7600 10w synth. FM xcvr	375.00	229.95
MARS-7600 MARS/CAP adaptor	19.95	14.95
RM-76 Microprocessor control unit	125.00	79.95
TR-2400 2m FM HT/battery/charger	395.00	259.95
ST-1 Desk quick/trickle charger	86.95	79.95
SMC-24 Speaker microphone		32.95
BH-1 Belt hook		4.95
TR-7850 2m FM Transceiver (40w)	419.95	319.95
TR-9000 2m FM transceiver	499.95	379.95
80-9 System base for TR-9000	42.95	32.95
MC-45 Touch-tone encoder mic	49.95	44.95

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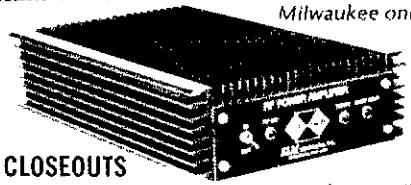
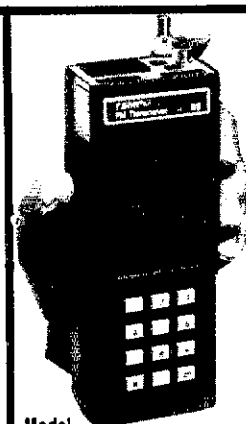


CLOSEOUTS

Model	Band/Mode	In	Out	Reg.	NOW
PA2-25B	2m FM	1-4w	25w	$ 99.95	$ 69.95
MA-35BL	2m FM/SSB	.1-4w	35w	129.95	89.95
PA10-170BL	2m FM/SSB	10w	170w	299.95	219.95
PA15-40BL	2m FM/SSB	5-15w	40w	149.95	99.95
PA4-80BL	2m FM/SSB	1-4w	80w	229.95	169.95
PA15-80BL	2m FM/SSB	5-15w	80w	179.95	119.95
PA15-60BC	220 FM	5-15w	60w	199.95	129.95
PA45-120BC	220 FM	15-45	120w	279.95	199.95
PA4-40CL	450 FM/SSB	1-4w	40w	279.95	199.95

Receiver Preamplifiers:	Reg.	NOW
PRA-50C 6m, 10 dB, 2.5 dB NF	$63.95	$39.95
PRA-144I 2m, 10db; for older KLM amps	63.95	39.95
PRA-144II 2m, 10db; for newer KLM amps	63.95	39.95
PRA-220C 220 MHz, 15 dB	63.95	39.95

Misc.	Reg.	NOW
ECHO 70 432 Mhz SSB/CW transceiver	$449	399.95
CS-1 antenna circularity switch	24.95	14.95
219-226-9 9 el. 220 Mhz antenna	29.95	24.95
KT-34A 20-15-10m, 4 el beam	**Special**	$299.95



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Synthesized models available for 146, 220 or 440 MHz FM. Comes with telescoping whip antenna, 450 ma/hr nicad battery, wall charger & earphone. Size: 2.5"w × 6.5"h × 1.6"d, 1 lb.

Shown with optional TTP

Model	Reg.	NOW
S-1 2w 2m HT/batt/cgr D	$279.00	179.95
S-1T 2w 2m HT/batt/cgr/TTP D	309.00	199.95
S-5T 1/5w 2m HT/batt/cgr/TTP D	309.00	249.95
HM-5 Speaker/microphone	35.00	
S-30 2m FM 30w amplifier	89.00	82.95
S-80 2m FM 80w amplifier	149.00	136.95
S-15 1/5w 2m HT/batt/cgr/duck †	289.00	249.95
S-15T 2m HT/batt/cgr/duck/TTP (16) †	319.00	269.95
ACH-15 1 hour quick charger	59.00	
ACH-25 Extra wall charger	10.00	
BP-15 Extra battery pack	29.00	
CC-15 Carrying holster	25.00	
DC-15 Cig lighter DC cord	6.00	
DCC-15 Cig lighter cord & charger	15.00	
HM-15 Speaker/microphone	35.00	
S-30 2m FM 30w amplifier	89.00	82.95
S-80 2m FM 80w amplifier	149.00	136.95
S-2 2w 220 HT/batt/cgr †	289.00	229.95
S-2T-12 As S-2, with 12-button TTP †	319.00	249.95
S-2T-16 As S-2, with 16-button TTP †	339.00	269.95
HM-5 Speaker/microphone	35.00	
S-20 220 FM 20w amplifier	89.00	82.95
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S-4 2w 440 HT/batt/cgr/duck †	289.00	229.95
S-4T-12 As S-4, with 12-button TTP †	319.00	249.95
S-4T-16 As S-4, with 16-button TTP †	339.00	269.95
HM-6 Speaker/microphone	35.00	
S-40 440 FM 40w amplifier	149.00	136.95

Accessories for all models:

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TS-CC-TT Case for TTP models	20.00
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TELETYPEWRITER parts, manuals, gears, tools, supplies. Toroids. S.a.s.e. list. Typetronics, Box 8873, Ft. Lauderdale FL 33310. Buy unused parts, cash or trade.

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C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
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RS35M	25	35	149
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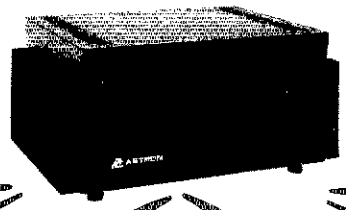

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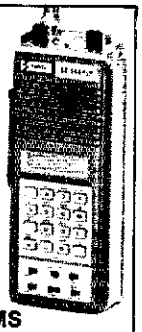

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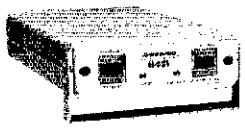

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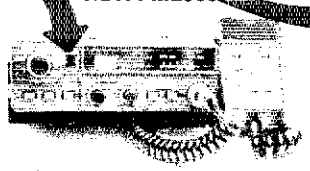

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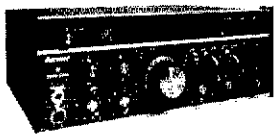

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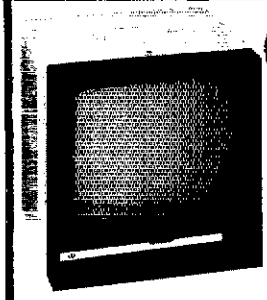

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- 80 Characters × 24 Lines
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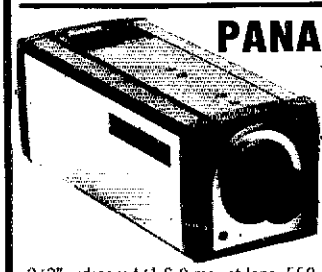

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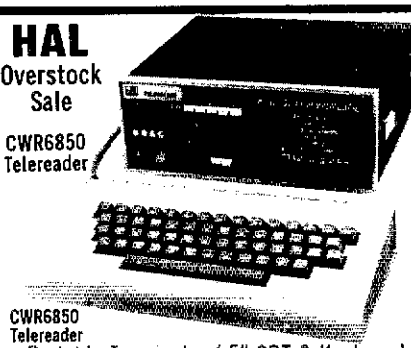

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Portable Terminal w/ 5" CRT & Keyboard
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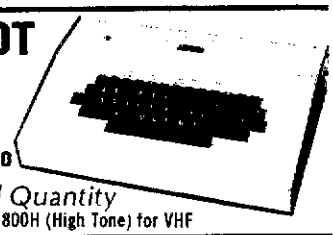

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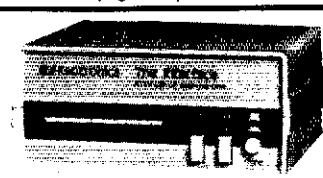

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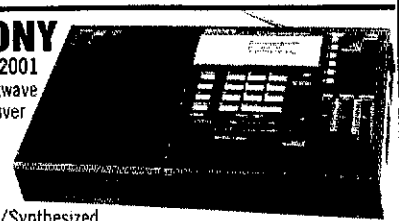

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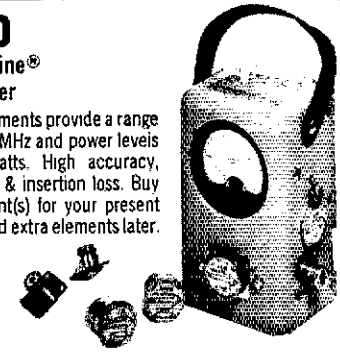

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5 watts	—	5A	5B	5C	5D	5E
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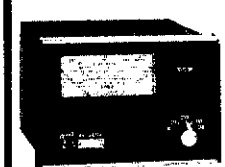
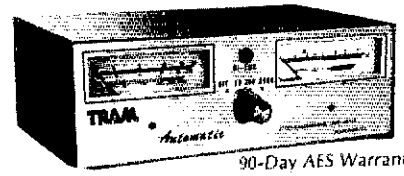
25 watts	—	25A	25B	25C	25D	25E
50 watts	50H	50A	50B	50C	50D	50E
100 watts	100H	100A	100B	100C	100D	100E
250 watts	250H	250A	250B	250C	250D	250E
500 watts	500H	500A	500B	500C	500D	500E
1000 watts	1000H	1000A	1000B	1000C	1000D	1000E
2500 watts	2500H					
5000 watts	5000H					



DRAKE Wattmeter

WH-7 Directional, in-line type for 1.8-30 Mhz. Scales: 0-20, 0-200, 0-2000 watts & VSWR. Accuracy: 5%/reading. Coupler removable for remote metering. 5⅛"h×6¾"w×7½"d, 3 lbs.
Reg. $129 - **Sale $79.95**



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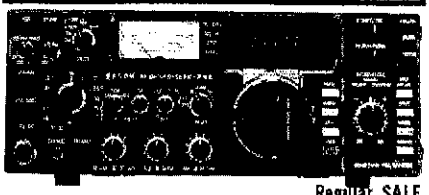

