August 1983

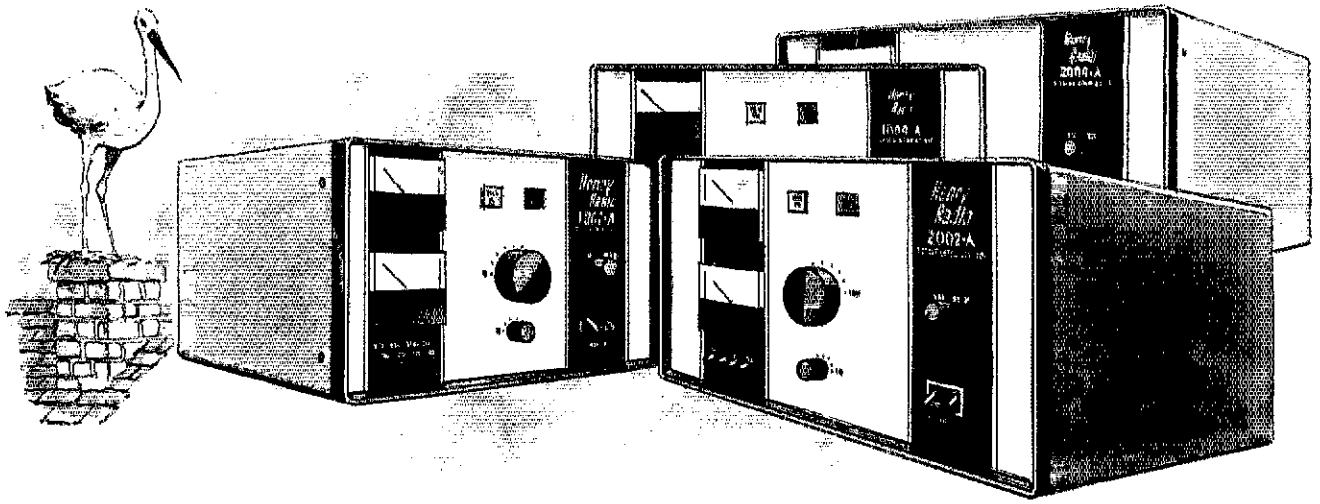
QST

devoted entirely to Amateur Radio

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

How to work the first ham in space

Page 50



We're proud to announce the birth of FOUR fabulous new VHF and UHF amplifiers

Henry Radio has taken a giant step forward, combining the most advanced technology (including Eimac's new 3CX800A7 power triode) with Henry's traditional quality.

1. the 2002-A . . . a bright new rework of our popular 2002 2 meter amplifier. It uses the new Eimac 3CX800A7. The RF chassis uses a ¼ wave length strip line design for an extremely reliable approach. It provides 2000 watts input for SSB and 1000 watts input for CW. Because this tube is rated at an unheard of 15dB gain, only about 25 watts drive is required for full output. The 2002-A. . .$1095.00

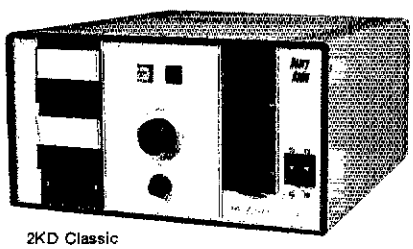
2. the 2004-A is identical to the 2002A except that it is set up for the 430 to 450 MHz band. This amplifier will use a ½ wave strip line and offer all of the same specifications as the 2002A. This will replace our limited production 2004. The 2004-A. . .$1295.00

3. the 1002-A is a 2 meter amplifier with the same design as the 2002A, except using one 8874 tube for ½ power specifications. The 1002A is rated at 600 watts PEP output and 300 watts continuous carrier output. It employs the same strip line design as the 2002A. The 1002-A. . .$795.00

4. the 1004-A . . . a half power version of the 2004A - using again the 8874. The 1004A will cover the 430 to 450 MHz band using a ½ wave strip line design. The 1004-A. . .$895.00.

The Henry 2002-A (Special) and the 1002-A (Special) for any frequency between 50 and 500 MHz, full and half power respectively, are available for non-amateur laboratory, scientific or communications use.

These exciting new Henry amplifiers will also be available in FCC type accepted models for commercial two-way FM communications. These amplifiers join 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.



2KD Classic

IKD-5. . . 1200 watt desk model $695

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

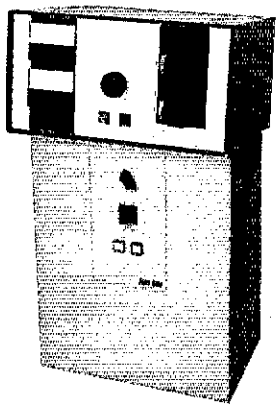
The 2K CLASSIC The latest and best version of the console that made the name "2-K" famous around the world. $1295.

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. $1795.

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



2K Classic

55 YEARS OF C SERVICE

Henry Radio

Prices subject to change without notice

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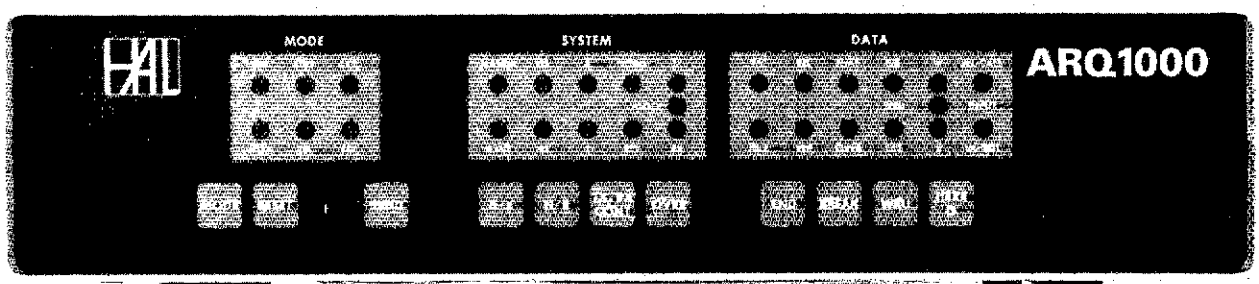
For all states except California.
Calif. residents please call collect on our regular numbers

AMTOR RTTY

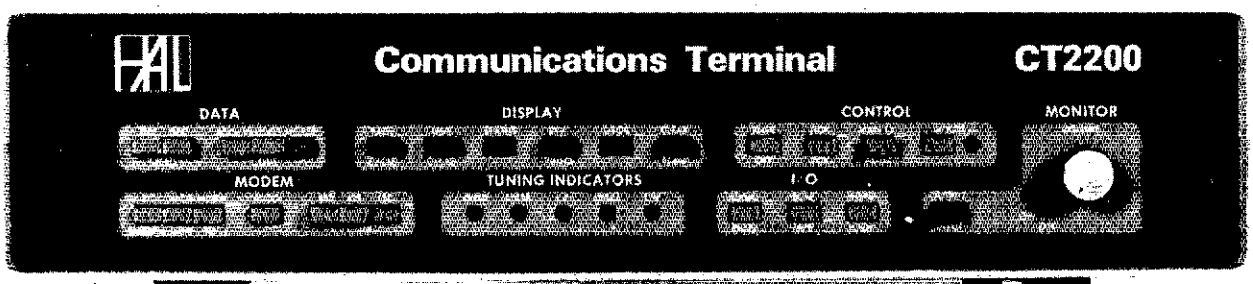


HAL is proud to announce the ARQ1000 code converter. This terminal not only supports the AMTOR amateur codes, but meets ALL of the commercial requirements of CCIR Recommendation 476-2. The ARQ1000 can be used with present and previous generation HAL RTTY products. In fact, any Baudot or ASCII full duplex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

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

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

BY POPULAR REQUEST



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

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

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

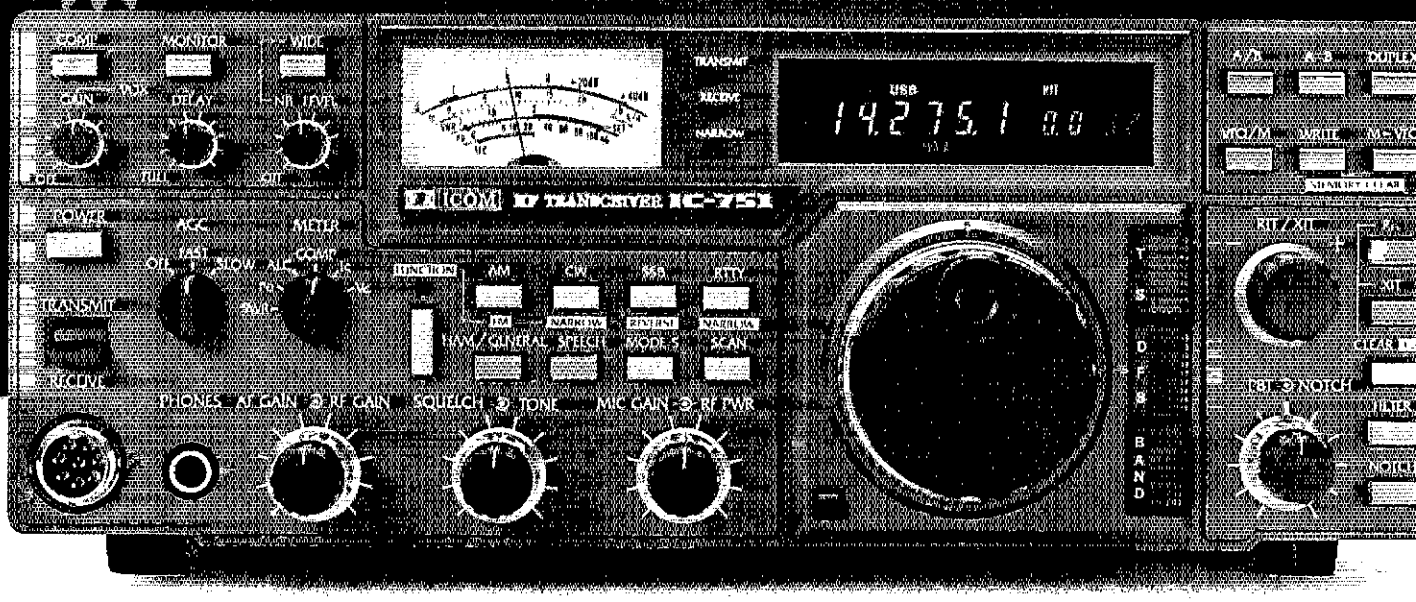
In addition, an update kit is available so that all CT2100 owners can update their CT2100's to include CT2200 features. The kit even includes a new CT2200 front panel! Rather than making a proven product obsolete, HAL put even more behind the buttons. Pick up a CT2200 at your favorite HAL dealer and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

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

ICOM IC-751

The New Standard of Comparison

NEW Competition Grade Transceiver!



ICOM is proud to announce the most advanced amateur transceiver in communications history. Based on ICOM's proven high technology and wide dynamic range HF receiver designs, the IC-751 is a competition grade ham receiver, a 100KHz to 30 MHz continuous tuning general coverage receiver, and a full featured all mode solid state ham band transmitter, that covers all the new WARC bands. And with the optional internal AC power supply, it becomes one compact, portable/field day package.

Receiver. Utilizing an ICOM developed J-FET DBM, the IC-751 has a 105dB dynamic range. The 70.4515MHz first IF virtually eliminates spurious responses, and a high gain 9.0115MHz second IF, with ICOM's PBT selectivity. A deep IF notch filter, adjustable AGC and noise blanker (can be adjusted to eliminate the woodpecker), audio tone control, plus RIT with separate readout provides easy-to-adjust, clear reception even in the presence of strong QRM or high noise levels. A low noise receiver preamp provides exceptional reception sensitivity as required.

Transmitter. The transmitter features high reliability 2SC2097 transistors in a low IMD (-32dB @ 100W), full 100% duty cycle (internal cooling fan standard), 12 volt DC design. Quiet relay selection of transmitter LPF's, transmit audio tone control, monitor circuit (to monitor your own CW or SSB signal), XIT, and a high performance speech processor enhance the IC-751 transmitter's operation. For the CW operator, semi break-in or full QSK is provided for smooth, fast break-in keying.

Dual VFO. Dual VFO's controlled by a large tuning knob provide easy access to split frequencies used in DX operation. Normal tuning rate is in 10Hz increments and increasing the speed of rotation of the main tuning knob shifts the tuning to 100Hz increments automatically. Pushing the tuning speed button gives 1KHz tuning. Digital outputs are available for computer control of the transceiver frequency and functions, and for a synthesized voice frequency readout.

32 Memories. Thirty two tunable memories are provided to store mode, VFO, and frequency, and the CPU is backed by an internal lithium memory backup battery to maintain the memories for up to seven years. Scanning of frequencies, memories and bands are possible from the unit, or from the HM 12 scanning microphone. In the Mode-S mode, only those memories with a particular mode are scanned, others are bypassed. Data may be transferred between VFO's, from VFO to memories, or from memories to VFO.

Standard Features. All of the above features plus FM unit, high shape factor FL44A, 455 Khz SSB filter, full function metering, SSB and FM squelch, convenient large controls, FM option, a large selection of plug-in filters, and a new high visibility multi-color flourescent display that shows frequency in white, and other functions in white or red, make the IC-751 your best choice for a superior grade HF base transceiver.

Options. External frequency controller, external PS-15 power supply, internal power supply, high stability reference crystal (less than 100Hz, -10°C to +60°C), HM12 hand mic, desk mic, filter options: SSB: FL30
CWN: FL52A, FL53A
AM: FL33

ICOM

The World System

ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155 / 3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-27

August 1983 *Volume LXVII Number 8*

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Offices

225 Main St., Newington, CT 06111 USA
Telephone: 203-666-1541
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Member of the Audit Bureau of Circulations

OUR COVER

Have (or have access to) a 2-meter fm transceiver? Able to put together a simple turnstile antenna? If so, you've got as good a chance as anyone of working W5LFL, the First Ham in Space. All you need to know is in the article beginning on page 50. *(official NASA photo)*

CONTENTS

TECHNICAL

BEGINNER'S BENCH

NEWS AND FEATURES

OPERATING

DEPARTMENTS

Subscription rate: $25 per year postpaid in the U.S. and Possessions, $30 in Canada, and $33 elsewhere. All payments must be in U.S. funds. Foreign remittances should be by international postal or express money order or bank draft negotiable in the U.S. and for an equivalent amount in U.S. funds. Individuals may apply for membership at the rates shown. Licensed Amateur Radio operators under 18 or over 65 — $20 U.S., $25 Canada, $28 elsewhere, plus proof of age. Membership and *QST* cannot be separated. Fifty per cent of dues is allocated to *QST*, the balance for membership. Single copies $2.50.

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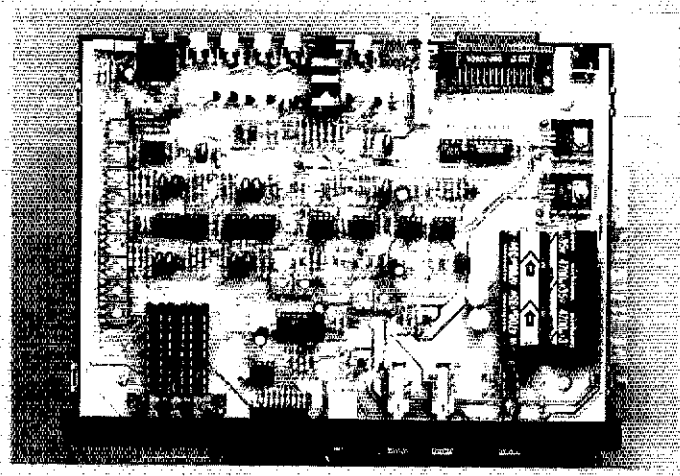
Indexed by Applied Science and Technology Index, Library of Congress Catalog Card No.: 21-9421. Microform editions available from Xerox University Microfilms, Ann Arbor, MI 48106.

CHAMPAGNE RTTY/CW on a Beer Budget



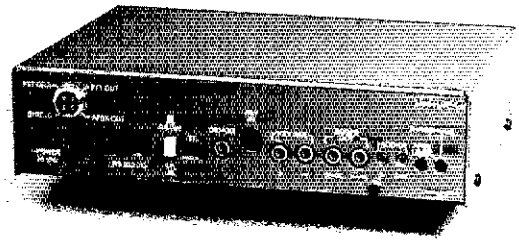
CP-1 Computer Patch™ Interface

The AEA Model CP-1 Computer Patch™ interface will let you discover the fastest growing segment of Amateur Radio: computerized RTTY and CW operation.

When used with the appropriate software package (see your dealer), the CP-1 will patch most of the popular personal computers to your transceiver for a complete full-feature RTTY/CW station. No computer programming skills are necessary. The CP-1 was designed with the RTTY neophyte in mind, but its sophisticated circuitry and features will appeal to the most experienced RTTY operator.

The CP-1 offers variable shift capability in addition to fixed 170 Hz dual channel filtering. Auto threshold plus pre and post limiter filters allow for good copy under fading and weak signal conditions.

Transmitter AFSK tones are generated by a clean, stable function generator. Plus (+) and minus (-) output jacks are also provided for CW keying of your transmitter. An optional low cost RS-232 port is also available. The CP-1 is powered with 16 VAC which is supplied by a 117 VAC wall adaptor included with the CP-1.



THE HAM SHACK

808 N. Main St.
Evansville, IN 47711
(812) 422-0231

AEA
Brings you the Breakthrough!

Ringo Ranger II

Simply the best

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

Quick easy assembly and installation

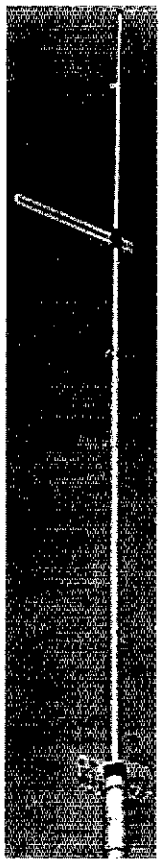
Mount anywhere with compact dimensions and neat appearance

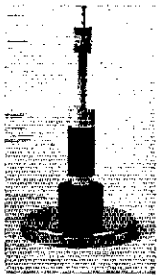
Proven performance and durability in all environments

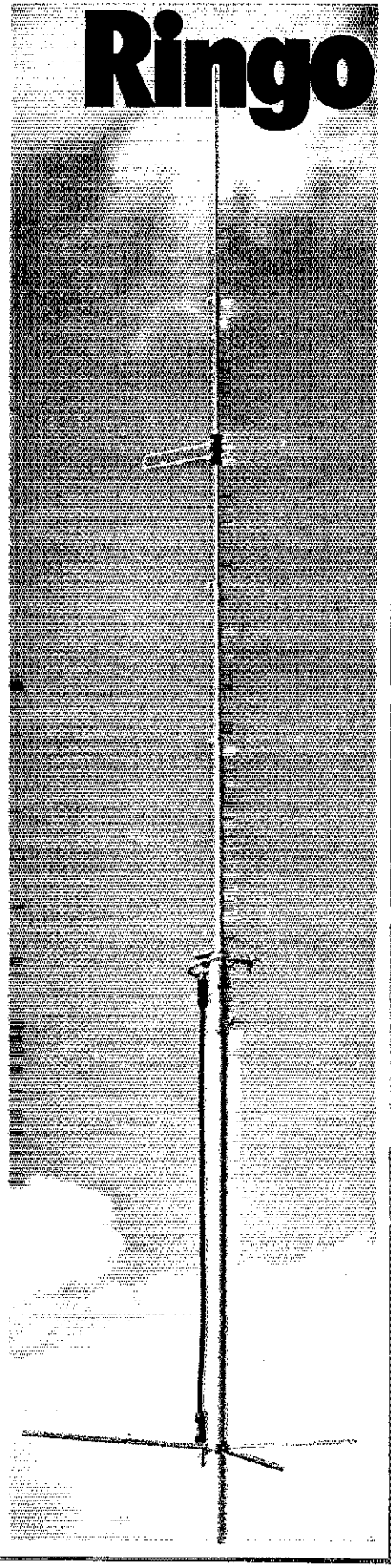
Complete FM band coverage

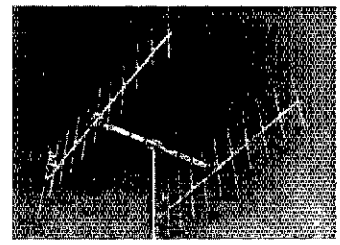
One year warranty

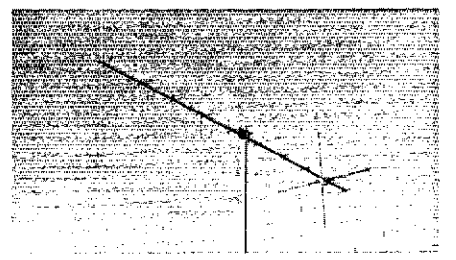
Cushcraft antennas created the FM antenna revolution by making the best performance and value available to every ham. We continue to set the pace with a broad line of antennas for every FM application. Tune across the band and you will find the overwhelming majority of hams using one, two, or more Cushcraft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











RINGO RANGER II

ARX-2B	134-164 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

MS-147	144-148 MHz	Magnetic Mount
TS-147	144-148 MHz	Trunk Lip Mount
MS-220	220-225 MHz	Magnetic Mount
TS-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

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CORPORATION

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

Scan the World.

NEW

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

R-2000

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

R-2000 FEATURES:

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

Other features.

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

Optional accessories:

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

VC-10 subject to FCC approval

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

KENWOOD

...pacesetter in amateur radio

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

One size fits all...

NEW

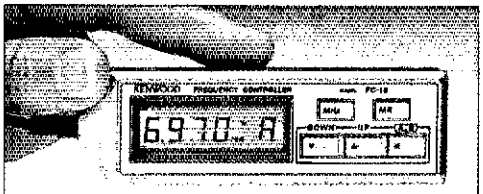
Ultra-compact and lightweight, priority, memory and band scan, 25 watts...

TM-201A

The KENWOOD TM-201A 2-meter FM mobile transceiver is designed to be the ultimate in compact size and lightweight, allowing maximum flexibility in automotive installations. New microprocessor controlled operating features, improved receive and transmit circuitry, a powerful 25 watts of RF output, and an easy-to-operate front panel control layout are packed into this new, ultra-compact radio, providing extended flexibility and ease of operation. The complete TM-201A system is supplied with a high quality external speaker, and a 16-key autopatch UP/DOWN microphone.

TM-201A FEATURES:

- **Ultra compact and lightweight**
  Measures 5.6 (141)W x 1.6 (39.5)H x 7.2 (183)D, inch(mm), weighs 2.8 lbs., (1.25 kg.).
- **25-watt output, with HI/LO power switch**
  Produces a powerful 25 watts RF output from a surprisingly compact design.
- **Dual digital VFO's built-in**
  Covers 142.000 to 149.000 MHz in 5-kHz steps, includes certain MARS and CAP frequencies. A "MHz" key shifts the frequency in 1-MHz steps.
- **5 memories plus "COM" channel, with lithium battery back-up (est. 5 yr. life)**
  Memories 4, 5, and the COM (common) channel store transmit and receive frequencies independently, for either odd or standard repeater offsets. COM channel switch for instant recall of frequency and tone (with optional TU-3 tone encoder).
- **Priority alert scan**
  With ALERT switch "ON," once every 6 seconds the unit scans back to memory channel 1 for approximately 0.3 seconds to monitor the activity on the priority channel (channel 1). A dual "beep" will sound if a signal is present on memory 1.
- **Memory scan/programmable band scan**
  Scan skips memories in which no data is stored. UP/DOWN switch on microphone initiates band scan in appropriate direction. Memory 5, set band scan limits. Scanning stops on busy channel, resumes after 6 seconds or when the signal ceases. Scan delay prevents scan resume if signal fades or is momentarily interrupted.
- **Highly visible yellow LED frequency display**
  The MHz decimal blinks while scanning, and the kHz decimal lights when VFO-B is in use. S/RF LED bar meter with "BUSY" indicator, "MR" (memory recall), "ALERT," and "ON AIR" LEDs.
- **High performance receive/transmit**
  GaAs FET RF amplifier for high sensitivity with wide dynamic range. Transmit modulation characteristics selected for best sound and minimum distortion.
- **External high quality speaker supplied**
  (No internal speaker)
- **16-key autopatch UP/DOWN microphone**
- **Repeater offset switch (±600-kHz or simplex) and reverse switch**
- **Audible "BEEPER" confirms operation**
- **Easy-to-install mobile mount**



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

Other optional accessories:

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

More information on the TM-201A and TM-401A is available from authorized dealers of Trio-Kenwood Communications 1111 West Walnut St., Compton, CA 90220.

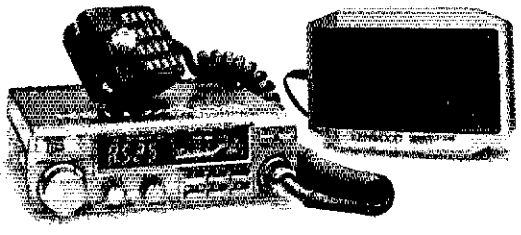
TM-401A

70-cm FM ultra compact mobile transceiver

- **Dual digital VFO's covering 440-450 MHz**
  Covers 10-MHz of 70-cm FM band in 25-kHz steps. MHz key for 1-MHz step.
- **Repeater offset switch, plus reverse switch**
  ±5 MHz or simplex. Odd offset with memories 4, 5, and COM channel.
- **HI/LOW RF output power switch**
  Selects 12 watts or 1 watt
- **Virtually same size and weight as TM-201A**
- **Other features similar to TM-201A**
  The complete TM-401A system is supplied with a high quality external speaker and a 16 key autopatch UP/DOWN microphone. Features five memories plus COM channel with lithium battery back up, priority alert scan, memory and band scan. Optional FC-10 frequency controller and TU-3 two frequency tone encoder available.

KENWOOD

...pacesetter in amateur radio



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

TM-401A subject to FCC approval

Directors

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THE AMERICAN RADIO RELAY LEAGUE, INC.

"It Seems to Us . . ."

A Star is Born

On June 16 a new satellite, different from all the others in space, joined the thousands of man-made objects orbiting the earth. AMSAT-OSCAR 10, known prior to launch as Phase IIIB, was orbited successfully by the European Space Agency (ESA) from its French Guiana facility on the northeastern coast of South America. In case you weren't among the thousands who tuned into the AMSAT Launch Information Network Service that day to hear the event-by-event description of the Ariane rocket lifting off the pad and hurtling into the early-morning sky, you may read an account of the exciting launch on page 52 of this issue.

Thoughtful radio amateurs always have marvelled that their predecessors were able to convince the world's nations that private citizens should be permitted to engage in direct radiocommunication, without a government intermediary, with their counterparts in other countries. How remarkable it is that, in this tension-filled world, we have been able to retain the support and trust of these governments and have managed to protect our precious access to the crowded radio spectrum! Equally remarkable in its way is the feat just accomplished by the non-profit Radio Amateur Satellite Corporation (AMSAT), in putting Amateur Radio on the path to new capabilities and new adventures. Overcoming the crushing disappointment of a 1980 launch failure, with limited resources at their command, a handful of dedicated volunteers from several countries managed the design and construction of a spaceworthy electronics package rivaling the most sophisticated commercial efforts. At a time when similar rides into orbit cost millions of dollars, and are in great demand, this same group convinced ESA to provide one free of charge. Had anyone predicted at the dawn of the Space Age, a scant 25 years ago, that radio amateurs would be capable of such a feat, he would have been dismissed out of hand as a dreamer.

Today, thanks to these efforts, we are about to enjoy a communications capability superior to anything we have ever experienced — even in those all-too-infrequent years of high solar activity. What makes AMSAT-OSCAR 10 such an important departure from earlier amateur satellites is a combination of technical advancements in the package itself, and the characteristics of its orbit. A-O 10 carries two transponders, controlled by an advanced on-board computer that is able to respond to a wide variety of commands from ground-based telecommand stations. Most of the time, the "Mode B" transponder will be available; it receives a 150-kHz segment of the 435-MHz band and retransmits it at 145.825-145.975 MHz. The second transponder, called "Mode L," receives an 800-kHz segment at 1269 MHz and retransmits it at 436.150-436.950 MHz. The relatively wide bandwidths of the transponders will make it possible for scores of contacts to take place simultaneously, without interference. This is particularly true of Mode L, although it will take some time for amateurs' ground-station capabilities to catch up with this feature of the spacecraft.

Virtually all of the OSCAR satellites to date have been placed in relatively low, circular orbits providing limited range and accessibility. Contacts through these satellites were possible only to a few thousand miles, and any given spot on earth (except for the polar regions) was able to "see" only a few 20-minute passes per day. Assuming that a series of routine maneuvers in mid-July is successful, by the time you read this AMSAT-OSCAR 10 will be in a highly elliptical orbit that will provide amateurs in the Northern Hemisphere with more than 15 hours of access per day, and will make it possible to communicate reliably and predictably with stations in most of the world. Roundtable discussions among stations in Europe, the U.S. and Japan, with all participants able to hear one another perfectly, should become commonplace; indeed, at times all six continents should be represented simultaneously! A-O 10 will not render high-frequency communication obsolete, but it certainly will add a new dimension to our Amateur Radio world.

Since the launch of the first OSCAR, in 1961, ARRL members have been strong supporters of the amateur-satellite effort. Following the failure of the 1980 launch, ARRL leaders pledged continued support for AMSAT's quest for a high-orbit satellite. The ARRL Foundation raised more than $90,000 through matching-fund drives and passed it along to AMSAT for use on the Phase IIIB project. League members, whether or not they have been active in the amateur-satellite program, can take pride in the role their organization has played in the birth of the newest star in our sky.

Why not tune in to A-O 10? Even with a simple antenna, a sensitive ssb/cw receiver for 145.8-146.0 MHz should give you a taste of what the Mode B transponder can do. From this starting point you can progress to a higher-gain antenna with tracking capability, a transmitting station for the uplink frequencies, and perhaps even a Mode L station. Those who dislike the competitive aspects of high-frequency operation should find satellite work, which relies on cooperation between users for its success, to be a relaxing respite. Those interested in data communications will find like-minded individuals among the early users of the new bird.

Our congratulations and thanks go to AMSAT and ESA for providing a new challenge, and a new opportunity. Let's show them that we radio amateurs are worthy of the great efforts they have expended on our behalf! — *David Sumner, K1ZZ*

League Lines...

The U.S. State Department has informed ARRL Hq. of a new third-party traffic agreement between the United States and Swaziland, prefix 3D6. The agreement became effective June 26, 1983.

ARRL has filed comments in PR Docket No. 83-28, vigorously opposing the FCC's plan to create a class of amateur license not requiring knowledge of Morse code. Senator Goldwater "completely supports" ARRL's comments! Details will be in next month's Happenings.

Cable television operators violating FCC rules are making the news again. Cablevision of Chicago, Illinois, was fined $15,000 for "its knowing unauthorized use of aeronautical frequencies." FCC Rule §76.610(b) requires that prior permission from the Commission is needed if a cable company wishes to use frequencies allocated for air navigation and aeronautical and marine emergency services. The FCC notified Cablevision that it was violating FCC rules, but the CATV company continued to operate on these frequencies for over two years, presenting a threat to the public.

A shortage of the paper forms on which licenses are printed caused processing delays for Amateur Radio licenses in May and June. The problem is now under control, however. According to Larry Weikert, chief of the FCC's General Radio Branch, a shipment of the forms arrived at the Commission's Gettysburg facility and, as of June 23, all backlogged licenses had been issued. Wiekert also reports that it is now taking approximately 20-25 working days to process routine license applications (renewals, simple modifications, and new applications not requiring special processing).

If you once held a KZ5 call in the Canal Zone, we may have QSLs for you! The former KZ5 QSL Bureau was left with an inventory of unclaimed cards, which are now at ARRL Hq. If you think any of them might be intended for you, please tell us your former KZ5 call and send a self-addressed, stamped envelope to get the cards to you.

The ARRL Membership Referral Program was launched last month (see July QST, page 56), but a last-minute problem prevented the referral cards from being inserted in QSTs destined for certain parts of the country. Those readers who did not receive a card last month should receive one in this issue of QST, but if you don't, just write to ARRL Hq., and we'll send you one. Participate in this new program and receive valuable awards for recruiting new members!

Senator Barry Goldwater will address ham radio operators across North America via the Teleconference Radio Net (TRN), September 1, at 7:30 P.M. Central Time. More than 75,000 amateurs are expected to be listening to K7UGA through TRN's interconnection of over 100 repeater stations in the U.S. and Canada. For information on how to tie your repeater into the TRN, send a self-addressed, stamped envelope to Rick Whiting, WØTN, Net Manager, 4749 Diane Dr., Minnetonka, MN 55343.

The FCC has clarified the prohibition against business communications in the Amateur Service by amending Part 97 of its Rules. According to a news release dated June 30, the Commission is, by order, adding a new rule section stating explicitly the prohibition against transmitting business communications. Also, the definition of the term "business communications" will be moved from §97.114 to §97.3 of the Rules. The amendments will become effective upon their publication in the Federal Register.

The FCC has adopted a Report and Order affecting the Novice examining procedure. The Report and Order in PR Docket No. 82-727 will permit a volunteer examiner to make up a Novice test from a pool of Commission-prepared questions, administer and grade the test, and then forward a passing application to the FCC for issuance of the license. The pool of Novice questions to be used in the exams will be available from FCC field offices. This action does not affect the pending ARRL volunteer examining proposal (PR Docket No. 83-27), which deals with examinations for classes of license higher than Novice. The new Novice examining procedure will go into effect on August 31. Requests for Novice exams under the old procedures will be honored until August 30, 1983. After that date, requests for Novice exams received at FCC's Gettysburg will not be honored. Details next month in Happenings.

High-Resolution SSTV

High-resolution pictures approaching the quality of fast-scan TV can be sent at audio bandwidth. It just takes a little time.

By Dr. George R. Steber,* WB9LVI

Amateur-standard 8.5-second slow-scan television (SSTV) has the capability of conveying much higher picture definition than first-generation scan converters can process. A new generation scan converter, the VIDEOSCAN 1000 from Microcraft Corporation, is completely compatible with amateur-standard SSTV yet conveys all of the resolution inherent in the signal. Perhaps of greater interest is that it can also operate at scans of 17 and 34 seconds for truly spectacular high-resolution SSTV.

This article discusses certain technical aspects of high-resolution scan conversion, including the impact on picture quality and the reasoning for the added scan periods. To begin, a short review is given of some of the significant historical developments and their effect on SSTV signal standards and picture resolution.

The age of slow-scan television began in 1958 when a young engineering student, Copthorne Macdonald, realized his dream of reducing a wide-band television signal to a narrow bandwidth signal that could be sent over a voice-grade communication system.[1] Macdonald spent a number of years in perfecting the system.[2-4] His persistence and that of other dedicated amateurs finally paid off, and after considerable experimentation, field tests and a number of petitions to the FCC, slow scan was permitted on the ham bands as part of the incentive licensing plan in 1968.[5]

The SSTV system that evolved was essentially a method of conveying low-resolution images over a 3-kHz-bandwidth voice channel. Each picture was composed of about 128 scan lines transmitted at a horizontal rate of 15 lines per second (15 Hz). Thus, 8.5 seconds were required to complete a single picture transmission.

Some method of storing the 8.5-second picture was needed so that a complete frame could be viewed at one time. The only inexpensive method available at the time was the long-persistence P7-phosphor radar tube. The yellow afterglow of P7 was used as a short-term memory that enabled one to view a whole picture. Unfortunately the afterglow was very weak and faded in a few seconds, and the pictures had to be viewed in a darkened room.

In the March 1975 issue of *QST*, I described an all-digital method for storing SSTV pictures that could be viewed on an ordinary TV monitor.[6] The "LVI" scan converter revolutionized SSTV since it allowed ordinary TV equipment to be used. Its main attraction was that it produced a bright stationary image that could be frozen on the screen of a TV monitor.

The basic idea was to divide each SSTV line into 128 picture elements (pixels), quantitize the brightness to 16 levels for each pixel and store the digitized image in a memory that could be read out at fast-scan TV rates. This procedure required a

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[1]Notes appear on p. 13.

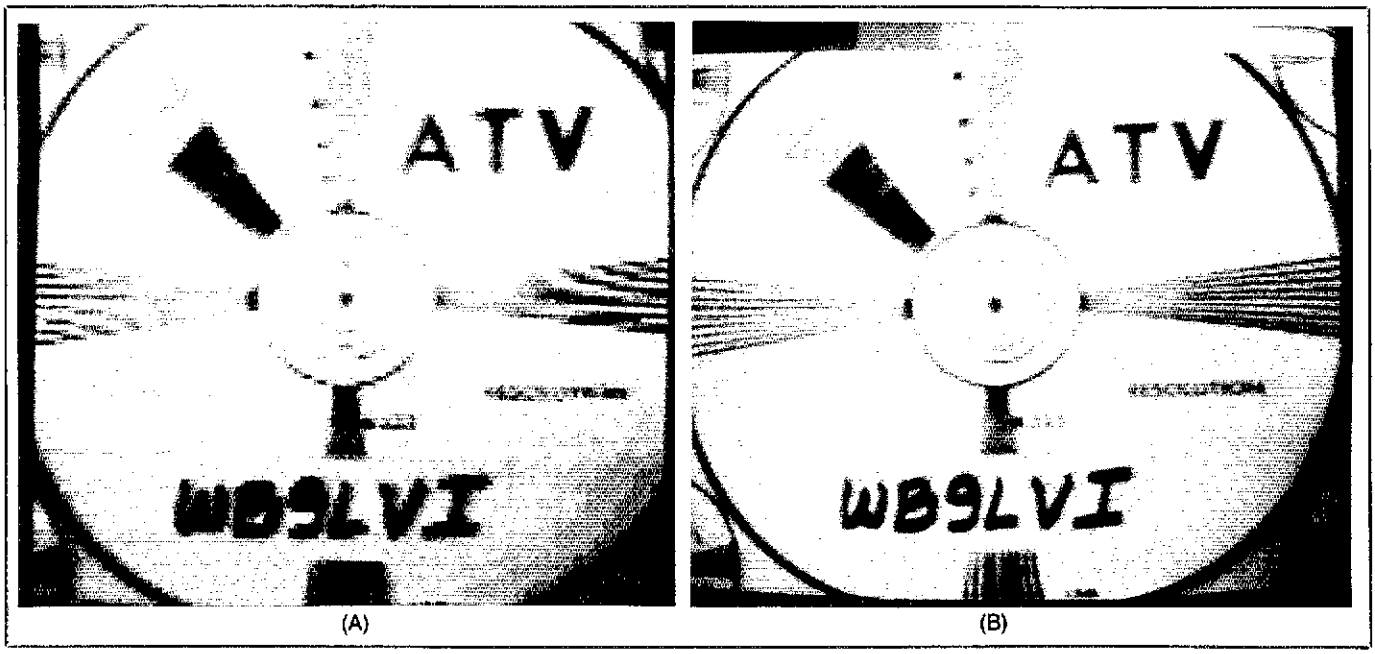

Fig. 1 — Resolution test chart comparing conventional 128 pixel by 128 line by 16 gray level picture at A, and 256 pixel by 256 line by 64 gray level high-resolution SSTV picture at B.

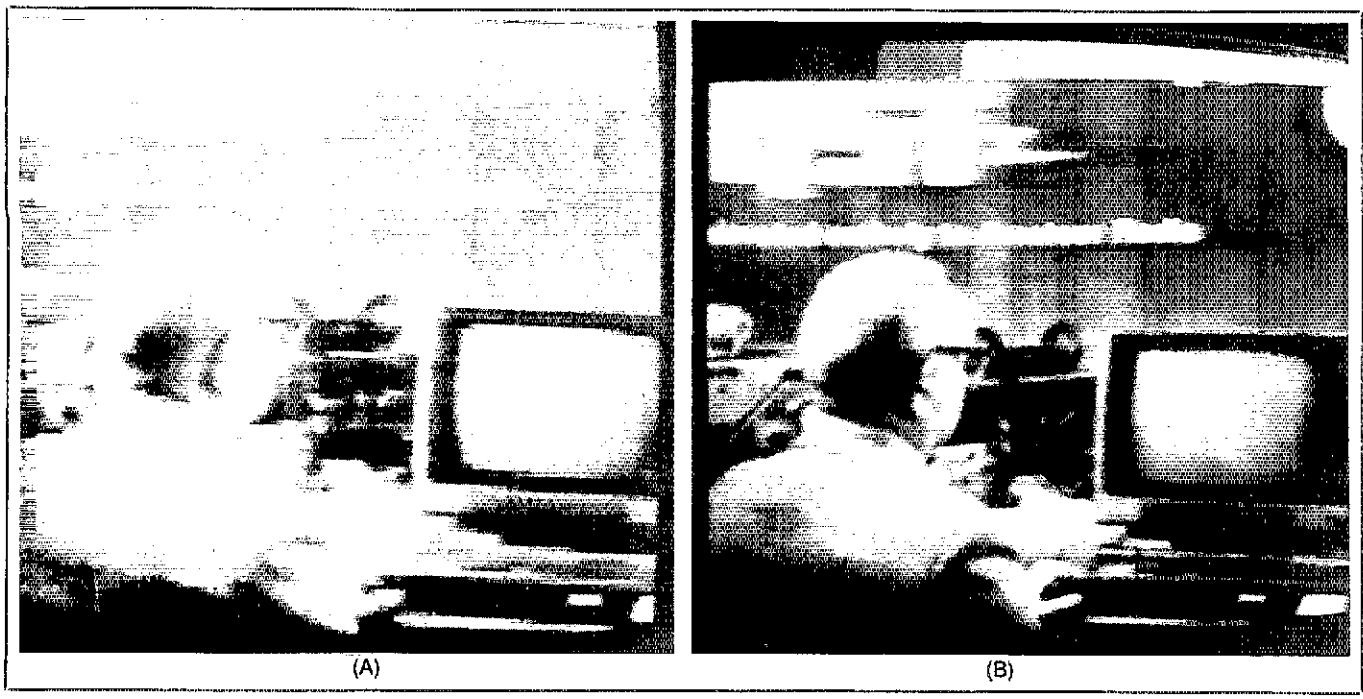

Fig. 2 — Example of pictures comparing 128-pixel by 128-line-by-16-gray-level image at A and 256 pixel by 256 line by 64-gray-level-high-resolution image at B. (These pictures were taken of the cover of May 1981 *QST.*)

large (for 1975) digital memory of 128 × 128 × 4 = 65,536 bits.

Because only 128 pixels were used on each line and only 16 levels of gray (4 bits) were used, it was recognized immediately that digital SSTV was inferior to P7 type SSTV in terms of resolution and gray scale. Nevertheless, the thrill of viewing SSTV on a regular TV set outweighed these factors and over 150 "LVI" scan converters were built world-wide based on the *QST* article. Some time later Robot Research introduced their popular model 400 scan converter, which used the same allocation of digital memory. The model 400 has since become the de facto standard for SSTV because of its wide acceptance by amateurs.

High-Resolution SSTV

With the introduction of VIDEOSCAN, pictures with greatly improved resolution may be conveyed via SSTV. This increase in picture fidelity is possible mainly because of the availability of low-cost, high-density digital memory ICs and other LSI ICs which allow more pixels of the SSTV picture to be processed and stored.

VIDEOSCAN uses 256 pixels per TV line with each pixel quantitized to 64 levels of gray (6 bits). In most cases this degree of quantitization produces a digital video signal that is almost indistinguishable from an analog signal. Objectionable contouring effects (false edges) associated with 16 gray levels are therefore eliminated.

It is important to realize that SSTV signals are bandwidth limited by the equipment used for transmission. In order for SSTV to be transmitted, the SSTV signal is converted to an fm subcarrier so that sync pulses and low frequencies in the SSTV signal can be transmitted. This fm subcarrier corresponds to 2300 Hz for white, 1500 Hz for black and 1200 Hz for sync. Since these frequencies fall within the voice spectrum, SSTV can be transmitted and received using conventional ssb equipment.

Analysis of the fm SSTV spectrum is complex. Assuming an ssb audio filter of 3 kHz, it can be shown that the maximum recoverable video frequency will be near 1.1 kHz. This corresponds to about 134 lines of horizontal resolution. Theoretically speaking this resolution could be achieved with 134 samples (pixels) per SSTV line. However, in practice, sampling a signal at the minimum rate generally leads to problems in accurately reconstructing the signal.

It has been shown experimentally that a standard 8.5-second analog SSTV signal can be closely reproduced with 170 pixels per line.[1] In other words, at least 170 samples per SSTV line should be employed to equal the resolution of the analog system. Thus the early "LVI" scan converter was somewhat deficient in taking only 128 samples. VIDEOSCAN, on the other hand, over-samples each SSTV line since 256 pixels per line are used. This oversampling enhances the detail on each line and more accurately reproduces the video waveform.

The designers of VIDEOSCAN realized that higher resolution SSTV would benefit from having more TV lines than 128. A logical choice would be to use 256 TV lines. Experiments confirmed that 256-TV-line pictures were vastly superior to 128-TV-line pictures, but they need a longer transmission time. Thus, if 256 TV lines are transmitted at 15 lines per second, this yields a vertical frame period of 17 seconds. Hence, 17 seconds was chosen as an alternate frame period for VIDEOSCAN. This period produces a very excellent picture in a reasonably short time. The overall resolution is considerably better than the early 128-pixel by 128-line scan converters.

To fully utilize the digital memory of 256 pixels per line, a slower horizontal rate is needed. Some amateur and commercial SSTV gear has used a half-rate 7.5-Hz horizontal rate. This doubles the transmission time from 17 to 34 seconds. After extensive experimentation it was found that this would be an excellent choice for a second frame period for high-resolution SSTV. There are several reasons for this choice. Foremost is the fact that the half-speed line rate of 7.5 Hz and the resulting 34-second transmission time produces exceptionally sharp, clear TV images that are comparable to commercial-quality TV images. This is true because band limiting problems in the fm modulation and demodulation process associated with the 15-Hz line rate are no longer a problem. In other words, more of the picture detail can pass through the ssb and SSTV filters when the lower line rate is used.

Of equal importance, this 34-second mode has the ability to cut through QRM, QSB (multipath) and QRN much more effectively than 8.5- or 17-second pictures. This is probably true because the interference usually represents a small percentage of each video line. Another advantage is that 34-second pictures recorded on cassette tape are affected less by wow and

Table 1
Comparison of Conventional SSTV Standards to High-Resolution SSTV Standards

	8.5-Second SSTV	*17-Second SSTV*	*34-Second SSTV*
Horizontal line rate	15 Hz	15 Hz	7.5 Hz
Horizontal samples	128/256 pixels	256 pixels	256 pixels
Vertical period	8.5 seconds	17 seconds	34 seconds
Number of TV lines	128	256	256
Horizontal sync pulse	5 ms	5 ms	5 ms
Vertical sync pulse	30 ms	30 ms	30 ms
Sync subcarrier freq.	1200 Hz	1200 Hz	1200 Hz
Black subcarrier freq.	1500 Hz	1500 Hz	1500 Hz
White subcarrier freq.	2300 Hz	2300 Hz	2300 Hz
Overall transmission bandwidth	300-3000 Hz	300-3000 Hz	300-3000 Hz

flutter of the recorder than 8.5- or 17-second SSTV pictures. Hence, an ordinary cassette recorder can be used to store high-quality SSTV pictures with little degradation.

Table 1 compares regular SSTV standards to the high-resolution standards employed by VIDEOSCAN. As can be seen, the 17-second mode is very similar to regular 8.5-second SSTV with the exception that 256 TV lines are used. The transmission of the additional lines serves only to double the transmission period. A 17-second picture, if copied on existing SSTV gear, will show only one-half of the picture and it will appear elongated. The 34-second picture mode is achieved by reducing the line rate to half, which effectively doubles the transmission time.

Comparison of Pictures

To illustrate the difference that can be expected when using these SSTV modes, a series of SSTV pictures were made as shown in Figs. 1 and 2. The original pictures were captured using a TV camera and a scan converter. It should be noted that resolution loss will be caused in the pictures by band limiting in the fm modulation and demodulation process. Additional resolution loss will be caused by the limited audio bandwidth (300 to 2700 Hz) of most modern ssb transceivers (the fm sidebands extend beyond 3000 Hz for 8.5- and 17-second SSTV). Also the photographic and printing processes have degraded the images.

Figs. 1A and 2A were generated on a WB9LVI scan converter using 128 pixels × 128 lines × 16 gray levels. The remainder of the pictures were generated and displayed using the VIDEOSCAN high-resolution scan converter.

As can be seen, the 8.5-second pictures on the original WB9LVI scan converter lack resolution and exhibit quantitization effects. The pictures made on VIDEOSCAN offer a much higher degree of clarity in all modes and have the capability of presenting very detailed images.

On-the-air experience has shown that 34-second pictures are much clearer and sharper than corresponding 17-second pictures. This advantage is offset somewhat by the two-to-one ratio of transmission times. The operator therefore has a choice: Send a 17-second picture with good resolution or a 34-second picture of very good resolution. In all likelihood, other factors such as signal strength, QRM and other band conditions will influence the decision of which high resolution mode to use at any given time.

Final Remarks

This article has presented some of the philosophy behind the VIDEOSCAN standards for high-resolution SSTV. It is hoped that these standards will prevail in the amateur community to promote growth and experimentation in the fascinating field of SSTV.

High-resolution SSTV now offers us the capability of conveying very high quality images in a few seconds almost anywhere in the world that we can talk to via ssb. This should open new horizons to Amateur Radio operators and help promote friendliness and goodwill in the international amateur fraternity.

Notes

[1]Macdonald, C., "A New Narrow-Band Image Transmission System," *QST*, August and September 1958.
[2]Macdonald, C., "S.C.F.M. — An Improved System for Slow-Scan Image Transmission," *QST*, January and February 1961.
[3]Macdonald, C., "A Compact Slow-Scan TV Monitor," *QST*, March 1964.
[4]Macdonald, C., "A Slow-Scan Vidicon Camera," *QST*, June, July and August 1965.
[5]"Slow Scan TV in the U.S. . . ." and ". . . And Slow Scan in Canada," Happenings of the Month, *QST*, September 1968, p. 80.
[6]Steber, G., "Slow-Scan to Fast-Scan TV Converter," *QST*, March and May 1975.
[7]DeWitt, B., "In Focus," *CQ*, September 1976, p. 30.

George R. Steber, Ph.D., P.E., is a professor of electrical engineering and computer science at the University of Wisconsin-Milwaukee, where he teaches courses in integrated circuits, microprocessors and control systems theory. He is a registered professional engineer in the state of Wisconsin. Dr. Steber earned his Ph.D. in electrical engineering from Marquette University in 1969. His research interests are in the areas of image processing, control systems and computer simulation, where he has published several IEEE papers.

A Life Member of the ARRL, Professor Steber has been licensed as WB9LVI since 1972. He currently holds an Advanced class license. Along with W9NTP, W3EFG, W9LMD and W6MXV, WB9LVI has been authorized by the FCC to conduct A5 and F5 (experimental medium-scan television, 36-kHz bandwidth) transmissions on the 10-meter band. Dr. Steber resides in Mequon, Wisconsin, with his wife, Gloria, and two children. In his spare time he enjoys slow-scanning on 15 meters, racquetball, photography, astronomy and visiting hamfests.

Strays

HAM HISTORY ON DISPLAY IN SOUTH AFRICA

☐ One-and-a-half years ago, there was no museum of Amateur Radio equipment in South Africa, so Julius Lieberman, ZS6AF, decided to start one in his ham radio store in downtown Johannesburg. Since then, he has managed to accrue an interesting variety of transmitters, receivers, tubes, QSL cards and other items of days past that are on display for the public. Of particular interest is the collection of telegraph keys, which now numbers about 100 types.

All items in the museum have been donated or lent by hams. Each is labeled with the ham's name and call sign, and the history of the item is recorded and filed. Donations or loans of telegraph keys are welcomed and appreciated. For more information, write to ZS6AF at J. Lieberman Electronics, P.O. Box 8628, Johannesburg 2000, South Africa.

Next Month in QST

September: the month we've all been waiting for. While aboard the STS-9 Space Shuttle, Astronaut W5LFL will conduct the first Amateur Radio operation from space. Beginning shortly after the launch, now scheduled for September 30, the operation will put Amateur Radio in the public eye as it's never been before. Elsewhere in this, the August, issue you learned how to have the best chance of garnering a W5LFL QSL card. Next month's *QST* will tell you about Owen Garriott himself: how he got into Amateur Radio, and how he became a NASA Astronaut. Fittingly, NBC Science Editor Roy Neal, K6DUE, who has covered hundreds of space shots over the years, conducted the interview.

In a related story, learn what went on behind the scenes to obtain approval for the historic Amateur Radio operation aboard STS-9.

Also in September *QST:*

- for RTTY enthusiasts, construction details for an all-electronic Amateur Radio modem (terminal unit), and an account of an experimental graphics system.
- an adapter that allows a 2-meter transmitter to control a transceive-type Mode A satellite station.
- an update on AMSAT-OSCAR 10, the long-awaited "Phase III" spacecraft that will soon be humming with QSOs.

The Boom-Excited Beam Antenna

Here's a great way to put your beam on 10 MHz or below — and cheaply, too!

By Edward C. Pienkowski,* W8BEB

With decreasing sunspot activity and the recent addition of the 30-meter band, many of us would like to operate in the lower frequencies. And we'd prefer to do this without any extra strain on our antenna budget. Why can't we use an existing Yagi?

Yagi as Dipole

Boom-exciting is a way of operating a Yagi on an additional band. It can be done without impairing correct operation on the original band. This technique is accomplished by treating the boom and the elements at the ends of the boom (usually the reflector and "last" director) as a half-wave dipole. The half wavelength is measured from the tip of the director to the boom, along the full length of the boom to the center of the reflector and then out to the end of the reflector.

My 20-meter beam is a HyGain 204BA (Fig. 1). The length from one end of the director to the boom is 15 ft 7 in. The boom is 26 feet long, and it is 18 feet from the boom to one end of the reflector.[1] This gives a total length of 59 ft 7 in., slightly less than the ideal 64 to 68 ft for a 40-meter dipole. But there is another consideration: The configuration is not a straight piece of aluminum. Electrically, it is an end-loaded dipole, in which the boom acts as the center of the dipole and the reflector and director serve as end-loading elements. It may be resonant on 40 meters, even though it is physically a little shorter than it "should" be. End loading gives it the extra electrical length that is needed.

Although end loading may not sound familiar, perhaps top loading does.[2] Top loading a vertical antenna requires placing a horizontal wire or grid work at the top of the antenna so the vertical section can be made shorter. It loads the antenna and shortens the required height by increasing the capacitance between the top of the vertical section and the ground. In our case, end loading is essentially the same thing, and results from bringing the dipole ends closer together — increasing the mutual

*40 W. 938 Whitney Rd., St. Charles, IL 60174

[1]Notes appear on page 15.

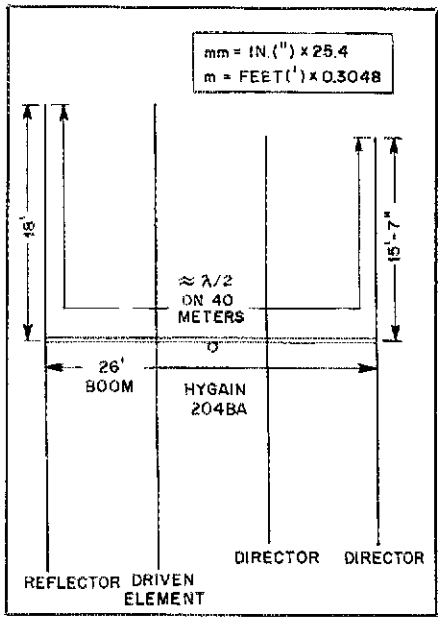

Fig. 1 — Example of how another amateur-band resonant length may be found on a Yagi.

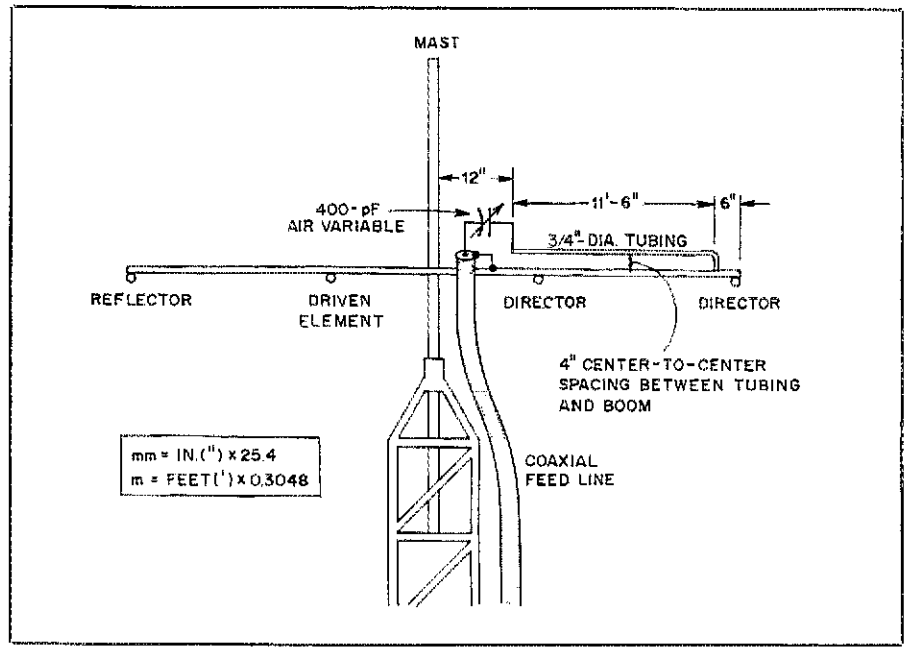

Fig. 2 — Gamma-match feed system used on the author's 20-meter Yagi.

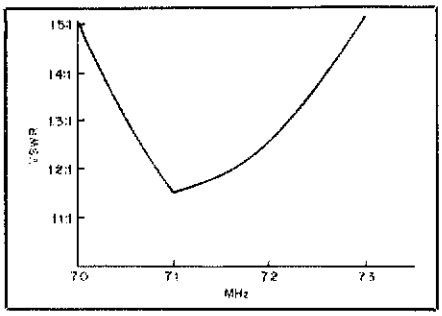

Fig. 3 — SWR curve of the boom-excited 20-meter Yagi when used on 40 meters.

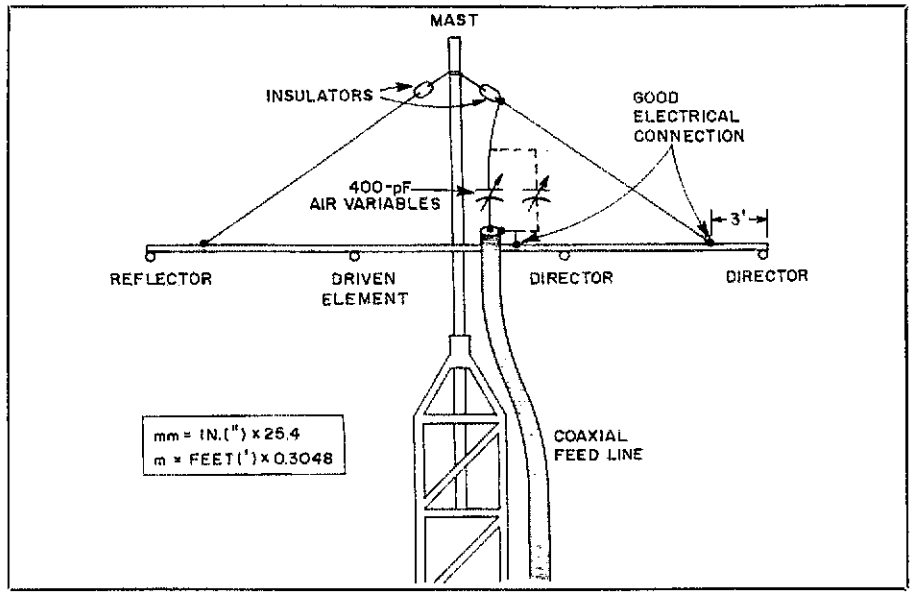

Fig. 4 — Alternative method of boom-exciting a Yagi, using the boom truss wire as part of the matching system. Capacitor in dashed lines is optional, but may be necessary to obtain a match in some systems.

capacitance. Additional capacitance or loading is provided by the other elements in the array.

Feed Systems

The first question is, "What's the best way to feed power to this system?" It's impractical to place an insulator in the center of the boom. Instead, I mounted a gamma match along the boom (Fig. 2). A delta match, a T match or an omega match should also work well.[3] I chose a gamma match because it was a simple technique for my antenna. The resulting SWR curve is shown in Fig. 3.

Another feed method that works well on a 1/12 scale model of my Yagi is to insulate the boom truss wires at the point where they attach to the mast. One of these is connected to the center conductor of the coaxial feed line through a series capacitor, as shown in Fig. 4. To obtain a good match, it is necessary to adjust the length of the truss wires and the series capacitor value. Also, care must be used in making a good electrical connection between the boom and the truss wire. On some antennas, a second capacitor connected in an omega match configuration might help. Experimentation will help determine your individual needs.

If your antenna is not the correct physical length for the desired band, the electrical length can be adjusted in various ways. One way is to insulate the outermost elements from the boom. Inductors (to lengthen) or capacitors (to shorten) the antenna can then be connected between the boom and the center of the elements. (I believe it is possible to develop a combination of coils and capacitors allowing operation on more than one additional frequency.)

Antenna length can also be adjusted through the addition of boom extensions. Based on a 1/12 scale model, a 10-foot extension on each end of the boom makes my Yagi resonant on 30 meters. This provides a trapless tribander on 20, 30 and 40 meters!

Another possibility involves adding boom extensions for 80-meter operation. Because of size limitations, this would unfortunately involve the use of lossy loading coils.

Performance

As with all antennas, there are some disadvantages to the boom-excited beam. Maximum radiation from this antenna is at right angles to that from the Yagi. There is no front-to-back ratio because the antenna is essentially a dipole, which has little gain at best. On the other side of the ledger, the boom-excited beam *does* have nulls off the ends (as all dipoles do), and they can be pointed at an interfering station. On my antenna, the nulls are about 15 to 20 dB in depth. Because there are no lossy loading coils and the antenna has heavy conductors (the boom) in the area of maximum antenna current, efficiency seems to be very good. The full length of the antenna is at one height, which helps to lower the overall radiation angle. On-the-air tests have yielded good signal reports.

All these techniques are bound to raise questions about boom-exciting other types of antennas. I am sure this is possible, but it will take some experimenting to obtain the answers. If you decide to experiment, I'd be anxious to learn of your results. Perhaps additional findings will be reported in a future issue of *QST*.

If nothing else, after boom-exciting your antenna you can impress your friends by telling them you now have a 4-element, trapless 40-meter beam. Well, that's sort of true....

Notes

[1]mm = in. × 25.4; m = ft × 0.3048.

[2]G. Hall, ed., *The ARRL Antenna Book*, 14th ed. (Newington: ARRL, 1982), Chapter 2, p. 25.

[3]*The ARRL Antenna Book*, Chapter 5.

Strays

INTERCONTINENTAL PACKET RADIO A REALITY

☐ A successful two-way 10-meter packet-radio QSO took place between the U.S. East Coast and New Zealand on May 27, 1983 at 2300 UTC. Tom Clark, W3IWI, in Maryland, and Ian Ashley, ZL1AOX, near Auckland, made this record 13,850-km contact. The Tucson Amateur Packet Radio (TAPR) terminal node controller (TNC) was used at both ends, running at a speed of 1200 baud and using amateur AX.25 link-level protocol. On May 30, Vern Riportella, WA2LQQ, joined W3IWI and carried on a one-hour contact at 600 baud.

THANKS, ICOM

☐ Icom America, Inc., recently donated an IC-251A 2-meter multimode transceiver to the ARRL Technical Department. This unit will be used as an i-f source for developing and evaluating transverters for a book on uhf and microwaves. The ARRL expresses its gratitude for this gift.

AMTOR PHOTOS NEEDED

☐ The ARRL Technical Department is looking for good-quality B & W photographs of AMTOR stations, especially homebuilt ones. Those accepted would be used in *QST* or the *Handbook*, with appropriate photo credit given. Please send the photos to the attention of Paul Rinaldo, W4RI, at ARRL Hq.

A Low-Cost, Modular Approach to RTTY

Here's a helpful review of several approaches to setting up for RTTY operation. Included is a description of an expandable, low-cost system.

By J. Robert Witmer,* W3RW

After operating receive-only RTTY for approximately 18 months with a surplus model 15 teleprinter, the '15 developed a problem: It just "hammered away" at the same spot on the paper. The family wasn't upset at all. More than once they had complained about the noisemaker in the basement!

In trying to determine the cause of the problem, I became convinced of two things: Whoever designed the model 15 must have been an excellent mechanical engineer, and it was time to upgrade my equipment! To simplify matters, I made a list to help me evaluate the various new equipment options available, and decided to use the TU (terminal unit) I had on hand. The following areas were taken into consideration during the evaluation: cost (should be low), noise (had to be family compatible), capability of using multiple speeds, complexity, ASCII operation as well as Baudot, information storage and display-unit features. I forged ahead with these items in mind.

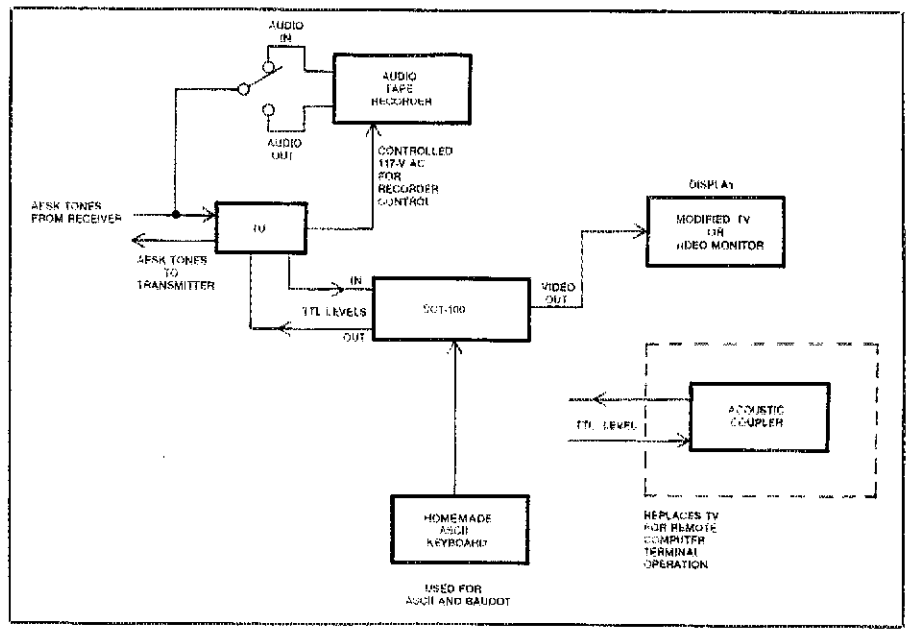

Fig. 1 — Block diagram of the XITEX RTTY station setup.

Surplus TTY Gear

The teleprinter models 15, 19, 28, 33 and some newer units are available in most areas. It's hard to beat this type of gear for cost. In fact, I got my original model 15 (completely reconditioned) for $20! However, these teleprinters, especially the models 15 and 19, are quite noisy. Multiple-speed capability is mechanically possible only if spare gears are on hand and you want to be changing them each time you shift speeds.

From an electrical standpoint, it is hard to get much simpler equipment. Mechanically, it's tough to get much more complex! This may be a trade-off that depends on your personal talents. ASCII/Baudot capabilities are singular. You can have one or the other — not both with the same machine.

By nature, this type of equipment provides a permanent record ("hard" copy on paper and/or punched tape) of transmitted and received information. The ability to see many lines of copy is an advantage. This is almost impossible to duplicate except with another type of printer or with a multiple-page CRT-type terminal (very expensive, usually!).

Dedicated Terminals

New multifunction terminals are appearing all the time. Since the majority of this equipment is new, it usually carries a pretty high price tag. But, the noise is gone! Most operation takes place using a video monitor, a TV set or an LED/LCD readout. One of the biggest advantages of this type of system is the flexibility. ASCII, Baudot and Morse code capabilities are usually inherent or available as options. Permanent message storage requires the use of an external printer (extra cost, noisy) or an audio tape recorder. Transmitted and received messages can usually be recorded on audio tape using the afsk tones.

The display device characteristics vary greatly from unit to unit. Some display only one line or several characters of text at once. Those that use an external TV set are usually limited to a maximum line display of 32 to 40 characters because of TV-set bandwidth limitations. This can be a problem since many operators send 60 to 70 characters per line. If you plan on copying pictures, the shorter line length is a definite disadvantage. If a video monitor is used, the wide bandwidth permits displaying up to 24 or more lines of 80 or more characters each.

Home Computers and Interfaces

These combinations are popular. If you already have a personal computer, this may not be a bad approach, but the interfaces

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and software can be as expensive as the computers! The machine noise is gone, but where the family is concerned, you may still have a problem — you'll have to fight for the use of the computer!

Most interface/computer combinations allow the use of multiple speeds as well as ASCII, Baudot and Morse transmission and reception. ASCII, after all, is the "natural language" of the computer (the ZX81/Timex 1000 being a notable exception)! The message storage and display features are similar to those offered by the dedicated terminals.

Another Approach

After reviewing the options, I wasn't happy with the overall results. The two-part article by Greg McIntire, AA5C, in January and February 1982 *QST*, reminded me of an ad I had seen in *QST*.[1] After digging through back issues, I found it — the advertisement was for a single-card video terminal, manufactured by XITEX Corporation, the SCT-100.[2]

The SCT-100 is designed to operate as an ASCII/Baudot terminal with two speeds for each mode: 110- and 300-baud ASCII, and 60- and 100-wpm Baudot. The display provides for sixteen 64-character lines.

There are three SCT-100 versions: an assembled unit, a kit and a semi-kit. With the latter, you supply some commonly available parts. The manual, while not Heathkit® style, is excellent and provides detailed interfacing and operational information. Since this is a type of dedicated terminal, the noise is nonexistent. I've found having a separate (from the home computer) unit to be a big plus. With the SCT-100, I use an audio tape recorder to store the information. The 64-character line is compatible with most RTTY operation. A summary of the evaluation is shown in Table 1.

Table 1

Evaluations Summary

Surplus Teleprinters

Advantages: Low cost, permanent storage capability, good readout.
Disadvantages: Mechanically complex, single speed, single mode, noisy.
Comments: May be the best choice for single-mode operation.

Dedicated Terminals

Advantages: Speed/mode flexibility.
Disadvantages: High cost, variable readout parameters, lack of permanent storage capabilities in some units.

Personal Computer Adapter

Advantages: Speed/mode flexibility.
Disadvantages: Relative high cost, requires use of personal computer, variable readout parameters, lack of permanent storage capabilities with some units.

XITEX System

Advantages: Relatively low cost, speed/mode flexibility, reasonable display.
Disadvantages: Lack of permanent storage (can be overcome by use of a tape recorder).

Station Description

How I integrated the SCT-100 into my station can be seen in Fig. 1. I use the TU described in the December 1980 and November 1981 issues of *QST*.[3,4] It is TTL-compatible and interfaces nicely with the '100. The autostart relay contacts are used to switch the 117-V ac supply to the audio tape recorder. This allows me to keep a record of TTY activity on a local 2-meter fm repeater when I'm out of the shack.

The SCT-100 board has provisions for 20-mA, four-wire full duplex, 60-mA two-wire simplex, modified RS-232C and TTL level I/O. I use the TTL level I/O for interfacing with the TU. For computer/telephone accoustic coupler use, the modified RS-232 output is employed. The '100 has an onboard 5-V power supply that requires only 8-V ac for operation. A 5-V transformer in series with one-half of a 6.3-V transformer secondary provides this potential. For powering an ASCII keyboard, 5 V at up to 250 mA is available at the I/O connector. Selection of ASCII/Baudot operation and speed is made by opening or grounding two points on the I/O connector by means of a switch.

Both composite video and discrete vertical and horizontal sync outputs are available to simplify the interfacing. The composite video output of the SCT-100 complies with EIA standard RS-170. It consists of a 1.5-V peak video signal and a 0.5-V peak sync pulse. This output drives a surplus video monitor. A modified TV set could also be used.[5,6]

It is possible to interface the SCT-100 with an unmodified TV set by using an rf modulator and feeding the rf to the TV antenna input. This is not recommended since the bandwidth required for the 64 × 16 display (64 characters per line, 16 lines displayed) is somewhat beyond that of most TVs. While this will not damage the TV set, the resulting picture may be distorted and unusable.

I use a "homebrewed" keyboard that provides the required 7-bit ASCII, TTL-compatible, positive-true logic signal with a strobe signal. One feature of the SCT-100 is that the LTRS and FIGS shift characters are generated automatically when a respective lower- or upper-case entry is detected.

Acquiring the Equipment

One advantage of this versatile system is that it can be expanded as your budget permits. A suggested first step would be to acquire the semi-kit. After all the other parts are gathered, the SCT-100 can be assembled and used for receive-only operation with a modified TV set. Next, add a keyboard for full transceive operation. A printer and a tape recorder could subsequently be added if desired.

These suggestions should help you decide on how to assemble your Baudot/ASCII RTTY station. Come on and join in on the RTTY fun!

Notes

[1]G. McIntire, "Designing a Microprocessor-Based RTTY Speed and Code Converter," *QST*, Jan. and Feb. 1982.
[2]XITEX Corporation, P.O. Box 2952, Garland, TX 75041.
[3]M. DiJulio, "A State-of-the-Art Terminal Unit for RTTY," *QST*, Dec. 1980, p. 20.
[4]J. Witmer, "Auto-start and Anti-space for the State-of-the-Art TU," *QST*, Nov. 1981, p. 28.
[5]S. Bach, "Converting a Bargain TV to a Video Monitor," *Kilobaud Microcomputing*, Jan. 1980.
[6]T. Loos, "Use Your Television Set as a Video Monitor," *BYTE*, Feb. 1979, p. 46.

Strays

QEX: THE ARRL EXPERIMENTERS' EXCHANGE

☐ The July issue of *QEX* featured:

• "Continuous RTTY Reception on the ZX80," by Kenneth Heitner, WB4AKK. This full-length feature article includes full program listings and interface circuitry.

• "Data Communications," by Dave Borden, K8MMO, a discussion of packet-radio network design issues. Also included is a report on U.S.-to-New Zealand packet-radio contacts between ZL1AOX and W3IWI, and subsequently with WA2LQQ.

• In an editorial, Steve Place, WB1EYE, describes the successful launch of AMSAT-OSCAR 10 and gives initial orbital elements.

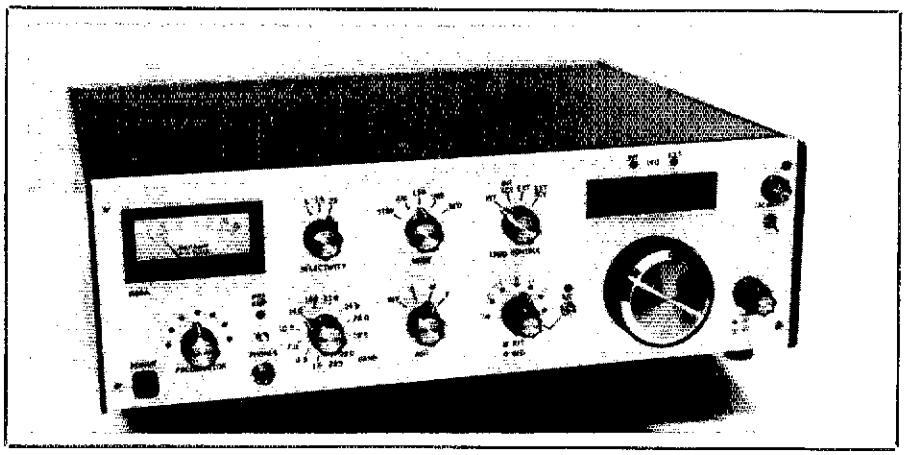
WANTED: ELMER-OF-THE-YEAR NOMINEES

☐ Nominations for the 1983 Elmer of the Year award are being sought by the Northern New Jersey Chapter of the QCWA. Nominations may be made by any licensed radio amateur in northern New Jersey, and eligible candidates must be licensed amateurs who reside in the area. Send your nomination, which should be accompanied by a statement (500 words or less) detailing why the person is worthy of the award, to Gordon S. Gregory, N2IN, 8 Winding Way, Denville, NJ 07834, tel. 201-627-4426. September 1, 1983 is the deadline for receipt of nominations.

I would like to get in touch with...

☐ anyone who has any information on the "Morris Coil Winder." Robert Morris, WB6MUM, 116 South F St., Lompoc, CA 93436.

A Structured Engineering Approach to the Design and Construction of Electronic Equipment



Want to increase the chances of success of your next construction project? Then follow these guidelines!

By Jerry L. Pittenger,* K8RA

Some hams believe that "homebrew" construction and experimentation are activities of the past. You hear about the ever-increasing price (and decreasing availability) of electronic components, and about the proliferation of "appliance operators." Also, many amateurs seem overwhelmed by the fast-moving pace of electronic technology. All this has convinced many would-be builders that constructing a quality station component such as a receiver or a transmitter is beyond their abilities.

Yet, the amateur journals are packed with technical information and construction articles. Hamfests sport flea markets with literally millions of electronic components at reasonable prices. This is proof that more than just a few amateurs are actively building and experimenting with electronic equipment. "Homebrewing," these hams have found, gives a feeling of pride that builds confidence and even a sense of self-respect.

You don't have to be an electronics engineer to build high-grade equipment. The real ingredients are the courage to get started, use of a well-structured approach to accomplish the task and the perseverance to complete the project.

Most hams don't start with a box of parts and quickly produce a quality product. A first-class job involves research, planning, more planning, design and plenty of testing. No miracle design and construction techniques exist that eliminate errors and problems. However, the approach presented here can help circumvent many of the problems that the inexperienced — or seasoned — builder is likely to confront.

The proposed approach is adapted from state-of-the-art Computer Application Engineering (CAE) principles to which I have been introduced in my profession. This technique provides a structured, well-organized approach to bringing a complex construction project to a level that can be understood easily. I have used these principles to construct many projects ranging from keyers, linear amplifiers and antenna-matching networks to a respectable solid-state receiver. The results of some of these projects are shown in the accompanying photographs.

The steps involved in using this technique include

1) Define the system.
2) Design the system.
3) Plan and document testing.
4) Implement system components.
5) Test the system.
6) Test for acceptance.
7) Provide user education.

The system is interpreted as the electronic unit being constructed.

To illustrate the functions of each of the steps, the solid-state receiver shown in the accompanying photos is used as an example. It is an amateur-band (including the WARC frequencies), solid-state design that uses diode switching throughout. Emphasis is placed on sensitivity, selectivity and high dynamic range.

Define the System

First, define the requirements of the unit. In CAE terminology, this is referred to as "developing a functional specification." Many potentially good projects have gone astray because the builder didn't think clearly about the required features and document them, to make the unit acceptable. The result is usually a device that almost meets requirements, but with just enough missing to justify pitching the unit aside later on.

I spent more than three months researching the literature before designing this receiver. A more experienced person may be able to shorten the effort. Because of my inexperience in receiver design, however, I read all I could about receivers to make sure the requirements I defined were technically current and achievable. Reviewing the alternative operational features for any electronic project provides a shopping list of features from which to choose. This results in a unit that best meets an individual's needs.

The options must then be evaluated, based on added capabilities, cost, complex-

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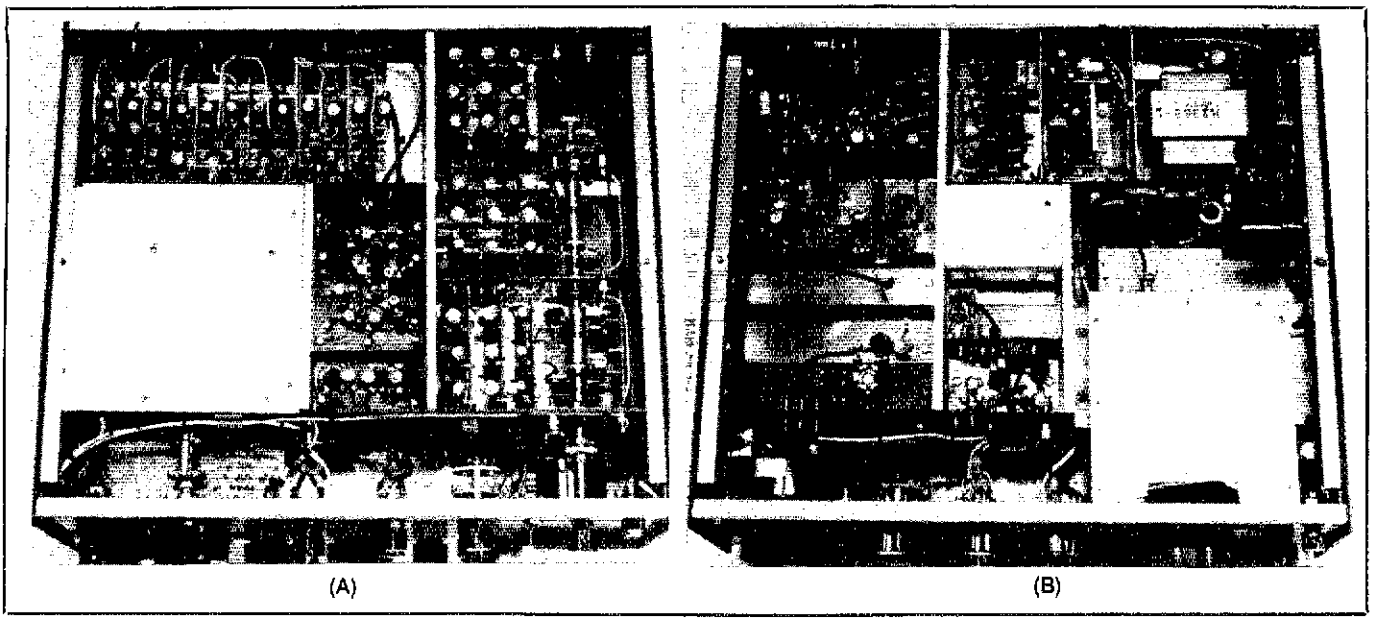


Bottom (A) and top (B) views of the homemade receiver.

ity, size, parts availability and any other constraints unique to a given option. Table 1 summarizes the specifications of the receiver. They emphasize "what" the unit should do, not "how" it will do it.

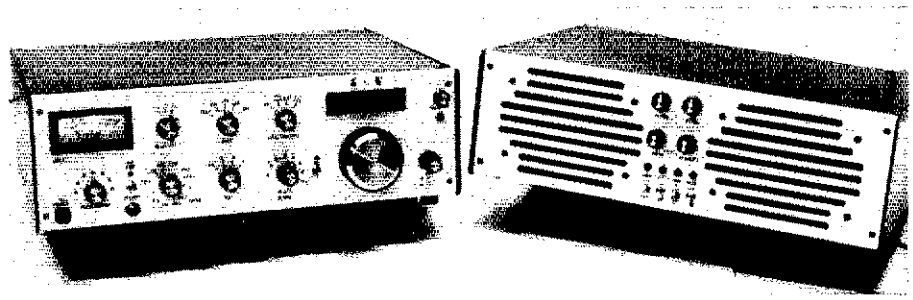
Design the System

Functional Design

This step translates the "what" into "how" it will be done. First, divide the unit into pieces. As in CAE, the division is carried out in steps: Divide the unit into major components, divide each major component into sections, and then subdivide these sections until they are small enough to be designed easily in detail. Each section should be small enough to be independent from other sections while serving a unique, identifiable function. I like to use the block-diagram approach for this process.

The method is best illustrated by an example. Fig. 1 shows the top-level block diagram for the receiver. This diagram is basic, but it provides a starting point. Then, each major component is broken down to the next level of detail. Fig. 2 shows the next level of refinement for the frequency-control module. Note that this module has been separated into several submodules. Fig. 3 shows the breakdown of the VFO module of Fig. 2. Similar diagrams were created for each module of Fig. 2. The refinement should go to the point where a set of simple submodules is defined, each performing an independent function. My recommendation is to separate a module into simple sections that you understand completely, and not go to extremes.

The bottom level of detail produces a set of lowest-level submodules that are referred to as the system "primitives." In Fig. 3, the VFO, buffer and amplifier are all primitives of the VFO submodule. Now, design the circuit for each primitive. This



The author's homemade receiver and speaker/filter unit. Notch, width and filter frequency controls are included on the latter.

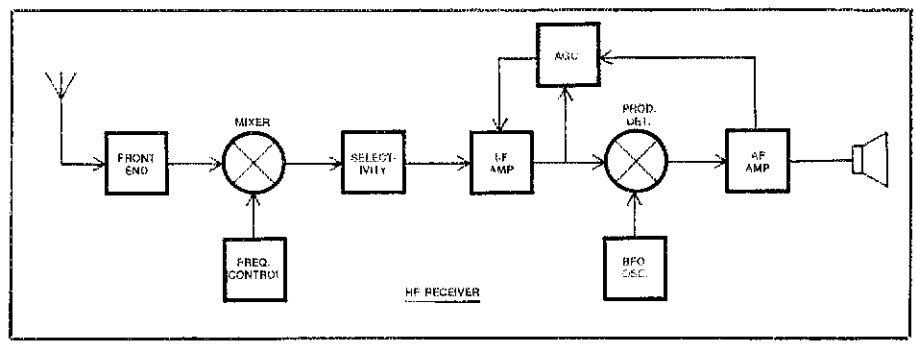


Fig. 1 — Block diagram of the receiver.

step may be nothing more than selecting a circuit from the available literature. On the other hand, you may develop your own circuit — something better than that which currently exists.

The simple circuits of the primitives combine to make the complete circuit of the project. Believe me, there are lots of parts in the example receiver! The complete schematic diagram is complex and would be nearly impossible to use in its entirety during construction of the receiver. When you look at the project as a simple set of much smaller subunits, however, complex projects become understandable and achievable.

Physical Design

You must also consider the physical design of the unit. Thought should be given to the physical appearance of the front and rear panels, as well as to how the modules fit together inside the unit. Few people are satisfied with an end result that works okay but looks like a piece of junk.

The original receiver front-panel design differed slightly from that of the final product. I mention this only to illustrate that

Table 1

Receiver Specifications

Frequency coverage:	28-30, 21-21.5, 18-18.5, 14-14.5, 10-10.5, 7-7.5, 3.5-4, 1.5-2 MHz.
Sensitivity:	0.5 μV for 10 dB S/S + N.
Selectivity:	Three optional filters, 2:1 shape factor at 6:60 dB points.
Dynamic range:	95 dB.
Noise floor:	−135 dBm.
Third-order input intercept point:	+5 dBm.
Frequency stability:	500 Hz from cold start to one hour later.
BFO:	Crystal-controlled on ssb; variable on cw.
Agc:	I-f derived, hang type.
Audio output power:	5-W minimum.
S meter:	Accurate within 20% with 6-dB/S unit calibration.
Transmitter interface:	Allow for mating with transmitter VFO control and split-frequency operation.
Power supply:	Internal.
Physical Specifications	
Appearance:	Compatible with existing station equipment. Cabinet dimensions (HWD): 5 × 17 × 14 in.†
Construction:	Modular, to allow for future experimentation.

†mm = in. × 25.4.

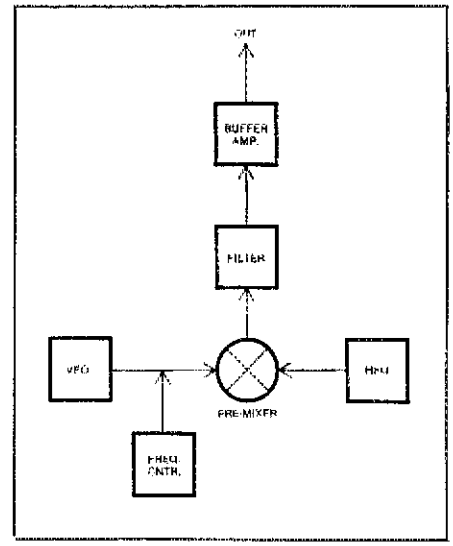


Fig. 2 — Breakdown of the frequency control module — the first step in simplifying the design approach.

the initial design is not sacred. The design is an iterative process throughout the life of the project. When it is advantageous or necessary to modify the design, do so. But always consider all the impacts of changes, and update the design documentation whenever changes are made.

Implementation Plan

In what order will the primitive submodules be built and tested? Try to capitalize on any advantageous sequence that allows easy module integration and testing. The plan used for the receiver is given in Table 2. Note that the sequence proceeds in reverse order from the speaker. After each submodule is constructed and tested independently, it is integrated with the other completed modules.

Table 2

Receiver Implementation Plan

1) Power Supply
2) Audio amplifier
3) BFO crystal oscillator
4) Variable BFO
5) Product-detector module
6) Post i-f crystal filter module
7) I-f amplifier
8) Agc module
9) Crystal filter
10) VFO
11) Frequency counter
12) HFO
13) VFO/HFO premixer
14) Premixer filter
15) Premixer buffer amplifier
16) Front-end mixer
17) Front-end tuned filters
18) Front-end preamplifier
19) Crystal calibrator

Design Documentation

All of the design data should be assembled to form a detailed design document. I usually assemble this information in a three-ring notebook. Take time to develop clear, precise diagrams, schematics and textual documentation, outlining why the final primitive designs were selected. Take careful notes and document literature references for future use. The design document provides guidance in the building phase, but it is even more valuable when something fails later on. One final recommendation: Keep the documentation current. When you get into the build/test phases of the project, it can be tempting to go forward and not take the time to change the documentation neatly as design changes are made. Avoid the pitfall!

This probably looks like a lot of extra work. I think this approach saves time. I am convinced that doing the detailed design on paper (where changes are easy to make) is worth the time invested. It avoids confronting such problems as not enough room inside the cabinet halfway into construction, trying to find room on the front panel for that extra switch you forgot, or mistakenly drilling holes in the front panel.

Plan and Document Testing

Careful consideration should be given to how the modules and completed unit will be tested. Writing a good test plan also provides the best possible design review. In designing and constructing electronic equipment, three levels of testing are recommended: module, integration and system.

The test plans are organized and documented prior to the building step. Two major pieces of documentation are required in any good test plan: The test-execution procedure and a list of the expected results. Writing good test plans is a difficult task, since it requires a designer to foresee problems.

Module Test Plan

A module is the lowest level at which testing is performed. The size and the number of modules are determined by the level of division performed in the system design step. Examples of modules in the receiver include the audio amplifier, the product detector, the i-f strip and the agc circuit. Consider the test plan (Fig. 4) developed for the product-detector module. Note that it includes the test setup, procedure and expected results. A plan similar to the example should be developed for each module identified in the Implementation Plan (Table 2).

Integration Test Plan

The second level of testing occurs during module integration. The tests should be defined in accordance with the Implementation Plan (Table 2) developed in the System Design phase. The objective of integration testing is to assemble one or more modules and test the assembly to ensure the modules work correctly together. (Remember, each module has been tested individually.)

The Integration Test Plan for the receiver is given in Table 3. RX MODULES lists all the receiver modules. PLAN defines where testing is to occur. For example, step 2 plans an integration test of the speaker, the audio power amplifier, the BFO crystal oscillator, the product detector and power supply modules. Note that these modules are completed in sequence for this test as defined in the Implementation Plan. For each integration test, a test procedure is developed. Fig. 5 outlines the test plan for step 2 of Table 3. Note that this includes a test-setup description, instructions on

Table 3

Receiver Integration Test Plan

RX Modules		*Plan*	
A)	Speaker	1)	A+B+O
B)	Audio power amplifier	2)	A+B+C+E+O
C)	BFO crystal oscillator	3)	A+B+D+E+O
D)	BFO variable oscillator	4)	A+B+D+C+E+O
E)	Product detector	5)	F+G+O
F)	I-f amplifier	6)	A+B+C+D+E+F+G+O
G)	Agc	7)	A+B+C+D+E+F+G+H+O
H)	Crystal filter	8)	I+J+K+O
I)	HFO crystal oscillator	9	I+J+K+L+O
J)	Premixer	10	A+B+C+D+E+F+G+H+I+J+K+L+O
K)	VFO	11)	A+B+C+D+E+F+G+H+I+J+K+L+M+O
L)	Front-end mixer	12)	All — proceed to System Test
M)	Front-end filters		
N)	Crystal calibrator		
O)	Power supply		

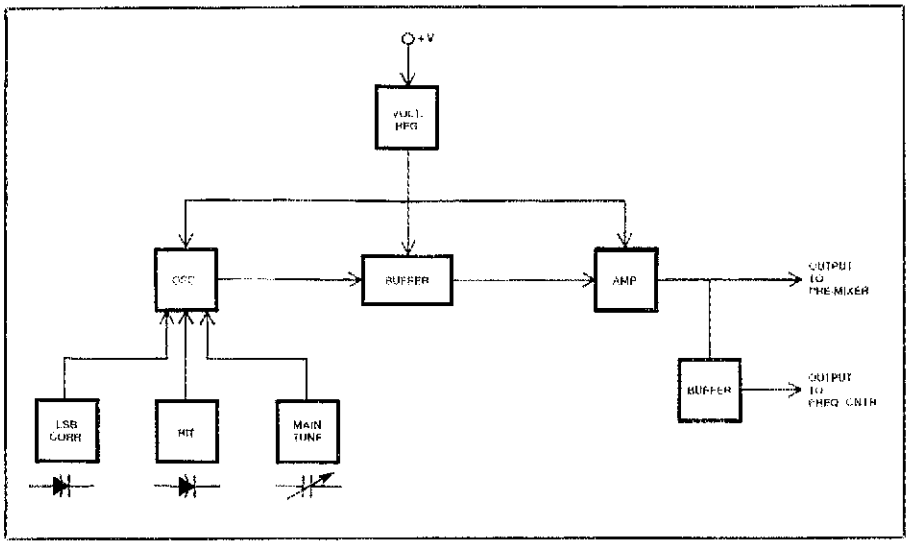


Fig. 3 — Taking the VFO module of Fig. 2 down to the "primitive" level.

how to perform the test and the expected results.

System Test Plan

Once the modules have been integrated, the last test recommended is a System Test. This is performed to verify that the complete unit meets all peformance requirements defined in the System Specification (Table 1). A procedure should be formulated for each specification. Fig. 6 defines a test for the receiver noise floor.[1]

Remember, test plans don't have to be complex. A frequency-stability test for the receiver was easy to do because the included 10-MHz band provided WWV as a frequency reference. Do what is necessary with the minimum effort to evaluate total system performance.

Test Plan Comment

Development of module, integration and system-test plans may seem tedious. Experience has shown that the time is well spent and provides a way to avoid problems early in the project when they are easiest to find and fix. Since all test results are documented, if problems occur later or if the unit is modified, the tests can be repeated. The results can be compared to those of earlier tests to see if the problem is cured, or if the modifications have caused any detrimental effects.

[1]*The Radio Amateur's Handbook*, 60th ed. (Newington: ARRL, 1983), p. 16-41.

System Components Implementation

This step is often referred to as the building step. We are finally at the point of assembling and testing the modules. By now, approximately half the project time should have been expended. Unfortunately, it is usually the starting point for those who do not use a structured engineering approach. This lack leads to false starts, construction errors and total project disasters.

Implementation should be a noncreative step, all major decisions having already been made. The modules are constructed in the defined sequence (i.e., Table 2). Each module should be tested as it is completed.

I offer no construction advice except to observe neatness. I used glass-epoxy board with silver termination pins in a point-to-point wiring technique. Other construction methods might include perf-board, terminal strips or etched board. Whatever technique you feel most comfortable with can be used.

The following advice is based on many hours of experience with some successes and some failures:

- Take your time — don't rush!
- Follow your planned design. You spent a lot of time planning the project, so use the product of your efforts.
- Use only quality components. Don't take shortcuts.
- Don't settle for "almost working." Several small problems add up to a big problem during system integration.
- Expect problems. Redesign when necessary.

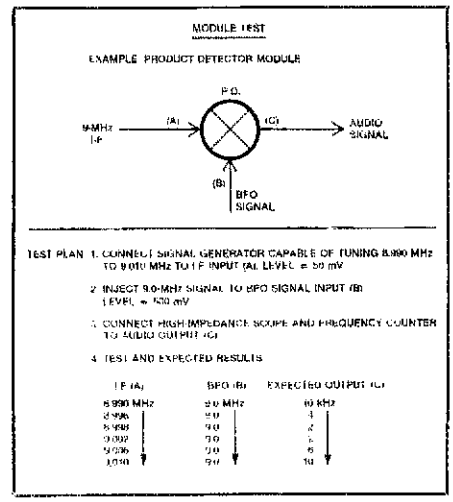


Fig. 4 — Module test plan for the product detector.

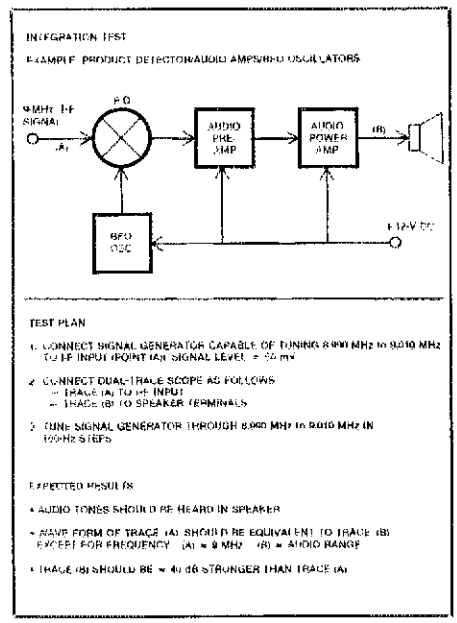


Fig. 5 — The Integration Test plan. At this stage, a number of modules are interconnected and tested as a unit.

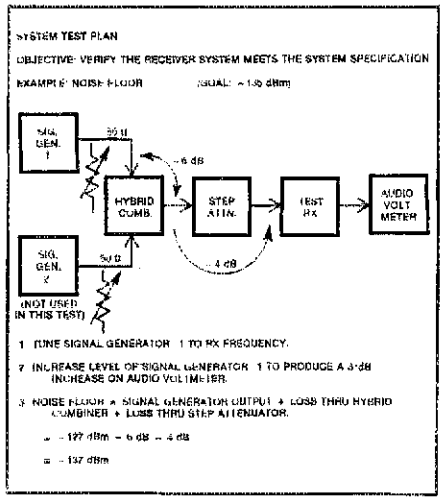


Fig. 6 — The System Test plan for the receiver. In this case, the receiver noise floor is being measured.

- Document any design changes.
- Keep organized notes.

As modules are completed, integrate them accordingly. The test results should be documented and included with the test plans for future reference. Temptations to move fast, skip testing and slight documentation are strong at this point. Don't succumb! Do the job methodically with all the diligence and attention to detail that you are capable of, and that the project deserves. The results will be rewarding.

System Test

The purpose of this test is to verify that the system (in this case, the electronic device) meets the operational and physical specifications defined in the System Specification (Table 1). With a proper design approach and the extensive module and integration testing performed, I've discovered few major problems during system testing. When changes are needed, carefully design the changes, implement them and update all documentation. Changes in the system design may require iteration of some integration tests to ensure that the overall system performance has not been disturbed. The module and integration test results provide a reference point to evaluate the performance gains or degradations resulting from changes.

Acceptance Testing/User Training

Acceptance testing is usually performed upon delivery of a unit to a customer. The test is executed according to a plan developed by the customer. Because in our case the builder is also the user, the system test also serves as the acceptance test.

User Training is not required. The idea of a person not knowing how to use the device after defining, designing, building and testing the unit is not a realistic consideration.

Some Final Comments

The CAE techniques appear to add more work to a given project. But I feel strongly that using such an approach will save time by avoiding the problems and pitfalls so often encountered. In fact, the use of this or some similar method could make the difference between achieving complete success or total failure with a construction project. I make this claim based on personal experiences, and from seeing the problems and results others have had.

I encourage you to try the approach, in its entirety or partially. I will be interested in hearing about possible improvements to the approach and any experiences you may have in constructing your electronic equipment. QST

Strays

INTERESTED IN LEAGUE-SPONSORED INSURANCE?

☐ The Membership Affairs Committee is studying the feasibility of offering League members additional insurance programs beyond the present ARRL Ham Radio Equipment and Club Liability programs. Participation in the plans would be voluntary. Please take a few moments to complete the following questionnaire and send it to the Membership Services Department, ARRL, 225 Main St., Newington, CT 06111. Make a photocopy if you'd like, or simply answer the questions on a separate piece of paper. Thanks.

I would be interested in the following types of voluntary insurance plans, should the ARRL offer them:

	I am interested	I am not interested
1) Life Insurance	☐	☐
2) In-Hospital Insurance (to pay a fixed amount each day during hospitalization)	☐	☐
3) High-Limit Accident Insurance (to pay specified amounts for specific levels of injury due to accident)	☐	☐
4) Disability Income Protection	☐	☐
5) Excess Major Medical (to pay medical charges above a deductible of $15,000 to $25,000)	☐	☐
6) Major Medical (to pay medical expenses above a deductible of $500 to $1000 but with a maximum benefit of $20,000)	☐	☐

I do not believe the ARRL should sponsor insurance programs that have no direct relation to Amateur Radio. ☐

Please note: An expression of interest in no way binds you to a particular course of action. This survey is designed only to gauge membership interest in these insurance programs.

MAKING PATTERNS AND TEMPLATES TO SCALE

☐ Starting with this issue, all pc-board patterns and other templates requiring full-size reproduction that appear in *QST* are accompanied by a 1-inch (25.4-mm) scale. This will enable everyone concerned with the pattern to ensure it has been reproduced full size; simply place a ruler alongside the scale and compare the 1-inch markings. — *Paul K. Pagel, N1FB*

THANKS, KLM

☐ KLM Electronics, Inc., recently donated 143-150-14C and 420-450-18C 2-meter and 70-cm circularly polarized antennas to the ARRL Technical Department. These antennas will be used for satellite communications. The ARRL expresses its gratitude for this gift.

Last year, the Conde brothers, of Granger, Wyoming, came up with a unique Father's Day gift: As a surprise for their Dad, WA7USI, they prepared for and passed their Novice exams. Left to right are Wally, KA7OMP, Andy, KA7OGQ, and "CQ," KA7OGR. *(W1YL photo)*

New and Improved Formulas for the Design of Pi and Pi-L Networks

Published equations relating to the design of pi networks are often inaccurate where circuit operating Q is concerned. If Q is of primary consideration, use the equations in this article.

By Elmer A. Wingfield,* W5FD

This article introduces new formulas for the design of pi networks and pi-L networks. These new formulas permit the network to be designed based on the resistances to be matched and on the actual circuit operating Q value, Qo. Design formulas now in common use have only a partial circuit Q value as the circuit Qo. In many practical design cases the error involved in the usual formulas can be quite large and the resulting network will not perform as intended.

The pi networks, the pi-L networks and the resonant-L networks considered in this article are only those that are configured in the low-pass arrangement with the inductance as the series element and capacitors as the shunt elements, as shown in Fig. 1. This is the arrangement in which these circuits are invariably used in amateur rf applications. These networks, consisting of two, three or four reactance elements, have only one absolute requirement: At least one of the reactances must be of opposite sign to the others for a "match" or transformation of a load-end R2 to a desired R1 value at the source end. This is because resonance is impossible otherwise. A low-pass configuration is not required for a match, but it is the only arrangement of any importance in rf uses of such networks and therefore the only arrangement considered in this article.

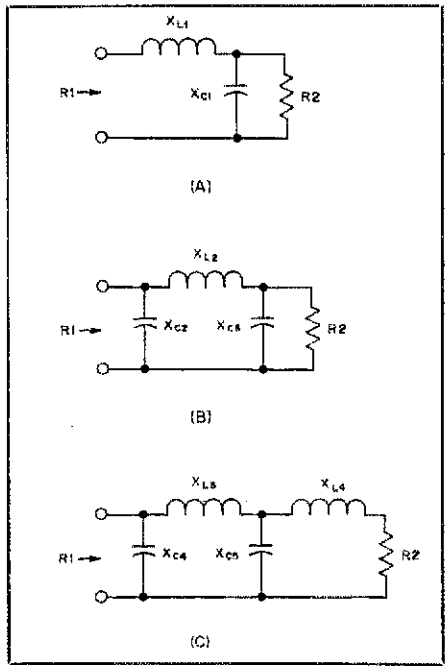


Fig. 1 — An L network is shown at A, a pi network is at B, and a pi-L network is at C. These networks are shown in the low-pass configuration. Each network matches the load, R2, to the input resistance, R1.

The "Old Standard" Equations

The old standard pi-network design formulas are those familiar equations that have been published in the ARRL *Handbook* for many years, in ARRL *Solid State Design,* the *ARRL Electronics Data Book,* the *Radio Handbook,* and Motorola *Application Note AN-267.* They appear in Fig. 2, and apparently were first published in the amateur literature by Pappenfus, WØSYF, and Klippel, WØSQO, in 1950.[1] The tabulated pi and pi-L network data given in current editions of the ARRL *Handbook* are based on these formulas, as is similar data in the *Radio Handbook,* 21st edition.