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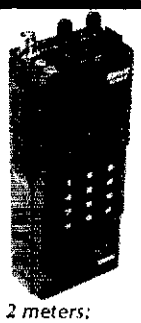

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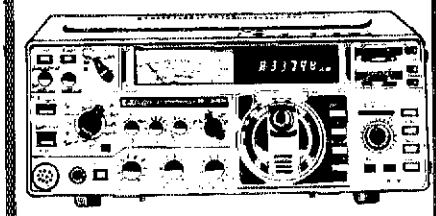

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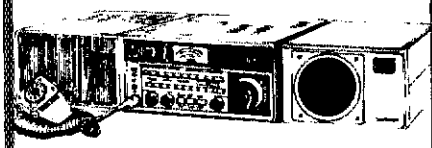

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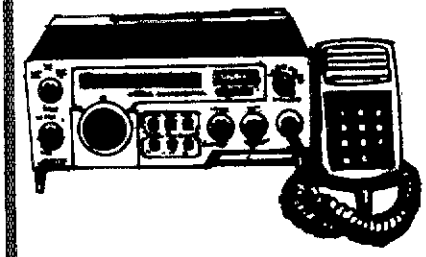

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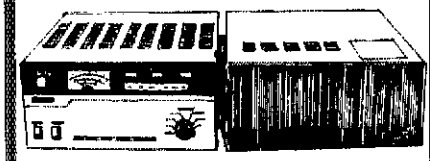

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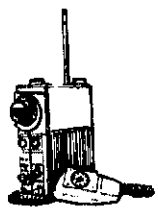

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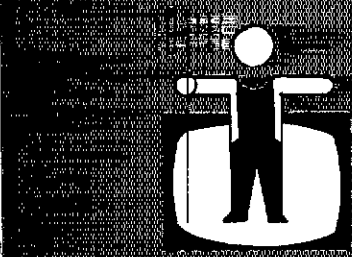

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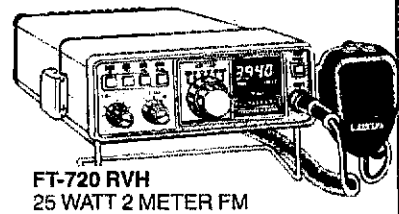

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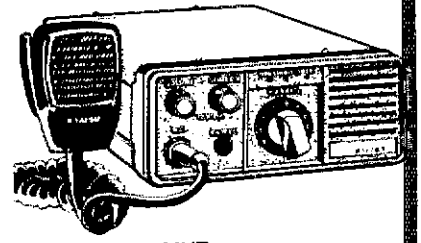

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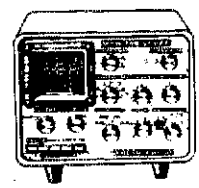

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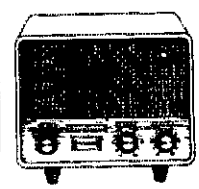

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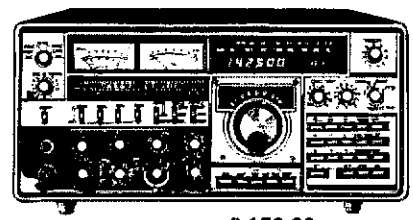

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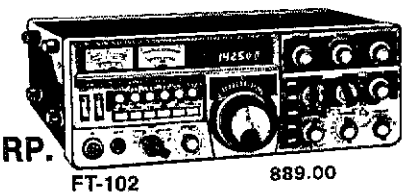

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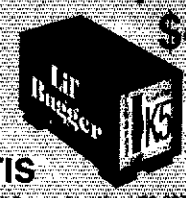

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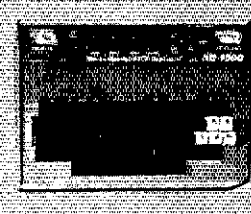

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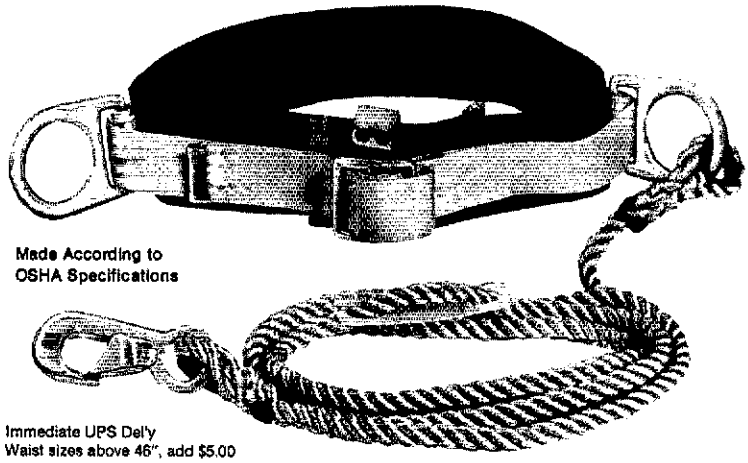

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VOCOM ANTENNAS/2m AMPLIFIERS
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True Romance

An unsolicited response to our recent ad "Why I love my ALPHA 78".

RECEIVED - 3 1983

John M. Shinall, K4BYK
P.O. Box 240
Cumming, Georgia 30130
United States of America

December 29, 1982

Dear OMs,

Reading your account of an Alpha 78 love affair in the latest QST prompts this letter from me as one of the first to be smitten.

Since placing S/N 8002 into service on July 22, 1979 with a shakedown QSO and 59 report from 4Z4PG on 15 meters I have worked 293 countries plus two that Don Search doesn't count. Operation has been on all bands on both SSB and CW utilizing 100 watts of drive with dipoles for 40 and 80 and a tri-band quad. Reliability has been superb overall with a couple of minor problems handled promptly and courteously by mail. (Absolutely no down-time has been experieced and no new ones missed.)

In early 1978 I acquired one of the "no tune-up" rigs and immediately ordered an Alpha 374 but the FCC threw a wrench into the works with the new 10 meter amp restrictions. While waiting for the mess to unravel you guys told me about the three hole 78 with QSK that was in the works so I decided to go for broke and changed my order. The 374A is quite an amplifier itself but my brown bomb was well worth the wait.

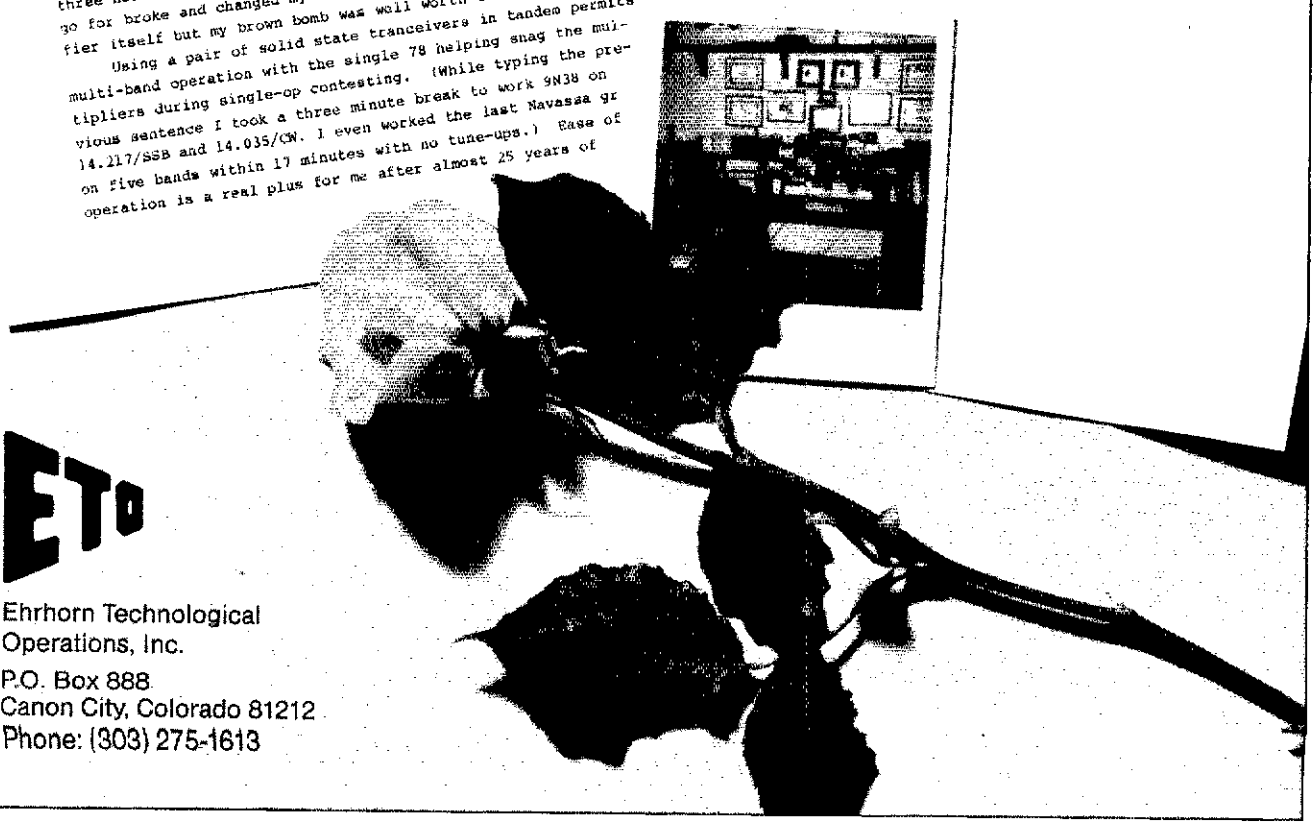
Using a pair of solid state tranceivers in tandem permits multi-band operation with the single 78 helping snag the multipliers during single-op contesting. (While typing the previous sentence I took a three minute break to work 9N3B on 14.217/SSB and 14.035/CW. I even worked the last Navassa gr on five bands within 17 minutes with no tune-ups.) Ease of operation is a real plus for me after almost 25 years of twisting ol' tune/plate and load.

The compact size is nice and in my shack allows for shelf-top rather than desk-top operation. (See enclosed photo.) I also understand that this and the Hypersil transformer facilitate shipping but this really doesn't matter to me as I don't anticipate our ever parting company.

Your ad writer doesn't lie...its all true and more. I defy anyone to put an Alpha 78 in line between a solid state rig and an antenna and not fall in love. And woe be unto the ham with a jealous wife when he brings home this tan little beauty with flashing eyes looking for a little excitement.

Yes, I love my 78 but I'll admit I've never met an Alpha owner who wasn't in love with his 76, 374 or 77 either. You guys have quite a harem of temptresses.

John, K4BYK



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Phone: (303) 275-1613

HAM Contesters: Fast machine language dupe program for the TRS-80 color computer. Dupes by call and band, deletes, prints, searches, reviews, sorts, saves to tape, 14 page manual. DUPE3400/UTILITY-3400 calls (32K) $15. DUPE1400/UTILITY-1400 calls 16K) $15. New Super Contester I has all the above features plus real time clock, automatic logger, and more. Super Contester I-2900 calls (32K only) $24.95. For info. or program write J.C. Software, Jeff, 214 South St., Battle Creek, MI, 49015.

SELL Yaesu communication rx FRG-7 mint $125. W2EZM 431 Oakland Ave. Maple Shade, NJ 08052. 609-663-8137.

SELL - Heathkit HA-14 amp Compact Kilowatt 80-10m mint $290 KG9N 309-965-2819.

STOP LOOKING for a good deal on Amateur Radio equipment — you've found it here — at your Amateur Radio headquarters in the heart of the Midwest. Now, more than ever, where you buy is as important as what you buy! We are factory-authorized dealers for Kenwood, Drake, Yaesu, Collins, Wilson, Ten-Tech, Icom, Dentron, Hewlett-Packard Calculators, MFJ, Tempo, Regency, Hy-Gain, Cushcraft, Swan and many more. Write or call us today for your low quote and try our personal and friendly Hoosier service. Hoosier Electronics, P.O. Box 3300, #9 Meadows Center, Terre Haute, IN 47803. 812-238-1456.

WANTED - Hammarlund HQ-160, Layfayette HA-230 or HA-225 KBØW, 916-272-7203 days.

COLLINS: KWM-2 transceiver (WE), 516F-2 power supply, fair condx. $425. KJ6N, 24 Catalpa Drive, Atherton, CA 94025 415-328-2449.

WANTED - two-tubes: Type 8122 - W1HTK - 51 Peterson Road, Vernon, CT 06066.

NEW Ten-Tec Argonaut 515 QRP SSB/CW transceiver. Power supply, external speaker. $275 I ship. Lane Zeitler KM3G 7273 Rupert Drive, Fairview, PA 16415.

DENTRON 2kW Clipperton "L" — $445 NQ6S 415-992-5330.

FOR SALE: Yaesu FT-101ZD with CW filter dc Shure 526-T; Motorola HT-220 2 freq. (set-up 1 freq.) with 2 NiCad paks and Rapid Charger: No reasonable offer refused KB2VD 201-796-2487.

RACAL RA6217A receiver manual excellent $500 George Guy, WD4OEI, Box 174, Onancock, VA 23417 804-787-7664.

TI99/4 Extended Basic Programs: CW practice, CW transmit SSTV keyboard, children's CW, children's math. Write Sam Moore AC5D Box 368, Stigler, OK 74462.

SOLAR Cells .4V 4" diameter 1.5 amps 10 for $50. 1.7 amps 10 for $60. 1.8 to 2 amps 10 for $85. All prices plus shipping. Ken Foster WBØDFS, 1742 Dowd St. Louis, MO 63136 314-522-6667.

FOR SALE Drake L-7 amplifier, mint 5 hours, modified for 10. $950. Drake RV-7 $100. N4DIE 404-745-4065.

WANTED: Highest prices paid for Harris RF-301 & associated equipment. Call Liberty Electronics collect 212-925-6048.

51S1 Cabinet new $75, 312B4 cabinet new $35, 351R2 rack $35, Telrex 20M536 $275, 4CX1000A new $195. Wanted: Bird 43 and slugs, 8874. Schaaf, 807 Sunbeam, Oneida, WI 54155. 1-414-434-2938.

KENWOOD TS-520S, mint. CW filter, d.c. power, speaker mike, exernal VFO - all Kenwood. Hustler 4BTV and BM-15. Drake dummy load and low pass filter. All for $525, you ship. Walt 713-482-4041. WD5FDV.

HEATH VL-1180, mint, $90. OSI C4P computer, 16 K RAM (room for 16K more), disk controller board, I/O board, color, sound, 32 x 32 or 32 x 64 selectable display, metal cabinet with wooden side panels, external 10-A Lambda power supply, 12-inch B&W monitor, $500. Single 572B (new), $30. 813s, $2 each. Two new Johnson kW plus 1000 pF variables, $20 each. Ten 200-mF/300-V surplus comptuer grade electrolytics w/mtg clamps, $1 each. Paul K. Pagel, N1FB, 4 Roberts Rd., Enfield, CT 06082. Purchaser pays shipping.

DRAKE C-Line, late model R4C, T4XC, 4NB, HP23; filters: .25kHz, .5kHz, 1.5kHz, 2.4kHz, 6.0 kHz; eleven aux. range xtals, manuals, cables. Excellent condition. $575. Kurt Eisenach 604-12th Ave., International Falls, MN 56649.

HAL DS-3100 ASR, $1800; Flesher TU-170 RTTY TU, $125; OSI C2-4P mini-floppy 24K RAM, manuals & software, $700; 4 QRP 80/40 CW xmtr kits, $10 ea. WBØTDB/9, 317-984-5276.

HEATHKIT HR-1680 receiver, $150. WB7RGV 509-375-0400 evenings.

WANTED Collins mint R.E. 51S-1 receiver, 516F-2 supply, SM-2, Signal One microphones, gold ElectroVoice 674, Bird coax switches, Henry 6N2 amp. Mint 62S-1 transverter, 651-S1, Help. Gary KE6MS 213-431-8931.

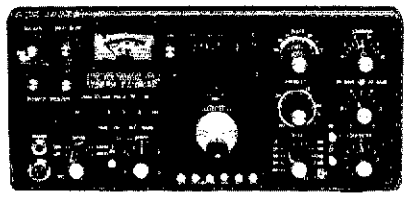
QST's 1972-1975 $8 year plus UPS also some later various issues S.A.S.E. W1NJ.

ICOM IC-260A 2-meter synthesized all-mode transceiver. FM/CW/SSB 10 watts out. With microphone and mobile mount. Excellent condition. $325. WB8IKJ. Call 616-372-3116 nights and weekends. 616-375-6300 days; ask for Ken or leave message.

MADISON - Collins repair KWM2/S-line. Complete service notes, 20 years experience, flat rates. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268, 1-800-231-3057.

ICOM IC-701, ps, mic, RM-2 microprocessor controller. Super clean. $575 firm. Steve, N2FT. 201-571-9203.

YAESU CLOSEOUTS



FT-101ZD MKIIIA (WARC) 9-band digital HF transceiver
Regular $925 - ***Closeout $699.95***

FTV-250 XVTR
Matching 2m transverter for the FT-101 & FT-101/FR-101 Series HF equipment. 144-148 Mhz; 20w; 10m I.F.
Regular $275
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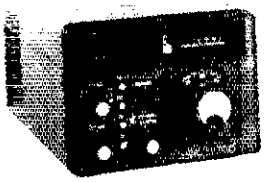
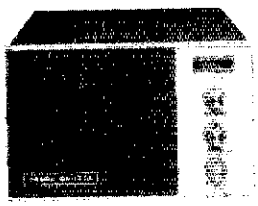
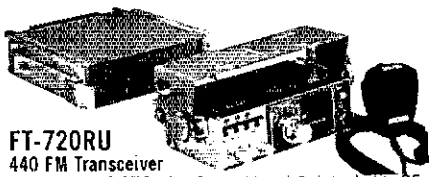


FV-101Z VFO
External VFO for the FT-101Z/ZD, FT-901/902-series transceivers.
Regular $175
Closeout $129.95



SP-107P Speaker/Patch
The matching external speaker & hybrid phone patch combination for the FT-107 transceiver or similar equipment.
Regular $65
Closeout $45.00



FT-720RU
440 FM Transceiver
10w, 440-449.975 Mhz. Control head & detachable RF deck for remoting or use of optional **720RVH** 2m 25w RF deck. 13.8vdc @ 6.5A; 6"w × 2"h × 10"d, 5½ lbs.
Regular $449 - ***Closeout $299.95***

FT-720RU Accessories:	Reg.	NOW
720RVH 144 MHz/25w deck	$229.00	199.95
S-72 Switch box	85.00	69.95
E-72S 6½' remote cable	35.00	29.95
E-72L 13' remote cable	40.00	34.95

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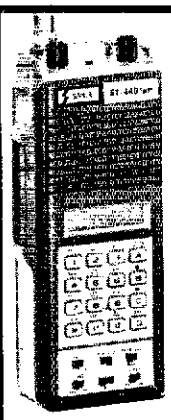