These old standard formulas are derived by treating the pi network as two back-to-back L networks. (The derivation is given in the appendix.) These formulas give correct results for the network reactance values for matching an R1 source end to the R2 load-end resistance. The only error involved is in assuming that the Q1 source-end L-network Q value used in the formulas is the resultant total pi-network Qo value. It is not, and understates the Qo value by the amount of the Q value of the load-end L network section, Q2.

$$R1 > R2$$

$$N > \sqrt{\frac{R1}{R2} - 1}$$

$$X_{C2} = \frac{R1}{N}$$

$$X_{C3} = \frac{R2}{\sqrt{\frac{R2}{R1}(1 + N^2) - 1}}$$

$$X_{L2} = R1\,\frac{N + \frac{R2}{X_{C3}}}{N^2 + 1}$$

Fig. 2 — The "old standard" equations for pi-network design. These equations are those appearing on page 54 of *The Radio Amateur's Handbook,* 55th (1978) edition, changed here for agreement with the reactance designations shown in Fig. 1. In these equations, N is the same as Q1 in the article.

In terms of the assumed formula Q1 value and the R1 and R2 to be matched,

$$Q2 = \sqrt{\frac{R2}{R1}(Q1^2 + 1) - 1} \qquad \text{(Eq. 1)}$$

This is the error involved in taking Q1 as the Qo value, since Qo = Q1 + Q2. The error becomes progressively greater as the ratio R1 to R2 becomes lower. For R1/R2 = 1, the error is 100%, as Qo equals

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[1]Notes appear on page 29.

2 × Q1. The error is greater for R1 × R2, a common arrangement in matching the required R1 load resistance of rf transistor amplifiers to the usual 50-ohm R2 load.

If the R1-to-R2 ratio is moderately high, say 20 to 1 or higher, then the error in taking Q1 as the circuit Qo will be relatively small. Therefore the old standard formulas may be used for the design of pi-network output tuning circuits for the usual tube-type rf amplifiers. For example, for a pi-network design of R1 = 2500 ohms, R2 = 50 ohms and Q1 = 12, the actual Qo will be 13.38 instead of 12, and this error is unimportant. This design would be representative for a pi network for rf linear amplifiers operated at the 2-kW peak level at a plate voltage of 3000 V or so, as is common for current amateur-band linear amplifiers. About the worst case for an amateur tube-type design would be four sweep tubes in parallel requiring a plate-load resistance on the order of 400 ohms. Then, with a formula Q1 entry of 12 and a 50-ohm load, the actual network Qo would be 16.14 — too high, perhaps, but still workable.

The conclusion is that the old standard pi-network formulas provide satisfactory pi-network output tank coupling circuit designs for amateur tube-type rf amplifiers and have done so for more than 30 years. The Q1 value used for Q differs only moderately from the correct circuit Qo.

Unsatisfactory Q Results

The old standard formulas do not give satisfactory designs for Q-based pi-network circuits intended for the fixed-tuned input circuits of cathode driven (grounded-grid) rf amplifiers. The rf exciter normally requires a 50-ohm load, and the fixed-tuned pi-network circuit must match this R1 source end to the rf-amplifier cathode-driving impedance at the R2 load end. At a minimum this load is perhaps 50 ohms, and it may be as high as 100 to 150 ohms or so for some tube types and operating conditions. For the tubes currently popular for the amateur services — zero-bias triodes operated as grounded-grid Class B linear amplifiers — the cathode driving impedance will be in the range of 50 to 75 ohms when operated at the 2-kW-PEP level.

Since the input tuned circuit is fixed tuned to obtain a broadband response, the Q of the circuit is kept at the lowest level that will just provide an adequate "flywheel" effect. In practice, a Q of 2 to 3 is used. If the network is designed using the old standard formulas for the "best" case (where R1 = 50 ohms, R2 = 50 ohms and a Q of 3 is chosen), an actual circuit Qo of 6 will result. The error is 100%. The error will increase as R2 is larger than 50 ohms, as it usually is. Because of the higher than intended (or needed) Qo, the input circuit will not be sufficiently broadbanded, and solid-state broadband exciters may not be able to drive the amplifier to the full intended power level because of SWR turndown in the exciter. This might be the case especially on the relatively wide 75- and 80-meter band. These fixed-tuned-input pi networks should be designed using the formulas given later in this article.

As an example of the very large errors that can occur in the Qo value when pi networks having low R1/R2 ratios are computed by the old standard formulas, the first data entry in Motorola *AN-267* indicates a Q value of 1 for the network that matches an R1 of 1 ohm to the R2 load of 50 ohms.[2] The actual Qo for this network is 10.95, almost 11 times the stated Q value.

Pi-L Networks

The standard formulas are not suited for the design of pi-L networks in which the circuit Qo is an important factor, as it is in tube-type and other rf amplifiers. The reason for this is that in the pi-L the output load resistance, R2, is stepped up to an intermediate value, Rm. Rm becomes the load-end resistance value for the input-end pi-network section. Then, the ratio of R1 (source end) to Rm (load end) for the pi-network section is quite a bit lower than the R1-to-R2 ratio in a straight pi-network tank. The Qo of the pi- network input section of a pi-L will therefore have an added increment of Q caused by the lower ratio R1 to Rm. In addition, there is an added increment of Q from the output-end L network. The resulting error in assuming Q1 as the network Qo is large.

As an example of the large error involved, the pi-L tabulated data in Table 10 on page 6-31 of the ARRL *Handbook* (1979 and later editions) indicates a circuit Qo of 12 for the network data given. For that data, the true circuit Qo for the high end of the band varies from 19.47 for Z_{in} = 1500 ohms to 16.29 at Z_{in} = 8000 ohms. The errors are too large, and the networks given will have unnecessary additional losses because of the higher-than-optimum Qo of 12. In practice, the pi-L output tuning network would be expected to accommodate the line input variations for a line having an SWR of 2, at least. Tuning the network to match actual impedances that may be encountered could result in the pi-L network Qo value going well above 20. The old standard formulas should not be used for the design of the pi-network section of a pi-L tank network circuit.

Two sets of formulas and procedures are given later for the design of pi networks and pi-L networks. These procedures are based on the R1 and R2 to be matched and on the desired circuit operating Qo value. Both of the formula sets are simple algebraic formulas similar to the old standard formulas. They are equally simple and straightforward in use, but with the decided advantage of giving precisely correct results for all quantities.

It was noted earlier that the old standard Q-based pi-network formulas would provide satisfactory design for a pi-network output coupling circuit for most amateur tube-type rf amplifiers. Only a small-to-moderate error in the actual circuit Qo value will result. Since the new formulas given later are equally simple and straightforward, and since they give exact results for all quantities for any possible Q-based pi network, it is recommended that they be used for the design of all pi networks in which Q is a factor.

Gibson, G2BUP, published an article pointing out the Qo error in the old standard formulas and giving a graphical procedure for a correct pi-network solution.[3] This material was later reprinted in another publication.[4] In private correspondence in 1978, Gibson clearly demonstrated that the Q1 or input L-net-section Q value used in the pi-network formulas did not account for all of the stored energy or reactive power associated with the output capacitor, C2, or its equivalent capacitive reactance, X_{C2}. The actual circuit Q is given by

$$Qo = Q1 + Q2 \qquad \text{(Eq. 2)}$$

or

$$Qo = R1/X_{C1} + R2/X_{C2} = X_L/Rs \qquad \text{(Eq. 3)}$$

where

Rs is the series equivalent resistance value of the parallel-to-series conversion of the R2 and X_{C2} components.

The standard pi-network formula Q error was also noted by Whyman, W2HB, and by Kajii, JA1FG.[5,6] Kajii gave a graphical design procedure to obtain a pi-network solution based on the correct value of the circuit Qo. The graphical design procedures have the limited accuracy and the limited range of variables inherent in charts and graphs. The algebraic formula methods do not have these limitations.

The algebraic formula procedures given below as Procedure 1 and Procedure 2 are intended so the user can simply plug in the network R1, R2, and Qo values and crank out the network reactance values. Use of Procedure 1 or Procedure 2 is at the choice of the user. The formulas and procedures are simple to use, but close attention must be paid to circuit-element designation including subscripts and superscripts. This is particularly so in the pi-L-network solution, which has the added L network to account for.

To avoid the clutter involved in adding too much detail in the procedures, some preliminary background basic ac circuit material is shown in the appendix. This includes the series-to-parallel and parallel-to-series conversion formulas. An addition to these results provides a resonant circuit, including a resonant L network, which is the

basis for deriving the old standard back-to-back L-net-derived pi-network formulas that are given. The fundamental energy-related Q is shown for the circuits for circuit components involved.

Of the two new procedures and formula sets given here, either will yield precisely correct design of pi networks and pi-L networks as used in amateur practice. This first set is based on an adaptation of the standard Q-based back-to-back L-network derived formulas. The second set is based on an adaptation of the non-Q-based general matching pi-network equations given by Everitt.[7]

Procedure 1, Pi Network

1) Refer to Fig. 3 and select the desired Qo value. Qo must be selected to satisfy the following:

$$Qo^2 > \frac{R1}{R2} - 1 \text{ and } Qo^2 > \frac{R2}{R1} - 1$$

2) Compute Q1.

$$Q1 = \frac{R1 \cdot Qo - \sqrt{R1 \cdot R2 \cdot Qo^2 - (R1 - R2)^2}}{R1 - R2} \quad \text{(Eq. 4)}$$

3) Then,

$$Q2 = Qo - Q1 \quad \text{(Eq. 5)}$$
$$X_{C1} = R1/Q1 \quad \text{(Eq. 6)}$$
$$X_{C2} = R2/Q2 \quad \text{(Eq. 7)}$$
$$X_L = \frac{R1 \cdot Qo}{Q1^2 + 1} \quad \text{(Eq. 8)}$$

4) For the special case where R1 = R2, select a value of Qo greater than zero. Then

$$X_{C1} = 2 \cdot R1/Qo \quad \text{(Eq. 9)}$$
$$X_{C2} = 2 \cdot R2/Qo \quad \text{(Eq. 10)}$$
$$X_L = \frac{R1 \cdot Qo}{\frac{Qo^2}{4} + 1} \quad \text{(Eq. 11)}$$

Note: Eqs. 9 through 11 are valid only for the special case where R1 = R2.

Procedure 2, Pi Network

1) Refer to Fig. 3 and select the desired Qo value to satisfy the following:

$$Qo^2 > \frac{R1}{R2} - 1 \text{ and } Qo^2 > \frac{R2}{R1} - 1$$

2) Compute X_L.

$$X_L = \frac{Qo(R1 + R2) + 2\sqrt{R1 \cdot R2(Qo^2 + 4) - (R1 + R2)^2}}{Qo^2 + 4} \quad \text{(Eq. 12)}$$

3) Compute Q1 and Q2.

$$Q1 = \sqrt{\frac{Qo \cdot R2}{X_L}} - 1 \quad \text{(Eq. 13)}$$

Q2 = Qo − Q1, or

$$Q2 = \sqrt{\frac{Qo \cdot R2}{X_L}} - 1 \quad \text{(Eq. 14)}$$

4) Then,

$$X_{C1} = R1/Q1 \quad \text{(Eq. 15)}$$
$$X_{C2} = R2/Q2 \quad \text{(Eq. 16)}$$

Note: Eqs. 13 and 14 for determining Q1 and Q2 above are valid only for Procedure 2, using X_L from Eq. 12 and the variable values Qo, R1 and R2 used in Eq. 12.

The Pi-L Network

For the following discussion, refer to Fig. 4. Select the intermediate Rm value that is supplied by the output L net as the load for the input pi network. For example use $Rm = \sqrt{R1 \cdot R2}$ or other as appropriate within the requirement that R1 > Rm > R2. Then compute the L-net Q value.

$$Q_L = \sqrt{\frac{R_m}{R2} - 1} \quad \text{(Eq. 17)}$$

Then

$$X_{L2} = Q_L \cdot R2 \quad \text{(Eq. 18)}$$
$$X_p = Rm/Q_L \quad \text{(Eq. 19)}$$

Select the desired pi-L network Qo value. Next, compute the required pi-network-section Q value.

$$Qo_\pi = Qo - Q_L \quad \text{(Eq. 20)}$$

Use either the Procedure 1 or Procedure 2 pi-network formulas to compute the values for X_{C1}, X_{C2} and X_L for the pi network. Use the value specified for Rm as the value for R2 in the selected procedure. Also, use the Qo_π value for Qo. Note that the X_{C2} value obtained will be the X'_{C2} value in the pi-L network arrangement. Then,

$$X_{C2} = \frac{X'_{C2} \cdot X_p}{X'_{C2} + X_p} \quad \text{(Eq. 21)}$$

This equation yields the pi-L X_{C2} value. This completes the pi-L solution.

A program in BASIC for the Procedure 1 pi-network formulas is given in Table 1. Table 2 gives reactance values for a Qo value of 12 for pi-network tube-type tank circuits. The range of plate load resistances in Table 2 should cover most amateur requirements. Tables 3 and 4 show reactance values for cathode-driven tuned-input circuits for Qo values of 2 and 3 for a range of cathode drive impedances that should cover most requirements. The computer program and printouts are by Don Reaves, KC5JH.

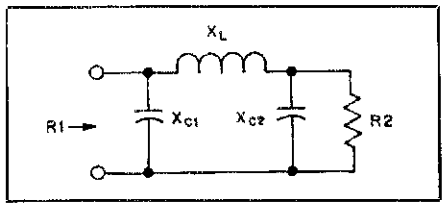


Fig. 3 — Pi-network component designations for use with Procedures 1 and 2. In these procedures, a single set of equations and conditions satisfies both step-up and step-down impedance transformations. Thus, it is unnecessary to specify R1 > R2 or R2 > R1. R1 is the source resistance, and R2 is the load resistance.

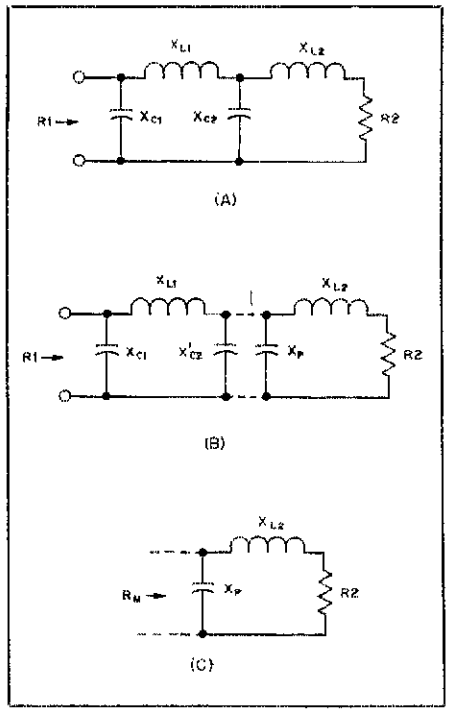


Fig. 4 — The pi-L network, A, is designed as a resonant L network, C, combined with a pi network, as shown at B. X_{C2} is determined through the use of an intermediate value, X'_{C2}, in parallel with Xp.

APPENDIX

For the circuit of Fig. 5A to be equivalent to that of 5B, it is assumed that

$$Z_{in}(A) = Z_{in}(B) \quad \text{(Eq. 22)}$$

$P_A(A) = P_A(B)$ = active (real) power (Eq. 23)

$P_X(A) = P_X(B)$ = reactive power (Eq. 24)

and

$$\frac{Rp}{Xp} = \frac{Xs}{Rs} = Q = \frac{\text{reactive power}}{\text{active power}} \quad \text{(Eq. 25)}$$

$$P_A(A) = I^2Rs = \frac{E^2Rs}{Rs^2 + Xs^2} = P_A(B) = \frac{E^2}{Rp} \quad \text{(Eq. 26)}$$

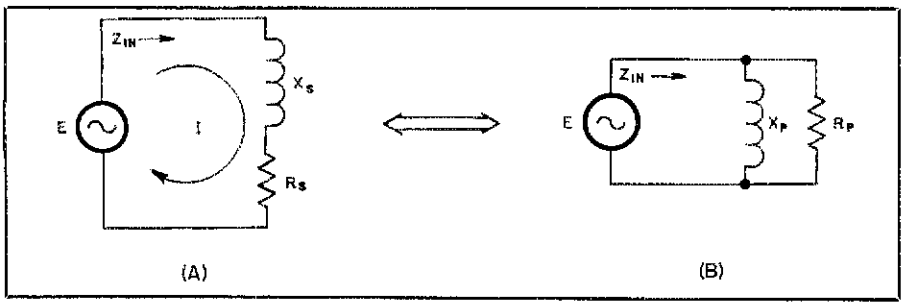


Fig. 5 — A series circuit, A, and its parallel equivalent, B. For the same value of Z_{in} in both drawings, Xs is not equal to Xp, and Rs is not equal to Rp.

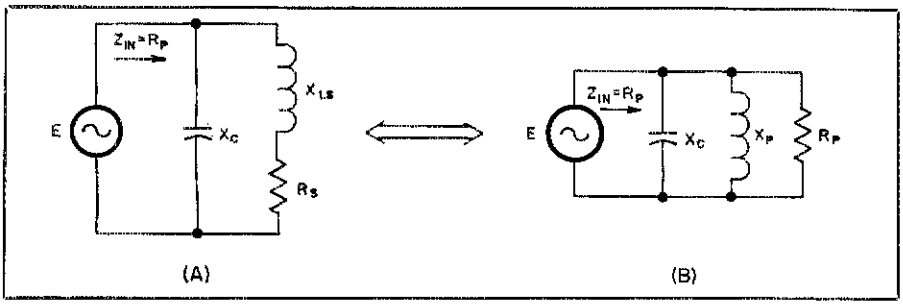


Fig. 6 — The resonant L network is shown at A. At B is the parallel-equivalent circuit.

Therefore,

$$Rp = \frac{Rs^2 + Xs^2}{Rs} = Rs\left[1 + \left(\frac{Xs}{Rs}\right)^2\right] = Rs(Q^2 + 1) \quad \text{(Eq. 27)}$$

$$P_X(A) = \frac{E^2 Xs}{Rs^2 + Xs} = P_X(B) = \frac{E^2}{Xp} \quad \text{(Eq. 28)}$$

Therefore,

$$Xp = \frac{Rs^2 + Xs^2}{Xs} = \frac{Rs}{Q} + Q \cdot Rs = \frac{Rs(Q^2 + 1)}{Q} = \frac{Rp}{Q} \quad \text{(Eq. 29)}$$

From the first terms of Eqs. 27 and 29,

$$Rp \cdot Rs = Xp \cdot Xs \quad \text{(Eq. 30)}$$

From Eqs. 25 and 27,

$$Rs = \frac{Rp}{1 + \left(\frac{Rp}{Xp}\right)^2} = \frac{Rp \cdot Xp^2}{Rp^2 + Xp^2} \quad \text{(Eq. 31)}$$

And from Eq. 25 and 29,

$$Xs = \frac{Rp^2 Xp}{Rp^2 + Xp^2} \quad \text{(Eq. 32)}$$

These formulas are for series-to-parallel and parallel-to-series equivalent conversions.

Now see Fig. 6. The series circuit, A, and its parallel equivalent, B, are made parallel resonant by adding a capacitive reactance X_C of a magnitude equal to Xp in shunt, as shown. At the resonant frequency, fo, the circuits appear to the generator as a purely resistive impedance, Z_{in} = Rp. The Q remains the same as before the addition of X_C.

$$Q = Rp/Xp = X_{LS}/Rs \quad \text{(Eq. 33)}$$

where X_{LS} = Xs in Fig. 5.

The circuit of Fig. 6A is the resonant L net. This circuit is redrawn in Fig. 7 with the circuit elements redesignated for convenience to use in developing the "standard" Q-based pi-network formulas that follow.

$$Q = R1/X_{C1} = X_{L1}/Rs \quad \text{(Eq. 34)}$$

$$R1 = Rs(Q1^2 + 1) \quad \text{(Eq. 35)}$$

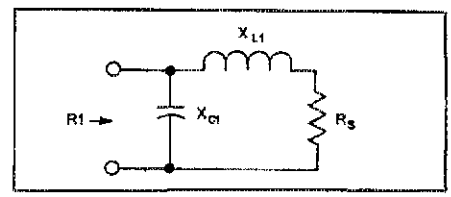


Fig. 7 — The resonant L network, redrawn from Fig. 6A.

where R1 > Rs. Other alternate forms are

$$Q1 = \sqrt{R1/Rs - 1} \quad \text{(Eq. 36)}$$

$$X_{L1} = \sqrt{R1 \cdot Rs - Rs^2} = \frac{Q1 \cdot R1}{Q1^2 + 1} \quad \text{(Eq. 37)}$$

$$X_{C1} = R1\sqrt{Rs/(R1 - Rs)} = Rs\,(Q1^2 + 1)/Q1 \quad \text{(Eq. 38)}$$

In the L net, R1 must be greater than Rs. That is, the shunt reactance element is placed in shunt with the larger of the resistances to be matched.

The pi network is divided into two back-to-back L nets, as shown in Fig. 8. Rs is not a physical resistor, but is rather a virtual resistance. It is the transformed value of R2, the load-end resistance value, and is the value of resistance required to afford R1 at the input or source-end L network for the Q1 value selected.

The standard pi-network Q-based formulas follow. Select the Q1 value. Then,

$$X_{C1} = R1/Q1 \quad \text{(Eq. 39)}$$

At the input end in Fig. 8A,

$$Rs = \frac{R1}{Q1^2 + 1} \quad \text{(Eq. 40)}$$

And at the output end,

$$Rs = \frac{R2}{Q2^2 + 1} \quad \text{(Eq. 41)}$$

Table 1
BASIC Program for Designing a Pi Network Using Procedure 1

```
100 REM  PINET4
110 REM Q BASED FORMULAS PER W5FD FOR CALCULATING PI-NETWORK REACTANCE
  VALUES
120 X1=0:X2=0:XL=0:R1=0:R2=0:QO=0:Q1=0:Q2=0
130 INPUT "R1";R1
140 INPUT "R2";R2
150 INPUT"QO";QO
160 IF (R1*R2*QO)<=0 THEN PRINT "Not a pi network": GOTO 340
170 REM  SPECIAL CASE WHERE R1 = R2
180 IF R1=R2 THEN X1=(2*R1)/QO:X2=(2*R2)/QO:Q1=QO/2:XL=(R1*QO)/Q1*Q1+1):GOTO 280
190 IF ABS((QO*QO+1)-(R1/R2))<.01 THEN PRINT "L network": GOTO 340
200 IF ABS((QO*QO+1)-(R2/R1))<.01 THEN PRINT "L network":GOTO 340
210 IF R1/R2>QO*QO+1 THEN PRINT "No solution":GOTO 340
220 R2/R1>QO*QO+1 THEN PRINT "No solution":GOTO 340
230 Q1=(R1*QO - SQR(R1*R2*(QO*QO) - (R1-R2)*(R1-R2)))/(R1-R2)
240 Q2=QO-Q1
250 X1=R1/Q1
260 X2=R2/Q2
270 XL=(R1*QO)/(Q1*Q1+1)
280 PRINT "R1 = ";R1
290 PRINT "R2 = ";R2
300 PRINT "QO = ";QO
310 PRINT "X1 = ";X1
320 PRINT "X2 = ";X2
330 PRINT "XL = ";XL
340 PRINT: RUN
```

Table 2

Pi-Network Calculations for Tube-Type RF Amplifiers

R2 = 50 ohms, Qo = 12

R1	X_{C1}	X_{C2}	X_L
1500	145	31	166
1550	149	31	170
1600	153	32	175
1650	158	33	179
1700	162	33	184
1750	166	34	188
1800	171	34	193
1850	175	35	197
1900	179	36	201
1950	184	36	206
2000	188	37	210
2025	190	37	212
2050	192	37	215
2075	194	38	217
2100	197	38	219
2125	199	38	221
2150	201	39	223
2175	203	39	226
2200	205	39	228
2225	207	39	230
2250	209	40	232
2275	212	40	234
2300	214	40	236
2325	216	41	239
2350	218	41	241
2375	220	41	243
2400	222	42	245
2425	224	42	247
2450	227	42	249
2475	229	42	251
2500	231	43	254
2525	233	43	256
2550	235	43	258
2575	237	44	260
2600	239	44	262
2625	241	44	264
2650	244	45	266
2675	246	45	268
2700	248	45	271
2725	250	46	273
2750	252	46	275
2775	254	46	277
2800	256	47	279
2825	258	47	281
2850	260	47	283
2875	263	48	285
2900	265	48	287
2925	267	48	290
2950	269	49	292
2975	271	49	294
3000	273	49	296
3050	277	50	300
3100	281	51	304
3150	286	51	308
3200	290	52	312
3250	294	53	317
3300	298	54	321
3350	302	54	325
3400	307	55	329
3450	311	56	333
3500	315	57	337
3550	319	57	341
3600	323	58	345
3650	327	59	349
3700	331	60	353
3750	336	61	357
3800	340	62	361
3850	344	62	365
3900	348	63	369
3950	352	64	373
4000	356	65	377

From this,

$$\frac{R1}{Q1^2 + 1} = \frac{R2}{Q2^2 + 1} = \frac{R2}{1 + \frac{R2^2}{X_{C2}^2}} \quad \text{(Eq. 42)}$$

Table 3

Pi-Network Calculations for Cathode-Tuned Input Circuits

R1 = 50 ohms, Qo = 2

R2	X_{C1}	X_{C2}	X_L
50	50	50	50
55	53	52	52
60	55	55	55
65	58	57	57
70	60	60	59
75	63	62	61
80	66	65	63
85	68	67	65
90	71	69	67
95	74	72	69
100	77	74	71
105	81	76	72
110	84	78	74
115	88	80	76
120	92	83	77
125	96	85	79
130	100	87	80
135	105	89	81
140	110	91	83
145	115	93	84
150	121	95	85

Table 4

Pi-Network Calculations for Cathode-Tuned Input Circuits

R1 = 50 ohms, Qo = 3

R2	X_{C1}	X_{C2}	X_L
50	33	33	46
55	35	35	48
60	36	38	51
65	37	40	53
70	38	42	55
75	39	44	57
80	40	46	59
85	41	48	61
90	42	49	63
95	43	51	65
100	45	53	66
105	46	55	68
110	47	57	70
115	48	59	72
120	49	61	73
125	50	63	75
130	51	64	77
135	52	66	78
140	53	68	80
145	55	70	81
150	56	71	83

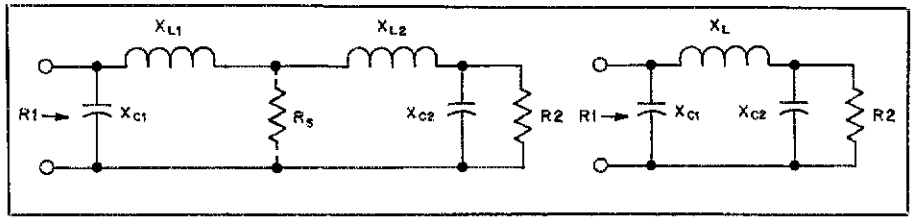


Fig. 8 — The pi network, B, may be considered as two back-to-back L networks, as shown at A. X_L equals the sum of X_{L1} and X_{L2}. Rs is a virtual resistance, not a real resistor.

Solving for X_{C2},

$$X_{C2} = R2\sqrt{\frac{R1/R2}{Q1^2 + 1 - R1/R2}} \quad \text{(Eq. 43)}$$

Further,

$$X_{L1} = Q1 \cdot Rs = \frac{R1 \cdot Q1}{1 + Q1^2} \quad \text{(Eq. 44)}$$

and

$$X_{L2} = \frac{Rs \cdot R2}{X_{C2}} = \frac{R1 \cdot R2}{(Q1^2 + 1)X_{C2}} \quad \text{(Eq. 45)}$$

$$X_L = X_{L1} + X_{L2} = \frac{R1 \cdot Q1 + R1 \cdot R2/X_{C2}}{Q1^2 + 1} \quad \text{(Eq. 46)}$$

Equations 39, 43 and 46 are the old standard Q-based pi-network formulas. They are in slightly different form from those of Fig. 2, but in fact are the same formulas. The formula for X_L may be put in a form involving only Q1, R1 and R2, by substituting the formula for X_{C2} (Eq. 43) into Eq. 46. There is no advantage in doing this, however, because the value of X_{C2} must be found from Eq. 43 and is already available.

These Q-based pi-network formulas give correct results for the network reactance values required for matching R1 to R2 and the selected input-end L-network Q1 value. It is to be noted, however, that this Q1 value is not the pi-network operating Qo value, which is

$$Qo = Q1 + Q2 = R1/X_{C1} + R2/X_{C2} \quad \text{(Eq. 47)}$$

A pi-network solution to match R1 to R2 at the Q value selected for Q1 is possible when $(Q1^2 + 1) > R1/R2$. When $(Q1^2 + 1) = R1/R2$, X_{C2} goes to infinity and an L-net solution results. As Eq. 27 indicates, $Q1^2 + 1 = R1/R2$ is the L-network equation. If $(Q1^2 + 1) < R1/R2$, no solution can be afforded. Note that both R1 and R2 must exceed Rs. (The $Q1^2 + 1 - R1/R2$ term of Eq. 43 takes care of this.)

Now we examine the Qo of pi networks and pi-L networks. In Fig. 9,

$$P_A = \text{active power} = E1^2/R1 = E2^2/R2 \quad \text{(Eq. 48)}$$

$$P_{X1} = \text{reactive power} = E1^2/X_{C1} \quad \text{(Eq. 49)}$$

$$P_{X2} = \text{reactive power} = E2^2/X_{C2} \quad \text{(Eq. 50)}$$

$$Q = \frac{2\pi \text{ max. energy stored}}{\text{energy dissipated per cycle}} = \frac{\text{reactive power}}{\text{active power}} \quad \text{(Eq. 51)}$$

$$Q_\pi = \frac{\frac{E1^2}{X_{C1}} + \frac{E2^2}{X_{C2}}}{\frac{E1^2}{R1}} \quad \text{(Eq. 52)}$$

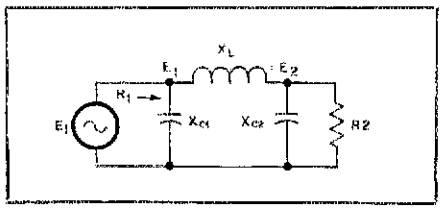


Fig. 9 — The pi network identified for a discussion of the circuit operating Q, Qo.

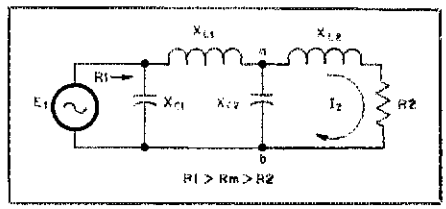


Fig. 10 — The pi-L network identified for a discussion of Qo.

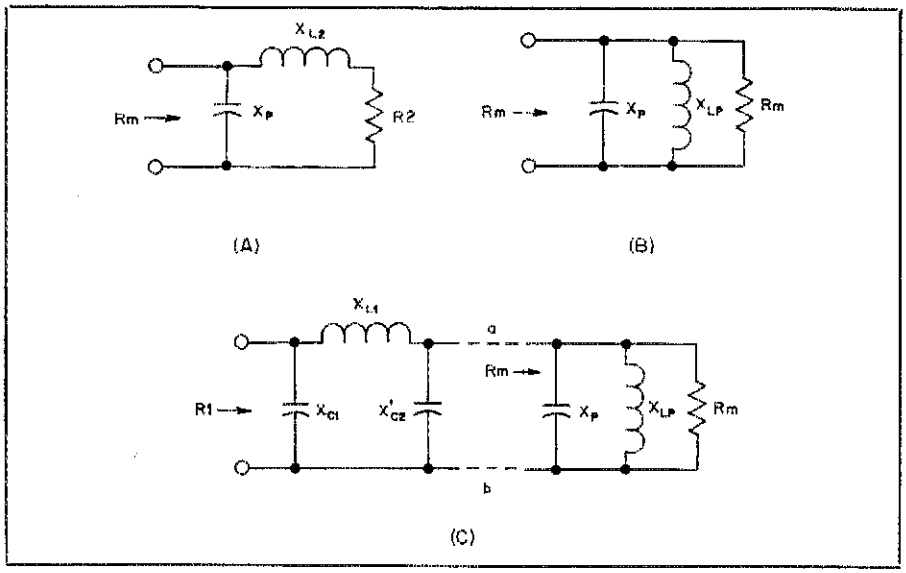


Fig. 11 — Derivation of the pi-L network from an L section, A, and its parallel equivalent, B. The parallel equivalent is added to a pi section, C.

where, from Eq. 48,

$$E2^2 = \frac{R2 \cdot E1^2}{R1} \qquad \text{(Eq. 53)}$$

Therefore,

$$Q_\pi = \frac{R1}{X_{C1}} + \frac{R2}{X_{C2}} = Qo_\pi \text{ (pi-net Qo)} \qquad \text{(Eq. 54)}$$

And for the Qo of the pi-L network, refer to Fig. 10. In that drawing,

$$Z_{AB} = R_{mid} = Rm \qquad \text{(Eq. 55)}$$

where R1 > Rm > R2.

$$Q_{\pi L} = \frac{R1}{X_{C1}} + \frac{Rm}{X_{C2}} = Qo_{\pi L} \text{ (pi-L net Qo)} \qquad \text{(Eq. 56)}$$

The reactive power associated with $I2^2 \cdot X_{L2}$ is included in E_{AB}^2/X_{C2}.

The Pi-L Network

Refer again to Fig. 4. The circuit Qo value for the pi-L network may be expressed as follows:

$$Qo_{\pi L} = \frac{R1}{X_{C1}} + \frac{Rm}{X_{C2}} \qquad \text{(Eq. 57)}$$

Only the arrangement where R1 > Rm > R2 is considered here, the output-tank-coupling-circuit operation. The Qo of the pi-L is shown as follows. To the series combination of X_{L2} and R2 there is added a capacitive reactance, Xp, to provide a resonant L net with $R_{in} = Rm$. This is shown in Fig. 4C, as well as in Fig. 11A. In that circuit,

$$Q_L = Rm/Xp = X_{L2}/R2 \qquad \text{(Eq. 58)}$$

The parallel equivalent for this circuit is shown in Fig. 11B. In this circuit,

$$Q = Rm/Xp \qquad \text{(Eq. 59)}$$

Adding the input-end pi network results in the circuit of Fig. 11C. From that diagram,

$$Qo_{\pi L} = \frac{R1}{X_{C1}} + \frac{Rm}{X'_{C2}} + \frac{Rm}{Xp} \qquad \text{(Eq. 60)}$$

$$Qo_{\pi L} = \frac{R1}{X_{C1}} + \frac{Rm}{X_{C2}} \qquad \text{(Eq. 61)}$$

where

$$X_{C2} = \frac{X'_{C2} \cdot Xp}{X'_{C2} + Xp} \qquad \text{(Eq. 62)}$$

$$\frac{Rm}{X'_{C2}} + \frac{Rm}{Xp} = Rm\left(\frac{X'_{C2} + Xp}{X'_{C2} \cdot Xp}\right) = \frac{Rm}{X_{C2}} \qquad \text{(Eq. 63)}$$

Derivation of the Q1 Formula Used in Procedure 1

Refer again to Fig. 8. From the back-to-back L-net pi-network equations,

$$Qo = Q1 + Q2 \qquad \text{(Eq. 64)}$$

$$\frac{R1}{Q1^2 + 1} = \frac{R2}{Q2^2 + 1} \qquad \text{(Eq. 65)}$$

$$Q2^2 = \frac{R2(Q1^2 + 1) - R1}{R1} \qquad \text{(Eq. 66)}$$

$$Q2 = Qo - 1 \qquad \text{(Eq. 67)}$$

$$Q2^2 = (Qo - Q1)^2 \qquad \text{(Eq. 68)}$$

$$\frac{R2(Q1^2 + 1) - R1}{R1} = Qo^2 - 2 \cdot Qo \cdot Q1 + Q1^2 \qquad \text{(Eq. 69)}$$

Solving for Q1 yields

$$Q1 = \frac{Qo - \sqrt{\frac{R2}{R1}\left(Qo^2 + 2 - \frac{R2}{R1}\right) - 1}}{1 - \frac{R2}{R1}} \qquad \text{(Eq. 70)}$$

This formula is rearranged in simpler form and is presented as Eq. 4 in Procedure 1, given earlier. This gives Q1 in terms of the known Qo, R1 and R2, and enables solution equations for the pi-network reactance element values in terms of Qo, R1 and R2.

Derivation of the X_L Formula Used in Procedure 2

Refer now to Fig. 3. Everitt's equations for the low-pass pi network follow.[6]

$$X_{C1} = \frac{R1 \cdot X_L}{R1 + \sqrt{R1 \cdot R2 - X_L^2}} \qquad \text{(Eq. 71)}$$

$$X_{C2} = \frac{R2 \cdot X_L}{R2 + \sqrt{R1 \cdot R2 - X_L^2}} \qquad \text{(Eq. 72)}$$

$$Q1 = \frac{R1 + \sqrt{R1 \cdot R2 - X_L^2}}{X_L} \qquad \text{(Eq. 73)}$$

$$Q2 = \frac{R2 + \sqrt{R1 \cdot R2 - X_L^2}}{X_L} \qquad \text{(Eq. 74)}$$

Qo is the circuit Q value, and may be expressed as

$$Qo = Q1 + Q2 \qquad \text{(Eq. 75)}$$

Substituting the Q1 and Q2 expressions in Eq. 75 and solving for X_L yields

$$X_L = \frac{Qo(R1 + R2) + 2\sqrt{R1 \cdot R2(Qo^2 + 4) - (R1 + R2)^2}}{Qo^2 + 4} \qquad \text{(Eq. 76)}$$

This gives X_L in terms of the known Qo, R1 and R2, and enables solutions for X_{C1} and X_{C2} from Everitt's equations or from the equations given in Procedure 2.

The networks discussed in this article are termed linear networks. In addition to other things, this means that they have a simple linear Ohm's law response to an input. It means that these networks work in both directions. That is, a pi, a pi-L or an L network may be designed to transform a load-end R2 value into a value of R1 ohms at the source or input end. If the physical resistor R2 is removed and a physical resistor R1 is placed at the R1 end terminals, then this value of R1 will have been transformed into a value of R2 ohms at the R2 end terminals.

It is to be noted that there is no restriction placed on the ratio of R1 to R2 in the new formulas given in this article. This is unlike the way in which the old standard Q-based pi-network formulas were normally stated, in which R1 had to exceed R2. The new formulas work equally well, whether R1 is greater than or less than R2. The only restriction is in the requirement that $Qo^2 + 1$ must exceed the higher value of R1/R2 or R2/R1. The requirement that R1 had to exceed R2, as the old standard formulas were normally stated, was never correct and, in fact, the old standard formulas work equally well for R1 > R2 or R1 < R2, as an application to an example pi network solution will indicate. This is in consequence of the fact that the old standard Q-based formulas did and do provide an exact "mathematical model" of the physical pi network insofar as computing the reactive network element values for the R1-to-R2 transformation. The only shortcoming of the old formulas is that the computation was based on a partial circuit Q value, and this partial value was taken as the circuit operating Q value. Even so, once the network was solved, the correct operating Qo value was readily available by adding the partial circuit Q value that was not accounted for. The new formulas allow the network solution based on the correct circuit Qo value selected at the outset.

Notes

[1]E. W. Pappenfus and K. L. Klippel, "Pi Network Tank Circuits, *CQ*, Sept. 1950, p. 27.
[2]F. Davis, "Matching Network Designs with Computer Solutions," *Application Note 267*, Motorola, Inc., p. 6.
[3]H. L. Gibson, "An Improved Design Method for Pi and L Pi Network Couplers," *Radio Communication*, June 1969, p. 390.
[4]*Radio Data Reference Book* (3rd edition). London: RSGB, 1972.
[5]E. W. Whyman, "Pi-Network Design and Analysis," *Ham Radio*, Sept. 1977, p. 30.
[6]K. Kajii, "Design of Pi-Type Circuits," *CQ Ham Radio* (Japan), June 1974, p. 264.
[7]L. Everitt, *Communication Engineering*, 1st edition (New York and London: McGraw-Hill Book Company, Inc., 1932).
[8]See note 7.

New Books

☐ *70 Years of Radio Tubes and Valves* by John W. Stokes. Published by the Vestal Press Ltd., Vestal, NY 13850. First edition, 1982. Hardbound, 8-3/4 × 11 inches, 247 pp., $21.95.

☐ Amidst the furor of home computers, large-scale integration and satellite TV, there remains a small, but highly devoted contingent of vacuum-tube enthusiasts. And why not? Admittedly, present-day use of tubes is largely restricted to high-power (usually transmitting) applications, but not a single modern-day radio circuit has developed without some footing in tube-based principles. For this reason alone, we owe homage to the vacuum tube with books that preserve the history of this noble device. *70 Years of Radio Tubes and Valves* is such a book.

Even today's "silicon generation" should find the story of vacuum tubes' golden age extremely interesting — or perhaps fascinating is a better word. John Stokes does much to promote this fascination in *70 Years*, which gives the book broad-based appeal.

The title may seem a bit misleading, for what, if *any*, difference is there between a valve and a tube? Technically, there is none. But Stokes, who is a New Zealander, writes as an impartial historian of the parallel but distinctly separate developments in the American and European tube industries. With American developments, he refers to the vacuum tube, while with European counterparts he refers to the valve, after Fleming's early name for the device.

Stokes has ordered his book according to the chronological development of the tube. He begins by documenting the early experiments of Edison, Fleming and DeForest, while carefully noting the ambiguity of this developmental period — primarily surrounding each man's claim to be *the* original inventor. As the book progresses, entire chapters are devoted to specific aspects of tube development. For example, there are chapters entitled, "The Grid," "Metal Envelopes," "Penta-Hodas" and "Miniaturization." Each chapter is extremely well-researched and so packed with information that I occasionally found it necessary to stop reading and digest a bit. My only criticism (and a minor one at that) stems from Stokes' tendency to cram perhaps a wee bit too much information into each chapter.

It should be noted that readers specifically interested in the developments of companies such as Telefunken and Phillips will not be satisfied by this book. Stokes has intentionally limited his research to the USA and England, citing language difficulties as the reason. These companies are mentioned (one minor chapter is on Phillips), but only when their achievements affected the course of tube development on a worldwide basis.

Some mention should be made of the excellent selection of photos and graphics in *70 Years*. There is an abundance of original tube advertisements, which alone often tell the state of the art at that time. It's interesting to see ads that directly brand competitors' products unauthorized under patent law. Also, there was a great deal of emphasis placed on "magic breakthroughs" in early tube technology that could easily cure *all* receiver problems — much the same as "snake oil" for your health! Photos are equally interesting, and practically every tube type that is mentioned finds its way into a photograph or excellent illustration.

As the subtitle, "...A Guide for Electronic Engineers Historians and Collectors," claims this book should prove to be a valuable reference work both now and in the future. You don't fit into any of the categories? Don't despair, for *70 Years* will prove to be interesting to *all* who have at least a passing fancy on the subject. — *Dennis J. Lusis, W1LJ*

Strays

WRITING TO HQ.?

☐ Each year, ARRL Hq. receives some 350,000 pieces of correspondence, which translates into a lot of cards and letters that have to be sorted, routed to the proper department and answered. To help us continue to provide prompt, efficient service to our members, we ask that you follow these guidelines when writing to ARRL.

1) Use a separate piece of paper for each separate request.

2) Type your letter (if possible), or print or write clearly.

3) Include your name, address, call and membership number from your *QST* label.

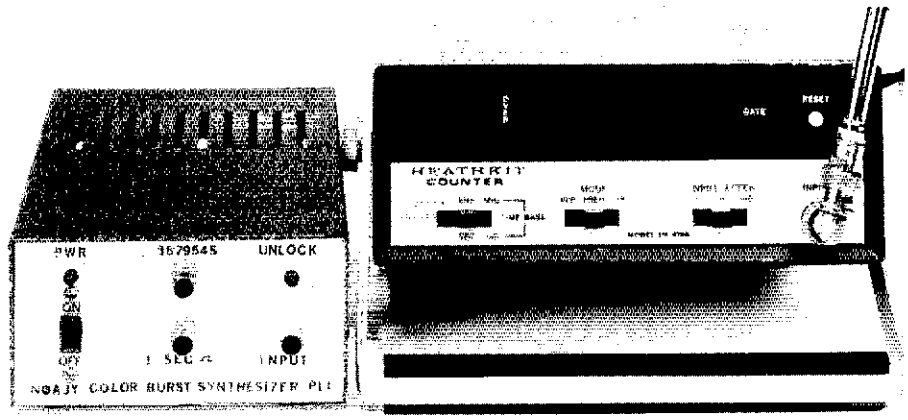
4) Enclose a business-sized self-addressed, stamped envelope if a reply is required.

5) Address your request to a particular individual or department, if possible, especially when responding to correspondence received from Hq.

6) Send a check or money order (IRCs for foreign requests) when applicable. Do *not* send cash.

The NØAJY cb Standard

Another Citizens Band radio conversion project? *No sir!* The term cb means *c*olor *b*urst — the ultimate in frequency-counter accuracy!



By David Bissen,* NØAJY

Have you tried to measure the frequency of your vhf transceiver with an inexpensive frequency counter? The results can be disheartening. This paper describes several methods of upgrading your counter to lab-quality status. Simple CMOS circuits are used to extract the 3.579545-MHz color-burst (cb) frequency from an ordinary TV set, and this signal is divided down and used to gate your counter. Why the cb frequency? During broadcasts by the four major TV networks, the cb signal is locked to a standard with stability and accuracy measured in parts per *billion!*

I own a Heathkit IM-4100 30-MHz counter. The accuracy was adequate for my requirements as a Novice, but after moving to vhf, I felt the need to make frequency checks that were above the range of the counter. After adding a divide-by-ten prescaler, I noticed heat inside the unit caused drift in the 10-MHz time-base oscillator. Changing the crystal and oscillator components did not cure the problem. A crystal oven, consisting of a Plexiglas® enclosure around the oscillator and a copy of a commercial temperature-control circuit, was tried as a solution. This improved the frequency stability to a point where a very accurate reference signal would be required to test the unit. Then, I remembered the color-burst frequency, 3.579545 MHz, which is available from a color-TV set.

Initial Tests

I found a spot in my TV, near the color-burst crystal, where a stable frequency reading was available. Measuring the signal frequency with my counter, I found the counter internal stability to be one part per million (ppm) after a two-hour warmup. This was not acceptable. The oscillator also made violent frequency excursions during warmup.

Color-TV Gating Circuit

The block diagram of my initial standard is shown in Fig. 1. It has selectable outputs of 1, 10 and 60 Hz, along with 3.58 MHz. The circuit uses the National MM5369 chip to divide the cb frequency by 59,569. This produces an output of 60.000084 Hz, which is a 1.4-ppm error. Counter accuracy remains good because the error is fixed and can be computed out mentally. The disadvantage of this approach is the requirement of a color TV receiver.

A "Universal" Circuit

There is a direct relationship between the horizontal-scan rate and the color-burst frequency in TV transmissions — the cb frequency in hertz is equal to the horizontal rate divided by 2 and multiplied by 455. The circuit shown in Fig. 2 was chosen for its low cost and locally available parts, and because it works! It consists of two sections. One section locks onto the horizontal sync of *any* television set (black-and-white or color) and develops the cb frequency, 3.579545 MHz. The other section divides this signal to a 1- or 1/10-second gating interval.

Input signals from a pickup loop near the TV set are cleaned and brought up to CMOS levels by means of transistor amplifiers Q1, 2 and 3. The horizontal-sync signal (15734.264 Hz) is then used to lock the PLL to 3.579545 MHz via dividers U1 and U3. The cb signal from the PLL is then corrected to 3.579540 MHz by a "one and only one" circuit consisting of flip-flops U8, U9 and U10. This circuit inhibits the input signal once for every 715,908 clock cycles. The 3.579540-MHz signal is then applied to the MM5369 divide-by-59,659 chip, which yields an output of exactly 60.000 Hz. A 1- or 1/10-second gating pulse is then delivered via U9 and U11.

Components and Construction

Transistors used in the standard circuit are general-purpose npn types with an hf_e of 40 or better. The 4046 PLL is rated at a maximum frequency of 3 MHz. I have found conflicting specifications, but conclude that they will work to at least 4 MHz with 15 volts V_{DD}. If Murphy's Law

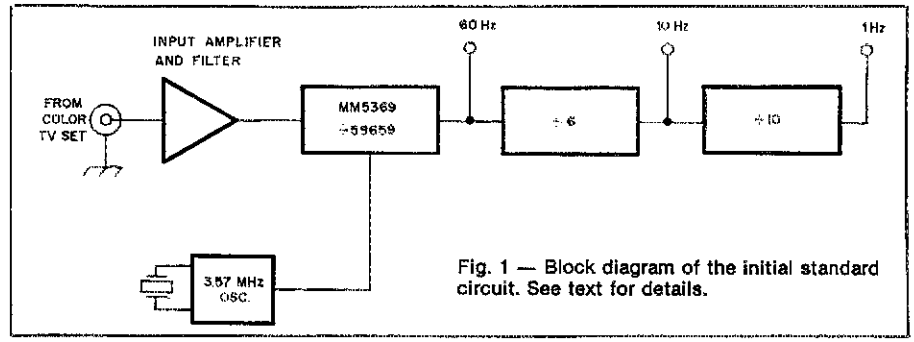


Fig. 1 — Block diagram of the initial standard circuit. See text for details.

*Box 196, Hokah, MN 55941

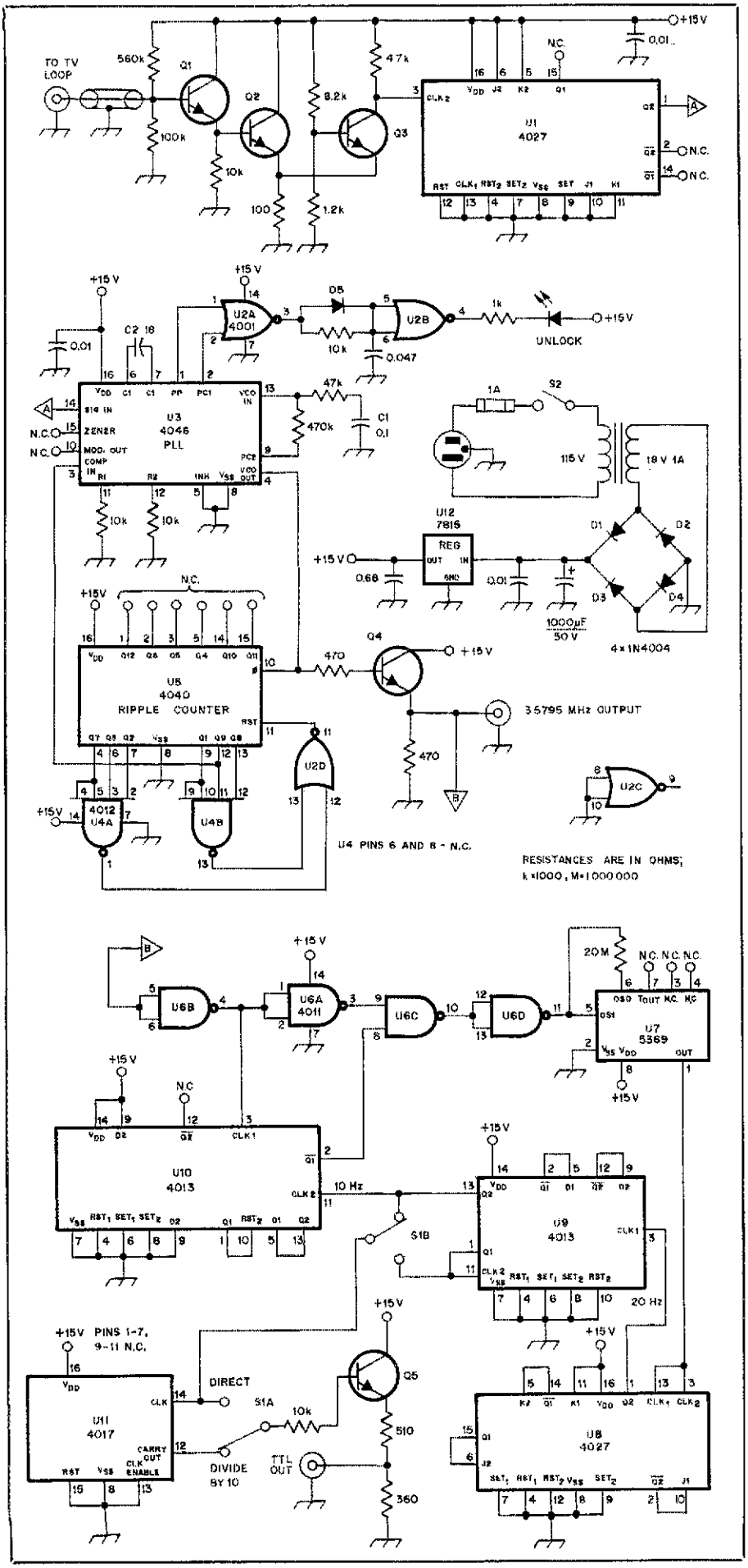


Fig. 2 — Schematic diagram of the NØAJY standard circuit. All resistors are 1/4-W carbon-composition or film types.
D5 — 1N4154 silicon signal diode.
Q1-Q4 — Small-signal npn silicon transistor, 2N2222A or equiv.
U1, U8 — CMOS Dual J-K Master-Slave flip-flop, CD4027 or equiv.
U2 — CMOS Quad 2-input NOR gate, CD4001 or equiv.
U3 — CMOS Micropower phase-locked loop, CD4046 or equiv.
U4 — CMOS Dual 4-input NAND gate, CD4012 or equiv.
U5 — CMOS 12-stage binary/ripple counter, CD4040 or equiv.
U6 — CMOS Quad 2-input NAND gate, CD4011 or equiv.
U7 — CMOS 17-stage programmable oscillator/divider, MM5369 or equiv.
U9, 10 — CMOS Dual "D" flip-flop, CD4013 or equiv.
U11 — CMOS decade counter/divider, CD4017 or equiv.
U12 — 15-V, 1-A positive-voltage regulator, type 7815 or equiv.