ENCOMM

Santec ST-144up/ST-440uP
Wideband - (2m) 142-149.995; (UHF) 440-449.975 MHz; Output: 3w, 1w or 100mW; 500 mA/Hr Nicd pack, 8-AA; C-MOS Computer & LCD; 10 memory channels (9 with offset, 1 simplex & scan limit); Priority Memory Scan; Programmed Band scan; Lock switch, 16 key touchtone® pad, 600 kHz offsets (5 MHz UHF); 24-hr clock; 3"w × 6¼"h × 1¾"d, 1.4 lbs; Supplied with NiCd pack, flex antenna & 16-hour wall charger

ST-144uP 2m HT (Reg. $359)..... **Sale $279.95**
ST-440uP 440 HT (Reg. $399)..... **Sale 299.95**

Accessories:

ST-LC Leather case	$29.95
ST-500B3 Extra battery pack	24.95
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ST-EMC External microphone connector	6.95
SS-32 32-tone CTCSS encoder	29.95
SM-3 Speaker/microphone	34.95
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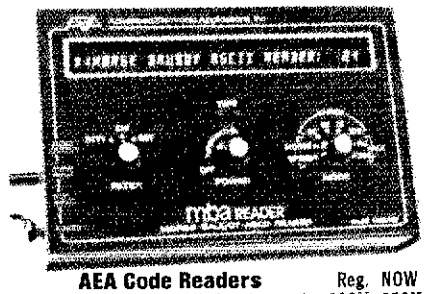
ST-SS Shoulder strap	5.00
ST-WC Extra wall charger	9.95

ST-7/T 2.5 watt 440 HT with battery pack, charger, TTP & flexible antenna (Reg. $349.95).. **Sale $229.95**



AEA Code Readers

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MBA-RO Basic CW/ASCII/Baudot reader	299.95	259.95
MBA-RC Deluxe reader/code converter	469.95	399.95
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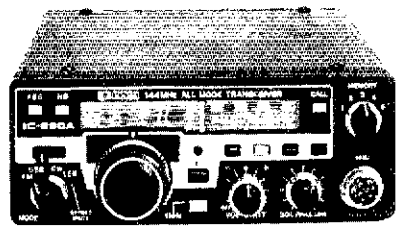
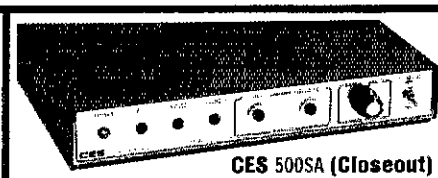
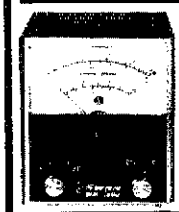


ICOM IC-290A 2m SSB/CW/FM mobile transceiver. 143.8-148 Mhz; 10 watts; T/T mic; 13.8vdc @ 3.5A
Regular $549 - ***Closeout $389.95***



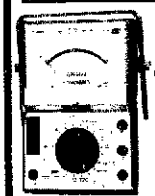
CES 500SA (Closeout)
A control/base station autopatch packaged with all equipment necessary to patch an FM base station with any telephone. Needs only an FM transceiver, no other repeater-type equipment needed. Use simplex or split. For tone dial system..... **Closeout $229.95**
Automatic CW ID'er (factory programmed)..... 42.50
3-tone sequential decoder..... 21.25

New Model!
510SA "Smart Patch" simplex autopatch. As above, with improved sampling and ability to work thru repeaters with tone-squelch option. Programmable to work as a repeater autopatch. (Reg. $349)..... **Sale $319.95**
Tone squelch unit (for repeater use)..... $79.95
Automatic CW ID'er (factory programmed)..... 25.00



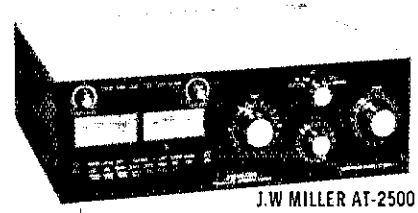
SWAN WM-1500 In-line Wattmeter. 5, 50, 500 & 1500w scales, forward & reverse. 10% accuracy 2-30 Mhz, usable at 50 Mhz with reduced accuracy. 6"w × 6"h × 4¾"d, 2 lb.
Regular $74 - ***Closeout $54.95***

ASTRO 150 80-10m transceiver
Reg. $925 - ***Closeout $599.95***
PSU-5 Power supply..... $159.95



AMECO Multimeters
M-300 Large (3¾"w × 2½"h) meter with easy to read scales and parallax mirror. 20K ohms/V DC & 10K ohms/V AC. **DC-volts:** 0-0.25, 1, 2.5, 10, 25, 100, 250, 1000. **AC-volts:** 0-10, 25, 100, 25 & 1000. **DC-current:** 0-50, 500uA, 5mA, 50mA, 500mA. **Ohms:** 0-6K, 60K, 600K, 6M. 5½"h × 4¼"w × 1½"d, 9.2 oz. With test leads and battery..... **$28.95**

D-200C LCD Digital type with 3/8"high, 3½ digit display. 10 meg. input-Z; Automatic polarity & zero; Over-range & low-battery indication; Overload protection. **DC-volts:** 0-200mV, 2, 20, 200 & 1000. **AC-volts:** 0-200, 750. **DC-current:** 0-200uA, 2mA, 20mA, 200mA, 10A. **Ohms:** 0-200, 2K, 20K, 200K, 2000K, 20M. 6¾"h × 3¼"w × 1¾"d, 18 oz. Test leads, batt. & case (Reg. $73.00).. **Sale $64.95**



J.W MILLER AT-2500
Automatic Antenna Tuner. Logic and motor system automatically tunes for optimum match to 10-300 ohm coax, long wires or balanced line with external balun. Continuous 3-30 MHz, 2500 watts PEP. SWR meter & Power meter with 250/2500 watt scales, fwd/ref. Reads RMS power on CW & PEAK power on SSB. Requires 115/230vac or 13.5vdc. 17"w × 5¼" × 14"d, 17 lbs.
Regular $850 - ***Sale Price $699.95***

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FOR SALE: Facsimile recorder Model AN/UXH-2C. $350 or trade for gear. N7AVL Jim Hill, 501 E. 31st St., Vancouver, WA 98663 206-696-9236.

INFO-TECH M-200E tri-mode converter $275 Kurt Eisenach 604-12th Avenue International Falls, MN 56649 218-283-8293.

HEATH HW-101 transceiver with AC power supply. New finals, aligned, and checked. Only $350. Heath HR-1680 HF receiver. Solid-state, excellent condition. $150. WB8IKJ. Call 616-372-3116 nights and weekends. 616-375-6300 days; ask for Ken or leave message.

TRANSVERTERS: Microwave Modules - all 28 MHz if, new, in-box, never-used. 50 MHz - $169., 144 MHz - $169., 432, 434 mHz - $229. L. Cramer Box 434, Midland, VA 22728 703-788-9797.

HY-GAIN 5BDQ trap dipole, 18AVT/WB vertical ant, $45 each, all hardware, good condition; MFJ 408 elec keyer, $40; Midland 13-510A, CES 800-ML scanner, CES Micropad touchtone mike, $300 NT4R 205-343-3051.

HEATH SB-301 $175, SB-401 $200, SB-600 $30, HW-29A "Sixer" $40, all very good with manuals; SB-650 $50 with manual as is; Model 33ASR, 2 available $275 each, Manual 310B (3 volumes) $25; Flesher TU170 $100; Johnson VFO122 $25. K1KQC 40 Beverly Drive, Avon CT 06001 203-673-6706.

YAESU FR101S receiver: 160 thru 2 meters. SSB, CW, AM, FM. Mint, must sell, best offer over $300. Jim WA1EDN 1-413-783-3172.

TELETYPE - Model 19 ASR, test set, CV-89A RTTY converter, maintenance manuals, $95. Pick up. WA1DND Brad Lentz, 29 Elmwood Ave., Attleboro, MA 02703 617-222-6315.

COMPUTER for sale Texas Instruments TI99/4A 16K-RAM. Used 2 hrs, under warranty plus cassette cables. In original boxes. I ship. $210. KB4FW 813-689-2924.

IC-701 w/ps and mike mint condition $550. Microlog AKB-1 $160. M. Fein, 132 Locust Lane, Irvington, NY 10533.

FOR SALE: Galaxy V transceiver with matching remote VFO, station console, audio filter, and power supply. Station console includes a speaker, SWR bridge, phone patch, and digital clock. Also included is an Astatic D-104 microphone. All in good condition. $400 firm. Call Phil WB5PVL evenings 405-721-3315.

SALE: Brand new AEA MBA-RO reader. $150 Herb (W2HNS) 914-631-9421.

COLLINS 75S-1 w/Waters filter, 312B-3, 32S-1, 516F-2, D-104, spare tubes: $695. 30L-1 we w/2 sets spare finals: $595. Maxi-Tuner w/SWR and balun: $195. All excellent condx with CoverCraft covers, manuals, cables. Autek QF1, like new: $40. Will ship at your expense. W4OQB, 508 Leatherwood Ct., Va. Beach, VA 23462. 804-499-7169 evenings/wkends.

HEATHKIT HW-101, HP-23C power supply $225 plus shipping. Bill McGrew, W4PRP 919-392-1242.

432 MHz Vanguard converter 432 in 14-18 out 12 Volt $35 K9VQC 312-284-2765.

FASTRAK® modular building system is the state-of-the-art in homebrewing. Build attractive, practical equipment for less. Send $1 (refundable) for info and product catalog. Proham Electronics Inc., 34620 Lakeland Blvd., Eastlake, OH 44094.

MUST SELL Yaesu FT-901DM, all filters, extra finals, FV-901 Scanning VFO, 40 memories, mint condition, $795 Dick KA1SM, 617-444-1660, Box 216, Needham, MA 02192.

HALLICRAFTERS complete operational station, SX-115 receiver HT-37 exciter, HT-41 linear amplifier, D-104, relay, extra tubes, manuals, $350, W0TSY, 316-267-9112, 67211.

WANTED: Drake MN2700 antenna tuner K7FL 15035 Greentree Oregon City, OR 97045 503-632-7140.

WANTED: Tungar bulb rectifiers and any information concerning them. Also want transmitting tube manuals, porcelain knife switches, and 604/7014 tubes. N9ALD, Brian Shore, 3517 Libal St., Green Bay, WI 54301.

REPAIR and Service of ham equipment. WA0VQF. 913-845-9034 evenings.

FOR SALE: T4XC, AC4 ps, spare finals, cables, 5 extra crystals, very stable PTO. Recently checked out A1 at communications lab. $365. Barry Wright, KA7V, 322 NW 18th Street, Ontario, OR 97914 503-889-4546.

ICOM 701 with PS20, spkr, mike $650. Yaesu FRG7700 with memory $450. MJF941 tuner $50. W7OUW 503-759-3184.

TEN TEC 540. Mint, with accessories $375. Walt, WA1YMN. 58 Presidential Apt. Amherst, MA 01002. 413-549-6543.

NATIONAL Radio Company Inc. equipment manual list SASE. We also quote specific NRC! parts. Maximilian Associates, 11 Plymouth Lane, Swampscott, MA 01907.

SALE: ADDS 980 terminal, extra set boards $725. Heath H8, H8-5 cassette $310, HW-101, CW filtr, PS-23 $390. SA-2060 tuner $205. SA-5010 keyer $80. Drake R4C, nb, MS4, 10 extra crystals, FL-1.5, FL-.5, FL-.25, Sherwood CF-600/6, CF-2K/6, CF 2K/16, detector, audio, power supply mods $750. T4XC, AC-4 $330, R4-1B, $195. FR-4 $95, Icom 251-A $410, IC-245, touch mike $160. Mirage B1016 $230 MP-2 $80. Ameco PT-2 $50, QF-1A $55, Xitec ABM-200 $125. Drake WH-7 $65. Tektronix 465 scope $1850. BK-1403-A scope $185. Anderson, Jacobson A242 Modem $180. WA4AOS, 2610 Layden St., Raleigh, NC 27603 919-833-3395.

WANTED: Swinging choke at least 30/5 Hy at 50/350 mA. Also want transformers: one about 3000 VCT at 350 mA, and one about 1200 VCT at 350 mA. N9ALD, Brian Shore, 3517 Libal St., Green Bay, WI 54301.

WANTED 200 and/or 500 cps CW filter for Collins 75S-3B/C. Call or write N1CGR, Kevin Donnelly, 8 Mystic St., Charlestown, MA 02129. Home: 617-242-3873. Work: 617-227-7940.

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COLLINS 75S3C, round, mint, $650. W9ZR, 1-414-434-2938.

SB-101 Heathkit xcvr 80-10 180W with ps/mike VGC, $240, UPS paid Paul, WA8PJK 1146 E. 76, Cleve., OH 44103 216-391-0241.

TS-180S/DFC with SSB and CW filters, SP-180 speaker, all manuals, and MC-50 microphone. Perfect condition with Kenwood-installed updates — $600. K7LJQ, 4220 Olympic Way, Salt Lake City, UT 84117 801-278-8550.

75S-3C 500, 200 filters; 32S-3A, 516F-2; 312B-4, SM-3. Purchased new, used twice $2400. 30S-1 $2300 Ron Dirker 2323 Lake In The Woods Apt 616 Ypsilanti, MI 48197 313-483-0590.

FOR SALE - ST-6 RTTY terminal unit with XITEX SCT-100 video board. Paneled and metered, all three shifts, ASCII/Baudot at different speeds. $250. WØFLG - Gene, Rt. 1 Box 1361 Branson, MO 65616 417-338-2128.

COMPLETE Drake "C" line new in original boxes used less than 15 hours. T4XC, R4C with FS-4 frequency synthesizer, MS-4, AC-4, MN-2000 transmatch/watt meter, Heathkit SB-614 monitor scope and Venus SlowScan TV. Over $2000 invested, must sell first $1250. WD5JDK 713-359-2884 after 5 P.M. CST.

HAL DS-2000KSR keyboard, ST-5000 demodulator, both mint, w/manuals, in orig. cartons, $450. Bank or certified check. USA only, will ship UPS. WA4GLJ, James Sohmers, 2132 Glenwood St., Kannapolis, NC 28081.

SWAN Astro-150 transceiver 80-10 meters, excellent condition, $475. 201-933-4683 W2NGN.

WANTED: Tube socket and chimney for 4CX1000/4CX1500. Socket-Eimac type SK800B. Chimney - Eimac type SK806. Joe Sposato, KA1BWO, 46 Second Street, Westerly, RI 02891.

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FOR SALE: Drake T-4XC, R-4C, AC-4, MS-4 all for $600. Also Model 28ASR w/typing re-perf, manuals for $500. Icom 255A w/encoder mic. $200. Azden 2000 w/encoder mic. $200. All gear in mint condition. Call Mark, W6JOB @ 213-821-9185, 4038 Moore Street, Los Angeles, CA 90066.

JOHNSON 4730 10M conversion by Certified, 25W PEP, $100; Hy-Gain 203 2M beam, $10; Yaesu NC-1A charger with 8 Nicads, $30; Astatic JT-30-C mike, $10; Dentron W-2 Wattmeter, $50. All in new condx. F. S. Eggert, Box 2154, Livonia, MI 48151.

CABLE/CONNECTORS wholesale. Call or write for free catalog. Amphenol PL-259, 74¢, Silver $1.29 ea, Teflon $1.39 ea. Type N UG-21D/U $2.46, 24 piece minimum. RG-8/U 80% shield foam $145/1000 feet, RG-58/U mil spec $68/1000 feet, RG-213/U mil spec $269/1000 feet. Shipping: Connectors add 10%-$3 minimum, cable freight collect. Nemal Electronics 1325 NE 119 St. N. Miami, FL 33161 305-893-3924. See our display ad. See us at Dayton.

WANTED: Early production run Kenwood R-1000 (preferably early 1980 or before). Victor Barz, Rm. 3305 Cross-Baits II, Ann Arbor, MI 48109. 313-763-2857 between 1100-1400 and 0400-0600 GMT.

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WANTED: xcvr Yaesu FT7 or FT7B (W6RGZ) write/tel 1330 Curtis, Berkeley, CA 94702.

WANTED: External RTTY brag tape for Microlog AKB-1. KA8FPN. Donie McFarland, Box 184, Mason, WV 25260.

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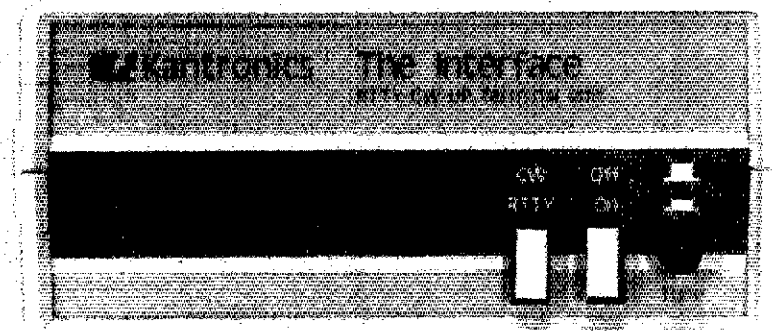

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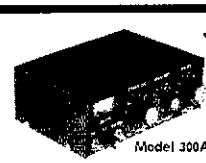

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KENWOOD R-820 rcvr. Mint 500 Hz filter. $700 Ten-Tec Argosy QRP transceiver with Model 225 p/s. Call Mitch W9TZ 217-224-7987.

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WANTED: scope probes in working order — 1X and 10X. Peter O'Dell, KB1N, 225 Main St., Newington, CT 06111. S.a.s.e. for response.

HEATH: VF-7401 2-meter, PTT, list $269 plus factory alignment. Sacrifice $225/b.o., mint. Eagle, Box 1047, Framingham, MA 01701 617-358-7974. Current model, warrantee.

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SELL me your broken solid state SSB or RTTY gear. List problems and price AD7I, POB 205, Holmdel, NJ 07733.

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WANTED: Ameco AC-1 CW transmitter in good condition. Also want Eico 730 Modulator. Tony Schlude WA9FBM 129 Taylor Street, Kaukauna, WI 54130.

KENWOOD R-1000, like new $275. Dave WA3WHR, 301-774-9131.

ICOM 720A - $850. PS 15 - $100. R-4C $295. L4B - $675. Steve, K1GBU, 617-222-5330.

WANTED, military surplus radios. We need Collins 618T, ARC-94, ARC-102, MRC-95, HF105, VC-102, RT-804/APN-171, RT-712/ARC-105, ARC-114, ARC-115, RT-823/ARC-131 or FM-622, RT-857/ARC-134 or Wilcox 807A, RT-859/APX-72, 313V-1 control, antenna couplers 490T, CU-1658A, CU-1669A, 490B-1, 690D-1, top dollar paid or trade for new Amateur gear. Write or phone Bill Slep, 704-524-7519, Slep Electronics Company, Highway 441, Otto, NC 28763.

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S-Line for sale: 75S3B, 32S3, 516F2, winged, mint $750 AD7I, 201-741-1151.

KWM-2 516F2 in speaker cabinet D104 mike $425. Drake 2NT, Ten-Tech 200 $125. Cannot ship KWM2, W2DED, 201-276-4388.

COLLINS 30L-1, round, mint, $450. K. Furgalus 216-333-7882.

YAESU FT-207R absolutely mint. Original owner, original box. Synthesized, memories, priority channel, full scan. Matching spkr/mic. $215, N2CJO, 201-852-2516.

COLLINS 51S-1, mint condition, with manual, $1200. Millard Oscherwitz, W9FSV, 2140 Sandy Lane, Wilmette, IL 60091. 1-313-256-3020.