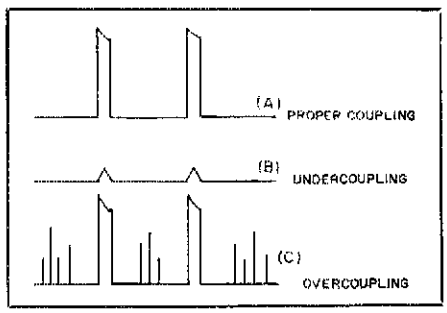
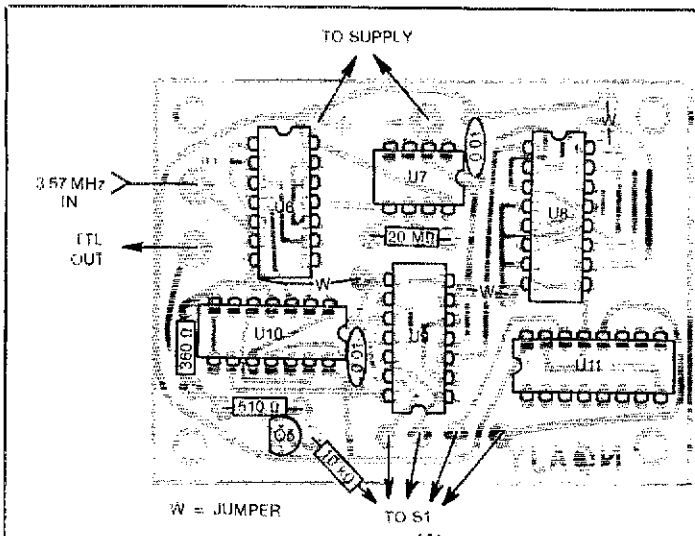


Fig. 3 — Under- or over-coupling the horizontal sync from the TV set will cause improper operation of the PLL.

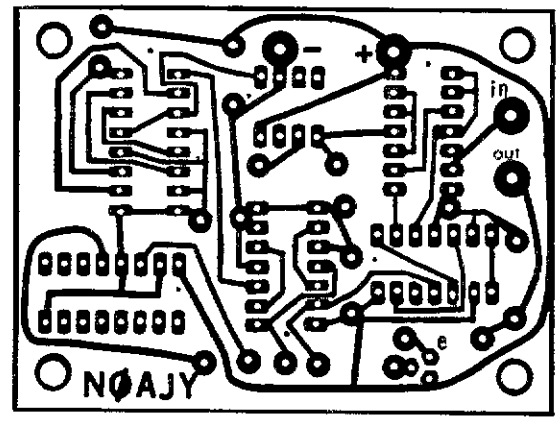
prevails and you purchase a slow one, try substituting another. The impedance at C1, the loop-filter capacitor, is very high; the capacitor should be a good low-leakage unit, such as a tantalum type. The prototype unit was built using two printed-circuit boards, and mounted in an aluminum case similar to a Radio Shack model 270-253. S1 is optional; the connections can be "hard wired" to suit your counter.

Check Out

Check the power-supply section of the project before installing any of the solid-state devices. After the ICs are in place and the power is applied, the UNLOCK LED should light. Check for proper VCO operation in one of the following ways: Connect a short lead to the base of Q1 and hold it near the screen of your TV set. The LED should flicker and go out; if it does not, readjust the position of the pickup cable until the LED stops flickering and stays off. Another method of confirming PLL operation is to monitor the frequency of the VCO while alternately connecting pin 9 of the 4046 from ground to V_{DD}. The VCO should swing above and below 3.58 MHz during this test, with 3.58 MHz being



(A)



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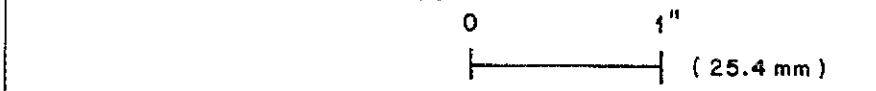

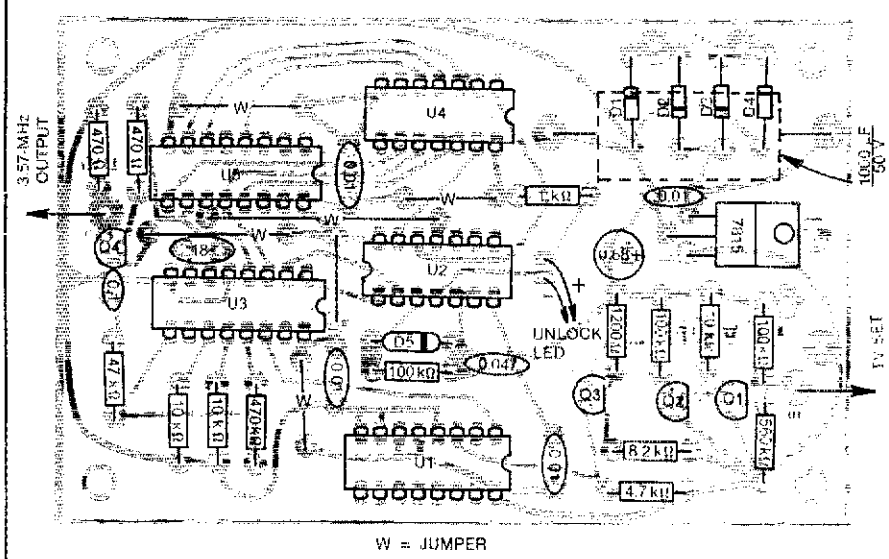

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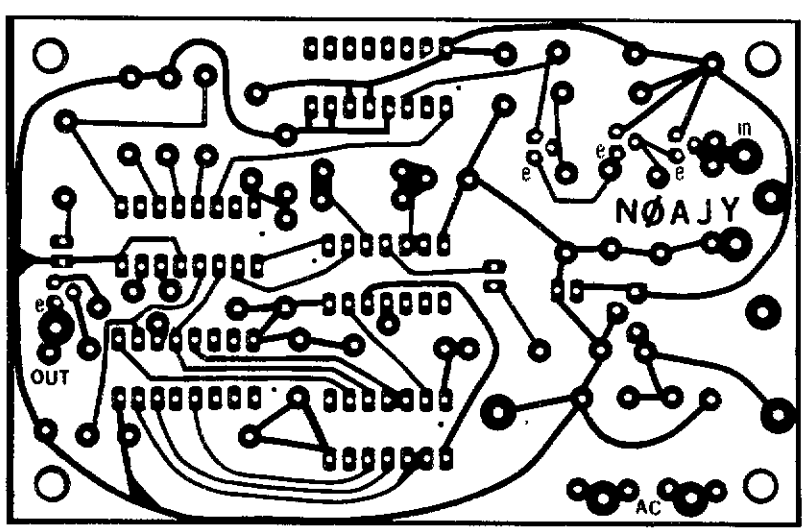


(D)

Fig. 4 — Parts-placement diagram for the reference boards. Components are mounted on the nonfoil side. Gray areas represent unetched copper. (A) and (C): Parts-placement diagrams for the reference components mount on the nonfoil side. Gray areas represent unetched copper. (B) and (D): Etching patterns for the reference boards. Patterns are shown actual size from the foil side of the board. Black areas represent unetched copper. Good engineering practice requires all unused inputs to be grounded. This was not done on these boards. Wire jumpers can be added to correct this fault.

the approximate center frequency. The free-running frequency of the VCO is set by capacitor C2, the value of which is quite critical. Values between 15 and 20 pF worked satisfactorily in the prototype. An 8- to 25-pF trimmer should be suitable for those desiring an exact adjustment.

Look Out for Troubles

Over-coupling to the TV set will cause ringing, which will unlock the loop. Examine the VCO output with a scope; it should look like Fig. 3A. Some counters may count noise or load the standard output circuit. It is important for the builder to be familiar with the ins and outs of his own counter. Occasionally, a glitch in the TV signal will wipe out enough sync signal to change the counter a few cycles; however, this is the exception, as the loop filter averages out minor noise pulses.

Summary

It is not often that the typical amateur has the chance to get his or her hands on test equipment of commercial quality. Less likely would be the ability to build equipment that rivals commercial standards. Those of you who build this unit will be amazed at the accuracy and stability. With gating locked to network standards, you will have a stable counter that can allow you to check for drift without wondering if the counter or equipment under test is at fault.

Thanks to Jim Summers, WB9QFC, for his technical help with this article. Please send an s.a.s.e. with any correspondence.

A Battery Low-Voltage Indicator

Don't get caught with dead batteries. Here are some simple circuits that provide advance warning.

By Harry M. Neben,* W9QB

Mobile and hand-held equipment usually does not contain an indicator to alert the operator to battery condition. One solution: Simple low-voltage indicators can be made from components found in many shacks.

The most common batteries found in amateur service are the nickle-cadmium and lead-acid types. NiCds are used in most hand-held transceivers, and lead-acid batteries are found in motor vehicles. Both are susceptible to being overlooked until it's too late to keep your rig going!

Nickel-cadmium cells have a no-load potential of 1.4 V and nominal output of 1.25 V; they will power your transceiver until they drop to a critical value of 1.1 V. This is shown in Fig. 1A.

Lead-acid batteries have a no-load voltage of 2.1, with a nominal output of 2.0 V, and are useful until they drop to a 1.8-V critical value. This is shown in Fig. 1B.

I constructed a simple device that pro-

*1151 Fairway Dr., Dunedin, FL 33528

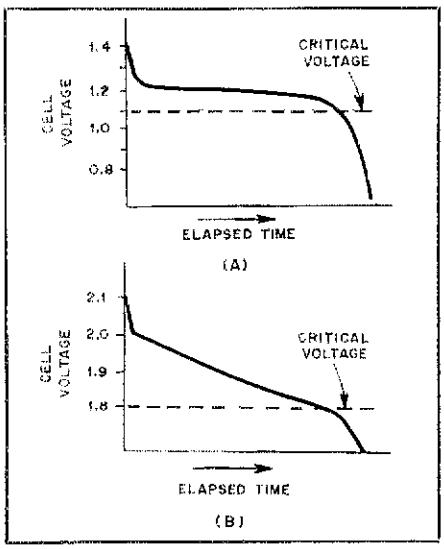


Fig. 1 — Voltage/time discharge curves (at constant current drain) for NiCd batteries (A) and lead-acid cells (B).

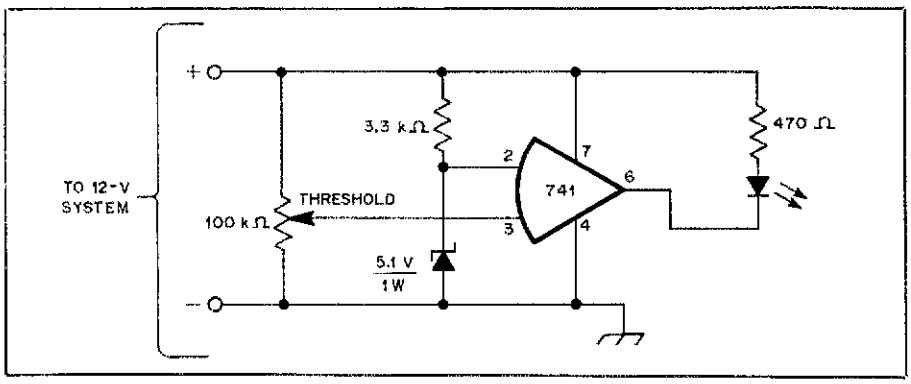


Fig. 2 — Basic comparator circuit used to indicate low battery voltage.

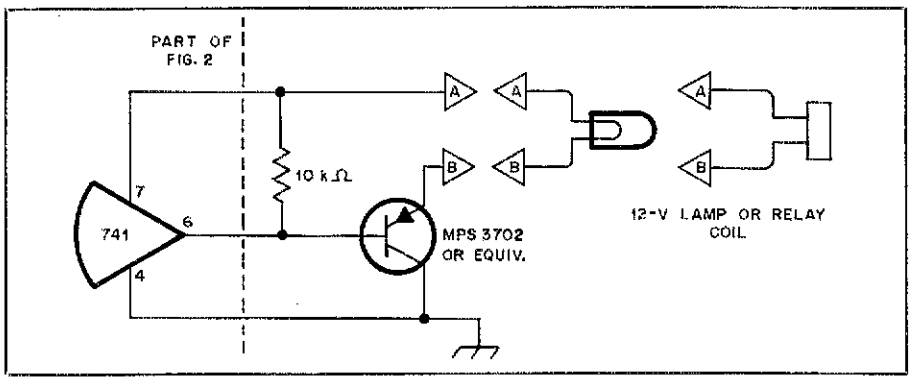


Fig. 3 — The simple addition of a transistor amplifier allows the use of a pilot lamp or relay.

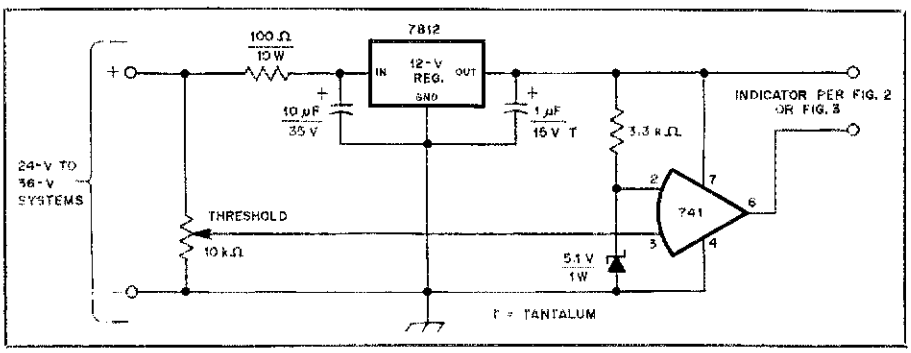


Fig. 4 — Higher-voltage systems such as found in airplanes and boats, necessitate voltage regulation before the comparator to avoid damaging it.

vides an indication of when battery voltage approaches the critical point. My circuit uses a 741 op amp in a comparator circuit (Fig. 2). This functions by comparing the voltage at pin three of the op amp with that found at pin two. As long as pin three is higher in voltage than pin two, the comparator output will be near the full supply voltage, keeping the LED off. However, when the voltage at pin three drops below that at pin two, the comparator output drops to near ground potential, and the LED lights. Simple, isn't it?

Reference voltage for the comparator is provided by a 5.1-V Zener diode, although any other value below the critical voltage will work as well. (Be sure to change the series resistor value, though!) The voltage at pin three is set by adjusting the 100-kΩ potentiometer. To calibrate, apply a dc voltage equal to the cut off value you wish to indicate. Simply adjust the potentiometer until the LED comes on. Check your calibration by *slightly* increasing the input voltage to the circuit. The LED should turn off. That's all there is to it!

To operate a relay or pilot light from this circuit, the LED and resistor are deleted, and a dc amplifier is added. Any general-purpose PNP transistor can be used as an amplifier. Fig. 3 shows these additions.

For those who need an indicator to use on a 24 to 36-V circuit, such as found in boats, airplanes or golf carts, the circuit in Fig. 4 should suffice. At these relatively high input voltages, the rating of the 741 op amp can be exceeded by a transient condition. A voltage-dropping resistor and regulator are added to bring the operating voltage within the rating of the 741. This little "rascal" is the hit of the golf-cart set!

All of these circuits may be left connected to an automobile battery with little effect on the capacity. In the standby mode (LED off), the current drain is only 2.5 mA. This will increase to about 30 mA with the LED on, and more if a relay or pilot light is used. If you are using one of these circuits with a NiCd battery pack, a switch to disconnect the unit is a useful addition.

Strays

It must be difficult for K2BLA to decide which use is best for these elements of his pipe organ: "Shall I build a 6-meter cavity resonator from this thing, or shall I make music with it?"

TA PROFILES

☐ This month, we introduce ARRL Technical Advisor Albert D. Helfrick, K2BLA, our expert on specialized modes, uhf and microwaves. We extend our hearty thanks to Al for the many services he has provided as a TA since 1979. He is a Life Member of the ARRL, and has written numerous *QST* articles (the first one for the December 1969 issue). Al has also contributed excellent material for the ARRL *Radio Amateur's Handbook*. In addition, he has written three non-ARRL books: one on Amateur Radio, one on communications equipment repair and a third, on aviation electronics, to be published early in 1984.

An Extra Class licensee, Al has kept the same call he was issued in 1957. He has operated in all bands, from 160 meters to 70 cm, using all modes. Al has been awarded WAS, WAC, WPC, WPX and DXCC certificates, all on cw. If you're looking for Al, you'll find him operating RTTY and cw in most of the hf bands.

Residing in Boonton, New Jersey, Al is employed by Cessna Aircraft. His principal responsibility at work is the design of distance-measuring equipment (DME) and navigation computers. He is an adjunct faculty member of Kean College of New Jersey, where he teaches electronics. He has received degrees in physics and mathematics, and has taught both subjects at the college level.

Aside from Amateur Radio, Al spends much of his free time playing a 7-rank pipe organ at home. He also plays low brass instruments. He is the organizer of and principal tuba artist in a brass chamber-music group that plays an ambitious concert season each year. If you search the rivers and ponds of North Jersey, you may spot Al paddling his kayak and enjoying the serenity after a busy day's work. — *Marian Anderson, WB1FSB*

HELLO, TEST...

☐ "Break, break...W6ISQ here... ahhhhh, anybody out there on the CATS net can give me a check on a new mike?

"Yeah, bad hum."

"Too much lows."

"Lotta background noise...you mobile or something?"

"Sounds like a hand-held rig."

"I don't hear no hum."

"Back off your derivation control."

"Sounds okay here."

"My scope says too many highs."

"Get closer to the mike."

"Break, break..."

"The first mike was better."

"Nothing wrong with your new mike. It sounds great. Can always recognize your voice, Sam."

"Break, break...ahhhh...I haven't even plugged in the new mike yet... QRX. I'll plug it in now...ahhhhh... testing...ha-one...how does this sound now? Oh, and this is *not* Sam...this is *Italian* String Quartets!"

"Sounds the same."

"Back away from your mike."

"Sounds like your rig is fming."

"It is a fm rig, Old Man."

"Too noisy...you got a fan going?"

"You gotta change that derivation control."

"Hum is worst."

"My scope says too many lows."

"I don't hear no hum."

"It ain't full quieting."

"Still sounds okay here."

"Break, break..."

"Naw, bad distortion."

"If I was you I'd get off the air."

"Aw, naw...don't pay no attention to all them reports. Everybody can still recognize your voice, Sam." — *John G. Troster, W6ISQ, Atherton, California*

I would like to get in touch with...

☐ anyone who has information on a homebrew RTTY device constructed in 1963 by K5EXW and labeled as designed by W2JAV with modifications by W5ANW. William Hulette, KA5BWU, 4331 Deer Creek Dr., Jackson, MS 39211.

BEGINNER'S BENCH

A Beginner's Look at RF-Power Measurement

Measuring transmitter output power is simpler than you may think. We need not purchase expensive rf-power meters. Ordinary test equipment or homemade instruments open the door to this routine ham-shack procedure.

By Doug DeMaw,* W1FB/8

Are you tempted to buy a commercially made device for measuring your transmitter output power? That's fine if you're willing to part company with those dollars you've been sequestering in one of the parts drawers in your workshop! But,there are simple and inexpensive ways to measure transmitter output power if you're willing to learn how. All that's needed is an rf ammeter (surplus) or a VTVM (vacuum-tube voltmeter) and a 50-ohm dummy load. Of course, an FET voltmeter can be used in place of a VTVM, but whichever instrument is chosen, it should have a very high input impedance in order to work with the rf probe we shall describe. More about that later.

We'll also discuss in-line power metering for the situation when our antenna is connected to the transmitter. But, no matter what we contemplate doing with our ham station, a dummy load is always an item that we should have on hand for all manner of equipment testing. The Heath Co. Cantenna is entirely adequate for amateur needs, and it is reasonably priced. If you don't have one in your shack, perhaps now is the time to obtain one, or at least a dummy load with equivalent characteristics.

Generally, we are more interested in knowing what the SWR (standing-wave ratio) on our feed line is than we are with the absolute rf output power of our transmitter. But there are times when we need to know something about the latter — especially when we repair an existing rig or test a new piece of homemade transmitting equipment. Therefore, it may not be prudent to spend a large amount of money for a power-monitoring instrument. Less-expensive alternatives are available to us if only occasional power measurements are to be made.

*P.O. Box 250, Luther, MI 49656

The Old Way — RF Ammeters

Many years ago, we used a standard technique when measuring transmitter output power in the medium- and high-frequency spectrum. The device was an rf ammeter. They are still available at reasonable prices from those dealers who sell military surplus. Rf ammeters show up frequently at ham radio flea markets. Some may have full-scale movements that are meant only to accommodate rf milliamperes, while others may be capable of reading rf current up to 10 A. Rf ammeters contain a bimetal device known as a "thermocouple." The rf energy heats this element and causes the meter to deflect. Thermocouple elements are sensitive to excessive current, and will burn out (become open) quickly if too much current is fed through the meter. Therefore, if you buy an rf meter, be sure it is rated for more current than your transmitter can generate at maximum rated output power.

Rf ammeters are usually meant for use from 50 MHz down, respective to operating frequency. Therefore, they aren't recommended for vhf use. Although they can provide a meter reading at vhf, the meter indication will not be accurate. Furthermore, the mere presence of the meter in the feed line can cause an SWR "bump," and disturb an otherwise low SWR. This is not apt to be a problem at 30 MHz and lower.

Fig. 1 shows the usual method for utilizing an rf ammeter to measure rf power. The instrument is placed between the transmitter and a 50-ohm dummy load. We need only to understand grade-school algebra to determine the transmitter power when we know the amount of rf current that flows into a known-value resistive load. In Fig. 1, we shall assume our transmitter puts out enough power to cause 3 A of rf current to flow through the meter. Using Ohm's law, we can readily calculate the power into R_L as 450 W. The same procedure would be followed if our feed line to R_L was 75 ohms or some other value. Of course, the dummy load would need to have a resistance that equaled the impedance of the coaxial cable. Our rf ammeter could remain in the transmission line during normal on-the-air activity, and it

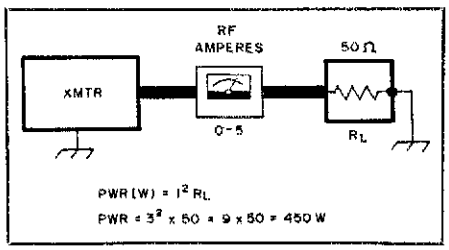


Fig. 1 — Method of rf-power measurement when an rf ammeter is used.

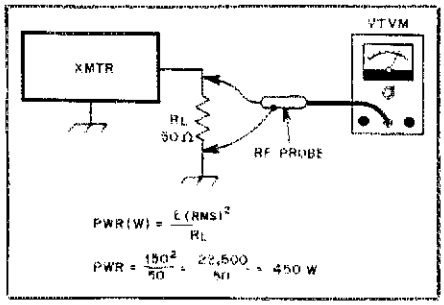


Fig. 2 — A vacuum-tube voltmeter can be used with an rf probe to measure rf power across a known load resistance.

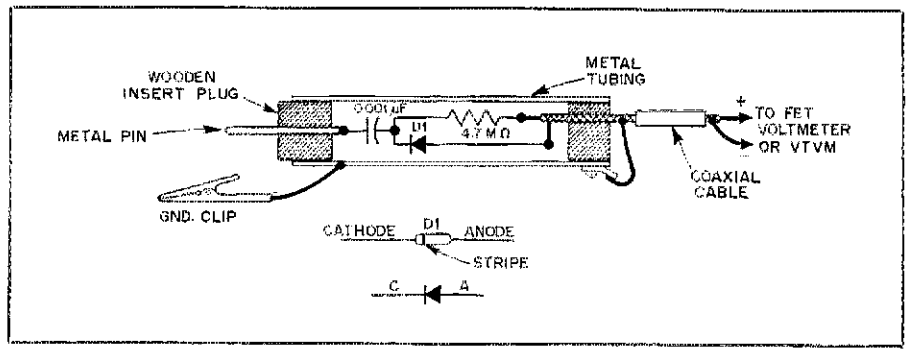


Fig. 3 — Details for building a homemade rf probe. D1 is a small-signal germanium diode.

would yield an accurate power indication as long as the antenna presented a 50-ohm impedance to the transmitter.

Power Determination with RF Voltage

If current is allowed to flow through a resistance, a voltage will appear across that resistance. This is illustrated in Fig. 2, where a 50-ohm resistor serves as our dummy antenna. Here again we need only to apply Ohm's law ($P = E^2/R$, where P is in watts, E is in rms volts and R is in ohms). A VTVM or FET VM and an rf probe are used to learn the rf voltage across R_L. In the example, we are able to read 150 V across R_L, our 50-ohm load. This is equivalent to a power output of 450 W. The rf probe rectifies the rf (ac) voltage and converts it to dc voltage so that we can read it directly on the meter of our VTVM.

If our readings are to be accurate, we must be certain the rf energy from the transmitter appears as a classic sine wave. That is, the wave form must not be distorted or contain a high amount of harmonic current. Most modern transmitters are very clean with respect to the output wave form, so no need to be alarmed about the accuracy of our readings.

Details for building our own rf probe are seen in Fig. 3. This circuit has appeared for many years in the ARRL *Handbook* and other League publications. It is being repeated here for the benefit of those who are new to Amateur Radio and may not have the reference material from which to obtain this information. The probe is contained in a metal case (brass or aluminum tubing), and the cable between it and the VTVM can be small-diameter coaxial line. RG-174/U subminiature coaxial cable is lightweight and flexible, and is excellent for this purpose. The larger cables are stiff and heavy, and may easily become the "tail that wagged the dog" if they are used! The voltmeter with which the rf probe is used should have an input characteristic of 10 megohms or greater for best accuracy of rf-power readings. One of the older Heath VTVMs or an RCA Voltohmist™ an be purchased inexpensively if you don't have a meter of this variety. Keep an eye on the *QST* Ham Ads for possible bargains, and don't forget the flea markets at hamfests.

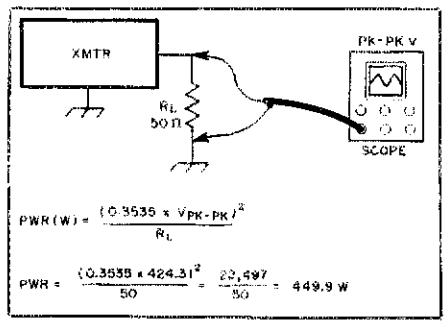


Fig. 4 — Procedure for measuring rf power with a scope.

The measurements chapter of recent editions of the *Handbook* contains directions for building your own FET VOM, should you be a "purist" of the first magnitude!

Using a Scope to Measure Power

We're in an entirely different badminton court when it comes to using a scope for rf-power measurements. Why? Because a scope responds to peak-to-peak (pk-pk) ac voltage rather than rms (root mean square) voltage. This must be taken into account when performing the type of test that can be made with a VTVM. The rf sampling technique remains unchanged, but the math we must employ is a trifle different. Fig. 4 illustrates the general method for using an oscilloscope.

Before we continue, a word or two about scopes is important. The scope must be capable of displaying the operating-frequency wave form of our transmitter accurately. Therefore, the rated *bandwidth* of the scope is important to know. If the real-time bandwidth is specified as 30 MHz, we're all set for hf-band power measurements. But, if the specs state that the instrument is for dc to, say, 5 MHz, our highest ham band for measurement of power will be 75/80 meters. This does not mean that we won't see a wave form above 5 MHz; it merely implies that the accuracy of our measurements will have "flown out the window" above 5 MHz.

Another point worth considering is that a scope tube can't display the voltage with as fine a resolution as we can obtain with the analog meter on our VTVM. The deflection may fall between or beyond the lines on the scope-tube graticule, which calls for interpolation of the precise pk-pk voltage. For most amateur purposes, this will be satisfactory (depending on how good your "interpolator" is!).

Calculations based on the pk-pk voltage are still as simple as those founded on rms voltage. The difference is that we must add a decimal factor to convert the pk-pk voltage to an rms value. All we need do is multiply the pk-pk voltage by 0.3535 to obtain that value. The equation in Fig. 4 shows how this is done when the transmitter power is being measured. Here we assume that the pk-pk voltage measured is 424.3, which becomes 150 V (rms) when multiplied by 0.3535. From this point on, we follow the same calculation procedure called out in Fig. 2. Simple, eh?

Measurements with the Antenna Connected

We can follow these same routes to power measurement, even when we have the antenna connected to the transmitter. How? Well, all that's necessary is to have the system look like 50 ohms during the measurements. If an SWR condition exists, we may insert a Transmatch (or antenna coupler or tuner, as some call them) between the sampling point and the antenna. This will require an SWR indicator in the line, as shown in Fig. 5. The Transmatch is adjusted to disguise the SWR condition, providing an SWR of 1:1. The rf ammeter can now be relied on to render meaningful data for our power-output calculations. In other words, even though the antenna may not allow the system to look like 50 ohms down in the shack, the transmitter and rf ammeter "think" they are in a 50-ohm system, and that's all we care about. It must be remembered that any SWR meter we use should be contained in a feed line that has the same impedance as that for which the instrument was designed. That is, we don't put a 50-ohm SWR indicator in a 75-ohm feed line — not if we want our SWR readings to be accurate.

The same rule applies when sampling the 50-ohm line with an rf probe or scope (Fig. 6). One method for providing a sampling point is the use of a coaxial T-connector.

This permits a through connection to the SWR indicator, while making a test point available for power measurements. Again, the Transmatch must be adjusted to disguise any reflected power on the feed line. Power measurements can be made when the SWR is 1:1.

The Classic RF-Power Bridge

A potentially accurate device for measuring rf-power output and SWR was designed by Warren Bruene (pronounced "brine"), W5OLY, of Collins Radio. It was described in April 1959 *QST*, and has remained the standard circuit in most commercial directional wattmeters for Amateur Radio use to this day. A circuit diagram of that instrument is shown in Fig. 7. Various adaptations of the basic design can be found in December 1969 *QST*.

A toroidal transformer serves as the heart of the instrument (T1 of Fig. 7). The transmission line is routed through the center of the toroid, minus the shield braid, and it serves as the primary of the transformer. D1 and D2 sample forward and reflected rf components on the feed line to enable the user to take SWR readings. C1 and C2 are used to balance the bridge when it is terminated in 50 ohms. R3 through R6, inclusive, provide calibration for the desired power ranges in the forward and reflected positions of S2. The calibration chart at the right in Fig. 7 will yield fairly accurate rf-power readings if a 200-μA dc meter is used at M1. Precise calibration can be effected by placing a laboratory-grade rf meter in series with the circuit of Fig. 7 and noting the reading on M1 at various power levels. A Bird Thruline wattmeter is excellent for the purpose, if you can borrow one for the tests.

Fig. 8 contains a nomograph for determining the SWR when using the circuit of Fig. 7. Alternatively, if you know the values of your forward and relected powers you can determine the SWR from

$$SWR = \frac{1 + x}{1 - x} \qquad \text{(Eq. 1)}$$

where

$$x = \sqrt{\frac{PWR\ (ref.)}{PWR\ (fwd.)}} \qquad \text{(Eq. 2)}$$

This grade-school algebra should be easy to work with, especially in this day of calculators! In fact, it is by no means formidable when doing it longhand.

A Practical Power Meter

The QRP enthusiast is usually forgotten when commercial power meters are designed. That is, we seldom find one with a low-power scale.

Our workshop project this month is a resistive rf power bridge that will safely handle power levels up to 10 W without damage to the bridge resistors. Momentary measurements (very momentary!) of powers up to 20 W are possible. The circuit of the power meter/SWR indicator is given in Fig. 9. Circuit boards or a kit version of this instrument are available.[1]

Parallel combinations of noninductive 2-W resistors are used for R1 through R6, inclusive. This provides ample power capability in the bridge arms without damage to the resistors. Each of these resistors is 100 ohms, which in the parallel format yield 50 ohms.

A 50-ohm dummy load is needed for calibration of the instrument. We may use an available 50-ohm load, such as a Cantenna, or we can build one from a group of 1-W composition resistors. An example of such a resistive load is shown in the photograph of Fig. 10. Here, we have a "resistor sandwich" composed of two pieces of pc board and 20 resistors. Ten 1200-ohm and ten 820-ohm resistors can be used to develop a 10-W, 48.7-ohm load. This is close enough to 50 ohms for our purpose. A coaxial connector of your choice can be connected to the two wires of the load (keep the leads short).

A pc-board potentiometer, R9, is used to calibrate the meter (M1) for 20 W at full scale. Other full-scale power levels can be

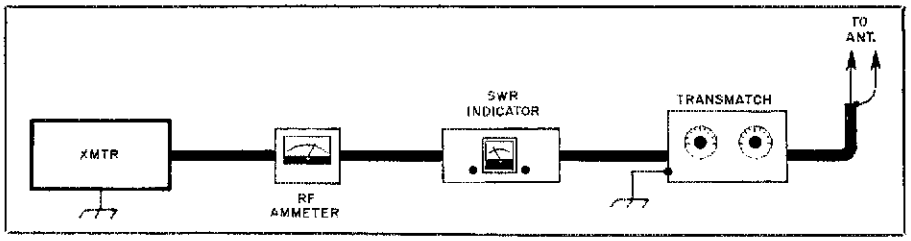


Fig. 5 — If the antenna does not present an SWR of 1:1 to the transmitter, a Transmatch can be used to disguise the SWR and accurate rf-power readings will be possible.

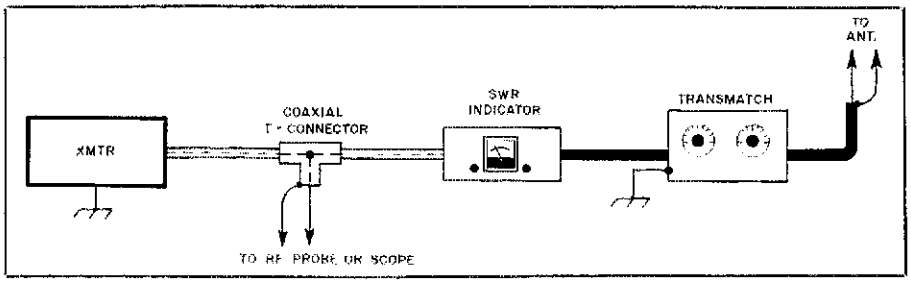


Fig. 6 — Sampling method for power measurement with a scope or rf probe. A coaxial T-connector is inserted in the 50-ohm line between the transmitter and the SWR indicator.

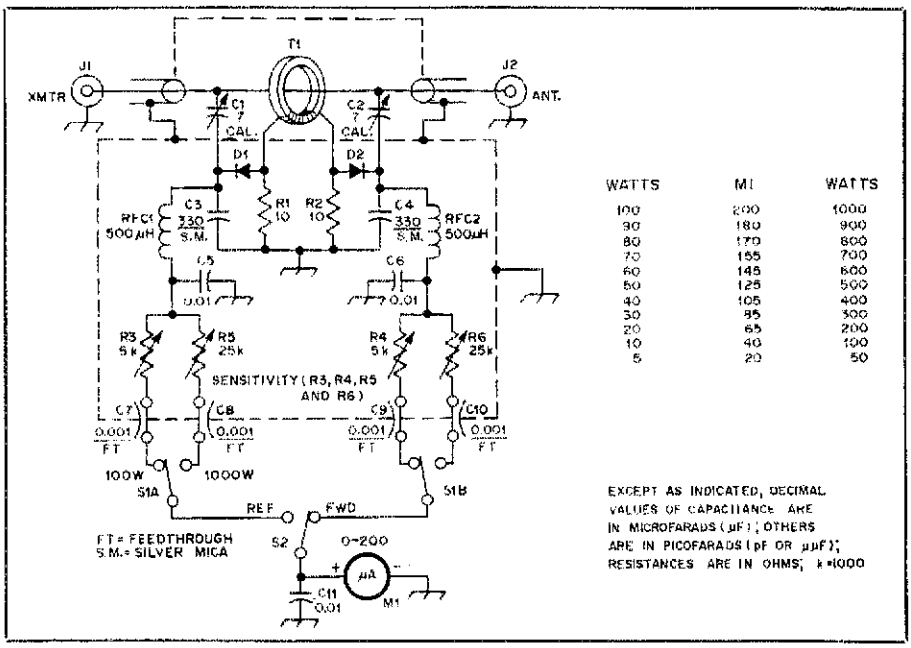


Fig. 7 — Circuit of one version of the Bruene power meter. A toroidal transformer serves as a sampling device. The calibration scale at the right is representative of the meter readings versus power when a 200-μA dc meter is used. R3 through R6, inclusive, are thumbwheel-adjust controls inside the instrument case. D1 and D2 are 1N914 silicon diodes.

[1]Notes appear on page 39.

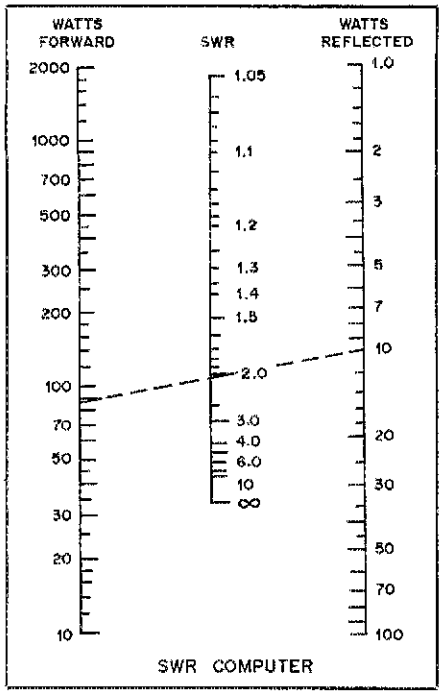


Fig. 8 — Nomograph for determining SWR when the forward and reflected power amounts are known. The dashed line shows an SWR of 2:1 when the forward power is 90 W and the reflected power is 10 W.

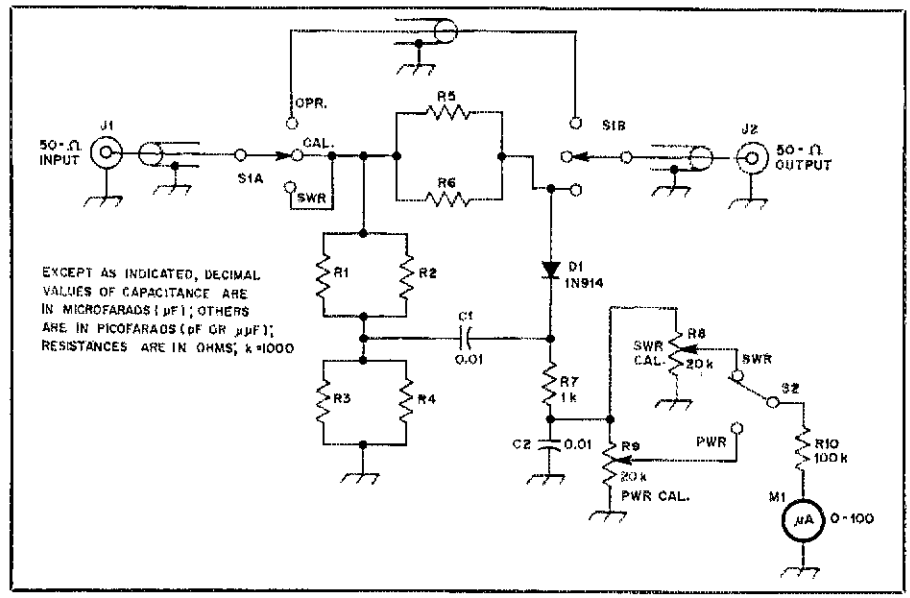


Fig. 9 — Schematic diagram of the resistive power bridge. Capacitors are disc or chip ceramic types. R1 through R6, inclusive, are 100-ohm, 2-W composition (noninductive) resistors. S1 is a two-pole, three-position phenolic wafer switch. S2 is a spdt toggle switch. R8 is a 20-kΩ linear-taper control with shaft (panel mounted). A pc-board control is used for R9. R7 and R10 are 1/2-W composition types. R10 aids the meter linearity. It can be removed if greater sensitivity is needed.

had by adjusting R9 accordingly. I chose a 20-W scale because of the surplus meter I obtained; it had a 0-20 W scale, plus an SWR scale.[2]

The SWR function of the instrument in Fig. 9 can be calibrated by means of a panel-mounted control, R8. The operating modes — OPR, CALIBRATE and SWR — are chosen by switch positioning of S1. The bridge is bypassed in the OPR mode. We may expect accurate power readings (within 10%) from 1.8 through 30 MHz with this circuit. Tests with a Bird Thruline wattmeter confirmed the accuracy. Two less-expensive meters are suitable for use in this bridge (Fig. 11) (see note 2), but you will have to develop your own calibration scale if one of them is used.

Construction Notes

The photograph on the title page of this article shows how the instrument is laid out. A green panel was chosen (pc board panel coated with Hunter Green spray-can paint) for use with green Dymo tape labels. This provides a reasonably professional appearance for the finished product. The U-shaped cover is fashioned from aluminum sheet and is painted gray. The kit version of this instrument is somewhat smaller than the W1FB version. Dimensions for the latter unit are (HWD) 3 × 4-1/2 × 3 inches (76 × 114 × 76 mm).

An interior view of the meter is seen in Fig. 12. The bulk of the components are contained on a pc board that is mounted vertically in the center of the box (Fig. 13). Miniature coaxial cable (RG-174/U) is used for all rf leads between the circuit points that we must join. The shield braid of the cables should be grounded at both ends. A pair of no. 6 spade bolts is used to secure the pc board to the base of the cabinet.

Our cabinet is made entirely of pc-board sections (single-sided board). The walls and bottom are joined by means of soldered seams. A 40-W or greater pencil type of iron is best for this work. It will ensure ample heating of the surfaces and will result in an even flow of solder.

Although SO-239 uhf connectors are used in my model of the bridge, other styles of rf connector can be used. It would be entirely suitable to use single-hole-mount RCA-style phono jacks, BNC connectors or CATV hardware. The use of phono jacks would certainly reduce the cost of this project. A parts-placement guide for the pc-board module of the instrument is provided in Fig. 15.

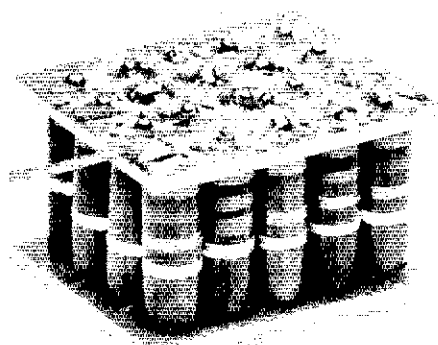


Fig. 10 — A homemade low-power 50-ohm load (see text).

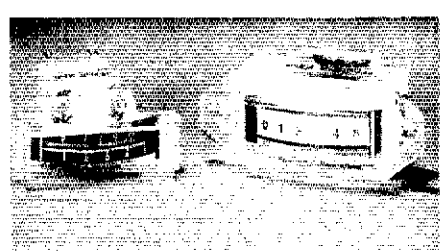


Fig. 11 — Low-cost surplus fm tuning meters can be used at M1 of Fig. 9.

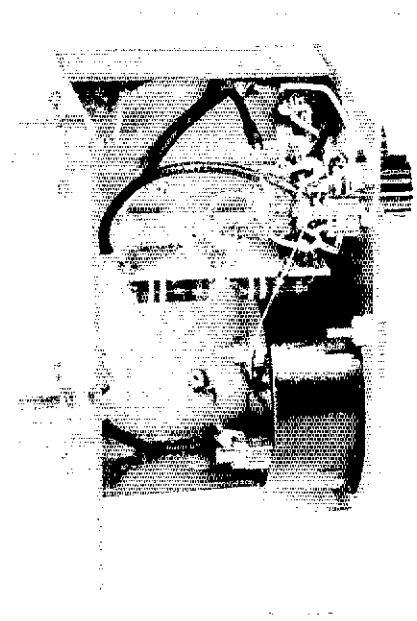


Fig. 12 — Interior view of the QRP power meter. W7ZOI "ugly construction" is used.

Bridge Setup and Use

A 50-ohm dummy load is connected to J2 of Fig. 9 during our testing of the assembled unit. A low-power transmitter, or a medium-power one with the drive turned down to provide a few watts of output, is connected to J1. S1 is placed in the CAL position, and R8 is set at midrange. Rf power is applied slowly to the bridge until a full-scale reading is noted at M1. Next, we will switch S1 to the SWR setting. If the circuit is functioning properly, the needle of M1 will drop to zero or nearly so. In the OPR position of S1, we can bypass the bridge during the operating period. Irrespective of the power output of your transmitter (within the safe rating of the bridge), the SWR adjustment remains as just described. In other words, set R8 for a full-scale reading of M1, then switch to the SWR mode and note the meter indication. If the meter does not display a zero reading, adjust the antenna matching device or Transmatch until the meter reads zero. That will indicate an SWR of 1:1.

Our next step calls for calibration of the instrument for reading rf power. First we must decide what the full-scale power range will be. It can be 0-1, 0-5 or 0-10 W, if we choose. If a calibrated power meter is available from a friend, the task will be a simple one. That instrument will be connected between our transmitter and J1 of Fig. 9. A 50-ohm dummy load will be attached to J2. The desired full-scale power is applied to the instrument, and the internal potentiometer, R9, is adjusted to yield a full-scale reading at M1. The transmitter power is next reduced in increments of 1 or 2 W, and the meter face is marked accordingly. Upon completion of the calibration exercise, we can, if we wish, make a new meter face and paste it over the original one. Fortunately, the meter shown in the photograph of my unit tracks very nicely with the circuit of Fig. 9 for a 20-W full-scale reading. The bridge resistors can't take a sustained 20-W power level without damage, however, so I make measurements in that range with short key-down bursts. A steady power of 10 W is not suggested either, because the resistors can change value over time at that power level. It is best to make our measurement periods short (a few seconds) when the power exceeds 5 W.

If you're unable to borrow a calibrated rf-power meter, you may plot your meter scale by following one of the simple procedures described earlier in this article: A dummy load can be connected to J2 of Fig. 9 and an rf probe with VTVM used to calculate the power through the load.

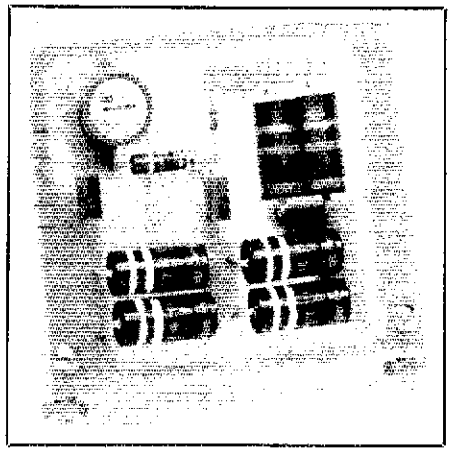


Fig. 13 — The pc board that contains most of the parts for the bridge portion of the instrument.

Some Final Comments

The characteristics of the diode used at D1 of Fig. 9 can have an effect on the relative linearity of the meter scale. Different types of small-signal diodes may have dissimilar conduction profiles, thereby resulting in slightly different conduction curves — especially at very low power levels.

A meter with a movement of 500-μA dc or less will be best for use in this circuit. Many of the surplus fm tuning meters (Fig. 11) have movements of approximately 200μA, making them suitable for use in this circuit. They can be taken apart to permit pasting on a new meter face. If the meter movement is greater than 500 μA, we may be unable to obtain full-scale deflection at very low power levels.

For the time being, at least, the QRP person can make accurate power measurements by building his or her own inexpensive instrument. The techniques are uncomplicated. If you haven't measured the output power of your rig, this article will show you how it's done. Good luck with your workshop project!

Notes

[1]Pc boards or complete parts kits for the QRP power meter are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002, tel. 303-542-5083. Catalog available.

[2]The meters shown in this article are available from Surplus Electronics Corp., 7294 N.W. 54th St., Miami, FL 33166, tel. 305-887-8228. Catalog available.

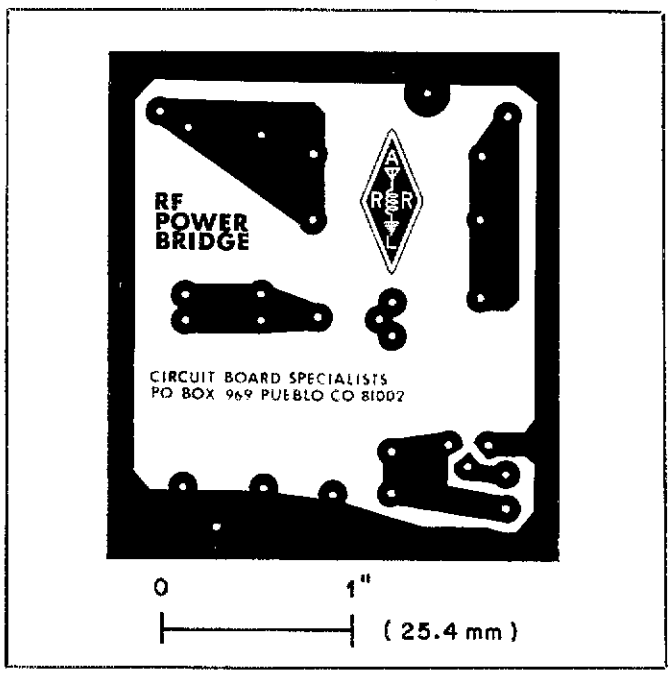


Fig. 14 — Circuit-board etching pattern for the RF Power Bridge. The pattern is shown full size from the foil side of the board. Black areas represent unetched copper foil.

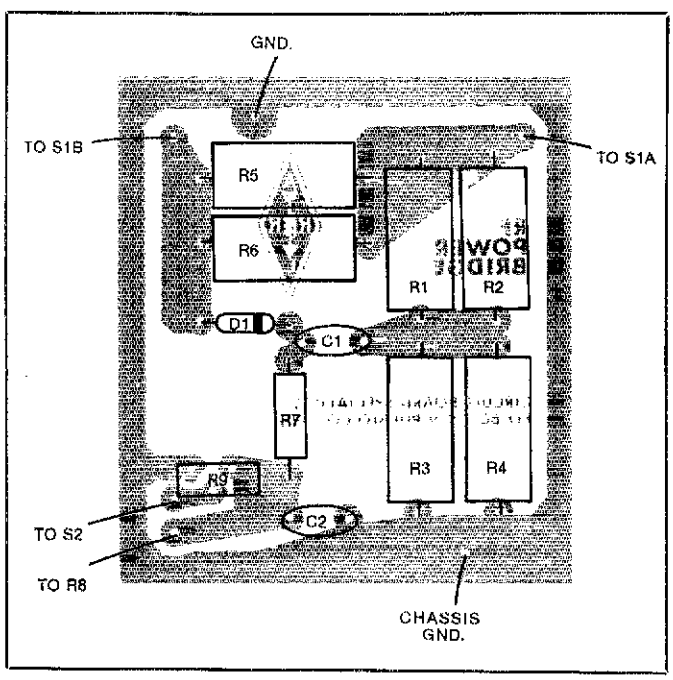


Fig. 15 — Parts-placement guide for the pc board of Fig. 14. Components are mounted on the non-foil side. Gray areas represent unetched copper.

Hints and Kinks

Conducted By Larry D. Wolfgang,* WA3VIL

A SIMPLE LOGIC PROBE

Many projects use logic circuits to perform a variety of tasks. Studying the operation of such circuits, or troubleshooting them, does not require a measurement of the actual circuit voltages. It is only necessary to know if a logic 1 or a logic 0 is present. Fig. 1 shows a simple but effective logic probe that I built as a weekend project. The components are easy to find, and the cost for all new parts should be less than $10. Most hams will be able to find many of the parts in their junk box.

This is a high-impedance probe. It will not load down the circuit under test. Input to the probe is through a 400-kΩ resistor to two transistors wired as a Darlington pair. Output from the Darlington amplifier is fed to a 7404 hex inverter, which is used to drive appropriate segments of a common-anode, 7-segment LED display. The complete schematic diagram is shown in Fig. 2.

Power for the probe is obtained from the circuit under test. Batteries could be used, but they would add to the size and weight of the unit.[1] I used an etched circuit board for my probe, but the layout is not critical; any construction method should work fine. Fig. 3A is a circuit-board etching pattern and Fig. 3B is the parts-placement diagram. Most small-signal npn transistors will work for Q1 and Q2. I made the probe tip from a 2-1/2 inch length of no. 12 copper wire soldered to the circuit board.[2,3] I covered this with the plastic barrel from an old ballpoint pen.

If the probe detects a ground (logic 0) or no connection, the top half of the readout will light, forming a small 0. If a positive voltage is applied to the probe tip, a 1 will be displayed. If the probe tip detects a pulse, a P will light up. The P will appear to flash at the pulse rate, but you should be aware that if the pulse duty cycle is much different from 50% a true indication will not be given.

I have found this logic probe to be a useful device for checking digital-circuit operation. I am sure it will be a welcome addition on your test bench. — *Robert Crawford, WA6RYZ, La Mesa, California*

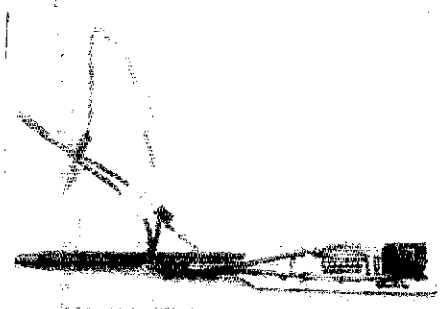


Fig. 1 — Photo of a simple logic probe built by WA6RYZ.

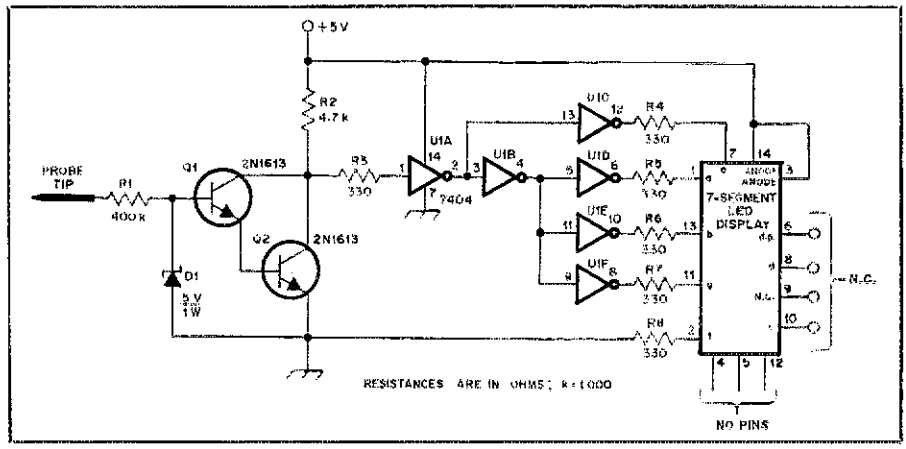


Fig. 2 — Schematic diagram of the simple logic probe. Operating power is taken from the circuit under test.

Q1, Q2 — 2N1613 or other small-signal npn transistor, such as 2N2222.

U2 — Common-anode, 7-segment LED display, such as Radio Shack part no. 276-053.

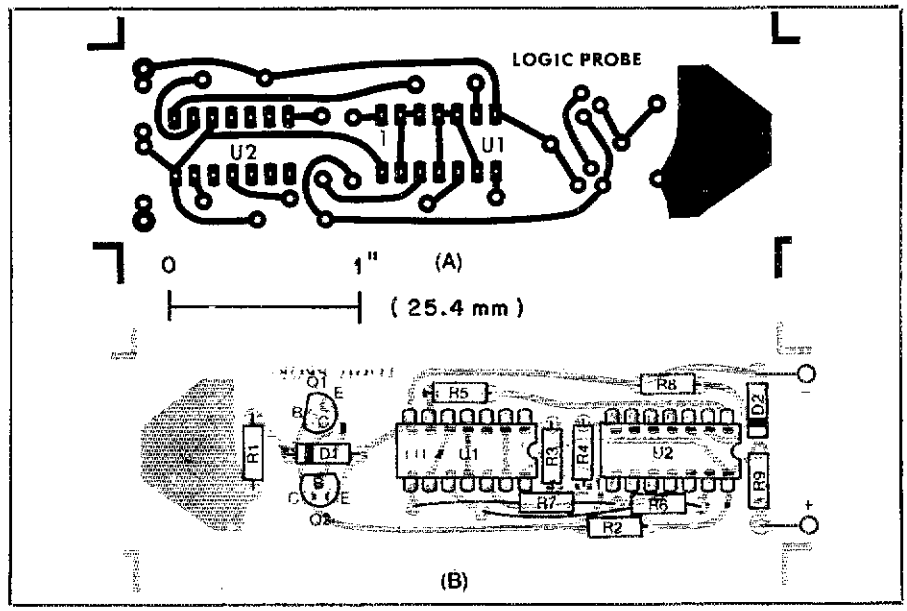


Fig. 3 — A full-size circuit-board etching pattern is shown at A. Black represents unetched copper, viewed from the foil side of the board. A parts-placement diagram is shown at B. This view is from the component side of the board, with gray areas representing an X-ray view of the remaining copper. R7 and R8 are mounted on the foil side of the board. This pattern includes a 5-V Zener diode (D2) and 150-Ω current-limiting resistor (R9) for the power leads.

[1]Editor's Note: As shown, the probe can only be used with circuits that have a 5-V supply. In the unit I built I wired a 5-V Zener diode across the power connection, and brought the positive supply lead to the board through a 150-Ω current-limiting resistor. This enables me to use the probe on circuits with up to a 12-V supply. The two extra parts are soldered to the appropriate circuit pads on the foil side of the board.]

[2]mm = in. × 25.4.

[3]Etched circuit boards and complete parts kits are available from Circuit Board Specialists, P.O. Box 969, Pueblo, CO 81002 and from RADIOKIT, Box 411, Greenville, NH 03048.

*Assistant Technical Editor

LOGIC LEVELS FROM THE TRS-80® MICROCOMPUTER CASSETTE OUTPUT PORT

The circuit for generating TTL levels from the Radio Shack TRS-80® Model I computer cassette output port, shown in the September 1982 Hints and Kinks column, has a significant drawback. The open-collector nature of the LM339 comparator may not properly force a TTL high. This can be solved by adding a 2.2-kΩ pull-up resistor between the output (pin 1) and V_{cc} (pin 3). Fig. 4A shows an alternative circuit

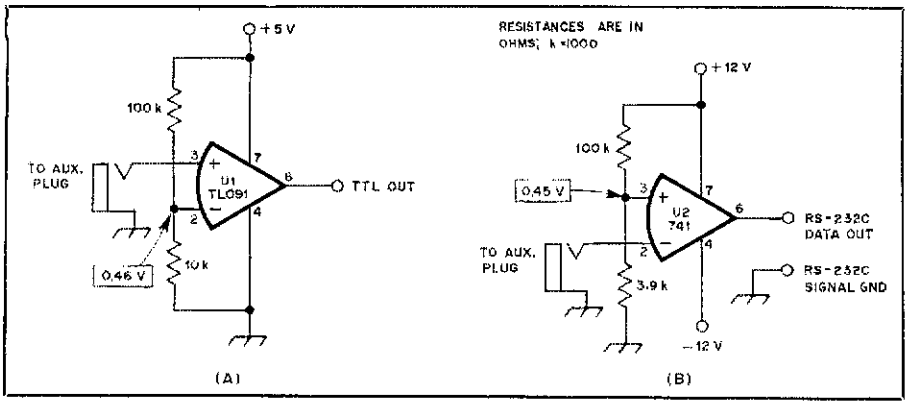


Fig. 4 — A circuit for developing TTL levels from the TRS-80® microcomputer cassette output port is shown at A. A similar circuit to develop RS-232C levels is shown at B.
U1 — TL091 op amp, Radio Shack part no. 276-1745.

using a TL091 op amp. It does not need a pull-up resistor.

A similar circuit can be made to drive an RS-232C line, if a dual-voltage power supply is available. Fig. 4B shows this arrangement. If you do not have a dual-voltage supply, two 9-V transistor-radio batteries (connected in series), with the common terminal between batteries as ground, will work with no modifications to the circuit. If batteries are used, changing the 3.9-kΩ resistor to a 4.7-kΩ unit will give slightly improved performance. Note that the LM741 is wired in the inverting mode because the RS-232C convention is for a voltage between −5 and −15 to represent logic 1 (mark) and for a voltage between +5 and +15 to represent logic 0 (space).

With both circuits, the statements "OUT 255,1" and "OUT 255,2" can be used to develop a logic 1 and logic 0, respectively. The logic states set by these statements will not change unless another OUT statement is executed, or the program in which the original statements are executed stops running. — *Michael Bilow, N1BEE, Cranston, Rhode Island*

INCREASING TUBE LIFE WITH A THERMOMETER

☐ Some operators find that the final amplifier tubes in their rigs will last for many years, while less-experienced hams will have to buy several sets of tubes in the same time. One important aspect to maintaining long tube life is to prevent the tube temperature from getting too high. My solution to this problem is to install a thermometer in the final-amplifier compartment. Now I can check the ambient temperature of the tubes. This gives an indication of how long I can hold the key down during tune up, and how effective the cooling fan is. Others who have tried this idea report that their tubes now last up to 100 times as long as before! I hope this information may help other amateurs keep their tubes operating longer. — *Jan Martin Noeding, LA8AK, Vaagsbygd, Norway*

MAGNETIC SWITCH FOR CW TUNE UP

☐ I use a Curtis Lil' Bugger keyer for cw operation. This keyer does not have a tune position, so there is no convenient method to produce a steady signal to tune my transceiver. Fig. 5 shows how I use a reed switch and a small magnet to provide a tune function. My transceiver requires a 1/4-inch phone plug for the key line, so I wired the switch into that. You can use whatever type of plug your rig needs. By holding a small magnet next to the plug, you can key the transmitter. Remove the magnet when you complete the tune-up operation and you are ready to go. — *Rick Lucas, WBØNQM, Lawrence, Kansas*

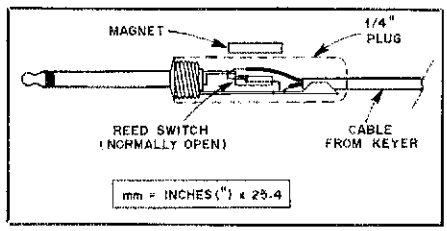


Fig. 5 — WBØNQM uses a reed switch and a small magnet to provide a tune function with his electronic keyer.

LIDS FOR PC-BOARD PROJECT CASES

☐ Adding a screw-down lid to a project case made from pc-board material can be a problem, especially when you try soldering a nut into the corner of the box. I find that a better way to fasten the lid is to use a piece of 1/8-inch brass or copper tubing. Hold one end in a vise and thread about a 1/2-inch length using a no. 4-40 tap. A little tap fluid may help. (The 4-40 screw is a bit small for 1/8-inch tubing. A no. 5-40 screw is the right size. This size tap will cut a full-depth thread in the tubing. — Ed.] You can cut off this section with a utility knife, by rolling the tubing on your workbench. A 1-foot piece of tubing will provide more than 20 "nuts." They line up easily in small corners, solder quickly in place and take up little space (Fig. 6). — *Robert Dixon, W8HGH, Rochester, Michigan*

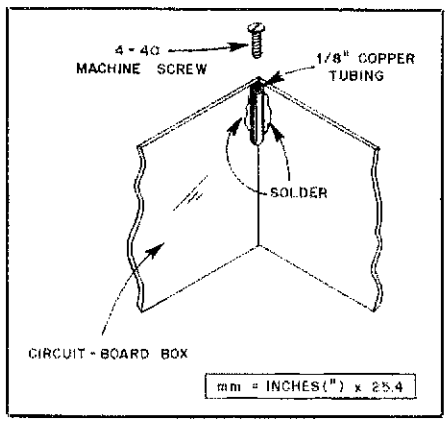


Fig. 6 — Copper tubing "nuts" are used to secure a lid to a pc-board project case.

WEIGHTED TUNING DIAL FOR SMOOTHER OPERATION

☐ My Kenwood TS-830S tuning mechanism had a nice feel, but I performed a simple modification that made tuning it even smoother. I removed the tuning knob and found a large groove around the inside edge. I simply added weight to the knob by carefully melting solder and letting it drip off the tip of the soldering iron into the groove in the knob (Fig. 7). I built up several layers of solder, allowing each one to cool before adding the next. Be careful that you do not block the set-screw holes with solder in the process! [Lead shot or BBs and white glue or epoxy also work well. — Ed.]

I reinstalled the knob after the solder had thoroughly cooled. The feel of the tuning dial is even nicer now, and a spin of the knob sends the VFO rapidly up or down the band. I am sure this modification can be made to many other rigs just as easily. — *Donald Cottingham, VE3HXY, Burlington, Ontario*

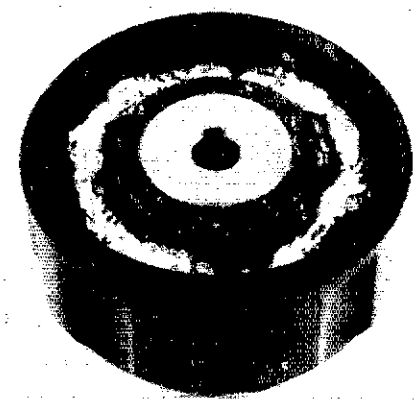


Fig. 7 — Photo showing the solder that VE3HXY added to the tuning dial of his TS-830S to provide smoother tuning.

RFI AND CAPACITIVE-TOUCH PADDLES

☐ I built the CMOS Iambic Keyer and added an Ash-Proof Keyer Paddle.[4,5] I soon found that being within 100 feet of an antenna, using anything more than 50 W, caused erratic operation. I added a 0.75-mH rf choke to each of the dot and dash lines from the touch pads. (Ferrite beads on these lines might also work.) The chokes eliminated the problem except during 20-meter operation. I also connected 100-pF capacitors from the pads to ground. Sensitivity adjustment is more critical if larger values of capacitance are used. These changes have solved my RFI problems. — *Rolla Wade, KF4TF, Kingsport, Tennessee*

[4]T. Theroux, "A Digital CMOS Iambic Keyer," *QST*, June 1982, pp. 26-28.
[5]R. Lewallen, "An Ash-Proof Keyer Paddle — Something New for CW Operators!," *QST*, Aug. 1981, pp. 30-31.

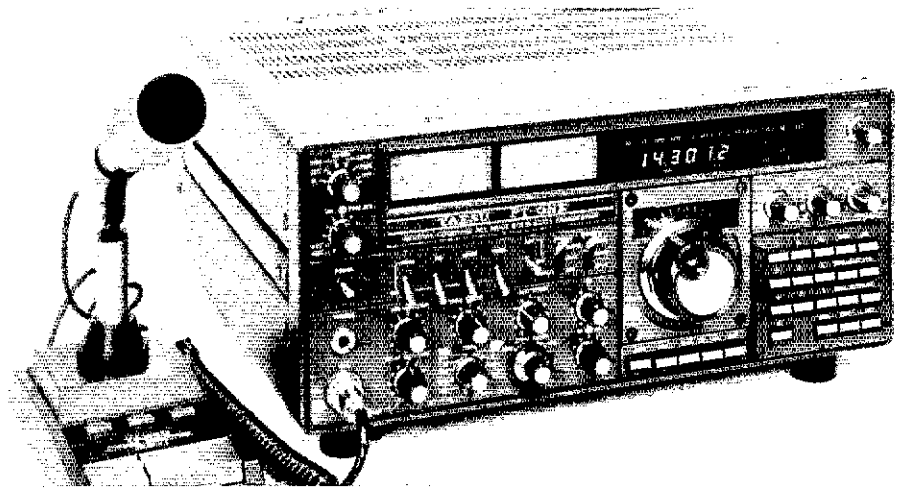
Product Review

Conducted By Paul K. Pagel,* N1FB

Yaesu FT-ONE HF Transceiver

One look at the FT-ONE and you know that it is not the "average" transceiver! There is such an array of buttons, knobs, switches and displays that there is no empty space on the front panel. My first thought upon receiving the review model was to hook up an antenna, plug it in and start tuning around. After a second thought, I decided to read the operating manual instead; I'm glad I did!

The clearly written manual does an excellent job of telling you what you need to know. For example, almost one page is dedicated to the operation of the variable bandwidth and i-f shift features. By studying the large accompanying diagram, one can easily grasp how these controls operate and how to use them to best advantage. I spent about an hour reading and digesting the contents. The time was well spent! I noticed later that people unfamiliar with the FT-ONE were not able to take advantage of the many features that make it a joy to use.



Yaesu FT-ONE HF Transceiver, Serial No. 040145

Manufacturer's Claimed Specifications	*Measured in ARRL Lab*
Frequency coverage: Receive — 150 kHz to 29.9999 MHz; transmit — 1.8 to 2.0, 3.0 to 4.0, 7.0 to 8.0, 10.0 to 11.0, 14.0 to 15.0, 18.0 to 19.0, 21.0 to 22.0, 24.0 to 25.0, 28.0 to 29.99 MHz.	As specified.
Modes of operation: cw, ssb, a-m (fm optional).	As specified.
Frequency display: Six digit.	3/8-inch high, six-digit yellow LED.†
kHz/turn of knob: 10 MHz/20/2.	As specified.
Frequency resolution: 100 Hz.	As specified.
Backlash: Not specified.	Nil.
S-meter sensitivity (μV/S9 reading): Not specified.	160 m, 9; 80 m, 8.5; 40 m, 8.5; 30 m, 8.4; 20 m, 10; 17 m, 8.8; 15 m, 9.1; 12 m, 9.0; 10 m, 9.1.
Transmitter output: 160-15 m, 100-W PEP; 10 m, 90 W.	160 m, 120; 80 m, 125; 40 m, 120; 20 m, 120; 15 m, 125; 10 m, 110.
Harmonic suppression: Better than 50 dB.	−53 dB (see photo).
Spurious suppression; Better than 40 dB.	−65 dB (see photo).
3rd-order IMD: Better than 31 dB.	−38 dB (see photo).
Receiver sensitivity: Less than 0.3 μV for 10-dB S + N/N.	Receiver dynamics measured with optional 300-Hz filter installed:

	80 m	*20 m*
Noise floor (MDS) dBm:	−133	−138
Blocking DR (dB):	noise limited	
Two-tone 3rd-order IMD DR (dB):	noise limited	
3rd-order Intercept:	noise limited	

Size (HWD): 6.2 × 14.6 × 13.8 in.	As specified.
Weight: 37.5 lb.††	As specified.

†mm = in. × 25.4. ††kg = lb × 0.4536.

A Peek at the Panel

Two meters are found on the front panel. The one on the right is an S meter during receive; in the transmit mode, it measures alc level. The other meter is controlled by a switch in the upper left corner of the panel; with it you can measure the final amplifier collector supply voltage and current, discriminator voltage (fm mode), compression level of the built-in speech processor, relative forward output power and SWR. Below the meter switch is a pair of concentric controls that set VOX and relative forward power sensitivity.

Below the meters is a row of toggle switches. Those labeled POWER, PROC and NB are used to turn on and off the main power, the rf speech processor and the noise blanker, respectively. The automatic microphone gain control (AMGC) switch enables a microphone gain threshold circuit. This circuit acts as a "microphone squelch" system. The microphone amplifier is not enabled until a minimum input level is present. Speech monitoring and cw sidetone are controlled by the MONI switch. An audio filter is controlled by the APF/NOTCH switch. In the APF position, it behaves as a cw audio filter; in NOTCH, an interfering carrier can be greatly reduced in level. Filter center frequency is controlled in the 300- to 1500-Hz range by a knob just below the switch. The AGC switch selects recovery time for the receiver age circuit; you can choose fast or slow, or turn off the age if you desire. The SCAN switch selects the desired stop mode during scanner operation. When this switch is placed in the AUTO mode, the scanner will halt on any signal that is strong enough (S1 or greater) to cause age action. To stop the scan manually while in the AUTO mode, place the SCAN switch in the STOP position momentarily. Place the SCAN switch in the MAN position for manual scanner operation; the scanner will be activated when the UP or DOWN switches on the keyboard or microphone are pushed. Release the switch to halt the scan.

The lower-left portion of the front panel contains two jacks. When a standard two-conductor phone plug is inserted into the PHONES jack, the internal speaker is disconnected automatically. The headphone impedance should be 4-8 ohms. An eight-pin MIC connector accepts the microphone audio input, as well as the push-to-talk (PTT) and scanning control lines. Nominal microphone impedance is 600 ohms.

To the right of the jacks is a series of knobs. Gain of the microphone amplifier during ssb and a-m operation is set by the MIC control; a concentric control labeled COMP is used to adjust the compression level of the rf speech processor. Another concentric control is used to set the speed of an optional internal electronic KEYER and to adjust VOX hang time DELAY. When the DELAY control is rotated fully counterclockwise into the click-stop, the transceiver is ready for QSK (break-in) cw operation. The DRIVE control is used to set rf levels on a-m, fm, cw, fsk and on ssb when using the rf speech processor. (When the processor is switched out, the MIC control determines rf levels.) When the noise blanker is switched on, turning the NB knob clockwise lowers the threshold, causing the blanker to be more sensitive to impulse noise.

The MODE switch has 11 positions for the selection of operating mode and optional filters.

*Assistant Technical Editor

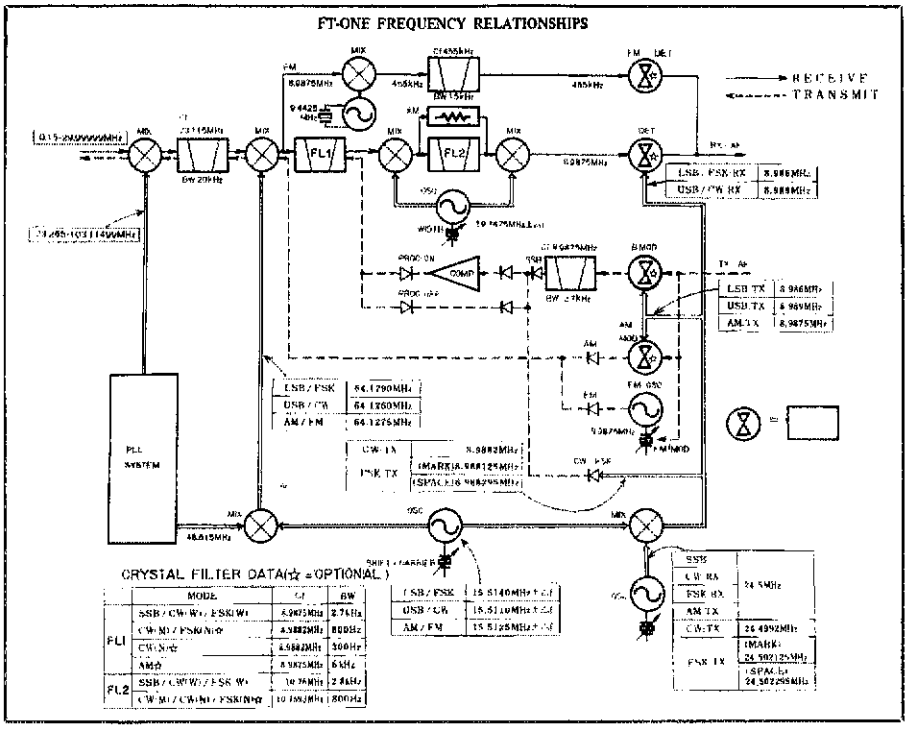


Fig. 1 — Block diagram of the FT-ONE showing frequency relationships.

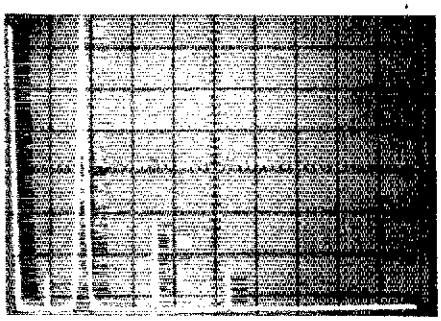


Fig. 2 — Worst-case spectral display of the FT-ONE. Vertical divisions are each 10 dB; horizontal divisions are each 2 MHz. Output power is 120 W at 1.8 MHz. All spurious emissions are at least 53 dB below the fundamental output. The FT-ONE complies with current FCC specifications for spectral purity.

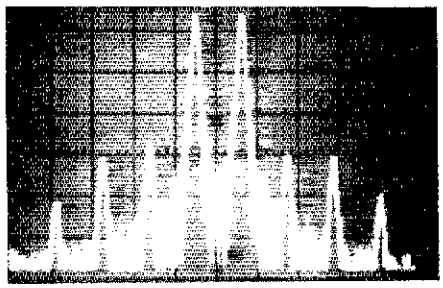


Fig. 3 — Spectral display of the FT-ONE during transmitter two-tone IMD test. Third-order products are 38 dB below PEP output, and the fifth-order products are 40 dB down. Vertical divisions are each 10 dB; horizontal divisions are each 1 kHz. The transceiver was operated at rated output power on the 160-meter band.

You can even choose RX-U/TX-L (receive usb, transmit lsb) or RX-L/TX-U. The value of that feature may not be obvious unless you plan to operate through the AMSAT Phase IIIB satellite (OSCAR 10). What goes up on usb (Mode J or L) comes down as lsb. A tip of the hat to the folks at Yaesu for that little extra that will add much to the value of the FT-ONE.

The SHIFT and WIDTH controls are mounted on concentric shafts. Moderate friction between them allows fingertip adjustment of the i-f shift and variable bandwidth features. The controls are normally aligned so that the black zone on the inner dial is fully within the cutout area of the outer (paddle) control. If interference is heard on ssb, narrow the bandwidth by holding the center knob and rotating the paddle control. A narrower bandwidth has now been set. Use the paddle to align the passband for optimum reception and interference reduction.

Receiver rf and i-f amplifier gain is varied by the RF GAIN control. Audio output level is set by the AF control. In the fm mode, the SQL control keeps the receiver silent until a signal is present.

Frequency Control

The transceiver main tuning knob can be used to control the VFO or the clarifier (RIT) frequency. Five push buttons, located directly below, are used in conjunction with the main tuning knob. When the alternate-action FINE switch is in, the main tuning knob will vary the transceiver frequency at a rate of 2 kHz per revolution; in the out position, the rate is 20 kHz per revolution. When the MHZ switch is held depressed and the main tuning knob is turned, the tuning rate is 10 MHz per revolution.

Pressing the CLAR switch activates the clarifier, allowing an offset in receive frequency of up to ± 9.9 kHz. Once the clarifier is activated, the transmit frequency cannot be changed. My first impression was that I did not like that feature. After using the FT-ONE for a few weeks, I changed my mind. While this feature can be used for split-frequency operation, it is not the best way to operate "split" — but more on that later. When the clarifier is operating, pressing the RX-TRX button causes both the transmit and the receive frequencies to offset. A second button depression causes only the receive frequency to offset. Pressing the button marked LOCK disables frequency changes by the main tuning knob.

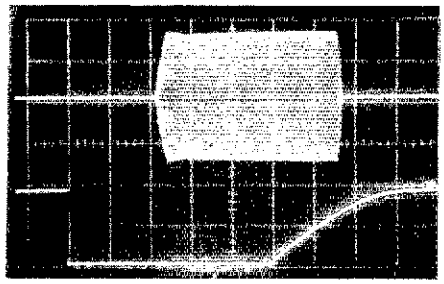


Fig. 4 — FT-ONE cw keying waveform. Upper trace is the rf envelope; lower trace is the dc level at the key jack. Each horizontal division is 5 ms.

To the right of the tuning knob is the keyboard and three VFO switches. This combination makes a versatile and powerful frequency-selection system. Fig. 5, taken from the FT-ONE operating manual, will give you an idea of how many ways you can select a given frequency. Once you become familiar with the equipment, you will be surprised at how quickly and easily you can change frequency, set up a split or scan a portion of a band.

The RF ATT control, located in the upper-right corner of the front panel, adjusts the receiver front end attenuation. PIN diodes are used in the attenuator. This control is particularly useful on crowded and noisy bands.

A yellow LED display directly over the tuning knob shows the operating frequency. A smaller red LED display to the right shows which of the 10 VFO memories is in use and the amount of clarifier offset (when the clarifier is switched in).

A set of 10 yellow LED indicators is located above the frequency displays. These indicators provide quick verification of various operating functions. When a particular LED is illuminated, the respective function is in operation. The functions include PROC (speech processor), NB (noise blanker), AMGC (automatic microphone gain control), MONI (ssb voice monitor/cw sidetone), APF (audio peak filter), NOTCH (audio notch filter), A. SCAN (automatic scan), RX (receiver clarifier), TRX (receive/transmit clarifier), D. LOCK (dial lock), TRCV (Transceive mode) and TX. DIS (transmitter disabled — lights when attempting to transmit outside an amateur band).

Versatility is the word that describes the front panel; it also describes the rear panel. Antenna connections are designed so you can use an external receiver, a separate receive antenna, a vhf transverter or other external equipment (see Fig. 6).

Other rear-panel jacks can be used to connect an external speaker, an fsk terminal (170-Hz shift), a tape recorder (400 mV at 50 kΩ, fixed level), anti-trip audio (from external receiver), a phone patch, a PTT switch (I use a foot

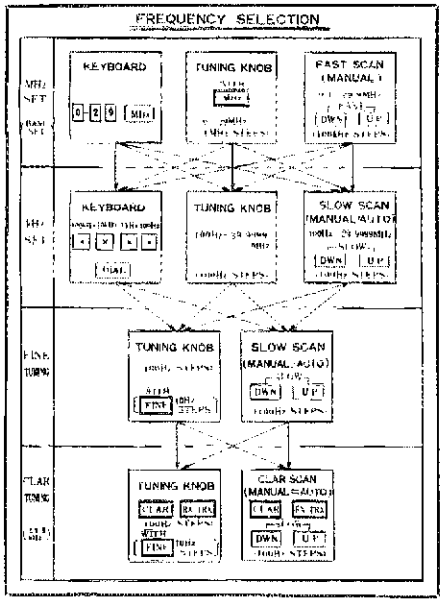


Fig. 5 — This diagram is used in the FT-ONE operating manual to explain the various ways of tuning to a given frequency.

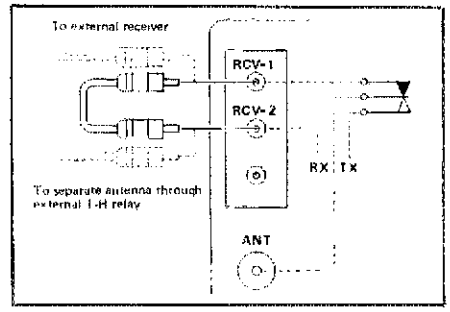


Fig. 6 — Antenna and rf connections on the rear panel of the FT-ONE. In normal operation, a jumper connects RCV-1 to RCV-2. The RF OUT jack provides transmitter output at −6 dBm into 50 ohms for use with a transverter or other accessory equipment.

switch), an i-f signal waveform monitor or sidetone (for external receiver). A pair of key jacks are used to key the transmitter directly (KEY-1) or to operate the optional internal electronic keyer unit (KEY-2). Two DIN-type jacks are used for making interconnections to linear amplifiers, transverters or other accessories.

Personal Observations

I wanted to change the cw offset on the FT-ONE. With other transceivers it has been as simple as setting the RIT control for the desired offset. That won't work with the FT-ONE! A telephone call confirmed the proper procedure; VR 3005 (TX CW) on the LO board sets the cw offset. Complete the job by adjusting the sidetone frequency as described on page 26 of the operating manual.

My linear amplifier has an electronic bias switch. When no rf energy is applied, the tubes are biased to cut off. When rf is first applied, it takes a couple of cycles for the switch to activate. The FT-ONE did not "like" that. When I tried to send a series of dots, the first few were severely level-limited by the transceiver alc. It took a bit of pondering to solve the problem (the FT-ONE worked fine with other amplifiers!). When I disabled the electronic bias switch, the transceiver and amplifier worked together nicely.

I have had the FT-ONE on the air for several weeks, and in a couple of contests. I am pleased with the results. Most reports have been complimentary (twice I was told that the keying was slightly harsh). The speech processor and AMGC help deliver clean, crisp ssb that is clear of background clutter. The joys of QSK must be experienced to be fully appreciated. When I need the amplifier (not very often!), it is only necessary to insert the appropriate delay — my amplifier is not equipped for QSK.

Split-frequency operation is handled with ease by using the VFO select switch in the RA-TB position. Set the A and B VFO channel selector switches for different channels. Tune in the station you want to contact. Set the VFO select switch in the B position. Tune in the frequency you want to transmit on. Return the VFO select switch to the RA-TB position and you are ready to call.

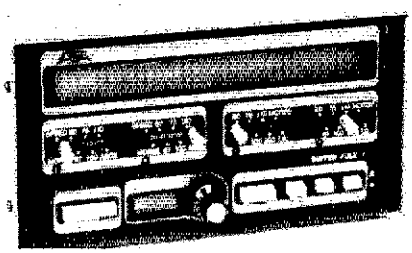
From my rural location, I noticed reciprocal mixing problems only a couple of times — and then not bad. In this regard, the FT-ONE is no different than most of the frequency-synthesized, hf transceivers that have been tested in the ARRL lab.

At the end of the review period, the FT-ONE developed a malady: It would not transmit in the low end of the cw bands. The transceiver was returned to the Yaesu service center. The problem, a bad solder joint on the PLL board, was repaired under warranty.

It is easy to summarize my opinion of the FT-ONE — I like it! It has the flexibility and features that appeal to DXers and contesters alike. Those same features make net and casual operating fun, too. The FT-ONE deserves to be called "top of the line."

Yaesu has two modification kits available for the FT-ONE. The NB-ONE is a noise blanker modification that the manufacturer says will eliminate the "woodpecker." A second kit, the FAN-ONE, changes the operation of the PA heat-sink fan from continuously running to on-demand. That is, the fan operates only during transmit periods or when the heat-sink temperature has risen beyond a specific point.

Price class of the FT-ONE with the 300-Hz cw filter, the 600-Hz cw filter, the 6-kHz a-m filter, the 3rd i-f cw filter, a memory back-up board and the fm board: $2900; KY-ONE keyer price class: $45; dc cable, $15. Price class of the NB-ONE is $10; FAN-ONE, $5.40. — *Chuck Hutchinson, K8CH*



AEA MBA-RC

☐ Probably the best word to describe this μP-based unit is "multifaceted." With it, you can receive and transmit Morse code and Baudot/ASCII RTTY. So, what makes this unit any different from many others on the market? The fact that it can perform code conversions and allow cross-mode operation. You can transmit in any of the modes and speeds available on the 'RC and receive a station using a different mode or speed. You cannot input 300-baud ASCII from your keyboard to the 'RC, but the unit can transmit 300-baud ASCII. (It speed converts 110 baud to 300 baud to do this.) The Baudot speed range is 60, 67, 75 and 100 wpm, while Morse speeds of from 2 to over 80 wpm can be handled.

At the top of the front panel is a 32-character vacuum fluorescent-blue display that offers a built-in monitoring system for reception and transmission. Input and output mode/speed selection switches occupy left and right positions immediately below the display. The bottom row of controls includes RTTY/cw filter selecton switches, a signal-tuning LED bar graph, a variable shift control, carriage return/line feed control switches, an i-d/cw speed set switch, mark/space inversion controls and a power ON/OFF switch. A BUFFER FULL LED sits just above these last switches.

All I/O connections are made at the rear panel. These include power, audio, speaker, tape, scope, keying and printer ports. TTL level output, parallel ASCII, 20/60 mA current loop keyer and an optional RS-232 hookup are available. Some less-often-used controls, such as the speaker and afsk output level potentiometers, and selection switches for downshift on space, printer lockup and 170/850-Hz shift, are there, too. A required external power supply delivering 13-V dc (±3 V) at about 1.2 A connects to the 'RC by means of a miniature coaxial power plug.

Two 3870 single-chip, 8-bit microcomputers are at the core of the MBA-RC. A pair of 74150 16-input multiplexers handle the speed/mode selector switch decoding, and a pair of 2114s provide 1K of RAM. An XR-2206 generates the afsk tones.

Positive and negative key lines are controlled by high-voltage transistors (MPSA42, MPSA92). Speaker tones are created by the ever-faithful 555 IC. Current-loop input and output circuits are optoisolated.

The demodulator section decodes both mark and space tones using op-amp filters. Demodulator performance is good. While there are frequency adjustment potentiometers to set the filters to their proper frequency, the manual contains no maintenance or alignment instructions. It does have three schematic diagrams and three board layout drawings, but that's it.

Three pc boards (including the display board) hold the circuit components. The boards are glass-epoxy types, double-sided and solder masked. Component quality is excellent.

A complete account of the multitude of control functions is beyond the scope of this review. With this machine, you'll want to read the instruction manual first. It's well written and contains plenty of drawings to aid you in equipment setup and operation.

Perhaps I'm spoiled by 24-line, 40- and 80-character displays, but I found I needed some time to get used to the "Times Square" scroll and the character style of the display. Along with the incoming text to be read, there are the special characters used for carriage returns, line feeds, etc. After a while, I learned to disregard (for the most part) those irrelevant characters. The 32-character display certainly makes for an all-in-one unit, and it has its applications, but my

eyes found the display difficult to follow except at slower speeds. Reading the display at rates of up to the commonly used 60-wpm Baudot speed was tolerable, but anything higher than that was a bit too fast for comfort.

After a bit of practice, tuning in a signal using the bar graph tuning indicator becomes easy. Of course, there is the option of using the scope outputs to provide the familiar RTTY cross pattern used for tuning.

The most fun I had with the 'RC was using it with my newly acquired (old) model 33 110-baud ASCII printer. The 'RC built-in current loop keyer provided a means of hooking up the '33 and getting some "hard copy." Because of the conversion abilities of the 'RC, I could print anything from cw to 110-baud ASCII. I got a kick out of tuning in a cw signal at, say, 15 wpm and seeing the copy placed on paper as if by a slow (very slow!) typist. Copying RTTY signals at any of the available speeds was no problem for the 'RC. For the more affluent, there's a Centronics compatible parallel printer port for use with the more modern printers. (That sort of printer is on my "wish list.")

At the other end of the copying spectrum, I tried receiving 60-wpm Baudot and 110-baud ASCII while using Morse code output. Sure it works, but the limitations of operating this way should be obvious. You can also reverse the roles, and input Morse while transmitting RTTY. If you're entertaining that idea, remember that if your Morse transmission is slow the receiving operator is going to have to exercise a lot of patience! On the other hand, if you can rattle the keys of a keyboard fairly well, you can make the transition more palatable.

Selecting the VAR position of the filter selection switch permits using the TUNE control to vary the space tone filter frequency from about 2225 to 3125 Hz. This provides a received frequency-shift range of approximately 100 Hz to 1 kHz to allow reception of other than standard RTTY shifts. The TUNE control also adjusts the cw filter center frequency within a range of 900 to 950 Hz.

Cw reception suffers from the same maladies that affect most other automated cw receiving machines, the primary problem being sloppy fists. As is said, "garbage in, garbage out." During Morse operation, the operator can monitor received and sending speeds. The speed indicator appears in the extreme right side of the display.

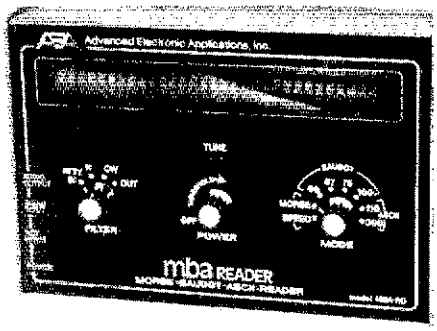
Cw transmission is best accomplished with a Baudot or ASCII keyboard. I tried using a hand key and a keyer to input Morse, but the buffered delay makes this type of operation confusing.

The I-D function performs two tasks: It is used to load an i-d message and to change the cw output speed. Unless you select a different speed, the 'RC will default to 20 wpm. I-d message length is limited to 40 characters. When that limit is reached, the BUFFER FULL LED will light and no more characters are accepted.

During transmission, the i-d message is sent by depressing the appropriate control button; it is not an automatic function. During reception, the BUFFER FULL LED illuminates when 25 characters are left in the 1024-character block. Should the buffer be forced into overflow, the display will extinguish, but data in the buffer at the time will not be lost. A.E.A. recommends using the 300-baud ASCII position of the receive output selector to avoid display blanking.

Manual and automatic control of the carriage return/line feed functions are switch selectable. In the automatic mode, a CR/LF is generated at the first space following the 60th received character or at the end of a 71-character line. Most operations will use the automatic mode.

The MBA-RC measures (HWD) 5 × 9-1/4 × 7-1/4 in. and weighs in at 4 lb 6 oz.[1] The price class is $470. It is available from Advanced Electronics Applications, Inc., 2006-196th SW, Lynwood, WA 98036. — *Paul K. Pagel, N1FB*



MBA-RO CODE READER

☐ I certainly found the AEA MBA-RO to be an interesting "appliance." It provided many hours of observing how poorly most of our cw operators handle the Morse, and it also showed the telltale evidence of my own lack of proper (cw) character formation!

One might wonder how effective a code reader can be in a crowded amateur band. Well, the circuit depends on being fed properly formed characters. It does not "like" to copy fists that are erratic or those with a "Lake Erie" or "banana boat" swing. But then, not many of us enjoy listening to that kind of sending, either! Generally, the MBA-RO will display gibberish if it is locked onto a signal that contains poor cw sending. Similarly, if the operator uses incorrect spacing between letters and words, the code reader will display exactly what is being fed into it — assuming the individual code characters are sent properly. It is distracting to have a cw message run together as though it were a horrendously long word, or to have enormous gaps between some letters or words. In practice, the human ear and mind can copy rotten cw much better than a machine can (I found myself taking my eyes off the digital readout of the code reader and relying on the coherence that my brain and ears could supply after so many years of cw copying).

This does not mean that the AEA product is deficient or poorly designed. Rather, it suggests that there aren't too many fists that such a device can copy. Indeed, it's a sad testimonial for the quality of the cw we find in our amateur bands, but it's a reality we must accept. QRM and heavy QSB tend to negate the good qualities of the instrument as well, despite the selectable built-in audio filter.

In a more positive vein, the MBA-RO does a fine job of copying keyboard-generated cw (allowing for the poor typing ability of some ops). Similarly, the RTTY copy was a delight. W1AW bulletins came through in perfect shape on both the cw and RTTY modes.

I would not recommend this device to beginners. It takes a fair amount of practice to be able to tune in a signal for reliable copy. It is not a casual operation, and one that could easily frustrate a newcomer to Amateur Radio. Conversely, I would recommend the system to anyone who hangs out on the keyboard frequencies or who works RTTY and ASCII. It would also be a suitable accessory for those who work stations that send proper keyer-generated Morse. If the operator uses his or her paddle correctly, the code reader will copy the data perfectly (I did run across a number of operators who were properly acquainted with the business end of their paddles or bug keys).

For many years, I fancied myself as a reasonable cw operator while using a quality paddle and keyer. I was gripped with despair when I hooked the MBA-RO to the sidetone output of my keyer and perceived what was being printed out on the display! My spacing wasn't all that bad, but there were a few letters that the code reader just couldn't digest. A few hours of practice, while monitoring my sending on the digital display, helped me to correct my not-so-good character formation. The code reader may be well worth the price for that application alone. If you want to be proud of your fist, you may want to give the MBA-RO a try.

The digital display has 3/8-in. characters (32 in all), and the color of the illuminated display is blue. The mode switch provides for straight Morse readout, or Morse plus the cw speed of the incoming message. In the speed-indicating mode the last two right-hand digits are used to display the sending rate of the other station. There are four Baudot positions: 60, 67, 75 and 100. The ASCII position takes care of 110 and 300 rates. Another panel switch permits wide or narrow RTTY selectivity; likewise for standard cw. The MBA-RO measures (HWD) 5-3/4 × 9 × 2-1/2 in. It is powered by a small external dc supply. The price class is $300. — *Doug DeMaw, W1FB*

CUSHCRAFT CORPORATION 220B 220-MHz "BOOMER"

☐ During the past few years, growing interest in vhf and uhf operation among amateurs in the U.S. and Canada has led manufacturers to develop high-performance antennas for the bands above 50 MHz. High performance is usually equated with forward gain, and forward gain is directly related to boom length. Cushcraft's entry in the high-performance antenna market is the "Boomer" line, aptly named in light of their relatively long booms. In addition to the 220B reviewed here, Cushcraft also markets "Boomers" for 50, 144 and 432 MHz.[2,3]

The 220B is based on the gain-optimized 4.2-λ NBS design.[4] This design calls for 15 elements on an 18-ft 9-in. boom.[5] The 220B is designated a 17-element antenna because of Cushcraft's "Trigon" reflector assembly, which employs two additional reflector elements for some additional gain. A T-match is used to feed the driven element, and the antenna is designed to be used with 50-ohm cable.

The 220B is made from high-quality aluminum stock. The machine work on the review anten-

[1]mm = in. × 25.4; kg = lb × 0.4536.

[2]G. Hull, "Cushcraft 617-6B 'Boomer' 6-Meter Yagi," *QST*, Sept. 1982, p. 41.

[3]D. Sumner, "Cushcraft 32-19 'Boomer' and 324-QK Stacking Kit," *QST*, Nov. 1980, pp. 48-49.

[4]P. Viezbicke, "Yagi Antenna Design," *NBS Technical Note 688*, U.S. Department of Commerce, Washington, DC, Dec. 1976. A discussion of NBS antennas also appears in D. Lusis, "Go for the Gain, NBS Style," *QST*, Aug. 1982, pp. 34-38.

[5]m = ft × 0.3048.

na was generally good, although some of the drilled holes were not deburred (causing one minor flesh wound).

The main portion of the boom is made from two 6-ft sections of 1-1/8 in. tubing joined by a 1-ft section of 1-1/4 in. tubing. Two pieces of 1-in. tubing complete the boom. The various boom sections are secured with worm-gear clamps and machine screws. Masts of up to 2-in OD will fit the boom-to-mast bracket. A rigid brace made from 3/4-in. tubing supports the boom. This brace may be mounted above or below the boom with no effect on antenna performance.

All elements are made from 3/16-in. aluminum rod, except for the driven element, which is made from 1/2-in. tubing. Elements are mounted to the boom by machine screws, which go through holes in the elements, then through small aluminum brackets to keep the elements from moving, and then through holes in the boom.

Cushcraft supplies first-rate hardware. All bolts, screws, washers and nuts (including the boom-to-mast U bolts and hardware) are stainless steel. Plastic end caps are provided for the boom and driven-element assemblies. Silicon grease and vinyl boots are supplied to waterproof the balun and feed-line connectors. It's obvious that Cushcraft has taken great care to provide the right parts for long and reliable antenna life.

Assembly took about one hour. The hardest part is making sure each of the 17 elements is in the correct spot along the boom. Cushcraft helps by bundling together directors number 8 through 13; they are all the same length. The instruction manual is brief and to the point. Using a minimum of text, the manual relies on clear, detailed drawings to guide you through assembly. Parts shown in the illustrations are numbered according to the parts list, leaving no questions about where each piece goes. The manual also gives instructions on stacking two or four of these antennas to provide additional gain.

Upon completion of assembly, care should be taken to align the elements. Because of the light weight of the 220B, installation can be a solo job. Remember to keep a watchful eye on the elements (especially the Trigon reflector elements) so they don't get caught in the tower. They will bend if pushed hard enough.

Chances are good that if you're reading this review you're a hard-core vhfer, or at least interested in vhf contesting. I fall into the latter category. The review 220B was originally set up at WA2OMY/3 in the Philadelphia area for the ARRL January VHF Sweepstakes contest. We mounted the antenna on a 50-ft self-supporting tower and fed it with about 70 feet of high-quality foam-type RG-8/U. Hardline is highly recommended at this frequency, but the coaxial cable was all we had available.

The antenna proved to be a real performer,

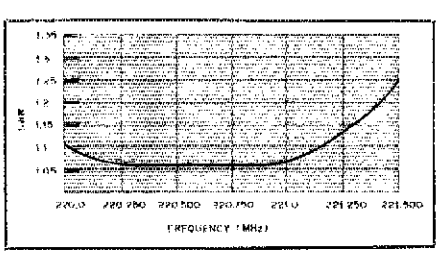


Fig. 7 — SWR curve of the Cushcraft 220B measured at the antenna with a Bird model 4410 wattmeter.

Cushcraft Corporation 220B 220-MHz "Boomer"

Manufacturer's Claimed Specifications	*ARRL Evaluation*
Boom length: 18 ft 9 in.	As specified.
Longest element: 26-1/16 in.	As specified.
Turning radius: 8 ft 8 in.	As specified.
Assembled weight: 10.5 lbs (4.77 kg).	As specified.
Windload: 2.6 sq. ft.	Not measured.
Frequency coverage: 220-223 MHz.	Confirmed.
VSWR: Less than 1.2:1 at 220.100 MHz.	Confirmed.

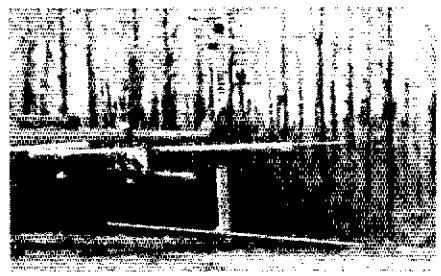


Fig. 8 — Close-up of the Cushcraft 220B Trigon reflector assembly.

despite the marginal feed line. With fair-to-average conditions, we were able to work every station we heard. Contacts north into New England and south into Maryland and Virginia were easy, whether we ran the 500-W amplifier or just the 10-W exciter. We ended the contest with the highest 220-MHz score among the Pack Rats. There was simply no comparison between the Boomer and an old-style 11-element Yagi we used previously.

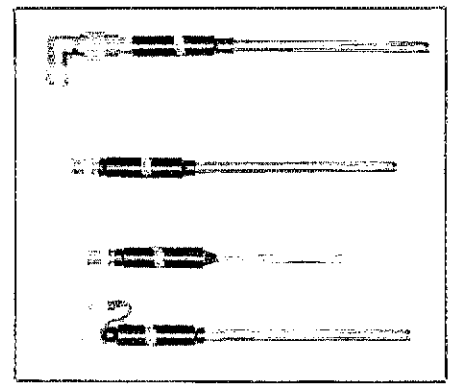
If you are looking for a reliable, well-built, high-performance antenna for the low end of 220 MHz, the 220B is worth serious consideration. It lists for $110. Manufacturer: Cushcraft Corporation, P.O. Box 4680, Manchester, NH 03108. — *Mark Wilson, AA2Z*

RF PRODUCTS 5/8-λ 220-MHz AND 450-MHz ANTENNAS

☐ In the last couple of years, 5/8-λ antennas for 2-meter "hand-helds" have proved their worth. With the increasing number of 220-MHz and 450-MHz hand-held transceivers in use each day, it was only a matter of time before someone began manufacturing similar antennas for these bands. RF Products, a manufacturer of antennas for the commercial services, has met the challenge.

Fully extended, the 220-MHz version measures slightly over 33 inches; collapsed, just under 8 inches. It (as well as the 144-MHz and 450-MHz versions) is available with BNC, PL-259 and no. 5/16-32 thread fittings. A heat-shrink-covered, copper-clad-steel spring between the whip and connector serves as a shock absorber and as part of the matching network. SWR is less than 1.5:1 across the 220-MHz band.

Using the 220-MHz 5/8-λ antenna, I am able to put a full-quieting signal into my favorite repeater from my living room with a hand-held unit, which I cannot do with a standard 1/4-λ whip. In fact, with the 1/4-λ whip, my received signal is noisy and will "drop out" when I move the whip a fraction of an inch. I am very pleased with the performance.



Diversity is the name of the game at RF Products. In addition to making gain antennas for portable equipment with a wide variety of base connectors, RF Products makes these antennas for 220, 450 MHz and 144 MHz.

Tests on the 450-MHz antenna indicated the SWR to be less than 2.5:1 across the fm band (440 to 450 MHz). Although we were unable to subject this unit to as extensive field tests as we did for the 220-MHz version, our experiments did show it to be a good performer. Most users should find a significant improvement over a 1/4-λ whip or "duck." Overall length ranges from 6-1/4 inches collapsed to 17 inches fully extended.

Price class for each antenna is $20. Additional information can be obtained from RF Products, P.O. Box 33, Rockledge, FL 32955, tel. 305-631-0775. — *Peter O'Dell, KB1N*

TWIN OAKS MORSE CODE TRAINING PROGRAMS

☐ A new series of tapes for learning Morse code, incorporating modern psychological theories, is being offered by Twin Oaks Associates. The firm, a partnership of amateurs who are also mental-health professionals, claims that its systems "represent careful interfacing of clinical psychology and Amateur Radio."