DIGITAL frequency display for Yaesu transceiver FT-101 series, FT-401/560 series Spectronics DD-1 excellent $80 offer. KH6CDO 808-988-7474.

COLLINS 75S-3B, round emblem, mint condition with 500 Hz CW filter. Asking $550. Mickey, W4YV, 703-586-DXDX.

KENWOOD TS-180S with DFC, optional SSB filters and PS-30 power supply $750. Heathkit SB303 (3 filters) $200, SB630 $35. MFJ-752 audio filter $50. All mint condition. Shipping not included. KA8IDX after 6 PM 313-625-0856.

COMPUTER OWNERS: At Last! CW/RTTY send/receive software by RAK Electronics for VIC 20. CW send/receive for Atari 400/800, Commodore 64, PET 2000/4000. Complete with schematic for simple homebrew interfaces, instructions and I/O connector. Will work with popular commercial interfaces, also. CW $19.95, RTTY (VIC 20) $24.95, both $39.95. Check, Visa/MC, C.O.D. SASE for information on these and many other cassette programs for games, education, home, Ham Radio! Amateur Accessories, 6 Harvest Ct. RD 7, Dept. Q, Flemington, NJ 08822, 201-782-1551 best after 6 P.M. EST.

COLLINS S-line 32S-1 trans. 75S-3 recv. 516F-2 power supply $700/B.O. Motorola 2 meter RF power amp 500 watts SSB, FM, AM model AM-494/GR with antenna $wt. $400 KA1HCT Quincy, MA 02169 617-479-3389.

ALPHA 77D, 2800 watts C.W. output! Bought new 3 years ago, used five hours and put back in the box. If you want the most powerful ham amp ever made, if you want an amp produced before the F.C.C. changed the rules, if you want to be first in a pileup, this is the chance of a lifetime. Its condition is perfect...$3500 F.O.B. Dallas. Jeff - NA5S, 214-234-3005 days or 214-349-6432 nights and weekends.

RTTY St-6000 demodulator deluxe DS-3000KSR (3X-version) video terminal Baudot ASCII $900 W4VDC Harold 904-641-0846 Jacksonville FL 32216.

SALE: Century-21, mint condition, $175. AA4TG, Callbook.

MICROWAVE-Modules: Call for our unbeatable price on: MMT144-28, MMT432/435-28s, MMT 1296-144. Lunar amplifiers with preamps - 50 MHz; 120 watt $238, 144 MHz; 40 watt HT $109, 100 watt $238, 150 watt $260, 200 watt $315, 220 MHz; 80 watt $186, vhf/uhf GaAsFET preamps by Lunar $112.45, mastmounted GaAsFETs $249.95, other preamp models available call! Astron: VS35M $167.50 RS35M $148.50, RS35A $129, other models available from 7-50 amps. KLM 140-150 MHz verticals $25, Mirage D1010N 100 watt 430-450 MHz $280 VHF Shop Box 349 RD4 Mountaintop, Pennsylvania 18707 info/orders M-F after 6:00 PM, weekends anytime! 717-868-6565.

VHF SHOP - Phase III/129MHz. Equipment: 1269-144MHz linear transmit upconverters: 1 watt $300, 3 watt $365, 1269-1296MHz linear amplifiers: 50 watt $219, 120 watt $302, UHF-units: 1296-144MHz transverters: 1 watt $291, 3 watt $360, 1296-28-1 watt $349, F9FT 1296 MHz Yagis $48.35. K3MKZ 717-868-6565.

LINEAR amplifier: Swan Mark II with matching power supply. Both $295 plus shipping WA2FUJ 516-751-6447 after 230 UCT.

COLLINS S-line 75-S1/noise blank, 32-S1. $500/offer. KWM-2 covered relay $500. Both excellent. PM-2 $100. 516F-2 $125. Call Dr. Young KH6CDO 808-988-7474.

HAM house for rent: 3 bedroom 1 acre 10-80 m antennas. Chicagoland area, W9ON 312-526-6489.

WANTED: Robot 60 or 61 viewfinder, N2DDL, 914-967-0635.

HAVE an interesting item you think would make a good Stray? Submit it to ARRL Hq. by the 10th of the second month preceding desired publication. If photos are included, use good quality, black-and-white ones. Above all, the material should be of interest to most *QST* readers!

Jobs for Hams

HAM RADIO Specialists - Coed camps located in Milford, PA., approximately 80 miles from New York City. Excellent salary and working conditions. June 17-August 19. Contact Steve Brownstein, NJ YMHA Camps, 21 Plymouth Street, Fairfield, NJ 07006, 201-575-3333.

WANTED for Summer of 1983: Instructors in electronics, computers, and ham radio. Small boys' science camp in Pennsylvania. Apply: Donald Wacker, P.O. Box 356, Paupack, PA 18451.

COUNSELORS...Maine Boys' camp ham radio, Electronics, code, General License, may bring own equipment. Write: Richard Krasker, 95 Woodchester Dr., Chestnut Hill, MA 02167.

SUMMER Camp Counselor, General or better, to teach Novice and DX programs plus AM in house station supervision at private New Hampshire boys' camp. Nine summer weeks. Top equipment, triple beam tower, established program. Winter office, Camp Cody, Five Lockwood Circle, Westport, CT 06880, Dr. Stolz, 203-226-4389.

COUNSELORS: Connecticut brother-sister camp. Completely equipped with ham radio station. Program includes electronics, kit building, code and communications. June 25 - August 22. Send resume: Lloyd Albin (N2DMQ) Ken-Mont and Ken-Wood Camps, 2 Spencer Place, Scarsdale, NY 10583.

COUNSELORS: Ham Radio. Also specialists in land sports, water and cultural activities. Camp Wayne children's camp, Northeast Pennsylvania. 18-1/2+ years. 570 Broadway, Lynbrook, NY 11563 516-599-4562. (Include telephone number)

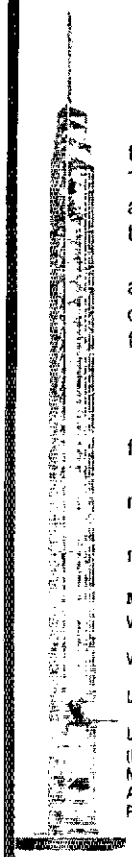
ADVERTISING DEPARTMENT STAFF

Lee Aurick, W1SE, Advertising Manager
Sandy Gerli, AC1Y, Assistant Adv. Mgr.
Jean Marhefka, Advertising Assistant

203-667-2494 is a direct line, and will be answered only by Advertising Department personnel.

Index of Advertisers

ANTENNA SYSTEMS/TOWER HARDWARE



Tri-Ex® Tower Sale!

These rugged crankup towers now available from Texas Towers! All models available On Sale for tremendous savings to you!

To save on freight costs, all towers are shipped directly from the Tri-Ex factory to you!

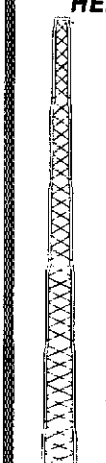
Check these features:

- All steel construction
- Hot dip galvanized after fabrication
- Complete with base and rotor plate
- Totally self-supporting—no guys needed

Model	Height	Load	Sale Price
W-36	36 ft.	9 sq. ft., 50 mph	$ 499
W-51	51 ft.	9 sq. ft., 50 mph	$ 799
LM-354	54 ft.	16 sq. ft., 60 mph	$1449
LM-470D (Motorized)	70 ft.	16 sq. ft., 60 mph	$2499

Masts—Thrust Bearings—Other Accessories Available at Sale Prices—Call!

HELD OVER by Popular Demand



UNARCO-ROHN Self Supporting Towers — On Sale!

Freight Prepaid

These rugged beauties are being offered at Big Discounts and - we are shipping them freight prepaid! Look over the specifications and pick the unit most suited for your needs, then - Call us to place your order with Mastercard/Visa or write and include your check for quick shipment - Freight Prepaid!

And – Save even more – include antenna and rotor of your choice with the order and we will ship them along freight prepaid also! Hows that for good old fashioned savings?

Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	269	24	293
HBX48	48 ft	10 sq ft	303	BXB7	349	26	375
HBX56	56 ft	10 sq ft	385	BXB8	419	30	449
HDBX40	40 ft	18 sq ft	281	BXB7	313	26	339
HDBX48	48 ft	18 sq ft	363	BXB8	399	30	429

BUTTERNUT

HF6V	80-10 mtr. Vertical	$129
TBR 160KD	160-mtr. Coil Kit	$ 49
RM KIT	Roof Mount w/Stub Tuned Radials	$ 39
STR KIT	Stub Tuned Radial Kit	$ 20

CUSHCRAFT

40-2CD	2-El. "Broad Band" 40 mtr. Beam	$279
A3	3-El. Triband Beam	$179
A4	4-El. Triband Beam	$229
A743/A744	40 mtr. Add-on Kit for A3/A4 Antenna	$ 69
R3	New Motor Tuned 20/15/10 mtr. Vertical	$229
AV5	80-10 mtr. Trap Vertical	$ 95
20-3CD	3-El. 20 mtr. Beam	$179
20-4CD	4-El. 20 mtr. Beam	$239
15-3CD	3-El. 15 mtr. Beam	$ 99
15-4CD	4-El. 15 mtr. Beam	$109
10-3CD	3-El. 10 mtr. Beam	$ 76
10-4CD	4-El. 10 mtr. Beam	$ 89
A50-5	5-El. 6 mtr. Beam	$ 65
424B	24-El. 432 MHz "Boomer"	$ 63
214B	14-El. 2 mtr. "Boomer"	$ 69
214FB	14-El. 2 mtr. FM "Boomer"	$ 69
228FB	28-El. 2 mtr. FM "Power Pack"	$189
32-19	19-El. 2 mtr. "Super Boomer"	$ 83
220B	17-El. 220 MHz "Boomer"	$ 75
ARX2B	2 mtr. "Ringo Ranger II"	$ 36
ARX450B	450 Mhz "Ringo Ranger II"	$ 38
A147-20T	2 mtr. Vert. & Horiz. 10-El. Beam	$ 63
A144-10T	10-El. 2 mtr. Satellite Antenna	$ 45
A144-20T	20-El. 2 mtr. Satellite Antenna	$ 69
A432-20T	20-El. 432 MHz. Satellite Antenna	$ 45
A14T-MB	Dual Antenna Mounting Assembly	$ 25

MANY OTHER CUSHCRAFT ANTENNAS IN STOCK – CALL!