Twin Oaks markets three Morse code training programs: the System 12 Alphabet Book (designed to take the student to over 5 wpm), the System 12 (for speeds to over 13 wpm) and the System 24 (to take the student over 20 wpm). Each system has several common denominators. Emphasis is placed on learning through auditory processing — listening then mentally or verbally recognizing what was sent. The student must be willing to commit at least *30* minutes each day to code practice. The goal is to enable the student to recognize/process ever-increasing amounts of auditory material at an automatic level.

Each system asks that the student never rewind a tape to pick up something that was missed. Just listen to the first side and then the second side, repeating this process until everything on the tape is readily understood. After comfortably mastering the first tape, the student may proceed to the next tape, and use the same study method. Succeeding tapes are increasingly demanding. A written study guide details the methods and theories used to design the tapes. According to Twin Oaks, "this method has been proven under many test situations. It works if used as directed."

As the saying goes, "The proof is in the pudding." ARRL staff member Andrew Tripp tested the System 12 Alphabet Book (and is now

KA1JGG, as a result!). Here's what he had to say about it:

"Like many methods of teaching Morse code, the Alphabet Book uses an ear-training system. That is, it teaches one's brain to associate the sounds of code with the number of dots and dashes. This system, however, has a few interesting twists.

"First, one is instructed to go through all 12 sides *without* writing anything down. Only after students have mastered all the material aurally should they practice writing down what is heard. By doing this, the system's author says, you allow your brain and ear to work together without also having to be concerned with writing.

"Another interesting feature is the use of reinforcement, a technique no doubt gleaned from the author's vocation, psychology. After each character is sounded, it is identified by a narrator. This helps shorten the learning process, as well as giving the student an immediate progress report. Side 2 of each tape reviews all previous material without the narrator, simulating on-the-air conditions more closely.

"The material is presented in a unique way. Groups of characters are presented according to the number of dots and dashes they have, instead of at random. For example, Tape A introduces letters E, T, I, A, M and N, which have one or two dots/dashes. This builds, with the addition of a dot/dash per tape, to Tape E and the presentation of numerals and punctuation, which have the longest code equivalents. Again, this method helps cut down the time needed to master the material, as the repetition of sounds has a cadence to which the ear can easily become accustomed. However, this technique falls somewhat short of preparing one for on-the-air conditions, in which code is far more random in nature.

"Any problems encountered were with the audio quality of the tapes, not with the actual mechanics of the code course, which succeeded in preparing me for the Novice code test. For instance, at a couple of points in the program a microphone "thump" is heard, or the narrator's voice fades out. Also, one of the tapes had an irritating tendency to slow down, causing the code to be slurred. Gaps, created by missing code or narration, and a misplaced letter (K in with H) occurred, but were not prevalent. But these problems were minor, and could be remedied easily."

Others used the System 12 and System 24 to sharpen their cw skills after having been away from code for a while. The consensus agrees with Andrew's opinion: The only minor problems were with audio quality on the tapes. All agree that by following directions and being committed to practicing 30 minutes each day, success is *inevitable.* This is no magical path to conquering cw, but it is a viable, realistic method for success.

The Systems are produced by Twin Oaks Associates, Rte. 5, Box 37, Knoxville, IA 50138. Price class: System 12 Alphabet Book, $15; Systems 12 and 24, $30 each — *Carol L. Smith, AJ2I*

N9CR CONTEST RADIO OPERATING SYSTEM

☐ I am a contester, but I hate to shuffle paperwork. Operating a contest with an arsenal of aluminum of the "death-ray" variety can be a very enjoyable experience, but compiling the paperwork associated with a 24- or 48-hour operating stint makes me feel more like a *victim* than a *victor.* I shudder when I think of how many times I've put a serious effort into a contest operation, then haven't bothered to submit an entry for fear of the drudgery of duplicate checking.

I've often thought that it would be nice to operate a contest, push a few keys on a computer keyboard and be left with legible, *error-free* log and dupe sheet printouts! A foolish dream? A few years ago, perhaps, but with modern microcomputer technology, a very reasonable one.

With this idea in mind, N9CR has developed a real-time program for the APPLE® II microcomputer that puts *all* contest paperwork where it belongs — in the closet with your old vacuum tube handbooks! The system not only compiles a running log and checksheet while you operate, it *sends cw contest exchanges as well!*

Computer Requirements

To use the Contest Radio Operating System, an APPLE II Plus or APPLE II microcomputer with 48K of Random Access Memory (RAM) and at least one 16-sector disk drive are needed. With the APPLE II (Integer BASIC), Ramcard APPLESOFT® is an additional requirement.

Log and checksheet printout is accomplished with any of the available Apple-compatible printers. For log printout, a 67-column printer is required, but a unit capable of printing a 92-column line is necessary for dupe sheets.

N9CR lists a clock card as an option but I would have listed it as a definite requirement if a serious effort is planned. Without such a clock card, it is necessary to input a four-digit time entry with each QSO. Depending on the contest and exchange, this could slow the operator down considerably. After approximately 20 entries without the clock card, I chose to borrow one from a friend to complete the review.

System Operation

Operating-system software is supplied on a single 5-1/4 inch diskette. To utilize the program for logging and duping duties, it is necessary to use the supplied software diskette to format another, on which the log and duplicate check sheet(s) are maintained. A single log diskette formatted with the software diskette can store up to 2350 QSOs, or the results of 17 contests, whichever occurs first.

When the user first runs the program, the software requests contest-rules information. System provisions enable a consecutive serial number to be sent and incremented (for ARRL SS, for instance). The software can also be used to keep a dupe sheet for each band/mode; for Field Day or IARU Radiosport competitions, this is a must.

While the system is in operation, the dupe-search function performs almost as quickly as I can type in the call sign. I've seen many programs that have taken as much as a minute or two before completing a single check! In addition, provisions have been made to allow editing of the call sign and received report during operation. A call sign or report can be edited after the contest, also.

The software contains approximately 20 abbreviated commands, all designed to speed up the system and virtually eliminate operator-generated "cockpit" errors. An example of one such command is used to change cw transmitting speed. Instead of being forced to "break" the program and restart, the keystrokes CTRL-S, a numeric input between 4 and 100 (WPM), and the "RETURN"(ENTER) will instantly change the cw routine speed.

Documentation

With each software diskette, the manufacturer supplies 14 pages of information. A detailed, 13-page instruction manual presents the prospective user with information on software usage as well as interfacing instructions. In addition, valuable information on user modification of the software is given. This information enables the user to modify several functions, such as logging in local time (instead of UTC), or to locate the real-time clock in a slot other than 4.

While the program is in operation, the software writes information to the disk every four QSOs. This could cause a few QSOs to be "lost" if shack power should ever fail. If this possible loss of information annoys you, the software can be modified to force a "write to disk" after every QSO. Modification provisions for control of various printers is also addressed.

For the operator (like myself) who has difficulty remembering his or her *own* call at 3 A.M., a single-page, quick-reference guide is provided. Posted near the machine, this sheet will remind the user to achieve the desired system function.

Comments

I found the software a joy to use after becoming familiar with the numerous commands. My first attempt was to use the operation on an old contest log. Just as with a new electronic keyer, I would suggest several off-the-air practice sessions before using the system on the air, as one slip of the keys can confuse the unskilled user.

I would prefer an optional two-digit time input format to the required one. This would allow entry of the time every five minutes or so, and allow a four-digit input at the change of the hour. This would eliminate the added expense of a clock card.

Overall, I would recommend this operating system for anyone who really loves to contest, but hates paperwork. Think of it — no more nasty letters from the ARRL Contest Branch about dupes or sloppy logs!

The N9CR Contest Radio Operating system is available from CR Software, 2512 James Dr., Dyer, IN 46311. Price class: $35. — *Michael B. Kaczynski, W1OD*

Strays

Visitors to the Eastern India Science Camp in Calcutta pause to watch and listen as VU2MKI makes a contact. Members of the Amateur Radio Department of the Birla Industrial and Technological Museum (curator VU2BMT) manned a booth at the Camp for a week last February/March.

Technical Correspondence

Conducted By
Dennis J. Lusis,* W1LJ

VOLTAGE-SENSITIVE BRIDGES

☐ Voltage measurements can be important. Often, the most important consideration is whether a particular voltage level is exceeded. The voltage-sensitive bridge is useful in this type of detection. I've reviewed a few types of voltage-sensitive bridges and will provide hints for their use.

Resistors connected in a Wheatstone bridge arrangement (Fig. 1) produce no difference in voltage between points A and B when the ratio of voltage divider R1 and R2 is the same as at divider R3 and R4. If the resistance of R1 is reduced, A will become positive with respect to B, while increasing R1 will in turn make A negative. If the supply voltage is ac, the A-B voltage will reverse polarity with every input voltage reversal. This polarity reversal can be used as a control signal.

Bridge balance is independent of the supply voltage as long as all of the resistors will increase current *proportionally* to the applied voltage. The bridge balance can be made sensitive to applied voltage by using one or more resistors whose current is *not* proportional to applied voltage.

One of the simplest voltage-sensitive bridges can be made by substituting incandescent pilot lamps for one or two of the resistors (Fig. 2). Tungsten lamps will show an approximate 10:1 increase in resistance when hot, as compared to cold. This resistance depends on the rms voltage applied; therefore, this circuit will work on both dc and ac above approximately 60 Hz. (The metal filament has thermal inertia and tends to stay at a nearly constant temperature across the ac cycle.)

In the circuits of Fig. 2, as the applied voltage is increased from zero, the A-B voltage will exhibit a polarity reversal as the lamp filament temperature (resistance) passes the balance point. This principle was used more than 50 years ago to provide "volume-expander" action in entertainment receivers. A more modern embodiment uses Zener diodes (Fig. 3). The circuit shown in Fig. 3B is commonly used in solid-state voltage regulators, and when using glow regulator tubes or neon lamps, was used previously as the sensing element in vacuum-tube, high-voltage regulators. Corona tubes have also been used as the breakdown element in cathode-ray-tube supply controls. Note that the voltage sensitivity of the full bridge (Fig. 3A) is twice that of the simplified bridge at Fig. 3B. One disadvantage, however, is that the balance voltage has to be approximately twice that of the regulator element.

Both Zener bridges are designed for ac use, and are sensitive to the instantaneous value of the waveform, rather than the rms value. Also, glow regulators must have an initially high

*Assistant Technical Editor

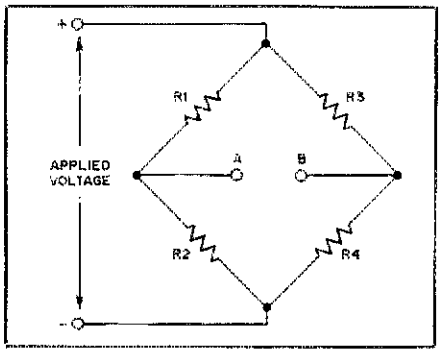


Fig. 1 — The Wheatstone bridge has no potential between A and B when R1R4 = R2R3. Different voltages can unbalance the bridge when one or more "nonlinear" resistances are used.

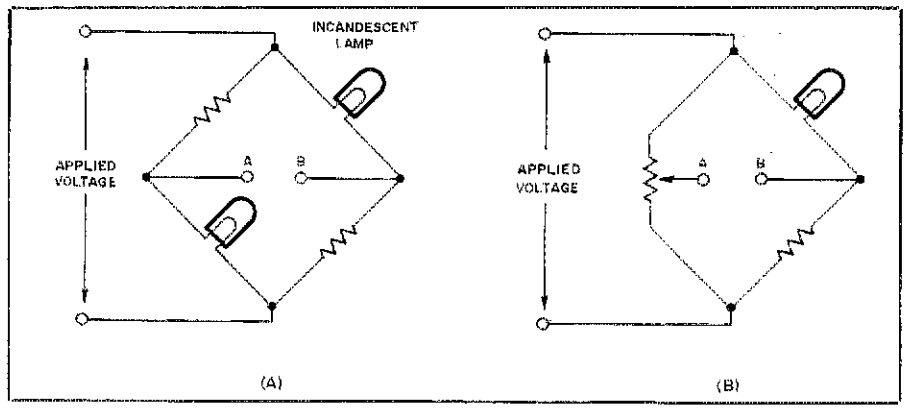


Fig. 2 — Low-impedance, voltage-sensitive bridges using incandescent pilot lamps. Heat inertia allows these to respond to rms.

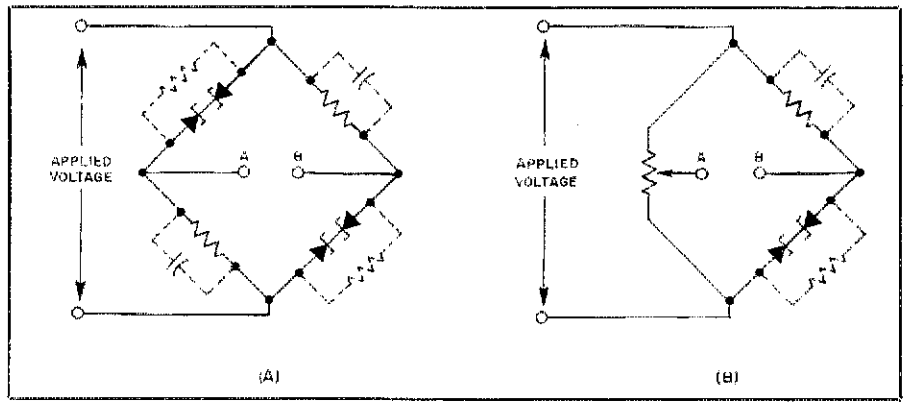


Fig. 3 — Zener bridges, which respond to instantaneous voltages. Use of balance resistors (dashed lines) eliminates response to less than twice the Zener voltage in the full bridge (A) and less than the Zener voltage at B. Small capacitors (dashed lines) help minimize spurious responses.

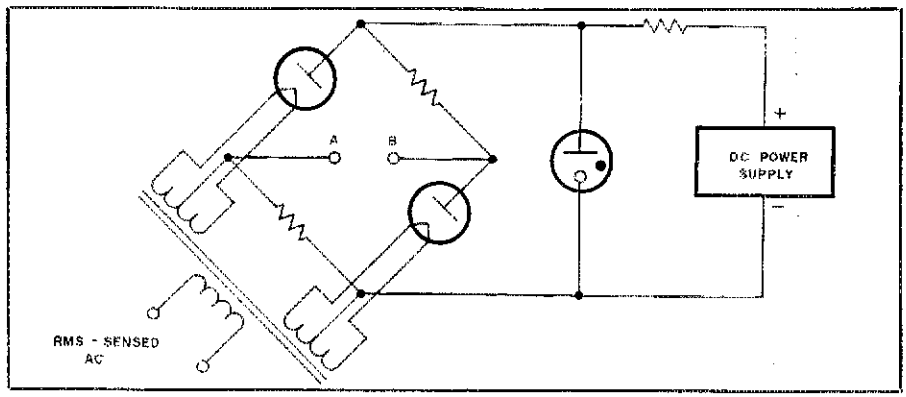


Fig. 4 — Special temperature-limited diodes act as variable resistors, which respond to heater rms voltage.

voltage to start the glow and, practically speaking, are much better for dc than ac.

Sorenson (a Division of Raytheon) solved many of the problems of rms voltage sensing by using temperature-limited diodes with high heater inertia (Fig. 4). Such diodes emit very few electrons from a cool filament and appear as a high resistance, which decreases as the filament receives more power. As the thermal intertia is controlled by design, the response to changes in rms level can be made fairly independent of waveform.

A practical transient sensor (Fig. 5) can be made from a dc Zener bridge and a bridge rectifier. This sensor produces voltage between points A and B whenever the sensed voltage exceeds 400 V, either polarity. While most major appliances are supposed to withstand occasional 1200-V surges, surges of 400 V or more often occur in residences and may damage underdesigned equipment. Capacitor C (usually under 1000 pF) is adjusted to minimize either overshoot or undershoot at A when less than 200-V dc is suddenly applied to the "sensed voltage" terminals. The fuse is used to prevent a line fault if surges more than 1000 V short a 1N4007 rectifier. — *David T. Geiser, WA2ANU, ARRL TA, New Hartford, New York*

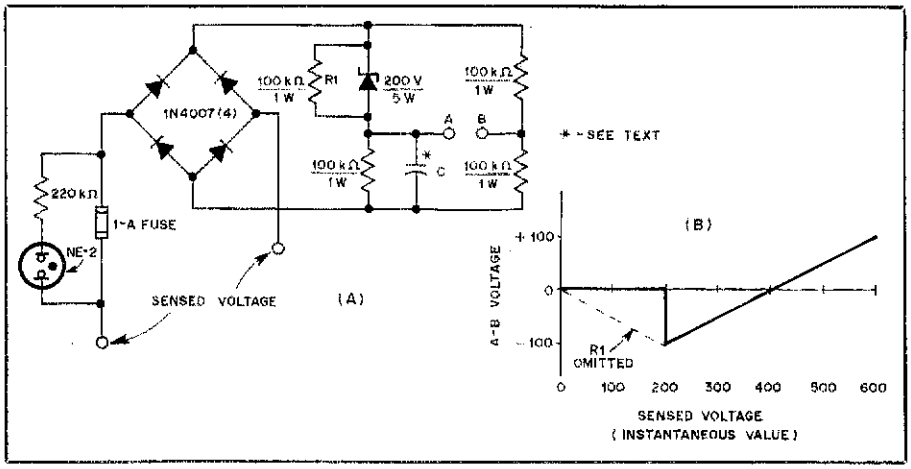


Fig. 5 — A practical transient line-voltage sensor providing indication of surges exceeding 400 V. The neon lamp indicates that a surge exceeding 1000 V has shorted one or more rectifiers. At B, a graph represents the response of the line-voltage sensor circuitry.

HEADPHONE FREQUENCY RESPONSE

☐ It appears the most popular brands of headphones provide rather broad frequency response. What is the use of a headphone with a frequency response from 300 Hz to 20 kHz when receiver filtering leaves us a 300-Hz to 3-kHz range? For cw or ssb operation, should one look for a narrow or a broad response in headphones? It is difficult to answer these questions, for there are no references in the literature on headphones or speakers and their responses. — *David J. Schoenwald, WB2KJL, Huntington, New York*

CMOS PLL NOTES

☐ A variety of CMOS phase-locked loop (PLL) integrated circuits is currently available, including the Motorola MC145145 and MC145146, and other members of this series.[1] These ICs easily interface to a microcomputer bus and can provide a low-cost, easy-to-build, high-performance frequency synthesizer.

Unfortunately, certain aspects of using these PLLs with varactor-tuned VCOs are not clear from the data sheets; in some cases, the data-sheet formulas will lead to a design that will not achieve lock when the tri-state phase detector output (PD) is used rather than the ϕ_R and ϕ_V outputs. Often, it is desirable to use the PD output because a passive loop filter can be constructed, which will give low phase noise and fast settling time.

The loop-filter equations given in the MC145146 data sheet are based on the presumption that the short-term average (dc) output level from PD_{out} is proportional to the phase error. This is true if the VCO input can be represented as a resistance to ground or to V_{DD}, and the loop will obey the data sheet equations. However, if the VCO dc input resistance is extremely high, as in a FET gate or a varactor, the PD output acts more like an integrator than a phase detector. That is, if the input phase lags behind the reference phase by a small amount, the PD output will charge up any capacitors in the loop filter until it reaches very nearly V_{DD}. This is not in agreement with the stated $K_\phi = V_{DD}/4\pi$ (in volts/radian) for PD, but is in agreement with the tri-state timing model given in the data sheet.

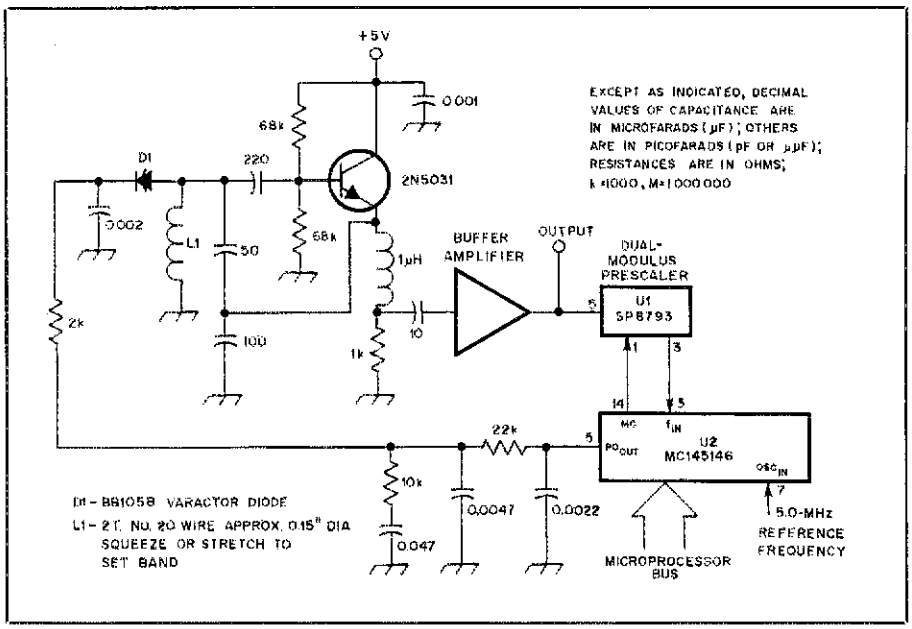


Fig. 6 — CMOS PLL frequency synthesizer described in the text.

Furthermore, when the input and reference phases are almost perfectly in step, PD_{out} changes to a "doublet mode" in which it puts out a positive and negative pulse before returning to the high-impedance state. In this mode, the sum of the durations of the two pulses is approximately 200 ns, and their relative widths depend linearly on the phase error; in the doublet mode $K_\phi = V_{DD}/(f_R \cdot 2 \times 10^{-7})$, where f_R = the reference frequency. Note that the doublet mode is a very desirable way to operate the PLL, as the doublet at equilibrium has no f_R content but only harmonics of it — and those are at low levels.

Returning to the "normal" mode of the PD output, the integrator action adds an extra 90° phase lag to the PLL, destabilizing it. If the phase error can be made to go through zero slowly enough for the PD to "catch" the loop in the doublet mode (and stay in the doublet mode), stable, low-phase-noise operation will result. For this to happen, the loop filter must be relatively fast and should resemble a Type 2 Second-Order sytem.[2] A circuit I have used (Fig. 6), acquires frequency lock to within ≤200 Hz in ≤50 ms, with 5-kHz steps at 2 meters. Fm noise in the audio range is less than 25-Hz peak deviation. The circuit covers a bit more than 3 MHz of the band. I wish to thank Patscenter International, Inc., Princeton, New Jersey, for allowing me to use their facilities in this research. — *Raymond Simpson, WA2PYX, Princeton, New Jersey*

[1]Motorola Semiconductor Products, Inc., Box 20912, Phoenix, AZ 85036.

[2]G. Nash, *Phase-Locked Loop Design Fundamentals (AN535)*, Motorola Semiconductor Products, Inc., Box 20912, Phoenix, AZ 85036.

Space Shuttle *Columbia* Calling All Radio Amateurs

Will NASA Astronaut W5LFL, the first ham in space, put you in his STS-9 log?

By Bernie Glassmeyer,* W9KDR, Peter R. O'Dell,** KB1N and Roy Neal,*** K6DUE

Electrifying excitement is building rapidly as word is spread around the world of the official NASA approval of Owen Garriott's bid to become the first Amateur Radio operator in space. On September 30, the Space Shuttle *Columbia* will, if all goes according to plan, lift off the launch pad at Cape Canaveral, Florida, carrying a specially built 2-meter fm transceiver. Dr. Garriott will establish two-way communications with as many amateurs as he can while he circles the globe.

All Amateur Radio operators will have an equal chance to work W5LFL from *Columbia*, but his operating time will be limited. It will be impossible for everyone who would like a QSL card from space to complete a two-way contact, since Owen will be allowed a total of only six hours of operating (one hour per day). Before delving into the mechanics of this historic event, let's look at it from a public information standpoint.

You and the Press

You don't have to make a contact to participate in this history-making event. Simply monitoring the operation and passing up-to-the-minute information to your local media will enable you to become involved personally. But if you do make a QSO, so much the better. As Rich Moseson, N2BFG, of the CBS-TV program "In the News," explains, "A local person actually talking to an astronaut could easily be front-page stuff in a newspaper or a near-to-lead story on a radio or TV newscast." Rich also points out the other side of the coin: "No reporter or editor can cover a story he or she doesn't know about."

It's not too early to set up an appointment with your local news reporters or editors. Make your arrangements now. This is the first major national story about Amateur Radio that doesn't involve a catastrophic event. Let's make the most of a perfect opportunity to promote the Amateur Radio Service.

Dr. Owen Garriott, W5LFL (left), and Bernie Glassmeyer, W9KDR, discuss some antenna-mounting possibilities inside the Space Shuttle Trainer at the Johnson Space Center in Houston. (*NASA photo*)

Begin by making a survey of your local media; in addition to the obvious daily newspapers, radio stations and TV stations, remember the not-too-obvious things such as company newsletters, cable-TV stations and weekly "shoppers." Send the ARRL Public Information Coordinator (ARRL Hq.) a list of the reporters/editors you will be in contact with, including the type of an organization they represent. We'll send you a Press Information Kit explaining what the Garriott mission and Amateur Radio are all about. You can pass these kits on to these reporters and editors when you contact them. (This should be done at least several weeks before the launch.)

The next thing is to think about your station, the image it presents to the "uninitiated" public and what you can do to make the most favorable impression on visitors. First of all, it just makes good sense to tape-record everything on a mission like this. You should experiment now to determine the best method of hard-wiring the recorder into your station. (There are too many variables to give you a "universal" interface, but start with some 1-kΩ isolation resistors.)

The next thing to consider is what your station is going to look like to the outsider — particularly one with a camera. Ask unlicensed members of your family how it looks to them. If you have an instant camera, take a few photos and go over the prints carefully. (You don't have to dispose of the box of surplus RTTY gears you bought at the hamfest; honest. Just hide them.) Dispose of clutter until your station conveys an image of "professionalism."

Suppose you are trying to work the Shuttle and a reporter asks you a question; what would you do? The best bet is to team up with at least two other hams. Two can keep track of the station equipment and operations, watch the clock and, generally, double-check each other. The third should act as spokesman for the team. The spokesman should be completely familiar with the station and its operation, because he or she will need to answer questions about what is going on. (You'll also need a second set of handouts for the reporters who cover the story. ARRL Hq. will provide these to the people who make the advance contacts we suggested.)

This is a once-in-a-lifetime opportunity for the local ham to be a part of a national story — and it's a story that doesn't involve pain and suffering. Make your preparations early. *Do it now!*

Preparing for W5LFL's Flight

How can you have the best chance to work W5LFL aboard the Orbiter? Completing a two-way contact is going to take some advance preparation — and some luck!

Starting on day three of the nine-day mission, Dr. Garriott will provide about one or two hours advance notice of his intention to operate the Amateur Radio transceiver. He will announce this to Mission Control on the Orbiter's normal air-to-ground frequency. The announcements will then be disseminated through AMSAT nets, W1AW bulletins and a special "900" telephone number that will be announced before launch.

Operation will be limited to a maximum of about one hour per day, when no other flight activities (or sleep periods) are

*OSCAR Program Manager, ARRL
**Public Information Coordinator, ARRL
***c/o NBC News, 3000 West Alameda Ave., Burbank, CA 91523

Table 1
STS-9 Operating Frequencies

Space to Earth: 145.510 to 145.770 MHz
Earth to Space: 144.910 to 145.470 MHz
(20-kHz steps)
All operations will be F3.

This range of frequencies will allow operation from most parts of the world. Although some frequencies fall on some repeater inputs and outputs, operation through repeaters is not planned.

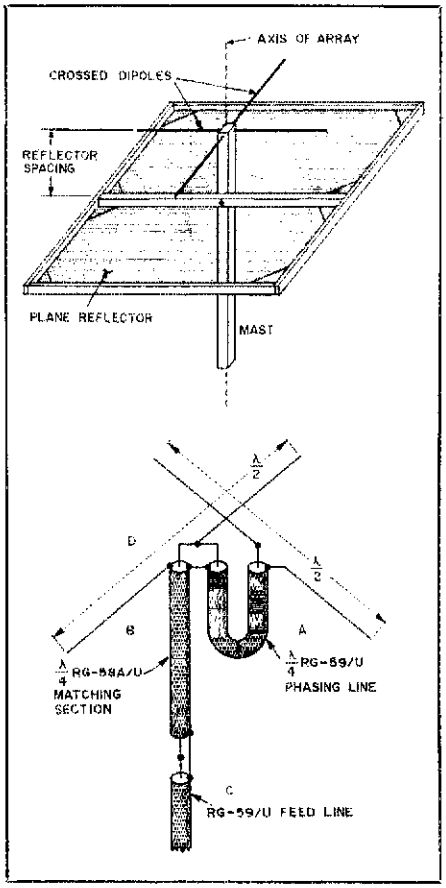


Fig. 1 — Dimensions and connections for the turnstile antenna. The phasing line is 13.3 inches of RG-59/U coax. A similar length of RG-58/U cable is used as a matching section between the turnstile and the feed line.

Table 2
STS-9 Orbital Parameters

Period: 90 minutes
Altitude: 155 nautical miles (250 km)
Inclination (angle measured north from equator): 57°
Increment (equator degrees that the earth turns during one complete spacecraft orbit): 22°

This data, with an equator-crossing time and coordinate (in degrees, west longitude) after launch, will "plug in" to most computer or calculator programs.

scheduled. Orbit numbers and ground tracks for potential Amateur Radio operations are being prepared and will be identified prior to flight.

As the Orbiter approaches the portion of the ground track where Amateur Radio operations are planned, Owen will call and listen on alternate minutes. He will transmit continuously for one minute, beginning on the even minutes, and will receive continuously for one minute, beginning on the odd minutes. Be sure to synchronize your station clock to WWV, plus or minus two seconds.

The transceiver will have the capacity to transmit and receive on channels 20-kHz apart within the planned operating range shown in Table 1. Discrete downlink (space to earth) frequencies and uplink (earth to space) frequencies will be announced before the flight.

During a typical even-minute transmission period, Dr. Garriott will identify a geographical area or call district that he will listen for. He will also announce the frequency range and, as time permits, describe crew activity or views of the earth.

During the odd-minute receive period, Dr. Garriott will scan the announced uplink frequencies for call signs from the designated area only. To establish contact, you will send your full *call sign only*, repeating it several times during the scanning period.

During the next transmission period, on the even minute, Dr. Garriott will acknowledge all call signs he has heard during the scan period. No other report will be needed; call-sign identification constitutes a two-way contact. This procedure will give more operators a chance to make a contact. If time permits, some stations may be called on for short transmissions to fill the time period.

How to Track the Orbiter

Maximum communication time as the Shuttle passes directly over your QTH is eight minutes. Accurate timing is essential, so calibrate your clock to the most accurate time standard available to within two seconds. Orbital information will be updated daily on the "900" number, on AMSAT nets and on W1AW bulletins.

Tracking with the OSCARLOCATOR is possible, but you will need to make a simple modification: You can modify your existing OSCAR 7 or OSCAR 8 overlay by tracing the full-size ground track and range circle shown on page 79. Use a permanent-ink fine-point pen, like the Pilot SC-UF, to trace your curve, and you're all set.

Those who have computer tracking programs will also be able to track the Orbiter. The elements needed for most programs are shown in Table 2. If you have a computer or programmable calculator and need a program, write to AMSAT Software Exchange, Box 27, Washington, DC 20044.

Equipment You'll Need

Making a 2-meter contact will not require an elaborate station setup. Actually, it will take less than is required for normal OSCAR-type contacts. AMSAT and ARRL recommend around 40 W of output power to a turnstile antenna (see Fig. 2) to have the best chance of being heard. Construction details are available in recent editions of *The Radio Amateur's Handbook* and *The ARRL Antenna Book*. Most 2-meter nbfm equipment will be able to make the earth-to-space connection. Dr. Garriott will be running only 5 W to a loop antenna, and it will be interesting to see how little power it takes to make a contact. Operating procedure and timing will be key factors in getting your call sign in the W5LFL log.

Since the planned operation calls for separate listen and transmit periods, you won't need special split-frequency capability. Having the exact frequencies of operation, you can simply monitor the space-to-earth frequencies during the even minutes and switch to the earth-to-space frequency of your choice for your transmission.

Do not try to track the Shuttle with azimuth and elevation control unless you have precision, computerized equipment; with only a few minutes of access time, you'll find it almost impossible, especially if your antennas have a narrow beamwidth. If you use a gain antenna, we recommend the old, reliable "Arm-strong Rotator" method — holding the antenna and aiming it by hand for best reception.

QSL Cards for All

Specially designed QSL cards will be available to everyone who sends a reception report of the Amateur Radio operation from Space Shuttle *Columbia*. Pass the word to your nonamateur friends so they can monitor on scanners, or let them listen in on your receiver so they can qualify for the special QSL. Send all reception and confirmed contact reports to ARRL, STS-9, 225 Main St., Newington, CT 06111 USA.

Operation Protocol

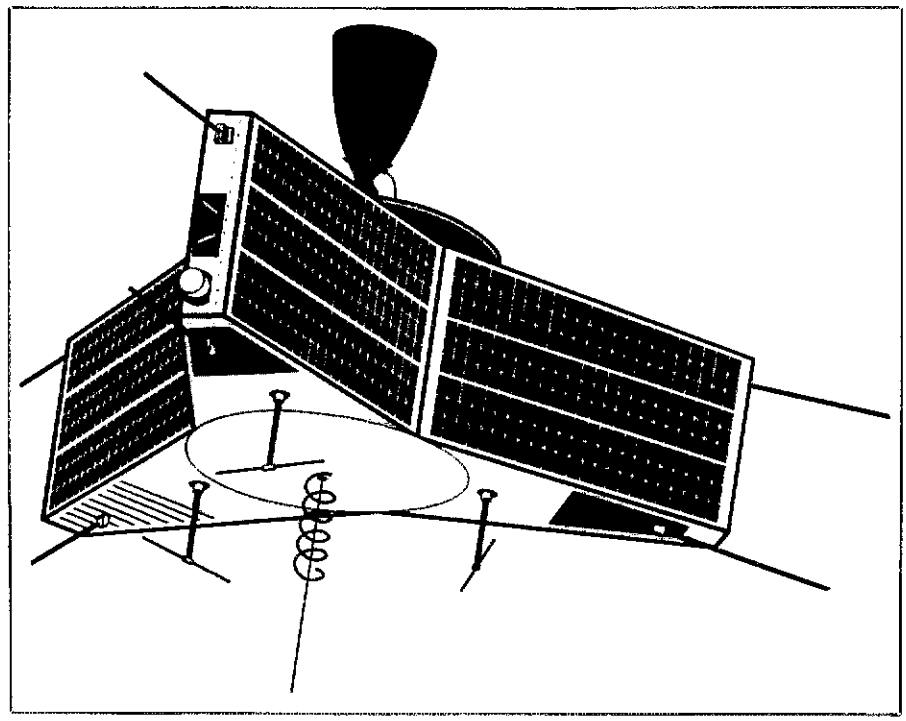
The first attempt to communicate with the Space Shuttle will present a challenge to most Amateur Radio operators. Beyond the achievement of being in the right place at the right time is another challenge: public relations. The public at large may have a little trouble relating to a cold piece of electronics hardware orbiting the earth, but they can relate to a human aboard the Space Shuttle. What we do and how we conduct our operations can bring more prestige to Amateur Radio and promote international goodwill.

If we can keep this historic event simple and remember our rules of diplomatic etiquette, we will have a better chance of gaining future Space Shuttle Amateur Radio opportunities. Join in the fun of this operating "Event of the Decade." QST

Birth of an Era — AMSAT-OSCAR 10

By Steve Place,* WB1EYI

Since the launch of OSCAR I in December 1961, the Amateur Radio satellite community has chased an elusive dream: reliable, predictable, long-distance and long-duration radio communication at vhf and higher frequencies. From the garage and basement workshops of the '60s to the sophisticated labs and cooperative international projects of the late '70s and '80s, each successive OSCAR has brought us one step closer to realizing that dream. And now, with the recent successful launch of AMSAT-OSCAR 10 on June 16, the Amateur Radio Service has entered that new era of communication — yesterday's dream has become today's reality.



Soon to be available for use by amateurs around the world, AMSAT-OSCAR 10 has ushered in a new era for Amateur Radio spacecraft that will see communication via amateur satellite become almost routine. Its ultimate capabilities have probably not even been thought of yet. *(drawing courtesy AMSAT/DL)*

Launch Day

T minus 20 seconds...
9...8...7...6...5...4...3...2...1...
Ignition confirmed.
Liftoff confirmed.
Liftoff time is 11 hours, 59 minutes, 30.36 seconds...
Everything is nominal.

The ensuing 13 minutes seemed an eternity to the thousands of hams worldwide who breathlessly monitored live coverage of the launch on AMSAT's hf ALINS (Amateur Launch Information Network Service) net. With excited anticipation and an unavoidable sense of apprehension, they hung on every word. It had been a scant three years since Phase IIIA, AMSAT-OSCAR 10's sister spacecraft, had tumbled into the Atlantic Ocean only four minutes downrange of the French Guiana launch site.

We have first stage burnout.
Second stage ignition confirmed...
...Separation...
...Third stage is burning.

Bolstered by the knowledge that AMSAT (Radio Amateur Satellite Corporation) had again performed its engineering magic, producing the most complex yet healthiest spacecraft to date, and by the faith that the European Space Agency (ESA) Ariane L6 mission simply *had* to succeed, listeners intently weighed each live report as the launch sequence continued toward orbital insertion.

...Okay...third stage shutdown.
The ECS-1 spacecraft is separated from the Sylda.
Phase IIIB separation should occur in about one minute...
...All right! Amateur Radio has a new satellite! AMSAT-OSCAR 10 was born at 12:16:53 UTC on this, the 16th of June 1983. A letter-perfect launch. Congratulations to all!

The culmination of more than two decades of volunteer effort and international cooperation, the successful launch of AMSAT-OSCAR 10 is a tribute to the spirit and dedication of AMSAT and to all who were spurred on by the loss of Phase IIIA in May 1980. So, June 16 is a doubly proud day for Amateur Radio.

Separation and insertion into the transfer (temporary) orbit was only the beginning, however. How would the electronics aboard the satellite perform? Would AMSAT be able to fire the on-board kick motor on schedule to lift OSCAR 10 to its final orbit? How much power would it take to work through the transponders — would the prelaunch calculations prove accurate? How strong would the signals emanating from the beacons be with either the omnidirectional or gain antennas switched in — at the 35,800-km apogee or the 200-km transfer-orbit perigee?

Hundreds of hams continued the worldwide vigil well beyond the first few minutes of excitement. As OSCAR 10 swung past perigee and began the gradual climb to apogee on its 10 1/2-hour first orbit, amateurs in North America tensely awaited the first acquisition of signals by fellow hams on the other side of the earth.

Shortly after 14:44 UTC, word was relayed: ZL1AOX had heard the first beeps from the newborn satellite. AMSAT-OSCAR 10 was alive!

Within seconds, other stations reported acquisition: JH4PBQ, JA5XPN, JA7IE, JR4BRS, JR1SWB and JA8DXB. As the

*Manager, Club and Training Department

satellite rose higher and higher along its orbit toward apogee, illuminating yet greater portions of the earth with its beacon signal, more and more stations celebrated their first receptions. By this time, prelaunch anticipation and apprehension had swung full cycle to a feeling of unmitigated joy.

Transfer Orbit Anomaly

Throughout the day and into the evening (evening in the United States and Canada, that is), telemetry reports poured in to the AMSAT engineers for analysis. It was then that the first inklings of an anomaly appeared: The sun angle channel was not reading the desired value, solar array current was low, the spacecraft temperature was not stabilizing at the expected value and OSCAR 10 was running "cold." Information from a variety of sources, including government agency tracking facilities, indicated that the transfer orbit was well within the expected tolerances. What was wrong?

Comparing data and analyzing all the possibilities, AMSAT experts determined that, though the orbit was a good one, OSCAR 10 had achieved an "undesirable, disadvantageous" attitude (or orientation) toward the sun. Immediately, the question arose: "How serious is the problem?" Analyses over the next few days and *excellent* communication over the daily AMSAT nets were to teach the interested laymen among us a good deal about orbital mechanics and OSCAR 10's capabilities.

What is the problem?

The spacecraft, spinning about its "Z-axis" for stabilization (the Z-axis is the one through the center of the spacecraft that is perpendicular both to the "bottom" [kick-motor] surface and "top" [antenna] surface and parallel to the solar-panel surfaces), was oriented at about 70° to the sun. Ideally, the solar panels would face the sun directly.

What caused the problem?

Within the first week after launch, AMSAT had not determined the cause and had not yet received separation-attitude data from the European Space Agency.

How does this explain the telemetry values?

The sun angle is a measure of orientation toward the sun, with +90° representing the "top" antenna surface facing the sun directly and −90° representing the "bottom" kick-motor-bell face pointing directly toward the sun. Consequently, a 0° reading would indicate that the solar panels were facing the sun continuously as they spun about the Z-axis.

At a +70° sun angle, the "top" face is tilted toward the sun and the solar panels are tilted at an angle away from the sun. The sun sensor, a tiny device mounted on the end surface of one of the three spacecraft arms, has a range of +45° to −45°. An angle of 70° is beyond its operating limits; hence the meaningless data.

As the sun strikes the solar panels at an unfavorable angle, the generated current is lower than desired. As the top is being illuminated more than planned, it is running considerably hotter than the bottom surface, causing the observed temperature gradient between the two. This also explains the colder-than-expected internal operating temperatures; thermal design is an exacting science, and OSCAR 10 was designed to operate in a different orientation to the sun.

What about the initial kick-motor firing?

AMSAT had intended to fire the kick motor at the fourth apogee; they have decided to delay the firing until about orbit number 50. [Editor's Note: OSCAR 10's *transfer orbit* period is about 625 minutes, meaning that it orbits the earth about 2.3 times each day; the 50th orbit will have occurred about 21.7 days after launch, or in the early (UTC) morning of July 8.]

Is the low perigee of the transfer orbit safe?

At a perigee of about 200 km, the atmosphere exerts significant drag on the spacecraft; OSCAR 10 cannot be left in this orbit indefinitely. Serious orbital decay will not occur for roughly two months, however, giving AMSAT plenty of time to rectify the situation.

What's the fix?

To fix the problem, AMSAT must, of course, reorient the spacecraft before firing the kickmotor. By design, OSCAR 10 is equipped for such maneuvers. It contains a set of "magnetorquers," or torquing coils, that can be pulsed under computer control. The resulting calculated magnetic field acts against the earth's magnetic field, causing the desired torque and resultant reorientation.

Fortunately, the sun angle has been observed to be changing in a favorable direction with time. AMSAT experts have postulated that a combination of seasonal movements of the earth (and consequently the orbital plane) about the sun, atmospheric drag on the kick-motor bell near perigee and magnetic torque from eddy currents induced as the spacecraft frame passes through the earth's magnetic field are causing the observed 3° to 4° per day favorable movement. At the time this was being written, AMSAT had chosen to "wait it out."[1]

What Lies Ahead?

Sometime near the 50th orbit as now planned, the on-board kick motor will be fired for about a 40-second burn, lifting the inclination angle from its initial 8.6° to about 11°, and lifting the initial 200-km perigee to its final, safe 1000-km height. Following a period of critical ranging tests, and spacecraft stabilization and reorientation as necessary, the final kick-motor firing will take place; it will burn until all of the onboard propellants have been exhausted. This final firing should lift the inclination to about 57° without affecting the perigee height appreciably. Then, following another period of testing, the transponders will be turned on and a regular schedule of activity will commence.[2]

ARRL extends its heartiest congratulations to AMSAT and to all who have supported the OSCAR 10 efforts so enthusiastically. To single out any one person for congratulations would be unfair to the hundreds of volunteers whose perseverance has brought us to this new era of communications. To all of you, then, our heartfelt thanks and respect for a job well done!

Notes

[1]To determine the current status of AMSAT-OSCAR 10, tune into W1AW bulletins (see schedule elsewhere in this issue) and monitor the AMSAT nets (3850 kHz, UTC Wednesdays: 0100 UTC, East Coast net; 0200 UTC, Mid States net; 0300 UTC, West Coast net).

[2]To learn how to operate through AMSAT-OSCAR 10, see April and May 1983 *QST* and recent issues of AMSAT's publications *Orbit* and *ASR*.

Strays

GETTING YOUTH INVOLVED

☐ The Santa Cruz County (California) ARC has a unique way of promoting Amateur Radio among youth. Not only has the club elected a teenager as club president for 1983-84, they have sponsored two junior high school ARCs and have provided second-hand equipment for the stations.

One of the schools, Del Mar Junior High, has developed a curriculum involving the use of Amateur Radio and computers. In one social studies course, students get credit for researching countries contacted through Amateur Radio. There is a science elective for 8th graders, too, in which the Novice or Technician/General test is the final exam. Students who pass their exams are rewarded with sailing lessons and cruises. Morse code is emphasized during the cruises: All requests of any nature have to be in code, a practice that quickly leads to a high wpm rate!

Not every club has a sailing boat handy, but what really counts is the initial sponsorship and then the giving of *real* responsibility to kids. It works in Santa Cruz. Why not have it work in your area? — *Mary Duffield, WA6KFA, Santa Cruz*

Maxim Memorial Award Will Recognize Young Achievers

By David Sumner,* K1ZZ

Hiram Percy Maxim, W1AW, the founding President of the American Radio Relay League and the International Amateur Radio Union, passed away almost a half-century ago, on February 17, 1936. One year later, February 1937 *QST* made note of three ways in which the man whose genius had created the League was to be honored and remembered. One, the Maxim Memorial Relay, involved the sending, on the first anniversary of Mr. Maxim's death, of a commemorative message to all amateurs by ARRL President Eugene C. Woodruff, W8CMP, and acknowledging radiograms from those who received the memorial text. The second, the licensing of the ARRL Headquarters station with the *in memoriam* call sign W1AW, was at the time an unprecedented FCC action. (The construction and dedication of the building that to this day houses W1AW was to occur the following year, in 1938).

The third tribute to Mr. Maxim came from his own children, Mrs. John G. (Percy Maxim) Lee and Mr. Hiram Hamilton Maxim. They created a Hiram Percy Maxim Memorial Award, to be given annually to the member of the League under 21 years of age who had made the greatest contribution to Amateur Radio during that year. Nominations were to be made by ARRL Section Communications Managers, and the award itself was $100 in cash and a miniature reproduction of the dreaded Wouff Hong, the instrument of imaginary torture made famous by Mr. Maxim in his *QST* articles written under the pseudonym, "The Old Man."

The first Hiram Percy Maxim Memorial Award, for the year 1936, was given to a 19-year-old Arizona amateur with the call sign W6KFC (Arizona then being in the same district as California). August 1937 *QST* had this to say about the winner: "His career demonstrates an intensive, aggressive application to Amateur Radio, with a high degree of useful accomplishment, especially in communications and traffic-handling activities. Combined with a splendid radio record is one of courage and spirit in overcoming heavy obstacles in life's pathway."

The W6KFC of 1936 is Victor C. Clark, now W4KFC, the incumbent President of the American Radio Relay League. Can there be any finer testimony to the concept of the Maxim Memorial Award than for its initial recipient to assume the Presidency of the League some 46 years later, after a distinguished record of service to the League in other volunteer roles? Vic notes, "As a young amateur, I was inspired to greater effort as a recipient of the award. The $100 cash presentation was a godsend, coming as it did in the midst of the Great Depression; in my case, it enabled me to finance the purchase of my first car, and this, in turn, led to a valuable employment opportunity."

Nearly 50 years after his death, Hiram Percy Maxim serves as a role model for the award, about to be reinstituted, that bears his name.

Who Will Win the Maxim Memorial Award?

The Hiram Percy Maxim Memorial Award will be given annually to the licensed radio amateur under the age of 21 whose accomplishments and contributions are of the most exemplary nature within the framework of Amateur Radio activities, including, but not limited to, the following:

1) participation or leadership in organizational affairs at the local or national level;
2) technical achievement;
3) operating record;
4) recruitment and training of new amateurs;
5) public relations activities.

Later this year, *QST* will announce the opening of nominations for calendar year 1983.

Contributors to the Endowment for the Hiram Percy Maxim Memorial Award

Mrs. John G. (Percy Maxim) Lee and Hiram Hamilton Maxim
John Adel, W5RR
P. L. Anderson, Jr., N4AE
Victor C. and Hester Clark, W4KFC/WA4PAE
Richard C. Fenwick, K5RR
Harold Fox, W3AA
Gordon S. Marshall, W6RR
Hazard E. Reeves, K2GL
Robert Hamilton Robinson, W4ZR
John H. Sanders, WB4ANX
Alberto Shaio, HK3DEU
Ethel Smith, K4LMB
Leland W. Smith, W5KL
L. Phil Wicker, W4ACY
Mabel C. Young (in memory of Leo C. Young, Sr., W3WV)
Richard (W3PZW) and Mary Young
Eugene M. Zimmerman, W3ZZ
Foundation for Amateur Radio
ARRL Foundation

Nominations based upon achievement during 1983 will be solicited later this year, with a deadline for submission of March 1, 1984. A committee of five distinguished amateurs will review the nominations and select the winner.

The Hiram Percy Maxim Memorial Award should provide encouragement, and a tangible reward, for outstanding young amateurs. It will also provide an opportunity for Amateur Radio, and its many benefits for young people, to be brought to the attention of the public in a favorable light.

When the first of the new awards is presented, some time in 1984, we think The Old Man will be proud. QST

*General Manager, ARRL

Low SWR, Q5 and Addicted to RF

By Peter Costa,* WA1VVF

Hello, my name is Peter and I'm a ham-aholic. I'm addicted to rf. I monitor all the bands from 60-cycle hum to gigahertz, and I'm consumed with ham radio even when I'm not on the air. After years of dial spinning, brass pounding, keyboard pecking and headphone wearing alone in my ham shack, I have decided to come out of the closet. So, I'm announcing that I'm powerless over ham radio and am turning to others for help.

Aged hams say there is no cure. Even power failures cannot deter the true ham addict from his rf fix. Thanks to the invention of rechargeable NiCd batteries, hams can go on the air during disasters like hurricanes, tornadoes, floods — or visits from their mothers-in-law.

Psychiatrists, mental health experts and sociologists cite the transistor as the invention that drove more social hams ("I just ham on Fridays and maybe have a QSO or two at lunch") over the line into ham-aholism. As transceivers got smaller, ham addiction grew larger. During the late 1960s, hand-held 2-meter equipment allowed hams the opportunity to indulge in their addiction virtually everywhere. Hand-held transceivers were used in cars, on bicycles, in boats, while walking, at parties, in the stacks at libraries, in elevators, in barbershop chairs, in shoe stores and — unforgivably — in matrimonial beds.

My wife talked to close friends about her concern that her husband was becoming a Dr. Frankenstein who had strange black boxes in a little room and made strange squealing noises with them. I told her it was sideband. RTTY tones she never could understand.

I started to neglect my weekend yard chores. I prayed for rain. Let it rain and I would be able to say I couldn't work outside on the house or the lawn, or go for a picnic or make the long drive to my mother-in-law's.

If it rained biblical amounts and there was even the slightest street flooding, I had a bona fide reason to go on the air: I was an important link in our local emergency communications network. More often than not, however, during the heavy rains the "network" (my local buddies) and I would talk about how the rain was creating intolerably high SWR readings and causing antenna loading problems. But it was the spirit of the thing that mattered. We were ready to help if needed.

Even when my wife succeeded in luring me away from the shack by promising me that the new movie we were going to see had a lot of police using hand-held radios and mobile computers, I found myself consumed with uncontrollable rf thoughts. On the way to the theater, I would compulsively look at rooftops, scanning the horizon for beams or ground planes or 2-meter J-poles. When there were no antennas to see, I looked at transformers on telephone poles and tried to guess which side was the primary and which was the secondary.

One particularly embarrassing moment happened when I failed to come to a complete stop at a stop sign and was pulled over by a policeman. While he was writing out the ticket, I got into a discussion about the little hand-held radio he was wearing on his belt. After a few minutes, I showed him how to tweak the crystals so he could be right on frequency. "So that's why they don't hear me so well when I'm on foot patrol," he said. Well, what should have been a short time to write a ticket grew into a long and happy roadside chat while my wife got as red as the plate in the final of an a-m transmitter.

But that's all in the past now. My wife and I are in couples therapy, and we already have spent eight $75 sessions addressing the problem. I think I may be on the road to recovery.

Sometimes, however, I'm not so sure. You see, my therapist is an avid gun collector who talks to me about the milling of rifle barrels and the beauty of an old six-shot revolver, even though the firing pin is missing. I commiserated with him, and told him I knew where he could get a new pin mechanism. All I would have to do is mention it on the local net and I was sure some ham/gun collector out there would help him.

"That would be great," he said.

"I could do it now, if you'll give me a minute to get my 2-meter hand-held from the car," I said. "I'll call a friend of mine and he can put it on the net right now."

"Terrific," he said. "It's an 1879 Colt ...."

My wife told me later that she had left, quietly, after Dr. Hornsby and I had been in animated conversation for about a half an hour. We didn't realize she was gone until after I had enrolled him in our club's next Novice class.

The last time I saw my wife, she was muttering something about a new "miracle drug." If one comes around, I'm afraid they'll have to give me a dose normally reserved for a platoon of Marines.

Am I still addicted? Let me tell you about this nifty ac hum on my neighbor's TV....

*630 Prospect Dr., Stratford, CT 06497

Happenings

Conducted By Carol L. Smith,* AJ2I

- *Official Government Recognition of Amateur Radio*
- *RACES Spectrum Expansion Proposed*
- *Good-bye Logging Requirements*

ARRL, NCS Sign Memorandum of Understanding

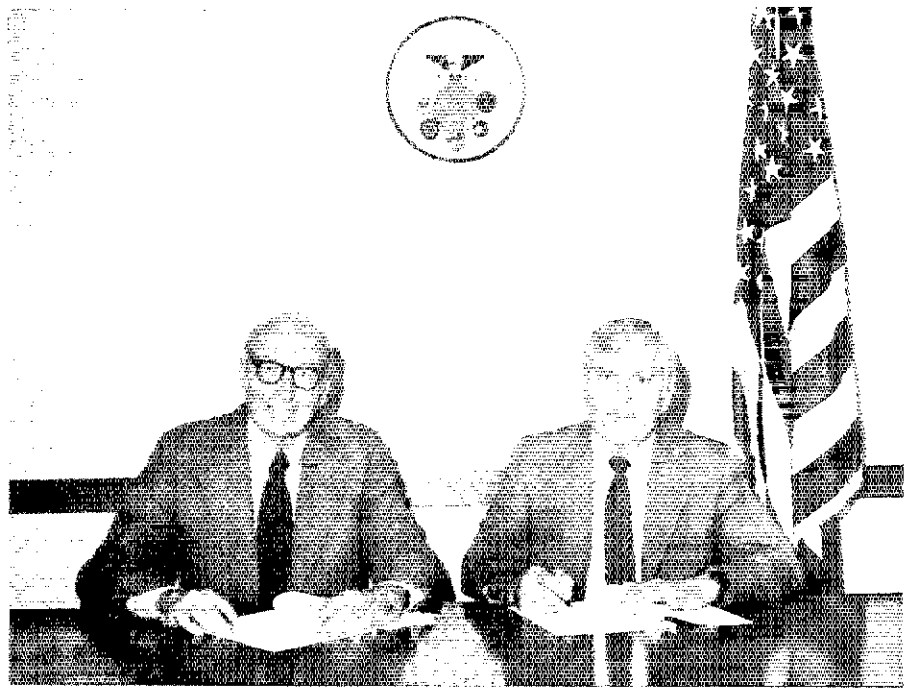
Amateur Radio attained a new level of official governmental recognition on June 2. On that date the League and the National Communications System (NCS) signed a Memorandum of Understanding, which is intended to "enhance the nationwide posture of telecommunications readiness for any conceivable national emergency." The Memorandum is a direct result of successful amateur simulated emergency tests that convinced the NCS that hams are a "valuable national resource whose capabilities should be utilized, further developed and exercised to improve our national security."

The NCS is a confederation of government agencies established to ensure that federal telecommunications needs can be met in times of national emergencies or disasters, and in everyday situations. The NCS recognizes that the "ARRL is the principal organization serving more than 400,000 U.S. radio amateurs and, because of its organized emergency communications, training and resources, can be of valuable assistance in providing critical communications and restoration of government circuits during emergencies and disasters when normal lines of communication are disrupted."

The ARRL and the NCS have specifically agreed to

- encourage ongoing liaison with each other;
- participate in cooperative pre-emergency planning, exercise and training programs at the federal, regional and national levels;
- cooperate in times of disaster or emergency to meet the needs of the government, and of the agencies and organizations attempting to restore communications;
- make their facilities, resources and capabilities accessible to each other.

No sooner was the ink dry on the Memorandum when a test of Amateur Radio hf bands as a means of helping the main public telephone networks to restore long distance communications was held in parts of the East. Results were successful — amateurs' ability to restore communications was adequately demonstrated.



ARRL President Vic Clark, W4KFC (left), and NCS Deputy Manager John Grimes signed a Memorandum of Understanding on June 2 in Washington. This document further enhances federal recognition of Amateur Radio's capability to provide emergency communications.

MOST LOGGING ELIMINATED

On June 9, logging requirements for the Amateur Radio Service were virtually eliminated. The Report and Order in PR Docket 82-726 did, however, retain certain technical and documentary mandates for stations in repeater, remote control and auxiliary operation. (See December 1982 *QST*, p. 69, and March 1983 *QST*, pp. 58-59, for background information.)

The FCC concluded in the Report and Order that most station log requirements were no longer useful or necessary. "Various aspects of routine station operation were intended to provide the Commission with a means to verify when a station was in operation and whether communications from the station were of a permissible nature," it said. "We [the FCC] have rarely used information from the log, preferring to rely instead on monitoring data we have collected."

Changes in this Report and Order include:

- most amateur stations will no longer need to maintain logs. For example, tape recording of third-party transmissions on repeaters is no longer necessary. In fact, third-party-traffic record-keeping functions are no longer mandated for U.S. amateurs.
- records that must still be maintained may be kept in any form that can be made readily available to the Commission;
- stations in repeater, auxiliary and remote-control operation must still maintain certain technical and functional records;
- FCC Engineers-in-Charge now have the power to require individual licensees to maintain station logs on a case-by-case basis;
- the licensee of a station is assumed to be the control operator unless documentation exists to the contrary.

Though the majority of commenters favored the Commission's proposal to eliminate logging (many purported that repeater logging, especially of third-party traffic, was a burden), others pointed out the advantages of keeping a station log. The Commission noted, however, that licensees are always free to keep records of whatever information they find of value. Station logs will, of course, continue to be important as a station record, aiding in research and development, and resolving RFI/TVI complaints. The FCC is also relying heavily on amateur self-regulation to eliminate unintentional violations of international treaty requirements (especially third-party-traffic regulations).

*Membership Services Assistant

Exact changes in Part 97 of the Rules include:

§98.79, Control operator requirements.
(b) Every amateur radio station, when in operation, shall have a control operator. The control operator shall be present at a control point of the station, except when the station is operated under automatic control. (Automatic control is only permitted where specifically authorized by the rules of this part.) The control operator may be the station licensee, if a licensed amateur radio operator, or may be another amateur radio operator with the required class of license and designated by the station licensee. The control operator shall also be responsible, together with the station licensee, for the proper operation of the station. (For purposes of enforcement of the rules of this part, the FCC will presume that the station licensee is, at all times, the control operator of the station, unless documentation exists to the contrary.)
§97.85 Repeater operation.
(g) Each station in repeater operation transmitting with an effective radiated power greater than 100 watts on frequencies between 29.5 and 420 MHz, or 400 watts on frequencies between 420 and 1215 MHz, shall have the following information included in the station records during any period of operation:
(1) The location of the station transmitting antenna marked upon a topographic map having contour intervals and having a scale of 1:250,000 (indexes and ordering information for suitable maps are available from the U.S. Geological Survey, Washington, DC 20242, or from the Federal Center, Denver, CO 80255);
(2) The transmitting antenna height above average terrain (see Appendix 5);
(3) The effective radiated power in the horizontal plane for the main lobe of antenna pattern, calculated for the maximun transmitter output power which occurs during operation;
(4) The maximum output power which occurs during operations;
(5) The loss in the transmission line between the transmitter and the antenna (including devices such as duplexers, cavities or circulators), expressed in decibels; and
(6) The relative gain in the horizontal plane of the transmitting antenna.
3. In Section 97.88, paragraph (a) is revised, paragraphs (a)(1) and (a)(2) are removed, and new paragraphs (f) and (g) are added to read as follows:
§97.88 Operation of a station by remote control.
(a) A photocopy of the license for the remotely controlled station shall be posted in a conspicuous place at the station location.
(f) The station records shall include during any period of operation:
(1) The names, addresses and call signs of all persons authorized by the station licensee to be control operators; and
(2) A functional block diagram of the control link and a technical explanation sufficient to describe its operation.
(g) Each remotely controlled station shall be protected against unauthorized station operation, whether caused by activation of the control link, or otherwise.
§97.90 System network diagram required.
When a station has one or more associated stations, that is, stations in repeater or auxiliary operation, a system network diagram (see §97.3(v)) shall be included in the station records during any period of operation.
5. Section 97.92 is added to read as follows:
§97.92 Record of operations.
When deemed necessary by the Engineer-in-Charge (EIC) of a Commission field facility to assure compliance with the rules of this part, a station licensee shall maintain a record of station operations containing such items of information as the EIC may require under Section 0.314(x).

ROUTINE RULES CHANGES BRING IMPORTANT SURPRISES

In an Order in which "due to the nature of these amendments, the notice and public procedure requirements of the Administrative Procedure Act may be dispensed with," the Commission made several changes of vital importance to digital operators. It also amended, deleted and codified certain rules and restrictions, effective June 15, of the Communications Act of 1934. (See League Lines, July 1983 *QST*.)

Among the noncontroversial points in this Order are:

- deletion of the requirement that prohibits the renewal of Interim Amateur Permits;
- allowing amateur operator license renewal applicants to submit a photocopy instead of their original license;
- codifying the existing requirement that the Commission have the "authority to inspect all radio installations . . . which are subject to the provisions of any Act, treaty or convention."

Technical changes include:

- station-identification changes would no longer require amateurs using radioteleprinter codes or fast-scan TV to identify in Morse code or plain-language voice. If using Baudot, ASCII or AMTOR, stations may identify using the particular digital code being used for communication. If using other digital codes above 50 MHz, stations may identify using Baudot, ASCII or AMTOR. Fast-scan TV transmission may be identified using the U.S. 525 scan-line standard described in Part 73 of the Rules.
- for F1 or A2J emissions used in automatically controlled beacon operation in 28.20-28.30, 50.06-50.08, 144.05-144.06, 220.05-220.06, 222.05-222.06 and 432.07-432.08 MHz bands, the radio or audio frequency shift shall not exceed 1000 Hz;
- for A2, F1 or F2 emission used below 50 MHz, the radio or audio frequency shift shall not exceed 1000 Hz. When these emissions are used on frequencies above 50 MHz, the frequency shift, in hertz, shall not exceed the sending speed, in baud, of the transmission or 1000 Hz, whichever is greater.

The cw or plain-language voice i-d requirement will still apply to facsimile and sstv transmissions. Amateurs will have the option to continue using cw or voice i-d as at present for radioteleprinter or fast-scan TV.

Specific changes in Part 97.84 are:

(g) The identification required by this section shall be given on each frequency being utilized for transmission and shall be made in one of the following manners:
(1) By telegraphy using the international Morse code (if this identification is made by an automatic device used only for identification, the code speed shall not exceed 20 words per minute);
(2) By telephony using the English language (the Commission encourages the use of a nationally or internationally recognized standard phonetic alphabet as an aid for correct telephone identification);
(3) By telegraphy using any code authorized by §97.69(b), when the particular code is used for transmission of all or part of the communication or when the communication is transmitted in any digital code on frequencies above 50 MHz; or
(4) By video using readily legible characters when A5 emissions are used, the monochrome portions of which conform, at a minimum, to the monochrome transmission standards of §73.682(a)(6) through §73.682(a)(13), inclusive (with the exception of §73.682(a)(9)(iii) and §73.682(a)(9)(iv)).

This document was an Order, so there were no comment or reply comment periods. Effective date for the changes was June 15.

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.

SECOND NOTICE — ARRL ELECTIONS

Attention all ARRL members! Nominations are now open for candidates for ARRL director and vice director in each of the following divisions: Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific and Southeastern.

The ARRL Board of Directors is the governing body of the nonprofit, educational and scientific corporation chartered under the laws of Connecticut as the American Radio Relay League. The Board of Directors is ultimately responsible for all League matters, including deciding ARRL priorities and services that will be made available to the membership. There are 16 directors, who are elected by the membership on a geographical basis. Half of the directors stand for election in even-numbered years, half in the odd. At the same time directors are elected, vice directors are also chosen, who can fill in when directors are unable to serve. For this reason, candidates for vice director must meet the same requirements as the candidates for director.

For a candidate to be eligible for the office of director or vice director, he or she must submit a nominating petition bearing the signatures of 10 (or more) full members of a division naming him or her as a candidate for director or vice director. The petition must be received by League Headquarters no later than noon on August 20, 1983. Each candidate must also provide information (on a form provided by Hq.) that will allow the Executive Committee of the Board of Directors to determine the eligibility of the candidate in accordance with the provision of the ARRL Articles of Association and By-Laws, and a statement of not more than 300 words setting forth the candidate's qualifications, which will be included with the ballot mailed to members. The candidate's 300-word statement will be reprinted without content editing; if the statement as submitted exceeds 300 words, the first 300 words will be used. The statement must not contain any derogatory reference to any person or entity. The candidate must also submit an accompanying signed statement certifying that the information is true to the best of the candidate's knowledge and belief. Any willful violation of the statement will be grounds for disqualification by the Executive Committee.

The nominee must reside in the ARRL division he or she seeks to represent. He or she must also be the holder of at least a General class amateur license, or a Canadian Advanced Amateur Certificate, must be at least 21 years of age, and must have been licensed and a Full member of the League for a continuous term of at least four years at the time of the election. No person is eligible whose business connections are of such nature that he or she could gain financially through the shaping of the affairs of the League by the Board, or by the improper exploitation of his or her office for the furtherance of his or her own aims or those of his or her employer. The primary test of eligibility is the candidate's freedom from commercial or governmental connections of such nature that his or her influence in the affairs of the League could be

used for his or her private benefit. The idea behind these rules is to ensure that candidates (1) possess a lasting interest in Amateur Radio and the League (2) have the legal capacity to make decisions for the ARRL, and (3) are free from conflicts of interest.

The following form for nomination is suggested; it may be copied onto any paper, or a blank following this form may be obtained from Headquarters on request:

Executive Committee
The American Radio Relay League
Newington, CT 06111

We, the undersigned Full Members of the ARRL residing in the...Division, hereby nominate...of...as a candidate for director; and we also nominate . . . of . . . as a candidate for vice director from this division for the 1984-85 term.(Signature...Call...City... ZIP...Date...)

Whenever there is more than one candidate for either office, ballots will be sent to all Full members of the League in that division who were in good standing on September 10. The ballots will be mailed no later than October 1 and, to be valid, must be returned to Headquarters by noon, November 21. A group of nominators can name a candidate for director, for vice director, or for both, but there are no "slates" as such. Each candidate appears on the ballot in alphabetical order.

All ARRL members who are licensed by the FCC or DOC but temporarily residing outside the U.S. or Canada are eligible for Full membership. These members overseas who arrange to be listed as Full members in an appropriate division prior to September 10 will be able to vote this year where elections are being held.

Even within the U.S., Full members temporarily residing outside the ARRL division they consider home may now notify the Secretary of the League prior to September 10, giving their current *QST* address and the reason why another division is being considered home. So if your home division is the Atlantic, Canadian, Dakota, Delta, Great Lakes, Midwest, Pacific or Southeastern, but your *QST* goes elsewhere, please let the ARRL Secretary know, as soon as possible but no later than September 10, so you will receive a ballot for your home division.

If a person is nominated for both director and vice director, the nomination for director will stand and that for vice director will be void. A person nominated for both offices does have the option, however, of declining the higher nomination and running for vice director if he or she wishes.

Since all of the powers of the director are transferred to the vice director in the event of the director's death, resignation, removal outside the division or inability to serve, careful selection of candidates for vice director is just as important as for director.

These persons presently hold the offices of director and vice director, respectively, in the divisions conducting elections this year: Atlantic — Hugh A. Turnbull, W3ABC, and George W. Hippisley, K2KIR; Canadian — Thomas B. J. Atkins, VE3CDM, and Harry MacLean, VE3GRO; Dakota — Tod Olson, KØTO, and Howard Mark, WØOZC; Delta — Clyde O. Hurlbert, W5CH, and Edward W. Dunn, W4NZW; Great Lakes — Leonard M. Nathanson, W8RC, and George S. Wilson, III, W4OYI; Midwest — Paul Grauer, WØFIR, and Claire Richard Dyas, WØJCP; Pacific — William J. Stevens, W6ZM, and Jettie B. Hill, W6RFF; Southeastern — Frank M. Butler, Jr., W4RH, and Evelyn Gauzens, W4WYR.

Petitions need 10 or more signatures of Full members and are due at League Headquarters by noon, August 20. If there is only one candidate for an office, he or she will be declared elected by the Executive Committee; otherwise, ballots will be mailed not later than October 1 to Full members of record September 10. To be valid, ballots must reach Headquarters before noon, November 21. The new term will begin at noon, January 1, 1984.

Nominees or, indeed, any member, may obtain a copy of the ARRL Articles of Association and By-Laws, along with a pamphlet outlining the duties and responsibilities of elected League officials. Interested persons should write or call ARRL Headquarters, 225 Main St., Newington, CT 06111, tel. 203-666-1541.

For the Board of Directors:
July 1, 1983
David Sumner, K1ZZ
Secretary

OBSCENITY IS FACTOR IN LICENSE REVOCATION

Rafuse, ex-KA1AQ

James H. Rafuse Jr., of Scituate, Massachusetts, no longer is an Advanced class operator or holder of station license KA1AQ, by an FCC Order of Revocation and Affirmation. Rafuse's station and operator's licenses were taken away because of 1980-81 "willful and repeated violations of Amateur Rules 97.119 (transmission of communications containing obscene, indecent or profane words, language or meaning) and 97.121 (transmission of false or deceptive communications or signals)."

Rafuse admitted to using "foul mouth" on the air on certain occasions. He further admitted saying "testing for the FCC," but claimed he meant "frequency counter check." For violations occurring on other dates, Rafuse claimed innocence, saying that other stations had taped his voice and used his call sign trying to discredit him. He also alleged that he was being used as a scapegoat by the government for the general decline in Amateur Radio.

The Commission concluded that Rafuse's denials were "not supported by the evidence." Citing *Roy A. Filbert, Armond J. Rolle, FCC v. Pacifica Foundation* and others in support of its action, the FCC said that "[Rafuse's] repeated transmission of obscene, indecent or profane words, meaning or language as well as his repeated violations of false or deceptive communications, establishes a record of disinclination to comply with the Commission's Rules. Thus, revocation is not only warranted, it is essential." — *FCC Order*

RACES WARTIME FREQUENCY EXPANSION PROPOSED

An NPRM in PR Docket 83-524 proposes to make additional frequencies available to RACES during emergencies "which necessitate invoking the President's War Emergency Powers." Changes in the Rules governing operations on these frequencies are also proposed.

The National Telecommunications and Information Administration (NTIA) and the U.S. Department of Commerce requested the additional spectrum for RACES. In support of this request, a Department of Defense review of the situation found that:

- frequency bands now authorized for RACES use in wartime have proved inadequate during peacetime disasters. As such, the situation under conditions of war would be completely unsatisfactory.
- more amateur equipment, especially repeaters, is now available for use than when RACES was established.
- should RACES be activated on short notice, it would be important to use existing amateur configurations without change.

The Commission sees merit in these findings and proposes additional frequencies and changes in operational rules governing RACES. More 10- and 18-MHz spectrum could be added to the proposal if the U.S. ratifies the Final Acts of WARC 1979 during this rule-making process.

Certain deletions are also suggested, among them eliminating the:

- 30-day limit for RACES use of certain frequenices during an actual civil defense emergency;
- limitation of the use of RACES frequencies to specific geographical areas during declared national emergencies.

Part 97 would be amended to read:

§97.185 Frequencies available.
(a)All of the authorized frequencies and emissions allocated to the Amateur Radio Service are also available to the Radio Amateur Civil Emergency Service on a shared basis.
(b)In the event of an emergency which necessitates the invoking of the President's War Emergency Powers under the provisions of §606 of the Communications Act of 1934, as amended, unless otherwise modified or directed, RACES stations and amateur radio stations participating in RACES will be limited in operation to the following:

FREQUENCY OR FREQUENCY BANDS

kHz	*Limitations (see paragraph (c)*
1800-1825	1
1975-2000	1
3500-3550	
3930-3980	
3984-4000	
3997	2
7079-7125	
7245-7255	
14,047-14,053	
14,220-14,230	
14,331-14,350	
21,047-21,053	
21,228-21,267	
MHz	*Limitations*
28.55-28.75	
29.237-29.273	
29.45-29.65	
50.35-50.75	
53.30	2
53.35-53.75	
145.17-145.71	
146-148	3
220-225	5
420-450	4,5,6
1240-1300	4
2390-2450	4

(c)Limitations:[1]

(1)Use of frequencies in the Band 1800-2000 kHz is subject to the priority of the LORAN system of radionavigation in this band and to the geographical, frequency, emission and power limitations contained in §97.61 governing amateur radio stations and operators (Subparts A through E of this part).
(2)For use in emergency areas when required to make initial contact with a military unit; also, for areas when required to make initial contact with military stations on matters requiring coordination.
(3)Those stations operating in the bands 420-450, 1240-1300 and 2390-2450 MHz shall not cause

[1]Editor's Note: Some limitations are misnumbered in the table above and hence do not correspond with the correct paragraphs under "(c) Limitations." We have reproduced the document as released by the FCC.

harmful interference to, and must tolerate any interference from, the Government radiolocation service; and also the aeronautical radionavigation service in the case of the 1240-1300 MHz band.

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

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

(6)In the band 420-450 MHz and within the following areas, the DC plate power input to the final stage of a transmitter employed in the amateur service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the FCC Engineer in Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

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

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

(iii)The entire state of Arizona;

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

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

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

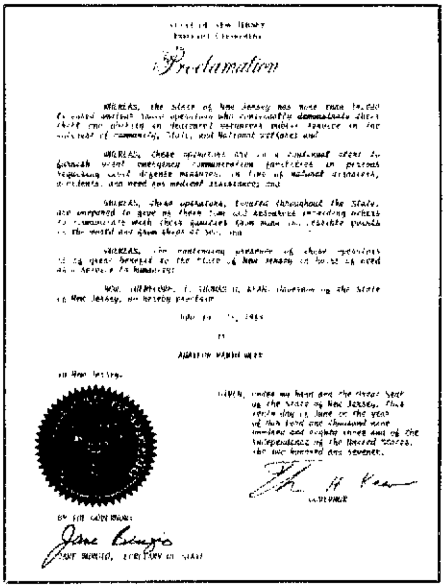
(vii)In the state of Alaska within a 160-kilometer (100 mile) radius of Clear, Alaska (latitude 64° 17' North, longitude 149° 10' West). (The Military Area Frequency Coordinator for this area is located at Elmendorf Air Force Base, Alaska).

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

Comments for the NPRM in PR Docket 83-524 are due on or before August 2, 1983; reply comments are due September 1, 1983. Ex parte contacts (any written or oral communications, other than formal, to the Commission by outside parties) are permitted in this proceeding.

PENNSYLVANIA AMATEURS TAKE NOTE: SUPPORT NEEDED FOR PRO-HAM BILL

Another bill to take local government regulation of antennas off the backs of radio amateurs has been introduced in the Pennsylvania Senate. Senator M. Joseph Rocks (D-4th) of Philadelphia has introduced Senate Bill No. 783 to prohibit Pennsylvania municipalities from adopting any zoning ordinances that would "exclude or restrict the erection, location or height of an amateur radio antenna, or the tower supporting such antenna." Regulations necessary to ensure the safety of life or property would still be permitted, however.



New Jersey Governor Thomas Kean proclaimed June 19-25 Amateur Radio Week. This proclamation, which comes to us via Jane Burgio, New Jersey Secretary of State and wife of W2JB, pays tribute to the thousands of New Jersey amateurs who serve their state so well in time of need.

S.B. 783 is identical to a bill introduced in the House last January by Representative Benjamin Wilson (R-144th). The House version is H.B. 49. Practically all hams know of situations where local government regulation has had a chilling effect on radio amateurs' public service and experimental activities. Now Pennsylvanians have an opportunity to do something to correct this situation. Radio amateurs wishing to support the efforts of Rep. Wilson and Sen. Rocks should let their own state legislators know they support Pennsylvania H.B. 49 and S.B. 783.

NEW HAMPSHIRE PRO-HAM BILL DIES IN COMMITTEE

Amateurs in New Hampshire have lost their chance this year to attain a bill similar to Pennsylvania's. State Government Liaison N1A1X reports that H.B. 561 has died in Committee, despite some effort to get it moving.

What are the chances for similar legislation being introduced next year? That question will be scrutinized carefully by "Granite State" hams, and the amount and kinds of support from individual hams will be a critical factor in any decision. — *W. Dale Clift, WA3NLO*

SECTION MANAGER ELECTION NOTICE

To all ARRL members in the New Mexico, Alabama, Western Massachusetts, Alaska, Santa Barbara, Kansas, Tennessee, Michigan, East Bay and Delaware sections: You are hereby solicited for nominating petitions pursuant to an election for Section Manager. Incumbents are listed on page eight of this issue. A petition, to be valid, must contain the signatures of five or more full ARRL members residing in the section concerned. Photocopied signatures are not acceptable. No petition is valid without at least five signatures *on that petition*. No member may sign more than one petition. It is advisable to have a few more than five signatures on each petition.

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

(Place and date)

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

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

An SM candidate must have been a member of the League for a continuous term of at least two years and a licensed amateur of General class or higher (Canadian Advanced Amateur Certificate) immediately prior to receipt of petition at Headquarters.

Petitions must be received at Headquarters on or before 5:30 P.M. Eastern Local Time, September 9, 1983.

Whenever more than one member is nominated in a single section, ballots will be mailed from Headquarters September 30, 1983. Returns will be counted November 22, 1983. SMs elected as a result of the above procedure will take office January 1, 1984.

If only one valid petition is received for a section, that nominee shall be declared elected without opposition for a two-year term beginning January 1, 1984.

If no petitions are received for a section by the specified closing date such section will be resolicited in January *QST*. An SM elected through the resolicitation will serve a term of 18 months.

Vacancies in any SM office between elections are filled by appointment by the General Manager.

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

David Sumner, K1ZZ
General Manager

Oregon SM W7QMU accepts Governor Vic Atiyeh's proclamation of Amateur Radio Week June 1-8. Adding support to the proceedings are (l-r) WB7SIC, KA7KSK, K7AII, N7CPA and WB7RQG. *(photo courtesy KC7YN)*

SECTION MANAGER ELECTION RESULTS

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

Uncontested

British Columbia	H. Ernie Savage, VE7FB
Colorado	William M. Sheffield, Jr., KQØJ
Georgia	Edmund Kosobucki, K4JNL
Los Angeles	Stanley S. Brokl, N2YQ
Sacramento Valley	Ron Menet, N6AUB
San Francisco	Robert Odell Smith, NA6T
Southern Texas	Arthur R. Ross, W5KR
West Virginia	Karl S. Thompson, K8KT

Canadian NewsFronts

Conducted By Harry MacLean,* VE3GRO

Volunteer Examination Program? — Part 2

What happened to that volunteer examination program for Canada? We asked for your input in April *QST*, and again in a follow-up letter to all Canadian clubs. (Didn't get one, eh? Send us your address and we'll put your club on our CRRL mailing list.) Here's a selection of the responses:

SONRA: *The opinion of SONRA is unanimous; the examination process should remain as is (VO1KR)*... Peterborough ARC: *We are keenly interested in this issue, but feel that DOC is the only authority that can ensure uniformity (VE3KXB)*... Vancouver Island clubs: *Considerable discussion took place; in every case, the consensus was that we should not become involved (VE7FDR)*... Northern Alberta ARC: *Would prefer more input on exam content, but generally feel the responsibility for conducting examinations is too large and complex (VE6BKW)*... CRA de Quebec: *Nous desirons que le ministre des communications administre entierement la conduite des examens (VE2DMV)*... North Bay ARC: *We are not in favour of this program (VE3LQO)*.

Was anyone in favour? Yes, a few, and CRRL received some excellent proposals on how a volunteer examination program could be carried out. But the CRRL submission to DOC was based on the wishes of the majority, and CRRL favoured only a limited involvement in the Amateur Radio examination process. CRRL also used the submission to zero in on some very real problems in that process: the lack of clarity in TRC-24, and examination questions that have been poorly worded, inordinately difficult or based on material not listed in TRC-24.

CRRL proposed (1) that DOC use amateur input to develop large banks of questions for the various Amateur Radio examinations; (2) that DOC establish a board consisting of DOC personnel and amateurs, to review the questions in the banks for overall suitability and wording; (3) that DOC eventually make the questions in the banks public knowledge; and (4) that DOC allow amateurs to *assist* DOC personnel at Amateur Radio examinations. The idea would be to provide an amateur presence that would ensure the suitability of the examination hall, help with housekeeping tasks and generally make the examination candidates feel more at ease.

Several of these proposals are being implemented in one form or another. Shortly after the submission was mailed, CRRL received an invitation from DOC, also extended to CARF, to send two representatives to Ottawa in September, to review the 400 questions in the existing questions bank. Not long after, DOC made its final decision on the whole question of a volunteer examination program:

> The Department has reviewed all submissions received from individual amateurs and those received from the two national amateur organizations. Our study indicates that the majority of amateurs who chose to offer comments are in favour of the Department continuing to administer the amateur examinations. Consequently, the Department will not be proceeding any further with the proposal that amateur volunteers conduct examinations.

The Department added:

> We note, however, a general willingness for amateurs to assist departmental examiners with the administrative aspects of the examination process (handing out papers, setting up locations, organizing facilities, etc.). We would be pleased to accept such help and have advised our regional offices that individual amateurs may be contacting our district offices in this regard.

So there it is. If you want to help, if you want to become involved, call your local office of DOC and tell them you're available. The only questions that remain concern expanding the question banks and possibly making the questions public knowledge. No doubt there will be some lively discussion on these topics at that September meeting in Ottawa.

TRC-24: ONE MORE TIME

No, that new TRC-24 wasn't perfect. Back in May, DOC asked CRRL and CARF to take one long, last look at it and suggest changes that would make it more useful. This was not to be a revision, just a "fine-tuning," and would not affect the implementation date, February 1984. DOC indicated, however, that they would make changes only if they received a single submission endorsed by *both* CRRL *and* CARF.

Art Blick, VE3AHU, and Ron Walsh, VE3IDW, from CARF; and Tom Atkins, VE3CDM, and your editor from CRRL, met in Coburg, Ontario on June 16 to tackle the problem. CARF had already drafted a proposal which was excellent, but with more changes than CRRL believed DOC would accept. The CRRL proposal had fewer changes but was in the format that DOC had requested. What to do? The solutions were to go over both proposals with a fine-toothed comb, and present both proposals to DOC with the understanding that either proposal was acceptable to both organizations.

This is the first time in many years that CRRL and CARF have tried to work together on a project. The success of the Coburg meeting and the fact that a CRRL representative and a CARF representative will be making a common presentation to DOC is most encouraging.

*163 Meridene Crescent West, London, ON N5X 1G3, Tel. 519-433-1198

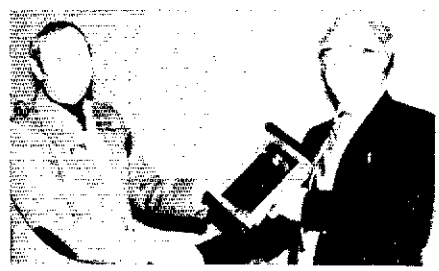
NEWS FROM ALL OVER

☐ DOC has announced a new third-party traffic agreement with J7, the Commonwealth of Dominica.

☐ CRRL recently asked DOC to permit a limited number of Canadian amateurs to operate propagation-study beacons in the 18- and 24.5-MHz WARC bands. Such beacons have been approved by FCC in the U.S., and the 18- and 24.5-MHz bands are even available for general use in many parts of the world. However, DOC rejected the idea, citing possible interference to fixed services still using these bands.

☐ Prefix hunters, take note! To celebrate the 125th anniversary of Renfrew, Ontario, special events station XN3GT will operate 2-metre fm and 80, 40 and 20-metre phone and cw on August 1-14. There is a special certificate for working this station. QSL via Ontario SM Larry Thivierge, VE3GT.

CRRL Ontario Director Ray Perrin, VE3FN (left), presents a *QST* Cover Plaque Award to Jim Swail, VE3KF, at a recent meeting of Ottawa ARC. Jim won the award for his fine article, "A Digital Readout System for the Visually Impaired Operator," in March 1982 *QST*. *(VE3MPG photo)*



Society of Newfoundland Radio Amateurs President Eric Salter, VO1KK (left), presents an honorary life membership in the Society to CRRL Assistant Director Clarence "Mitch" Mitchell, VO1AW. Mitch has been an amateur for 50 years, and is well known as a contest operator. *(SONRA photo)*

CRRL President Tom Atkins, VE3CDM, and Doris Cody, VE3BBQ, man the CRRL booth at the IEEE Vehicular Conference, held in Toronto in May. *(VE3AND photo)*

IARU News

Conducted By Richard L. Baldwin,* W1RU

LIBERIA

Liberian amateurs are using special call signs A81LC, A82LC, A85LC, A87LC, A88LC and A89LC for the rest of 1983 in order to call attention to the plight of the Ganta Leprosy Colony, with the stations to be operated by members of the Liberian Radio Amateur Association. QSL manager for this special event is Bob Johansson, SM4CWY, P.O. Box 134, S-67101, Arvika, Sweden. There will be a special award for any station who submits satisfactory evidence of having worked all six stations, with at least two of the contacts on cw.

HAM FAIR '83

The annual Ham Fair sponsored by the Japan Amateur Radio League will be held in the Tokyo International Export (reportedly the largest fairgrounds in the Far East) on August 19-21, daily from 10 A.M. until 6 P.M. There will be some 90 exhibitors, including the major Japanese manufacturers. There will be a number of technical and operating seminars, along with the usual flea market. Based on past experience, JARL expects some 38,000 visitors.

SINGAPORE 1983

On the other hand, if your travel plans for 1983 include the Far East slightly later in the year, you might want to keep in mind the 13th SEANET Convention, to be held November 18-20 at the Hotel Equatorial, Singapore. For more information about this annual meeting of the SouthEast Asia Net, contact 9V1TL at the Singapore Amateur Radio Transmitting Society, P.O. Box 2728, Singapore 9047.

FRIEDERICHSHAFEN 1983

Each year, the Deutscher Amateur Radio Club sponsors a large hamfest on the shores of Lake Konstanz. This year's meeting, held over the weekend of June 17, drew some 15,000 visitors who saw a wealth of equipment displays by many of the world's outstanding suppliers. There was the usual flea market, along with a number of technical and operating seminars. DARC president DK3LP also organized a meeting of European Amateur Radio leaders that was attended by 10 Region 1 Presidents or Vice Presidents, the Chairman of Region 1 IARU and the President of IARU. It was an excellent opportunity for the group to review, on an unofficial basis, some of the latest developments in IARU, including a lengthy and rewarding discussion of the first meeting of the IARU Administrative Council in Tokyo in April. Friederichshafen is a great place to meet many, many enthusiastic European amateurs. For those of you who might be thinking of European travel in 1984, next year's Friederichshafen dates are June 22-24.

WORLD COMMUNICATIONS YEAR 1983

A number of amateur societies are sponsoring various sorts of activities as a means of participating in World Communications Year. In Syria, YK1 amateurs will use the prefix 6C1 during the month of October. The Northern California DX Foundation has established another of its 14-MHz beacons, this one OH2B at the Helsinki University of Technology, under the auspices of the Finnish amateur society. And, in September, the Japan Amateur Radio League will sponsor a World Amateur Radio International Conference (WARIC) in Tokyo to consider the problem of encouraging the growth of Amateur Radio in the developing countries. QST

*President, IARU

Strays

DXING, THE SECOND TIME AROUND

☐ "Love's much lovelier the second time around." Isn't that how the old song goes? Well, we found the same thing applies to DXing, at least Montserrat style. The "we" refers to Frank Woodall, AK8W/VP2MFZ; his wife Kay, KA8MHK/VP2MHK; Howard Mark, WB8OBW/VP2MFM; and me, KA8LEH/VP2MNC.

My husband and I have discussed taking a DXpedition on several occasions, but after spotting an advertisement in *QST* for a villa for rent — with radio gear — on an unheard-of-to-us island in the West Indies, we immediately sent off our request for more information, never dreaming we were to find a place we will forever think of as our second home. In November 1979, together with Jerry Vanaskey, N8BM/VP2MEE, and his wife Joanne, we finally embarked on our first DXing experience, to Montserrat.

Two days and 2000 miles from home, we arrived at our destination, where we were met at the airport by Doc Hollatz, caretaker of the place we were to stay while on the island. After a harrowing 12-mile journey across the island (which is actually only 7 miles wide but very mountainous), we arrived at our QTH — a gray stucco ranch-type house overlooking the Caribbean.

We settled in and set up our radio equipment, just in time to check into the Stark County Mutual Aid Net, a local 10-meter net run by Bill Parks, K8JZN. He was very surprised to have three VPs check in only 30 hours after leaving their home. One of the main purposes of our trip was so N8BM could work the CQ Worldwide Contest, which he did and won his class and set a new North American record for single operator, single band.

But once was not enough. When we planned our 1981 DXpedition to Montserrat, it was with the same expectations. But because of financial commitments, N8BM and his wife decided to forgo the trip. By default, this left AK8W to uphold the group's honor in the CQ Worldwide Contest, Frank being the only Extra Class operator. He said he only wanted to operate "casually," and he really was pretty casual about it! He redeemed himself, however, in the 160-Meter contest the next weekend, in which he did well.

Things were a lot different on the 1981 trip. For instance, we only used the ham shack for operating and not as a third bedroom! Also, KA8MHK and I had VP2 calls this time, which made a tremendous difference. We started out by talking with the folks back home, but ended up working the pileups and gaining a lot of radio experience at the same time.

Will there be a third time around? The question remains unanswered. Traveling expenses have inflated, and what with growing a little older, maybe our itch to go gadding off around the world has been scratched. But then I reread this little story...excuse me, folks, while I go hunt up those photographs. — *Shirley Mark, KA8LEH, Tucson, Arizona*

Dave Sumner, K1ZZ (left), knows he has big shoes to fill as ARRL General Manager — but a hat is something else! K1ZZ received his Stetson from Chuck Miller, WAØKUH, of the PHD ARA, at the 1983 Missouri State Convention in Kansas City. *(WØHSK photo)*

Correspondence

Conducted By Peter R. O'Dell,* KB1N

All letters will be considered carefully. We reserve the right to shorten letters selected in order to have more members' views represented. The publishers of *QST* assume no responsibility for statements made herein by correspondents.

THANKS

☐ I wish to thank the hams of the Carlisle and Harrisburg, Pennsylvania, area for their emergency response on April 30, 1983 at 9:50 A.M. I was involved in an auto accident at PA 233 and I-81 (Newville exchange). The car I was driving was broadsided and was totaled. The amateur stations responded with emergency help within minutes in a very professional manner.

A heartfelt thank you for a job well done. — *Jack Kissinger, KA1QU, Lee, Massachusetts*

THANKS, AGAIN

☐ We in the Academy of Model Aeronautics really appreciate your help in bringing the new ARRL 6-meter band plan to what we believe is a most successful conclusion. With the new R/C subband now available as an alternative to the 53-MHz frequencies, we believe 6-meter R/Cers will now be able to enjoy many years of relatively safe (interference-free) flying. — *Torrey Williams, W4UV, Jacksonville, Florida*

OOPS

☐ What's on their minds? In the May 1983 issue of *QST*, ARRL General Manager Dave Sumner, K1ZZ, must have other things on his mind, and not his own personal safety.

In the photo on page 46, Dave is shown on a tower with his safety strap twisted through the tower, and the safety snap on the strapped hooked through the "D" ring of his safety belt incorrectly. By having the movable part of the snap toward the body, one can very easily put pressure on the snap, causing it to open and resulting in a serious, if not fatal, fall.

Always keep the movable part of the snap toward the outside, away from the body. — *Jim Pfirman, WB3EKV, Williamsport, Pennsylvania*

[Editor's Note: Jim is right about the safety snap. K1ZZ says bad habits are hard to break.]

ONLY IN AMERICA

☐ I have just finished listening to a 15-meter QSO between PY1USA and a local who said he lived near the White House. Is it possible I dreamed what I overheard?

PY1USA is a school club station in Brazil, and they were demonstrating ham radio to a class of teenage girls. The basic subject of conversation was the government of the United States. Here is most of the information I heard passed from this end. The ham here was unsure of our form of government, except that it was both good and bad. He wasn't sure, but he thought there were two branches of Congress (names not really known). The senators were elected for eight years. The other branch, name unknown, was elected for six years. The functions of either branch were unknown. There was some kind of judicial system. Why it existed, he did not know. Not more than two parties are allowed to exist. The only true answer I heard was that the president was elected for four years. By the time all of this was translated into Portuguese at the other end, I suspect that those students wondered if we really had a government.

Conditions were marginal, and without a beam I couldn't break the QSO. Had I succeeded after hearing all of this, I probably would have been too irrational to say anything diplomatic. How can anyone capable of obtaining a legitimate amateur license not be able to give the most elementary facts on our government? If this fellow works for the government, no wonder there is mass confusion in Washington. Certainly this QSO gave a poor representation of both our government and our educational system. My advice: If you don't know what you are talking about, keep your mouth shut so you don't expose your ignorance. — *Carl W. Brown, W3LUL, Burtonsville, Maryland*

HE'S MAD

☐ I am an active Amateur Radio operator with a so-called rare prefix. Because of this, I receive a lot of QSL cards. I gladly answer all cards which come through the ARRL DX Bureau, as well as cards which are sent to me direct with an s.a.s.e. Unfortunately, I receive many QSLs direct with no s.a.s.e. These remain unanswered. When I want a QSL card, I'll send along an envelope with postage as a courtesy. My cards are very nice and cost about 5¢ each. If someone wants my card, they should have the same courtesy and not expect me to pay an additional 20¢ postage as well as the cost of the envelope. — *John Bayne, KK9A, Glenview, Illinois*

MOON STRUCK

☐ I read with great interest the item under Strays in December 1982 *QST* (page 89) in which the claim was made that K4NI was the first ham to have his call letters on the surface of the moon.

"K7ILE" was the first call to arrive on the moon via the Ranger series of moon landers. *Ranger 6* impacted on the moon on February 2, 1964, followed by *Ranger 7* on July 31, 1964. Both of these vehicles carried my call letters scratched on the back of a heat sink installed on a module which was supplied to Jet Propulsion Laboratories by Burr Brown Research Corp., my employer at that time. We provided JPL with about 10 modules for the project, and my call was on each of them.

Confirmation was received by letter from JPL that our equipment was indeed on board when the first-ever man-made vehicle landed on the moon. Therefore, I conclude that the first call letters on the moon were "K7ILE." — *John Vancza, AK7X (ex-K7ILE) Tucson, Arizona*

MORE CODE

☐ The League's position on the no-code license is certainly not mine. I think 6-meters and 146-147 MHz should be "no code."

For those who enjoy cw, FB; it is probably a reasonable requirement on hf due to the international nature of those bands. Beyond that, I think a code requirement is, at the most, an unwise screening tool for the semimotivated.

Those who lack interest will give it up, and any "ne'er do-well" who wants on the bands need only buy a radio anyway. — *B. Housman, KA4MIC, Williamsburg, Kentucky*

☐ This letter is in response to KA5PNS and his "old fogy" remarks printed in your column of June 1983.

Maybe one of the reasons us "old fogies" are so slow to make changes in the amateur service or make entry into it easier is because of the "Get outa my way, or I'll punch you in the face and kick your pregnant wife in the tummy" attitude expressed by people like KA5PNS and his *new generation*. Perhaps when folks with outlooks like this begin to show a little bit more respect for their fellow man, both on and off the air, us old fogies might lean a little more their way. I'd like to remind KA5PNS and his bunch that there is no welfare line in this hobby, no free lunches. We earn what we get, so put your hand back in your pocket; there are no "gimmies" here. I guess if us old fogies won't play by his rules, he can stamp his feet, whimper and take his ball and bat and go home and complain to Mommy. — *Jim Beedle, W9NIN, Bartlett, Illinois*

☐ Concerning the necessity of a no-code license, only time will tell the tale. As more amateurs go the way of computer, RTTY and cw, perhaps code will go the way of spark; but be it machine generated or otherwise, high-speed code has a musicality and beauty which musters respect and admiration for those who work it.

I've never known a person who was truly proficient with code to dislike it. On the contrary, the more proficient they were, the more they loved it! Jean Shepard's introduction to the ARRL's "World of Amateur Radio" says it all.

As a dyed-in-the-wool cw operator, I feel sorry for Mr. Medlock and the feelings expressed in his comment. Just sign me: Proud to be a code master. — *Jon G. Flower, W5UA, Cambridge, Ohio*

☐ For my part, I am in favor of a code-free service, but it would not consist of giving all of the vhf bands. It would consist of only 500 kHz above the 50-MHz range, and the exam would be the same otherwise as given to Technicians. No repeater privileges would be given; only simplex operation would be allowed.

This method would give them a start in ham radio, and then when they got their code proficiency up to either Technician or General, they could be advanced. Giving them full privileges would be a violation of all that ham radio stands for.

This is my opinion of the situation, and remember I have been in ham radio a long time and many changes have happened. — *G. C. Larson, W7ASA, Boise, Idaho*

*ARRL Public Information Coordinator

Washington Mailbox

Conducted By Richard K. Palm,* K1CE

Band Plans

Got a renegade ham on your hands? You know the type: He operates simplex on the input of the local repeater. Or worse, he puts *his* repeater on a frequency pair of *his* choosing despite what the local frequency coordinator has to say. Some renegades enjoy setting up shop on fm in popular EME and terrestrial weak-signal areas, creating havoc with communications of good spectrum citizens. They're ornery. For more on the ornery ham, see FM/RPT, November 1982 *QST*.

The renegade writes off his "operation" as being in strict accordance with the letter of the law in Part 97. "Sure, wideband fm is permitted at 144.15 — check it out in the regs" and "I was here first — who cares if this happens to be some dumb repeater's input?" are popular retorts from the renegade.

These retorts, however, don't wash with the Commission. And thanks to a recent communique, the FCC's feelings are down on paper. This month, we'll take a look at the meaning of good amateur practice, and how it affects operation in accord with nationally recognized band plans. [For a discussion of the new 6-meter band plan, see page 72, this issue. — Ed.]

Q. How does the Commission feel about the amateur community's own frequency planning and coordination?

A. In a repeater rules proceeding a while back, FCC said:

"The Commission is persuaded by the comments and by observation that regional and national frequency planning and coordination by amateur radio operators themselves can result in the best spectrum utilization appropriate to the service." We'll add that "best spectrum utilization" means amateurs operating in accordance with "good amateur practice" — a requirement found in Section 97.78 of the Rules.

Q. How does FCC view amateurs who place their repeaters on frequency pairs in disregard of repeater band plans?

A. In an April 27, 1983, letter to a major repeater council, FCC said:

> The only national planning for Amateur Radio Service frequencies that has come to our attention is that done by the American Radio Relay League. The 1982-83 edition of the *ARRL Repeater Directory* lists over 5600 stations in repeater operation all over the United States and Canada. In view of this widespread acceptance of their band plans, we conclude that any amateur who selects a station transmitting frequency not in harmony with those plans is not operating in accord with good amateur practice. [For example] The *ARRL Repeater Directory* lists the frequency pair 144.83-145.43 MHz as a repeater channel. Therefore, designation of this channel by the regional frequency coordinator in [an] area is in accord with the ARRL national band plan.

The bottom line is that if stations transmit on frequencies 144.83 or 145.43 (to use the Commission's example above), in a manner that creates interference to coordinated repeaters, then sufficient cause would exist for issuance of an Official Notice of Violation of Section 97.78. And, such operation could mean an additional Notice for deliberate and malicious interference (97.125).

There are good reasons why simplex operation should be moved from repeater frequencies. The FCC has labeled three: (1) Repeater operation is not permitted on some Amateur Radio bands; (2) on those bands where repeater operation is permitted, such operation is confined to a limited portion — a subband — of the band; and (3) the nature of repeater operation necessitates some form of channelization; haphazard frequency selection would result in poor spectrum use, and constant frequency change is impractical.

Simplex stations do *not* have such limitations; thus, they have much greater flexibility in frequency choice. They must avoid repeater channels found in widely accepted band plans. Such avoidance constitutes good amateur practice.

Q. Do band plans exist for other bands and activities?

A. Yes; in fact, there are band plans for just about every amateur band. Let's take a look at the 450-MHz band plan, one that has developed over time to promote peaceful coexistence among the various modes and activities:

420.00-426.00	ATV repeater or simplex with 421.25-MHz video carrier control links and experimental
426.00-432.00	ATV simplex with 427.250-MHz video carrier frequency
432.00-432.070	EME (Earth-Moon-Earth)
432.07-432.08	Propagation beacons
432.08-432.10	Weak-signal cw
432.100	70-cm calling frequency
432.10-433.00	Mixed-mode and weak-signal work
433.00-435.00	Auxiliary/repeater links
435.00-438.00	Satellite only (internationally)
438.00-444.00	ATV repeater input with 439.250-MHz video carrier frequency and repeater links
442.00-445.00	Repeater inputs and outputs (local option)
445.00-447.00	Shared by auxiliary and control links, repeaters and simplex (local option); (446.0: national simplex frequency)
447.00-450.00	Repeater inputs and outputs

The 450-MHz band harbors many amateur activities: satellite, television, weak-signal terrestrial and EME communications, and fm and repeater operation. Sure, there's a lot of space in this segment, 420-450 MHz. But there are many activities that would collide with each other if it were not for this plan.

Let's be quick to point out that these plans are not unilateral decisions made in a vacuum. With *lots* of input from the VRAC, the VUAC and other leading groups, they develop and evolve over a period of several years, sometimes decades. Each plan is designed to promote the greatest spectrum efficiency possible.

All amateurs should make every effort to operate in concert with these plans, which have the approval of the ham community and the FCC. In fact, "good amateur practice" dictates compliance with these community standards.

Q. Where can I find copies of band plans?

A. You won't find them in Part 97. As mentioned above, band plans are generated within the amateur ranks, not from the desks of the FCC. You will find copies of these plans in *The FCC Rule Book* and the *Repeater Directory* (both published by ARRL).

Q. Why are band plans so crucial?

A. Since the beginning, amateurs have maintained a fine tradition of keeping their own shop in order. For years, the Commission has lauded our Service for its effective self-policing abilities. There is no clearer demonstration of this tradition than amateurs' own development of band plans.

As every active ham knows, there is a myriad of special interests in Amateur Radio. Band plans are in place, in lieu of regulations, to allow the array of operating activities to function with a minimum of QRM and frustration. They keep Amateur Radio on the straight and narrow path to coordinated and orderly progress. And most important, if we as amateurs can't keep order to prevent chaos, no one can!

[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.]

The Call for a 900-MHz Band Plan

As a result of the April ARRL Board Meeting, the League's VHF Repeater Advisory Committee and VHF/UHF Advisory Committee will jointly study suggestions for a band-usage plan for the new 900-MHz amateur allocation and the existing 1215-1300 MHz band. If you have some ideas for either or both of these bands, let your VRAC and VUAC representatives know about them. To determine your division's representative, check page 47 of October 1982 *QST*, contact your Division Director or write to ARRL Hq. and we'll distribute your ideas to the appropriate people.

Another study is underway concerning frequency coordination of repeaters. If you have suggestions for improving the way repeater channelization and planning is handled, tell your VRAC representative today! The full Board will wrestle with these issues at its Second Annual Meeting on October 4-5 in Houston. Let your voice be heard.

*Assistant Manager, Membership Services, ARRL

On Line

Conducted By Stan Horzepa,* WA1LOU

Translating BASIC

You own a Brand X computer, and you find a program in a book or magazine that you wish to run on your computer. The problem is that the program is written for Brand Z computer. What do you do? Either you try translating the program for your computer or you forget about it.

In January On Line, I provided a general outline for translating programs in BASIC and machine language. In this installment, I will translate a BASIC program step-by-step to show you how it is done. For this task, I have selected the MINIMUF program by Robert R. Rose, K6GKU, that was published in December 1982 *QST* (pp. 36-38). The program calculates maximum usable frequency (muf) by inputting solar activity data copied from WWV.

MINIMUF was written for a Tektronix computer. I will translate it for a Radio Shack TRS-80® Model I computer using Disk BASIC (hereafter referred to as "80-BASIC"). To follow this translation, refer to the program listing of MINIMUF as it originally appeared in December *QST*.