HYGAIN

V2S	New 2 mtr. Base Vertical	$ 39
TH5MK2S	New Broad Band 5-El. Triband Beam	$319
TH7DXS	New Broad Band 7-El. Triband Beam	$379
TH3MK3S	3-El. Triband Beam	$219
TH3JRS	3-El. Triband Beam	$159
TH2MK3S	2-El. Triband Beam	$139
HY-QUAD	2-El. Triband Quad	$279
402BAS	2-El. 40 mtr. Beam	$199
205BAS	5-El. 20 mtr. "Long John"	$299
155BAS	5-El. 15 mtr. "Long John"	$179
105BAS	5-El 10 mtr. "Long John"	$119
204BAS	4-El. 20 mtr. Beam	$229
203BAS	3-El. 20 mtr. Beam	$139
153BAS	3-El. 15 mtr. Beam	$ 79
103BAS	3-El. 10 mtr. Beam	$ 59
DB1015AS	3-El. 10/15 mtr. Beam	$159
64BS	4-El. 6 mtr. Beam	$ 55
66BS	6-El. 6 mtr. "Long John"	$109
18HTS	80-10 mtr. Hy-Tower Vertical	$339
18AVT/WBS	80-10 mtr. Trap Vertical	$ 95
214	14-El. 2 mtr. Beam	$ 35
2BDQ	80/40 mtr. Trap Dipole	$ 49
5BDQ	80-10 mtr. Trap Dipole	$ 99
BN86	80-10 mtr. KW Balun	$ 19

HUSTLER

3TBA	New 3-El. Triband Beam	$199
4BTV	40-10 mtr. Vertical	$ 79
5BTV	80-10 mtr. Vertical	$ 99
G6-144B	2 mtr. Base Vertical	$ 69
G7-144	2 mtr. Base Vertical	$ 99

HF Mobile Resonators (STD 400 Watt)		Super 2 KW)
10 & 15 mtrs.	$10	$15
20 mtrs.	$12	$18
40 mtrs.	$15	$21
75 mtrs.	$17	$32

BUMPER MOUNTS, SPRINGS, FOLDING MASTS IN STOCK

KLM

CALL!

KT34A	4-El. Tribander	$389
KT34XA	6-El. Tribander	$469
7.2-1	40 mtr. Rotatable Dipole	$159
7.2-2	2-El. 40 mtr. Beam	$299
7.2-3	3-El. 40 mtr. Beam	$449
7.0-7.3-4A	4-El. 40 mtr. Beam	$629
144-148-13LB	13-El. 2 mtr. Long Boomer	$ 79
432-16LB	16-El. 432 Mhz. Long Boomer	$ 69
144-150-16C	16-El. 2 mtr. Circular Pol. Beam	$ 99
420-450-18C	18-El. 435 MHz. Circular Pol. Beam	$ 59

CALL FOR OUR LOW PRICES ON OTHER KLM PRODUCTS!

MINI PRODUCTS

HQ-1	Mini-Quad Compact 20/15/10 mtr. Antenna	$139

MOSLEY

CL-33	3-El. Triband Beam	$229
TA-33	3-El. Triband Beam	$199
TA-33 Jr.	3-El. Triband Beam	$149
S-402	2-El. 40 mtr. Beam	$279

ROTORS & CABLES

Alliance HD73 (10.7 sq. ft. Rating)	$ 99
Alliance U100 (For small beams & Oscar Elev. Rotor)	$ 45
Ham 4 (15 sq. ft. Rating)	$199
Tailtwister (20 sq. ft. Rating)	$249
HYGAIN HDR-300 (Most HD. Rotor for BIG Arrays)	$439
8 COND (2-#18 GA/6-#22 GA) Rotor Cable	$0.19/ft.
H.D. 8 COND (2-#16GA./6-#18GA.) Rotor Cable	$0.36/ft.

COAXIAL CABLE & CONNECTORS

RG213/U (95% shield - non-contaminating jacket)	$0.29/ft.
RG8X (95% shield-non contaminating jacket)	$0.18/ft.
RG11/U (75 OHM - 95% shield)	$0.35/ft.
½" Aluminum Hardline w/poly jacket	$0.69/ft.
½" Copper Hardline w/poly jacket	$1.10/ft.
½" Alum. H.L. Conn (UHF or N - Male or Female)	$15.00
½" Copper H.L. Conn (UHF or N - Male or Female)	$22.00
Amphenol Silver Plate PL259	$ 1.25
Amphenol Nickel Plate PL259	$ 0.90
Amphenol N Type Male Conn For RG213/U	$ 2.95

HYGAIN CRANKUPS

HG37SS	37 ft. Self Supporting	$669
HG52SS	52 ft. Self Supporting	$949
HG54HD	Heavy Duty 54 Ft. Self Supporting	$1499
HG70HD	Heavy Duty 70 Ft. Self Supporting	$2399
HG50MT2	50 ft. Side Supported	$779

ALL HYGAIN TOWERS FREIGHT PAID! CALL FOR PACKAGE QUOTE ON TOWER, ANTENNA & ROTOR—FREIGHT PAID.

ROHN TOWERS

20G-$32.00 25G-$41.50 45G-$93.50

HBX32	32 ft. Free Standing (rated 10 sq. ft.)	$169
HDBX32	32 ft. Free Standing (rated 18 sq. ft.)	$189
HBX40	40 ft. Free Standing (rated 10 sq. ft.)	$229
HDBX40	40 ft. Free Standing (rated 18 sq. ft.)	$259
HBX48	48 ft. Free Standing (rated 10 sq. ft.)	$289
HDBX48	48 ft. Free Standing (rated 18 sq. ft.)	$319
HBX56	56 ft. Free Standing (rated 10 sq. ft.)	$349
FK2548	48 ft. 25G Foldover Tower	$789
FK2558	58 ft. 25G Foldover Tower	$879
FK2568	68 ft. 25G Foldover Tower	$959
FK4544	44 ft. 45G Foldover Tower	$1099
FK4554	54 ft. 45G Foldover Tower	$1219
FK4564	64 ft. 45G Foldover Tower	$1329

Foldover Towers Freight Paid-10% Higher West of Rockies.
ALL ROHN ACCESSORIES IN STOCK – CALL!

GALVANIZED STEEL TWR. HARDWARE

3/16" EHS Guywire (3990 lbs.)	$12/100 ft.	$111/1000 ft.
1/4" EHS Guywire (6000 lbs.)	$15/100 ft.	$139/1000 ft.
5/32" 7 x 7 Aircraft Cable (2700 lbs.)		$11/100 ft.
3/16" CCM Cable Clamp (3/16" or 5/32" Cable)		$0.30
1/4" CCM Cable Clamp (1/4" Cable)		$0.40
1/4" TH Thimble (fits all sizes)		$0.25
3/8 EE (3/8" Eye & Eye Turnbuckle)		$5.50
3/8 EJ (3/8" Eye & Jaw Turnbuckle)		$6.50
1/2 EE (1/2" Eye & Eye Turnbuckle)		$8.50
1/2 EJ (1/2" Eye & Jaw Turnbuckle)		$9.50
3/16" Preformed Guy Grip		$1.65
1/4" Preformed Guy Grip		$1.85
6" Diam - 4 ft. Long Earth Screw Anchor		$12.50
2" Diam - 10 ft. Long Heavy Duty Steel Mast		$39.00
5000 Guy Insulator (5/32" or 3/16" Cable)		$0.95
502 Guy Insulator (1/4" Cable)		$1.95
5/8" Diam - 8 ft. Copper Clad Ground Rod w/clamp		$11.00

ANTENNA WIRE & ACCESSORIES

12 Ga. Solid Copperweld	$.12/ft.
14 Ga. Solid Copperweld	$.10/ft.
14 Ga. Stranded Copper	$.10/ft.
14 Ga. Stranded Copper (70 ft. coil)	$ 7.00
14 Ga. Stranded Copper (140 ft. Coil)	$ 14.00
18 Ga. Copperweld (1/4 mile spool)	$30.00
Heavy Duty 6&W End Insulator	$4/Pair
HYGAIN Model 155 Center Insulator	$ 5.95
HYGAIN Model 157 Center Insulator w/SO239	$11.95
450 OHM H.D. Low Loss Ladder Line	$ .14/ft.

MasterCard

TEXAS TOWERS

A DIVISION OF TEXAS RF DISTRIBUTORS, INC.
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TELEPHONE: (214) 422-7306

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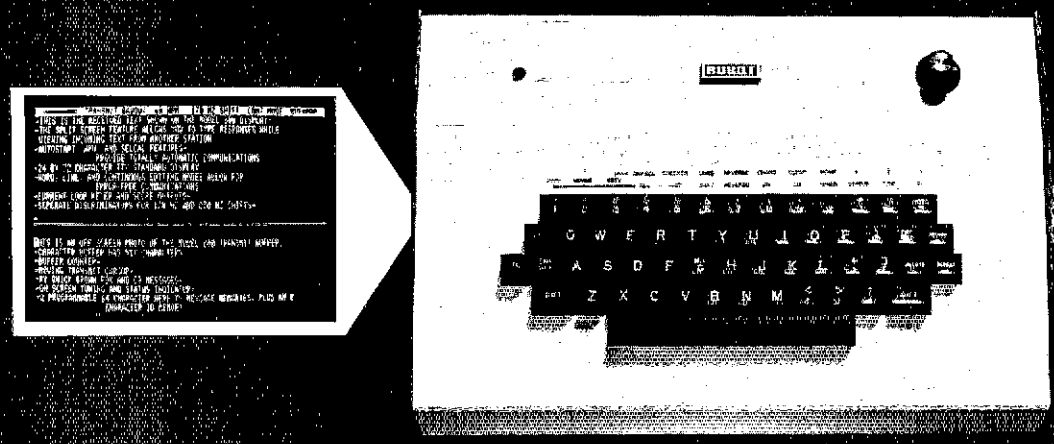
VISA



THE ROBOT 800 COPIES THOSE WEAK SIGNALS YOU USUALLY GIVE UP ON.

Our built-in demodulator makes it possible.

The Robot 800's built-in demodulator equals or exceeds the performance of those found only in expensive stand-alone terminal units.

We designed the Robot 800 terminal specifically for the amateur radio operators' needs. Unlike many terminals that require costly external hardware and modifications, the Robot 800 used with a standard TV monitor provides you with all the features and capabilities you need for a complete system for amateur radio operation.

We consider our built-in demodulator the most important feature of our 800, since the first function of any terminal should be to receive as many signals as possible, even weak ones or those under heavy QRM.

The demodulator built into the Robot 800 equals or exceeds the performance found in expensive stand-alone terminals. This is because our demodulator employs separate two tone active discriminator filters for the demodulation of RTTY signal.

Most demodulators share a given filter for several different shifts to retune the filter to obtain continuous shift tuning capability. However, this results in a serious compromise in demodulator performance. But if you plan to use your terminal primarily for amateur radio operation, the only shifts you need are those used in amateur radio, i.e., 850 Hz wide shift or 170 Hz narrow shifts. By choosing the Robot 800 you will be getting a terminal with a demodulator that will provide you with unparalleled performance in receiving those weak signals that you usually would give up on.

Other Robot 800 features include:

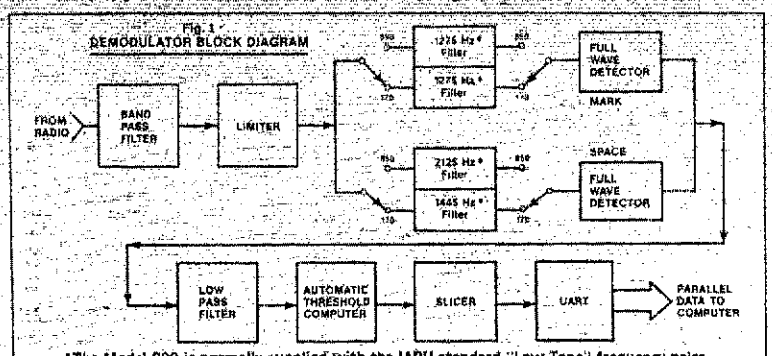
BAUDOT/ASCII Operation: □ Split screen operation □ Autostart □ Programmable WRU □ On screen status and turning indicator □ Current loop keyer for hard copy □ Programmable narrow shift I.D.

For Morse Code Operation: □ Morse autotrack □ Side tone oscillator □ Morse code trainer □ Speed indicator

SSTV Operating Features: The Robot Model 800 allows alphanumeric characters to be typed on an SSTV format, displayed on a TV monitor and transmitted as a normal SSTV picture.*

For complete information on all the Robot 800's features, write for literature or visit your Robot dealer.

Fig. 1
DEMODULATOR BLOCK DIAGRAM



*The Model 800 is normally supplied with the IARU standard "Low Tone" frequency pairs. Units with "High Tone" pairs are available on special order (Model 800H).

* The Model 800 does not receive SSTV pictures. The Robot Model 400 is necessary for this.

ROBOT

ROBOT RESEARCH INC.
7591 Convoy Court
San Diego, CA 92111
(714) 279-9430

World leaders in Slow Scan TV, Phone Line TV and Image Processing Systems

INTRODUCING . . .

THE FT-980 CAT SYSTEM ! ! !

Join the computer revolution in Amateur Radio with the Computer Aided Transceiver . . . the new FT-980 from Yaesu Electronics!

- 8-Bit microprocessor for greater operating flexibility.
- High-voltage, all solid state transmitter PA for excellent linearity.
- Keyboard entry of frequencies into any of twelve independent VFO/memory registers.
- Amateur band transmit plus general coverage receive capability.
- Full CW break-in with quiet solid state switching.
- CW Spot switch on front panel.
- Digital frequency display with resolution to 10 Hz. Digital readerboard-type coarse frequency sub-display.
- Keyboard entry of sub-bands for Novice, General, or Advanced Class operators. Separate sub-bands may be programmed on each memory.
- Up/Down scanning plus instant ±5 kHz/step QSY from front panel.
- SSB/CW/AM/FSK/FM operation built in. CW and AM Wide/Narrow selection using optional filters.
- Wide dynamic range and noise floor maintenance provided by husky front end design and IF filter gain balancing.
- 10 Hz synthesizer steps. Quick frequency change via keyboard or scanning controls.
- IF Notch filter at 455 kHz for interference rejection.
- Audio Peak Filter for narrow band CW signal enhancement.
- RX Audio Tone Control for signal laundering in AF line.
- Variable IF Bandwidth and IF Shift using cascaded filters.
- Memory storage of both frequency and operating mode.
- Pushbutton Memory Check feature for verification of memory frequencies without actually changing operating frequency in use.
- Pushbutton Offset Check feature for verification of memory-to-VFO frequency difference.
- Variable Pulse Width Noise Blanker.
- IF Monitor with front panel volume control.
- RF Speech Processor.
- Dual metering of Vcc, Ic, ALC, Compression, Discriminator Center, Relative PO, and SWR (Calibrated).
- Selectable AGC: Slow/Fast/Off.
- Separate RX-only antenna jack.
- Three FSK shifts built in.
- Optional Electronic Keyer Module.
- Optimization of audio passband for mode in use, for preservation of noise figure with changing bandwidth.
- Computer interface optional module available mid-1983, for remote transceiver control from personal computer terminal.

For a detailed brochure covering the FT-980 CAT System, call or write your Authorized Yaesu Dealer.

Price And Specifications Subject To Change Without Notice Or Obligation

YAESU

The radio.

0183

YAESU ELECTRONICS CORPORATION, 6851 Walthall Way, Paramount, CA 90723 ● (213) 633-4007

YAESU ELECTRONICS Eastern Service Ctr., 9812 Princeton-Glendale Rd., Cincinnati, OH 45246 ● (513) 874-3100

"Comm-packed."

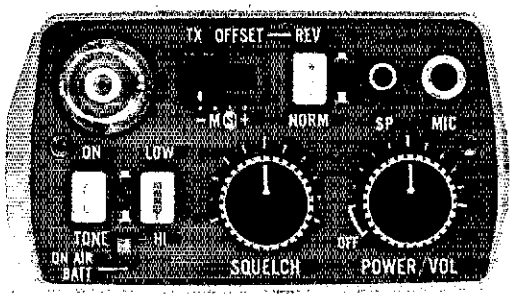
BIG performance... small size... smaller price!!!

TR-2500

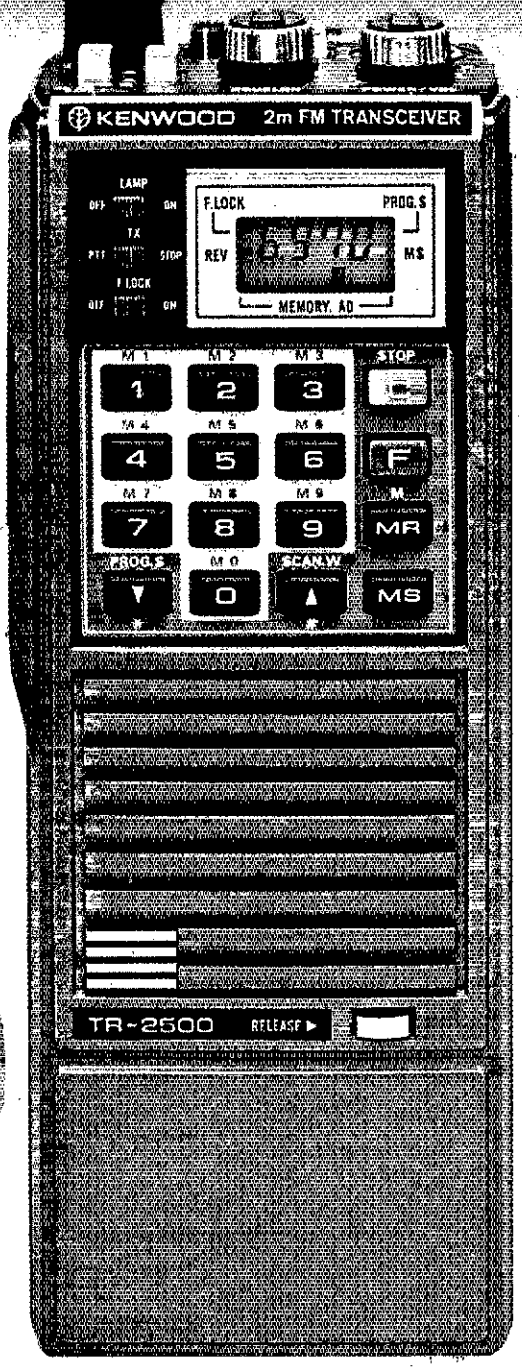
The TR-2500 is a compact 2 meter FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan, Hi/Lo power switch and built-in sub-tone encoder.

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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