In line 100, INIT sets all variables in the program to their initial values. In 80-BASIC, there is no INIT; however, CLEAR is its equivalent. CLEAR also allocates memory space for string storage. The two string variables (M$ and A$) defined in line 110 require some space; I will allocate 1000 bytes of memory for string storage. Initializing the variables and allocating memory for string storage is accomplished with a new line:

```
100 CLEAR 1000
```

Throughout the program, starting at line 150, pi is used in many equations to calculate muf. The value of pi is defined within Tektronix BASIC; however, in 80-BASIC, pi is treated as another variable and must be defined. This will be accomplished by adding a new line:

```
102 PI=3.141593
```

Lines 180 and 480 contain the statement PAGE. In Tektronix BASIC, PAGE clears the computer's display and moves the cursor to the upper left, the "home" position of the display. In 80-BASIC, CLS is the equivalent of PAGE. Lines 180 and 480 should be changed to

```
180 CLS
480 CLS
```

Starting at line 420, MINIMUF uses the Tektronix IMAGE statement to define the format for PRINT USING statements. Only one IMAGE is used more than twice, so it seems simpler to use PRINT statements rather than try to figure out the equivalent PRINT USING definitions for 80-BASIC. Therefore, delete all lines using the IMAGE definition (lines 420, 530 and 670). Now change lines 410, 500, 520, 550 and 560 to read as follows:

```
410 PRINT"INVALID DAY. MUST BE IN
  RANGE (1 TO "DY")."
500 PRINT"DATE: ";D6;A$
520 PRINT"LATITUDE ";L1;
  "LONGITUDE ";W1
550 PRINT"LATITUDE ";L2;" LONGITUDE
  ";W2
560 PRINT"SUNSPOT NUMBER = ";S9
```

The PRINT USING in line 660 is used 24 times, so it will be retained but modified for 80-BASIC:

```
660 PRINT USING U$;T5,J9
```

Now, the string variable used in line 660 (U$) must be defined. Add line 104 to define U$:

```
104 U$=" ##      ##.#"
```

(There is one blank space before the first # and six blank spaces between the two sets of #s.)

Line 490 uses the Tektronix BASIC SEG statement to create a new string variable (A$) by segmenting an old string variable (M$). There is no SEG in 80-BASIC; however, MID$ is the equivalent of SEG, and line 490 should be changed using MID$ in place of SEG:

```
490 A$=MID$(M$,3*MO-2,3)
```

In lines 1070, 1270 and 1380, the ACS (arc cosine) function is used. 80-BASIC does not have ACS; however, the following equation will derive the arc cosine of the value X:

```
1.5708-2*ATN(X/(1+SQR(1-X*X)))
```

Using this equation, lines 1070, 1270 and 1380 are changed:

```
1070  G1=1.5708-2*ATN(K7/(1+SQR(1-
  K7*K7)))
1270 D=1.5708-2*ATN(D/(1+SQR(1-D*D)))
1380 L0=P0-(1.5708-2*ATN(C/(1+SQR
  (1-C*C))))
```

To obtain the number of days in a month, MINIMUF uses a DATA and READ routine that will not function in 80-BASIC without modification. First, delete line 130 (READ M won't do us much good sitting on top of the program in 80-BASIC). Next, modify line 370 to go to line 392 rather than 400:

```
370 IF 1<=MO AND MO<=12 THEN 392
```

New lines 392 through 394 derive the number of days in a month:

```
392 FOR Z=1 TO MO
393 READ DY
394 NEXT
```

This routine takes the number of the month that was entered in line 360 (for example, number 3 for March) and repeats the READ DY statement that number of times (three times). The READ statement reads the data in line 120 (and after three READs gets the number 31; i.e., 31 days in the third month).

Finally, in line 400, the variable representing the number of days in a month M(MO)) must be changed to accommodate that same variable in line 393 (DY):

```
400 IF 1<=D6 AND D6<=DY THEN 430
```

That completes the conversion of MINIMUF from Tektronix to TRS-80 Model I BASIC. The process described may be applied to other programs written in any dialect of BASIC. By studying that foreign program and using a little elbow grease, even the most disagreeable-looking program will become putty in your hands.[1]

PX

Along with the main thrust of this installment of On Line, PX offers three versions of MINIMUF.

The program was converted for the Apple II+ by Jim Sullivan, KB8DE. This conversion of the program is expanded to include new features, and is available from Dept. PX as program no. 20.

Program no. 21 is the Timex/Sinclair version of MINIMUF. Bob O'Leary, KQ2F, converted and renamed it TSMUF-4. It requires 8K ROM and 16K RAM.

Jerry and Kay Colten, W9CZI and K9CLM, converted MINIMUF for the VIC-20. It is available via PX as program no. 22.

To obtain a listing of any of these programs, send a business-size s.a.s.e. with 37 cents postage to ARRL, Dept. PX, 225 Main St., Newington, CT 06111. Write the program number on the lower-left corner of the s.a.s.e.

PORTABLE 100

I am writing this installment of On Line with my new toy, a Radio Shack TRS-80 Model 100 computer. For those who are not familiar with the 100, let me provide a short description.

The Model 100 is a portable computer, approximately the size of *QST*, only thicker (not quite 2 inches thick, to be exact). It contains a standard, full-size alphanumeric keyboard and an 8-line by 40-character LCD display. An 8085 cpu runs the show, and 32K of ROM includes Microsoft BASIC, a telecommunications program, address and schedule programs, and the word processing program that I am using to write this text.

8K to 32K of user-programmable RAM may be installed. RS-232-C, printer, phone, cassette and bar-code reader interfaces are included. To complete the package, there is a built-in 300-baud direct-connect modem with an automatic dialer. All this is completely portable. It runs off of four AA batteries as well as an ac adaptor, and when the computer is turned off, all is saved by an internal NiCd battery.

The machine is clean. I ran the Model 100 next to hf, vhf and uhf equipment, and didn't detect a peep that could be attributed to the computer.

The potential of the Model 100 for ham radio applications is tremendous. Already, I downloaded a program from CompuServe's Hamnet that generates Morse code from the Model 100 keyboard. Surely, the 100 can also be programmed to receive cw as well as send and receive RTTY. Here is the perfect computer to take into the wilds to dupe and log those Field Day QSOs. It is also handy for performing the duping and logging chores in the shack. Whereas most home computers require a separate table, the 100 can sit next to your rig or in your lap as you squeeze that last multiplier out of the air.

In comparison to the Commodores, Ataris and TIs, the Model 100 is expensive. But none of the others offer the portability of the 100 (that is what attracted me to this computer). Also, many of the hardware and software features included with the Model 100 must be added onto the other computers or, in some cases, cannot be bought at any price.

All this may sound like a plug for the Model 100. I did not intend it to be one; I simply wanted to give you my first-hand impressions of this newest addition to computer technology, and I am impressed. If you would like an in-depth description of the Model 100, check the May issue of *Byte*.

SENDING SOFTWARE

If you ever send diskette software via the mails, provide adequate protection against electrical fields that the diskette may pass through on its way through the postal maze. I have received a number of unprotected diskettes through the mail that were unreadable; the data was destroyed on its journey between mailboxes.

To protect your software from electrical fields and moisture, cover the diskette with aluminum foil and seal the foil with tape. Also, mail the diskette between pieces of cardboard and mark the outer wrapper "Do Not Bend" to protect against the mechanical hazards of the postal system.

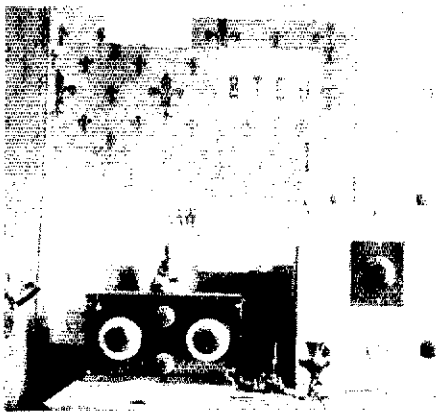
*72 Stiles St., Waterbury, CT 06706

[1] *The Basic Handbook*, 1981, by David A. Lien (Compusoft Publishing, P.O. Box 19669, San Diego, CA 92119) defines the BASIC words used in most dialects and is invaluable when translating programs.

How's DX?

Conducted By Ellen White,* W1YL/4

F8YM — A Photo Essay



F8TED (F8YM), circa 1928

F8YM today

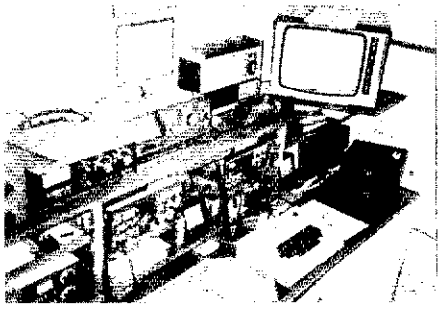
Claude's Civil Security mobile includes both gear and an emergency generator.

Photography records the gamut of feelings written on the human face, the beauty of the earth and skies that man has inherited, and the wealth and confusion man has created. It is a major force in explaining man to man. — Edward Steichen, *Time,* April 7, 1961

Some months back, this writer had the opportunity to see photos of the exceptionally interesting QTH of F8YM. In pursuit of further information, the unique amateur personality of Claude Leddet surfaced. The photos of the F8YM chateau and a subsequent inquiry led to an insight into the Amateur Radio life of OT F8YM.

Claude was born in 1912, at the chateau he lives in today. He was first licensed in 1928 as F8TED (the call F8YM was acquired in 1932). He worked, pre-WW II, as a technician for Radio-AIR and was instrumental in developing both receivers and transmitters for fighter planes, followed by work on radio guidance. On 80, Claude uses an Atlas 210X and a W3DZZ antenna. On 20, 15 and 10, a Kenwood TS-830S is used, along with a Drake 2700, radiating from a TET beam at the 100-foot level.

Vive, F8YM!



The F8YM station

F8YM's Chemille-sur-Deme QTH

FEEDBACK

Apologies to all concerned for inadvertently identifying the photo of SMØAGD as Jim Smith, VK9NS/VKØJS, in the July issue.

THE SPRATLYS: WHO HOLDS WHAT

Thanks to W3AZD for forwarding a copy of the April 28, 1983 *Far Eastern Economic Review,* which contains an interesting account of the Philippines beefing up its presence in the so-called Kalayaan (Freedom) Islands, part of the disputed Spratly group in the South China Sea. Currently, five countries claim some or all of the 100 or so islands, shoals and reefs: Vietnam, the Philippines, The People's Republic of China, the Republic of China and Malaysia. Amboyna Cay is shown as occupied by Vietnam, as are Union Banks and Reefs, Eldad Reef, Pearson Reef and Central Reef; all are in the area known to the Philippines Government as Kalayaan.

If the ARRL DX Advisory Committee recommends the deletion of Spratly, it most likely will be on the basis of a change in administration. From a former entry onto the list on the basis of "unadministered," there has been a significant change in the status of the Spratlys.

WHAT'S AN ORDINARY DXER?

An ordinary DXer is

- the ham who brings home a new rig, hooks it up and then, while reading the latest *QST,* finds that the rig has been discontinued and is on sale at 25% less than what he paid for it
- the ham who works the DX in a big pileup, doesn't get his call and sits there as the station goes QRT
- the ham who has to count "a thousand one, a thousand two, a thousand three" because the indicator doesn't work on his rotor dial
- the ham who hears rare DX calling "CQ," but for some reason can't get a reply and then (when the pileup is out of control) notices that the transceiver was set for split and he has been calling the DX station on sideband, on 14,025
- the ham who works a new one and then, when he goes to log the frequency, he realizes he was out of the band and immediately turns off the radio before FCC notices. — *The DXer, June 1983; tnx Northern California DX Club*

THE CIRCUIT

☐ *LI DX BULLETIN* pundit W2IYX holds the basic patents on radioteletype using fsk and, additionally, was awarded the Army Distinguished Service Award for his adaptation of Bell Lab's early development of ssb for military and commercial uses. Catch Harvey at one of the upcoming conventions for some interesting talk on Amateur Radio — past, present and future.

☐ SEANET 1983. Make plans now for the 13th annual SEANET Convention, Nov. 18-20, at the Hotel Equatorial, Singapore. A grand affair always takes place and could form the nucleus for your holiday jaunt. Details from the Singapore Amateur Radio Transmitting Society, Box 2728, Singapore 9047.

☐ HAM FAIR '83, Japan's answer to Dayton, takes place August 19-21, from 10 A.M. to 6 P.M., at the New Hall, Tokyo International Export Center. The theme for this year's spectacular will be World Communications Year. JARL will be programming sessions on the Introduction of Amateur Radio and its Con-

*19620 SW 234 St., Homestead, FL 33031

tribution to International Friendship, a panel discussion of relevant information on Amateur Radio worldwide, and new equipment from around the world. A replica of the first Japanese Amateur Radio satellite (scheduled for launching in two years) will be on display. Extras will include technical seminars, flea market, fox hunting and a cw contest.

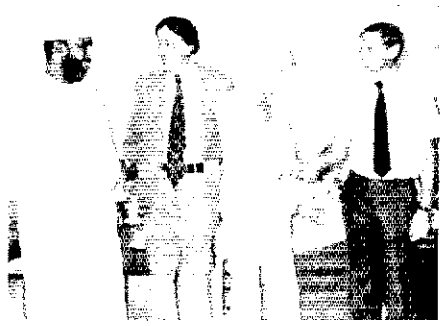
☐ *CW Into Foreign Languages* is a neat desk-top aid for those of the code persuasion, covering Spanish, Dutch, French, German, Russian, Polish, Swedish, Norwegian, Hungarian and Yugoslavian (Serbo-Croatian). Compiled by VE3EIM and VE3MGY, it should enhance the quality of many of your code contacts. Speed your $5 (which includes return First Class postage) to C. W. Publications, Box 2571, Station A, London, ON N6A 4G9, Canada.

☐ BV2A: Heard in Tim's shack (thanks to W9ZNY): "BV2A de K4—, you are a new country, you are a new country (you could almost feel the quaver in his fist). I will QSL. What country are you?" Along a similar line, the U.S. Postal Service, in its infinite wisdom, has seen fit to rearrange the whole rural route system in the part of West Virginia wherein resides Tim's manager K2CM. Here we go again, guys! This is the new, *new* address for those of you seeking BV2A confirmations: Charles E. Moraller, K2CM, Rte. 1, Box 43, Grantsville, WV 26147.

☐ Tunisia: AA4MI notes that Mashil, 3V8AA, is on 14,010-14,015 generally from 0000-0100 UTC, and will gladly confirm via IS0LYN.

☐ Honor Roll: W3AZD reports a continuing growth in the number of those qualifying, no doubt resulting from the recent availability of both China and Heard Island.

☐ Iraq: IRCs are sold in Baghdad and are, therefore, accepted by the YI1BGD group. Sending green stamps in envelopes may cause problems, so please, please desist! Three IRCs are sufficient. Note that the regulations stipulate that the reply coupons must be stamped and dated post-June 1980. The YI1BGD group is more active than before and recently received semiofficial permission to operate on 10 and 15. Cards direct via Box 5864, Baghdad.



Congratulating W6KG and W6QL on receiving the license W6KG/A4 for operation in the Sultanate of Oman are (l-r) A4XGT, the Colvins and A4XIJ. A4XGT and A4XIJ are, respectively, the chairman and secretary of the Royal Omani Amateur Radio Society. This successful operation netted 5000 two-ways in 127 countries, both phone and cw. Next stops for the Colvins were Qatar and then the Visalia DX Convention.

☐ Indonesia: All expatriate calls are being reshuffled, notes YB5AES (now YB5ASO). About the last call issued under the former system was YB0AFC. Effective recently, Jakarta has started reassigning calls starting with AQA. The assumption is that they will go on through AZZ. For example, YB5AEU is now YB5AQD and YB4AEP is now YB4ACQ. John (ASO) has added about 8000 feet of buried radials and is building a big outdoor receiving loop turned by a TV rotor. Watch for heavy 160-meter operation by him this winter!

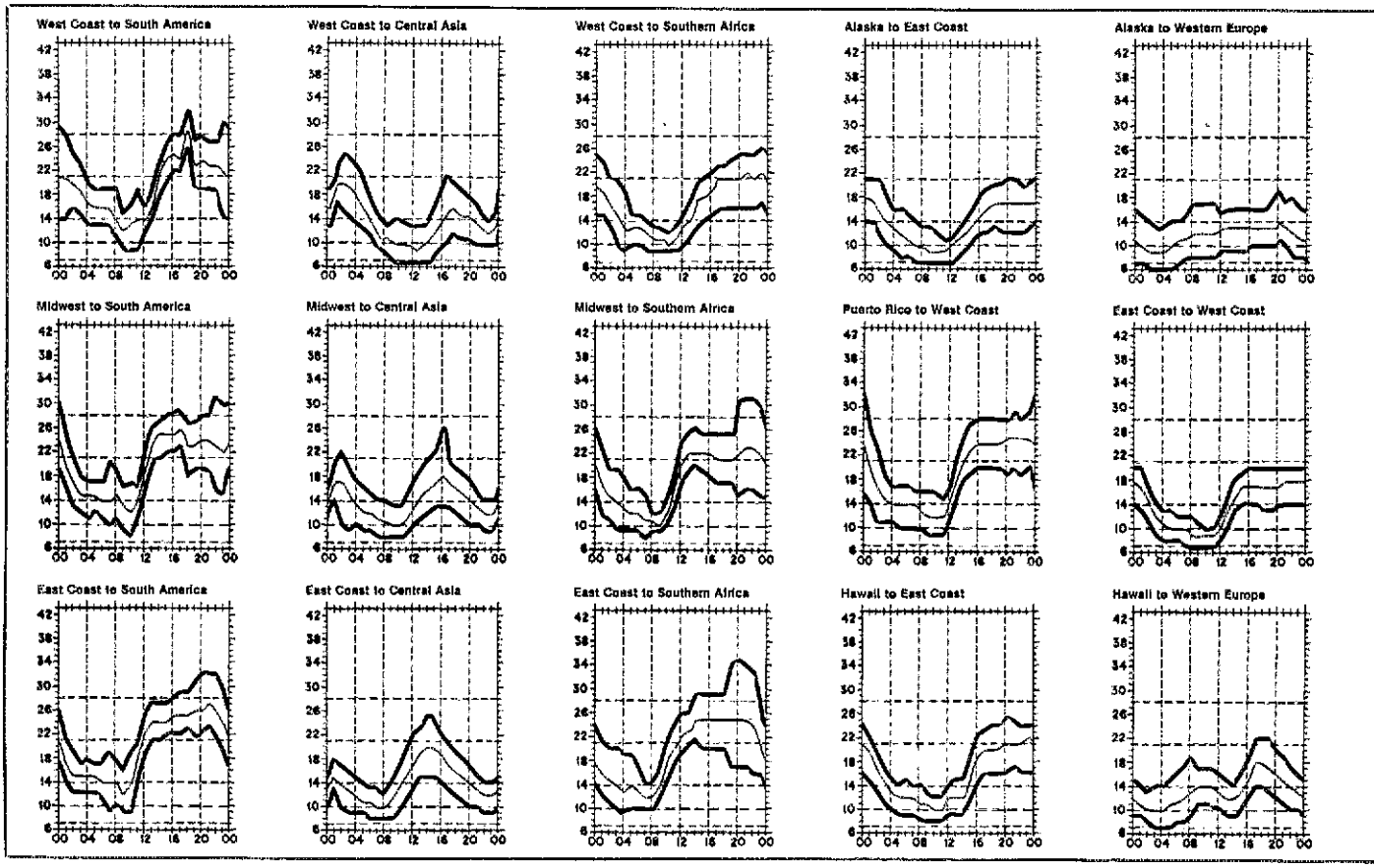
☐ Tiurai Special: July 10-17 saw lots of French Polynesian operation. If you worked three of the stations on at least two different bands, you've qualified for the beautiful award. (The same station can have been worked on different bands.) Send your log extract and 12 IRCs to the Radio Club of French Polynesia, B.P. 5006, Pirae, Island of Tahiti, French Polynesia. Note: July Radiosport contacts with FO8HL/TO8HL, FO0FB/TO0FB, FO8DF/TO8DF, FO8HO/TO8HO and FO8HI/TO8HI get confirmed via WB6GFJ.

☐ PJ8II/PJ0II are pirates, reports N8II. Jeff notes that the only active PJ8 calls are PJ8UQ and PJ8YL, at present and in the forseeable future. U.S. stations operating from the Netherlands Antilles must normally sign their U.S. calls portable PJ, except during contests when special P4 calls may be authorized. PJ0 has not been active for years. Jeff notes that he is not a manager for these pirates (or any other station), nor does he intend to be a manager.

☐ Guam: KJ9W is now on Guam. Along with N7DZE, he expects to be operating KJ9W/DU2 for the CQWW this year. Before that (and after), Dave hopes to be on from KH2 or some other Pacific site. In the coming year, look for possible activity from him from CR9 VS6 VQ9 9V1 KH1-0, and KC6. Cards via K9XR.

☐ Liberia: Special calls of A82LC A85LC A87LC A88LC and A89LC have been authorized by the PTT, hoping to draw attention to the plight of the Ganta Leprosy Colony. This special on-the-air activity started May 6 and continues through year-end. There will be a special award for any station submitting evidence of working all six stations on any band. (At least two of the stations must be via cw.) The Liberian Radio Amateurs hope that amateurs worldwide will identify themselves with the hams in Liberia, and learn the history of the colony and of the present conditions.

☐ Caution: KB0JW urges careful reading of the *Callbook*, upon receipt of a card that should have gone to K0JW. He notes that it helps to hold the envelope



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. Once 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

just underneath the listing as the address is transferred.

☐ Strange calls: W9ALZ loves 'em — EY2P commemorated 40 years of Soviet Power and EX5DW recognized 1500 years of Kiev.

☐ 9Q9A: The venerable W3AX reports a "hoax" — DL1NJ doesn't work 40, and certainly not cw — and says that this was, apparently, an active pirate.

☐ Guantanamo Bay: WB2CPV reports that KG4DX (KF4S) is now active (along with XYL KG4KM) on 160-10. QSLs via Bill Crews, WB2CPV, 5561 Gable La., Jacksonville, FL 32211.

☐ Western Samoa: From Oct. 27 to Nov. 5 last year, KB6JK operated 5W1DM and 5W5DM, producing over 5000 two-ways. Rich, KB6JK, furnishes card-routing information: ZK2JK, 5W1DM, 5W5DM and 5W5DQ via Rich, while pasteboards for 5W1DQ go direct to Graham Fuller, General Delivery, Apia, Western Samoa.

☐ Macau: WA4IKZ operated from Macau as CR9T on three separate occasions since July of 1982, mainly 15/20. To date he has made 5k contacts, all on cw. If anybody needs a card, send it to the *Callbook* address for WA4IKZ, or via Box 167, CC906, Saudi Arabian Airlines, Jeddah, Saudi Arabia. Dirk is planning a trip for the last part of September to either S79, H44 or 8Q7, depending on licenses and days off from the job.

☐ Diploma Padre Eugenio Barsanti (130th Anniversary of the Invention of the Internal Combustion Engine) for calendar year 1983. The hams of Verisilia count for 1 point; of Pietrasanta, 3 points; of Jolly, 5 points. If you worked the Central Radio station on June 10-26, you earned 10 points. Non-Europeans need amass 10 points; each hf contact counts a point. To qualify, send your QSL along with a certified log copy and a fee of 8.5 lire, IRCs or U.S. dollars, for return of the diploma by registered mail. Requests go to Award Manager I5DDF, c/o Sezione A.R.I. Versilia "Sergio Cassina," Casella Postale No. 200, I-55049 Viareggio/Italy.

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.

AM2AFO (EA2AFO)
AMØBEN/B (EA3BEN)
CR4VP (CT4VP)
CR9FE (KL7IHP)
C31NP (EA3BNX)
DK3GI/HKI (DL2MY)
EA9KQ Box 21, Melilla
EH3ITU (EA3AOC)
EI8EK (WA9AEA)
EK9D/1 (N8ACA)
FGØHUL/FS (N3CQM)
FGØVG (DJØFX)
FK8CW (K2IJL)
FKØAF (FK8DD)
FM7CF (WB3AKI)
HH2VP (N4XR)
J37AH (W2GHK)
J39AA (WB2LCH)
J39BS (WB2LCH)
J87LTA (K4LTA)
J88AY Box 93, St. Vincent, W.I.
KC6HA P.O.B. 221, Koror, Palau 96940
PF4CWY (PAØGAM)
PY1OL P.O. Box 70048, 22422 Rio de Janeiro, Brazil
TO5DO (F5DO)
TR8DR (W2PD)
TR8WHG (N4AXR)
TU2DP (KC4IR)
T32AI (KEØA)
VP2KBD (K1IJV)
VP2KBE (K1IJV)
VP2M (WB2LCH)
VP2MM (AB1U)
VP2FUX (KB9AW)
VP8AQU (KØJW)
VQ9XX (N6BFA)
XP1AB (WA2TTI)

QSL Manager Volunteers

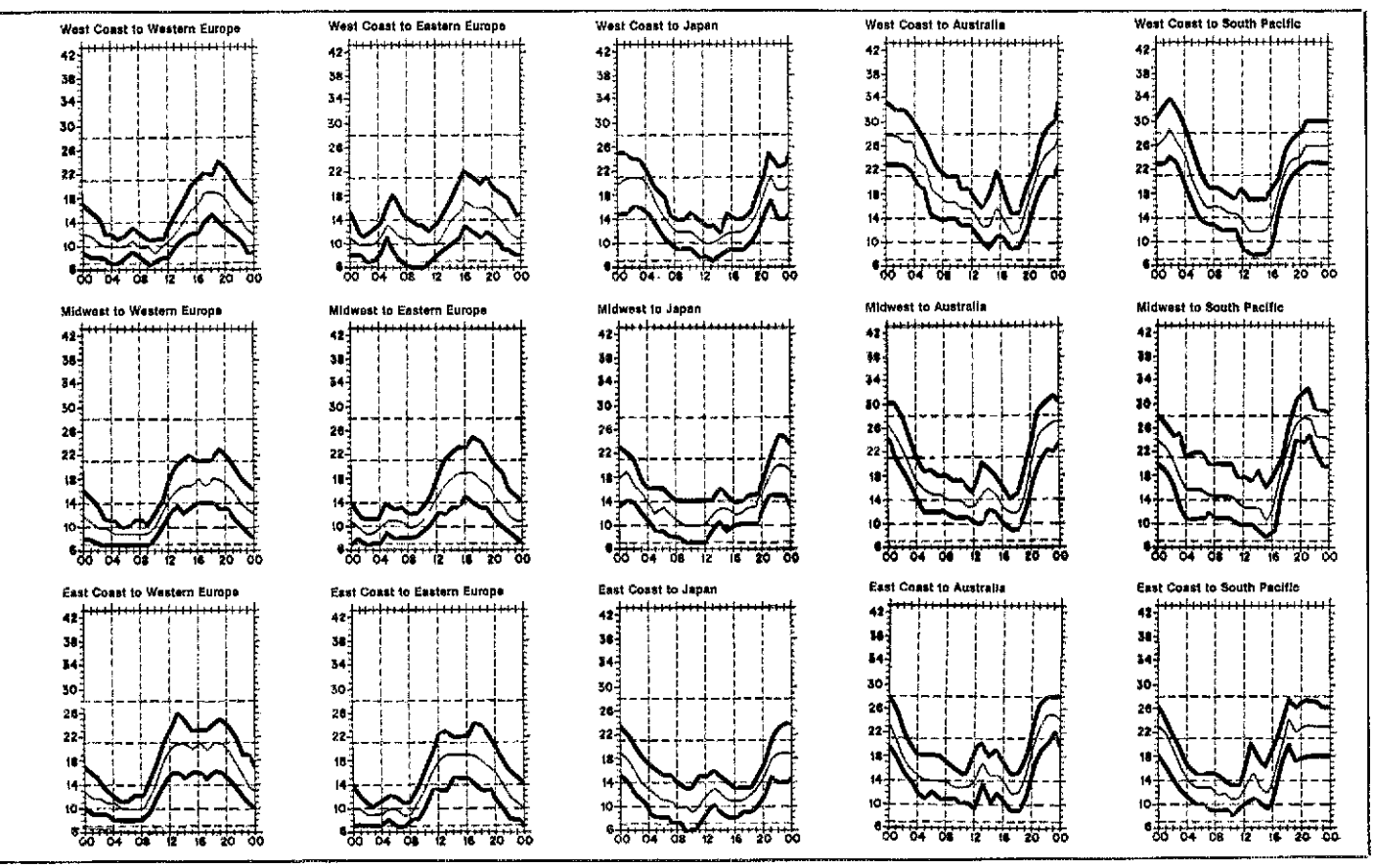
W5ND
W2PD

Special Notes

☐ WB2LCH is not manager for HI8CH.
☐ KH6BZF is not manager for KH7AA.
☐ W5QK is not manager for VS6CF.
☐ EA3BNX is not manager for C31NP.
☐ June 1983 QSL Corner, page 69, contains information and addresses for the Incoming Bureaus. April 1983 QSL Corner, page 65, contains information on the operation of the ARRL-Membership Overseas QSL Service. For information on the bureau operations (Incoming and Outgoing), send a self-addressed, stamped envelope to ARRL QSL Bureau, 225 Main St., Newington, CT 06111.

New QSL Bureau Addresses

☐ KV4, U.S. Virgin Islands (all calls): Virgin Islands Amateur Radio Club, G.P.O. Box 11360, Charlotte Amalie, St. Thomas, VI 00801.
☐ OH: SRAL, Box 1, SF-00751 Helsinki 75, Finland.
☐ VP2V: B.V.I. Radio League, P.O. Box 4, West End, Tortola, British Virgin Islands.
☐ SWL: Mike Witkowski, 4206 Nebel St., Stevens Point, WI 54481.
☐ 4X4 Manager: 4X4FU, P.O. Box 3500, Haifa 31034, Israel.



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 August 15 to September 15, 1983, assume a sunspot number of 68, which corresponds to a 2800-MHz solar flux of 119.

DX Century Club Awards

Administered by Don Search, W3AZD

The ARRL DXCC is awarded to amateurs who submit written confirmations for contacts with 100 or more countries on the official ARRL DXCC List. You may also submit cards to endorse your award in 25-country increments through 250, 10-country increments through 300, and in 5-country increments above 300. The totals shown below are exact credits given to DXCC members from May 1 through May 31, 1983. An. s.a.s.e. will bring you the full rules for participation in the DXCC, the DXCC list and application forms.

New Members

Mixed

CO7AM/118 DF6YH/184 DJ2ZM/103 DL1GZ/107 DL1FBO/165 DL1FBQ/138 DL4NAC/254 DL6OL/254 EA9GJ/106 FYØFOL/105 G4MVA/106 HA8KAX/121 HK3DDD/289 HK3NBB/168 I2PTE/110 I4FGG/158 JI1MNT/190 JA3WHG/110 JE3NWN/107 JA4IKD/262 JA6FBQ/156 JA7DYM/137 KH8AC/USA/101 KL7KJ/215 M1C/299 OH5AD/109 PT7AQ/125 SM5MEL/132 SM5MGW/103 SM6LIF/226 VE3AZJ/108 YU3UFS/127 YV3BNJ/112 Z55CO/102 ZS6P/103 8P6QL/104 9Y4KG/108 AE1S/102 K1IK/310 KA1CPN/103 WB1CFP/103 WB1ATZ/125 K2KTT/102 W2YLP/122 WA2EUA/124 WA2AXD/107 N4AOC/243 N4AVB/300 N4GFI/100 N4GXW/108 NR4K/157 WB4FLB/101 K5PC/161 WA5OSN/105 KC5SJ/122 KC5TW/105 KK5T/103 N5DF/128 K6UXO/100 KA6PET/107 NN6W/130 W6QL/PJ2/102 W6KG/PZI/111 W6QL/8RI/109 W6XP/326 K7NW/200 KA7KIS/108 KB7MD/106 WB7BWZ/101 W7AOL/102 KA8GAG/105 KD8CG/122 KM8E/101 KV8Y/273 N8ARY/110 N8ATR/258 N8CJR/124 N8CLA/112 N8FU/276 K9DDO/108 K9PBV/178 KC9NJ/100 KM9W/102 N9DR/120 WA9YTQ/108 WB9OJE/132 WB9YVR/110 KCØPR/113 KK0E/105 WØMD/106 WBØRXF/236

Phone

DL1EY/175 DL1YBS/113 DL5NAO/110 DL8UV/109 EA8YK/104 EA9GJ/106 HG5XW/124 JA1DNQ/100 JI1MNT/162 JA4IKD/257 JR6DQC/110 JR6EXN/238 KL7KJ/209 PT7KW/219 SM4DDY/101 SM6LIF/226 VE3DIJ/101 ZP5JCY/110 AE1S/101 K1IK/301 W1IQ/107 KC4DH/100 N4HIB/108 NR4K/108 W4TMU/111 KC5PR/109 KC5SJ/119 W5VNB/100 WA5BWM/110 KA6PET/102 N6COG/126 WA6CQW/124 K7NW/191 KB7MD/106 N8ATR/258 N8CJR/112 WA7TZE/125 WB7BWZ/100 KV8Y/270 KA9HVV/101 N9ASP/101 N89CLA/109 WB8SNJ/103 KA9AAA/102 KCØPR/109 WØMD/104 WA6HWH/105 W9LYZ/102 W9NUF/250 KCØPR/109 WØMD/104 W9NUF/217 W9TNZ/113

CW

DL1KB/238 DL5BAV/115 G4MVA/100 HZ1AB/135 I2IWM/134 JA1WPX/200 JR1AHH/110 JE3NWN/107 JR6APX/120 LA1IE/133 PY2RAN/158 SM3KMC/129 SM5MEL/112 SM7KJH/105 ZL1BEK/115 ZL3AGI/106 K1IK/238 KT2C/100 W2AO/139 W2YLP/109 WB2IVO/105 W3BWU/100 N4FF/102 NR4K/117 K5FUV/110 K5PC/114 KB5EK/100 W5OG/251 KD6PP/101 K6UXO/100 NN6W/127 W6SX/100 K7DBV/100 K7NW/104 W7KS/149 K8RLQ/100 KC9Q/100 W9NUF/217 W9TNZ/113

RTTY

ON7EP WA9WJE I5KGK WB6AFJ

160 Meters

KH8AC/U.S.

5BDXCC

K6XN N4AYO UA9NN K1EFI EA8RL OK3KAG LZ1WR ZP5PX W3DHM AKØA AC1X Y57WJ OZ1DYU UA4HBW UA4HFG W6SZN N6QR EA8XS I3BLF UP2BAO UY5OQ K4XL

Endorsements

Mixed

DF7AU/234 DJ1IK/271 DJ2MN/300 DJ5JH/331 DJ6OZ/270 DK5JI/249 DKØZR/251 DL1EY/283 DL1LD/329 DL1LZ/283 DL1PM/335 DL3OH/334 DL3ZI/344 DL7CW/324 DL7FT/341 DL8VN/279 EA1BC/344 EA8RL/230 F2BS/336 F2NB/310 F9IE/336 G3SJH/318 GI3IVJ/354 HB9AHL/315 HB9AIJ/323 HB9AMO/320 HB9G/272 HB9IK/339 HB9TL/357 HK3TF/208 HZ1AB/264 I1RB/338 I2VDX/310 I3LLD/320 I7WL/331 ISØLYN/280 ISØRZW/248 IT9TQH/228 IT9WGI/305 JA1AFF/181 JA1FHK/333 JA1JAN/329 JA1JQY/232 JA1NRH/313 JA1WPX/289 JH1GZE/319 JR1TNE/305 JA2FUJ/276 JA2GBO/294 JH2PYX/253 JA3EMU/322 JE3SAE/215 JA5EN/321 JA5PUL/311 JA6CNL/320 JA7BAL/293 JA7GLB/315 JA7HZ/325 JA7ZP/299 JH8MFS/260 JA9GPA/283 JT1AN/162 KP4AM/300 LA1H/284 LA1IE/204 LA1ND/288 LA2GV/300 LA9JD/166 LA9OI/234 OE1HGW/315 OE3ALW/283 OH3SG/227 OK1DH/300 OK1MP/345 ON5KL/330 OZ1ABA/236 OZ2E/226 OZ7QP/321 PP5UG/333 PY5CA/281 PY7ZZ/322 SM3DMP/273 SK6AW/311 SM6AOU/343 SM6CST/323 SM6CVX/331 SM6VR/329 SMØBZH/295 SMØMC/305 TG9NX/305 VE1YX/313 VE3BX/335 VE3DR/303 VE3II/313 VE3IMO/196 VE3LGQ/335 VE3MV/287 VE4AFO/230 VE3IU/251 VE7BD/324 VE7IO/316 XE1VV/262 YU1EXY/329 ZL1BIL/305 ZL4AW/318 ZS6IW/345 4X4JO/203 4X4NJ/326 4Z4AB/270 AD1S/290 K1DFC/334 K1EFI/304 K1GW/233 K1WVX/203 K1YHM/271 KA1A/265 KA1GDV/132 W1AB/340 W1ACB/293 W1CUH/225 W1DQH/322 W1FTX/342 W1IQ/162 W1LQQ/328 W1OR/322 W1PNR/259 W1VV/315 W1YN/287 WA1HJZ/296 WA1LOU/261 WA1TPR/296 AF2Y/147 K2AGJ/322 K2NJ/302 K2TK/272 K2UFM/317 K2UJK/332 K2UU/320 K2VVF/257 KB2CT/177 KB2EN/299 KG2A/289 KY2W/153 W2AYJ/359 W2BBK/300 W2CC/318 W2FTY/280 W2LZX/313 W2PSU/320 W2QXA/304 W2VJN/341 W2YC/260 WA2IZN/305 AD3Z/300 K3KA/309 KB3OQ/290 KF3C/202 KJ3L/281 N3KR/232 W3SOH/300 AA4G/311 K4CEF/326 K4FJ/341 K4GXQ/135 K4ISV/331 K4PR/247 K4XL/336 K4XP/314 KC4FW/198 KC4QT/176 N4AYO/290 N4CC/326 N4FKZ/274 N4JJ/315 N4KE/322 N4KG/332 W4DJJ/304 W4FLA/326 W4MGN/348 W4PZV/325 W4YA/327 W4YV/327 WA4HDD/305 WA4JTI/317 WA4MIT/240 WA4QEX/325 WB4OSN/306 WB4QGI/305 WB4TDH/308 WD4IZR/192 WD4NKP/293 WJ4T/178 K5BLV/305 K5HTF/179 K5TSQ/291 KA5CCO/127 KB5DQ/279 KD5MB/261 KU5L/206 N5DSK/265 N5FJ/181 N5FW/310 N5JR/304 N5WW/332 NA5C/253 W5EIJ/226 W5IR/334 W5LFK/316 W5MUG/332 W5NUT/PJ7/171 W5OG/276 W5PWG/154 W5RJC/306 W5TO/338 WA5IEV/332 WA5IPS/153 WA5SOG/220 WB5NAA/161 WB5QBV/198 WB5WQG/302 WD5JYU/171 K6AAW/316 K6IR/322 K6JGN/129 K6PZ/324 K6RK/318 K6SVL/323 K6VL/226 KA6IYE/177 KB6JK/288 KD6LB/228 KM6K/274 N6AR/345 N6COG/163 N6HC/212 ND6U/183 W6CSI/227 W6PLK/335 W6QL/336 W6SC/336 W6SX/134 W6TC/323 W6TKF/203 WA6HAT/287 WB6FGI/247 K7BHM/290 KQ7H/157 W7JBS/255 WA7BEV/322 AB8K/308 AC8K/317 AD8C/175 AD8I/295 K8CH/329 K8CMO/315 K8CSG/317 K8CX/300 K8LJG/324 K8MN/293 K8NA/314 K8NWD/286 K8QXB/272 K8ZO/298 KB8LH/258 KC8A/269 N8CKP/129 N8DUY/135 N8ZA/292 W8BCL/252 W8CHV/300 W8CY/305 W8KNH/309 W8NJC/300 W8NPF/315 W8QWI/329 W8SYR/300 W8UVZ/311 W8ZCK/336 W8ZET/340 WA8PYL/318 WB8RJX/297 WB8TRW/290 WD8RNC/175 K9BIL/291 K9BWQ/317 K9CJK/337 K9FD/305 K9HQM/309 K9IW/303 K9MK/302 K9VAL/300 KB9MI/224 KB9OX/206 KG9M/281 KQ9W/227 KR9O/293 KR9P/263 N9AF/333 N9ANR/244 N9BOK/155 W9AZP/342 W9IGK/142 W9KQD/337 W9NGA/317 W9NUF/287 W9RY/320 W9SC/304 W9TNZ/173 W9WAQ/230 WA9DYV/150 WA9OVU/250 WA9USE/290 WA9WJE/326 WA9WYB/206 WD9AEU/213 WD9AHJ/302 WD9JKZ/175 AC0G/221 KØPCG/228 KØTLM/263 KBØU/297 KCØLG/176 KCØUJ/186 KCØXK/131 WØIZ/323 WØJS/290 WØTJ/352 WAØIDK/307 WBØBJP/150 WDØCCW/200 WDØDDU/161

Radiotelephone

DF8FD/254 DJ6VM/325 DK4KL/298 DK6KK/227 DKØZR/203 DL4FV/151 DL7FT/339 DL9GU/132 I8ACB/310 IØMPF/316 IØSSW/300 JA1JAN/325 JH1GZE/316 JO1ABS/200 JA2FUJ/276 JA2GBO/263 PY5CA/280 PY5GA/323 SM5VS/281 SK6AW/304 SM6AOU/259 SM6CVE/200 SM6VR/317 SMØMC/301 KA1ZO/261 W1AB/262 W1HX/352 W1LQQ/301 W1PNR/259 W1YN/251 WA1HJZ/296 WA1LOU/254 KF3C/201 KJ3L/276 N3AZU/225 N3KR/137 W3DCT/206 W3FDP/305 W3IJT/150 W3MP/338 W4PZV/322 W4UNP/280 WA4HDD/304 WA4JTI/311 WA4QBX/317 WA4QMQ/296 WA4QQV/244 WA4UPS/300 WA5SOG/160 WB5HXK/148 WB5RQM/250 WB5WQG/294 K6IR/322 K6PZ/314 K6SVL/323 KB6JK/288 K8CX/289 K8LJG/323 K8MID/126 K8MN/276 K8NA/310 K8NWD/278 K8ZO/296 K8ZZO/289 K9HQM/306 K9IW/298 K9MK/289 K9PBV/178 K9VAL/295 KB9IS/291 KQ9W/257 KR9O/291

EA1VG/274 JA2UYS/290 SV1MO/157 WA1SMI/216 K4FJ/331 WB4CSK/201 KM6K/269 K8ZZU/276 KR9R/175
EA7LM/239 JH2PYX/253 VE1YX/312 WA1TPR/288 K4KUZ/280 WB4OSS/320 N6AR/337 KB8LH/248 N9AF/330
EA8JJ/330 JA5PUL/308 VE3BX/322 WA1WTP/275 KA4FQZ/250 WB4QGI/305 N6HC/188 KC8A/249 N9ANR/243
EA8LD/306 JA6CNL/295 VE3EFX/235 K2NJ/250 KC4FW/197 WJ4T/156 N6NA/339 KC8CY/295 W9DMH/300
F2BS/333 JA7BAL/271 VE3II/311 K2TK/250 KC4ST/223 KB5DQ/275 ND6U/162 KC8EU/266 W9GBC/255
F6DLM/304 JA7GLB/308 VE3LRU/253 K2UFM/314 KD4JD/128 KC5TF/232 W6BCQ/313 N8DUY/130 W9IGK/248
F6GPG/206 JA7HZ/324 VE3MRS/305 K2UU/319 KE4LY/132 N5AMA/177 W6FAH/125 W8COG/326 W9ITT/251
F9IE/332 JA7JH/321 VE3MV/287 KB2CT/177 N4AOC/243 N5AWS/281 W6KZW/218 W8CY/301 W9KQD/312
G3SJH/318 JA7ZP/290 VE4AFO/227 KC2KU/200 N4AVB/300 N5BBE/231 W6QWJ/226 W8KNH/307 W9TNZ/158
G3ZBA/326 JA8BAR/315 XE1NI/308 W2CC/318 N4AYO/281 N5DSK/265 W6YMH/178 W8NVP/315 WA9PWN/304
HB9BRC/254 JA9GPA/226 XE1VV/260 W2LZX/307 N4CFL/243 N5JR/200 WB6FGI/247 W8RDX/240 WD9AEU/209
HB9TL/355 KH6JEB/289 YV1EAH/280 W2MPI/301 N4DRC/237 N5NW/311 K7BCX/318 W8UVZ/269 WD9AHJ/296
HK3DDD/289 KP4AM/290 ZL1BIL/305 W2PSU/310 N4ETA/214 W5CRP/210 K7GEX/293 W8ZET/340 KØPCG/204
HK3TF/207 OE3ALW/282 ZS1OE/160 W2RSO/126 N4FKZ/264 W5EFA/296 KB7SU/258 WA8PYL/308 KØTLM/255
HZ1AB/154 OK1MP/336 ZS6JM/352 W2UI/275 N4KE/318 W5LFK/293 KQ7H/155 WB8NQC/150 KB0HJ/261
I1JQJ/253 ON5FU/302 4Z4DX/307 WA2BGE/226 N4KG/315 W5LLU/253 N7CTY/144 WB8WKP/151 KB0U/293
I1RBJ/338 OZ1BNZ/229 AD1S/287 WA2IZN/301 W4BBL/328 W5MUG/303 W7JBS/253 WD8DEL/258 WØIZ/297
I2BOX/322 OZ1BOD/229 K1EFI/282 WB2TKU/176 W4BIM/290 W5NUT/PJ7/171 AD8I/288 WD8PUG/277 WØRAO/284
I2YBC/319 OZ7OP/319 K1GW/199 WB2TOJ/176 W4DJJ/299 W5RJC/289 K8CMO/312 K9BIL/284 WØTJ/333
I2ZGC/313 PY2CYK/334 K1WVX/203 K3KA/306 W4MGN/337 WA5IEV/331 K8CSG/317 K9BWG/315 WD0CFZ/251
I4CSP/253 PP5UG/332 K1YHM/260 KB3H/124 W4MOM/225

CW

DK9MB/199 JA2GBO/255 OZ2E/169 K1GW/139 AA4CM/252 WA4QBX/225 N6HC/167 W8CY/211 W9RY/284
DKØZR/179 JA3FYC/297 OZ7BW/298 W1AB/275 K4CEF/174 WA4QMQ/191 W6BJH/261 W8GKM/261 K9VAL/140
DL1LZ/233 JE3SAE/213 OZ7OP/255 W1IQ/138 K4FJ/280 WB4CSK/175 W6PKB/127 W8QWI/279 KG9N/129
DL1SN/125 JA5PUL/257 SM6CST/281 WA1TPR/159 K4KUZ/276 WB4OSN/272 W6TC/297 W8RT/290 KQ9W/148
DL7CW/225 JA6CNL/232 SMØBZH/233 K2NJ/213 N4FKZ/176 N5FW/269 W7JKA/179 W8UVZ/298 KR9O/128
EA3BEN/164 JH8IVO/198 TG9NX/287 K2TK/183 N4KE/234 N5JR/300 AD8I/281 WA8SXQ/275 W9ZM/306
EA8RU/216 OK1MP/286 VE3BX/288 KB2EN/172 N4KG/285 WD5JYU/146 K8LJG/280 K9IW/280 WD9AHJ/294
F3AT/303 OZ1ABA/163 VE3II/260 KG2A/271 W4DJJ/279 K6RK/252 K8QXB/226 K9MK/206 ACØS/171
HB9CGO/153 OZ1FRR/276 4Z4DX/250 KJ2O/175 W4WJ/293 KA6IYE/162 W8AH/311 W9KQD/284 KØRWL/226
HK3DDD/176 OZ1VY/300 AD1S/133 W2LZX/279 WA4JTI/276 KC6X/151

Special Events

Conducted By Mark J. Wilson,* AA2Z

Winnipeg, Manitoba: Amateurs within the boundaries of Riding Mountain National Park will use the prefix CK4 *until Aug. 8* to commemorate the Park's 50th anniversary.

St. Catharines, Ontario: Niagara Peninsula ARC will operate VE3VM on *weekends during July and August* from the Welland Canal. Frequencies: 7.050-7.090 and 7.225-7.295. QSL via Box 692, St. Catharines, ON L2R 6Y3.

Helsinki, Finland: RC of Helsinki University of Technology will operate OH2WCA from *Aug. 1 to 16* from the athletes village during the first World Championships in Athletics. Operation on all hf bands and modes.

Renfrew, Ontario: XN3GT will operate from *Aug. 1 to 14* to commemorate the town's 125th anniversary. Frequencies: cw — 3.667 7.040 14.080; phone — 3.770 3.810 7.060 7.240 14.130 14.240. QSL via 34 Bruce St. West, Renfrew, ON K7V 3W1.

Oyster Creek, New Jersey: Jersey Shore ARS will operate KF2T from the Oyster Creek Nuclear Generating Station from 1800Z *Aug. 6* to 1800Z *Aug. 7*. Frequencies: phone — 3.930 7.230 14.260 21.260 28.560; cw/Novice — 30 kHz up from lower band edges. QSL via 619-17th Ave., South Belmar, NJ 07719.

Milwaukee, Wisconsin: Milwaukee RAC will operate W9RH from 0000Z *Aug. 6* to 0000Z *Aug. 7* to celebrate the club's 65 years of service. Operation 25 kHz up from lower General class phone and cw band edges, 80 to 15 meters. QSL via 1221 N. 72nd St., Wauwatosa, WI 53213.

Somerset, Pennsylvania: Somerset Co. ARC will operate AK3J from Mt. Davis, the state's highest point, from 1800Z *Aug. 6* until 1800Z *Aug. 7*. Operation in lower 25 kHz of General class phone bands and cw in the Novice bands. Certificate via Box 468, Somerset, PA 15501.

Friendship, New York: Allegany Highlands ARC will operate KW2J from 1300 to 2100Z *Aug. 7* in observance of National Friendship Day. Frequencies: cw — 7.125 14.060 21.060 28.060; phone — 7.280 14.280 21.380 28.580. Certificate via P.O. Box 373, Friendship, NY 14739.

Poughkeepsie, New York: Poughkeepsie ARC will operate K2KN from 1300 to 2100Z *Aug. 7* from the home of Samuel F. B. Morse. Frequencies: phone — 3.983 7.283 14.283 21.383 28.583; cw — 3.683 7.083 14.083 21.083 28.083; Novice — 3.745 7.145 21.145 28.145. Certificate and QSL.

Clinton, Ohio: Silvercreek ARA will operate WD8PNF from 1400Z *Aug. 7* until 0200Z *Aug. 8* in observance of Skunk Day. Operation in lower part of 20 and 40 meter General class phone bands. Certificate via KA8MPH, 1241 Comet Rd., Clinton, OH 44216.

Akron, Ohio: Cuyahoga Falls ARC will operate W8VPV/8 from 2300 to 0200Z *Aug. 10-12* and 1500 to 2200Z *Aug. 13* from the All-American Soapbox Derby. Frequencies: phone — 3.945 7.265 14.240 21.365 28.595; cw — 10 kHz inside Novice bands on the hour. Certificate via P.O. Box 6, Cuyahoga Falls, OH 44222.

Mackinac Island, Michigan: Tri-County Wireless Group will operate N8COY from 1500 to 2300Z *Aug. 13* from the Grand Hotel's "Longest Porch in the World." Operation on 7.280 14.280 21.380 28.580 147.480. QSL via N8COY.

San Rafael, California: Marin ARC will operate W6SG, starting at 1700Z *Aug. 13*, in celebration of the club's 50th anniversary. Frequencies: phone — 7.265 14.265 21.365; cw — 7.065 14.065 21.065.

Johannesburg, California: Los Angeles Air Force Station ARC will operate WA6NKL from a gold mine in conjunction with a similar group in Johannesburg, Republic of South Africa. Operation from 0100Z *Aug. 13* until 1900Z *Aug. 14* in the lower General class 20-, 15- and 10-meter phone bands. Certificate for working both stations via P.O. Box 1211, Torrance, CA 90505.

Collinsville, Illinois: Egyptian RC will operate W9AIU *Aug. 13-14* during the "Rediscover Cahokia Mounds" celebration. Operation around 14.235 and 7.230. Certificate via P.O. Box 562, Granite City, IL 62040.

Paramus, New Jersey: Bergen ARA will operate K2TM from 1500 to 2400Z *Aug. 13-14* to celebrate the club's 20th anniversary. Frequencies: 7.235 14.275 21.380 28.610 146.520. Certificate via K2UFM, 21 Forest Dr., Hillsdale, NJ 07642.

Logan County, West Virginia: Logan Co. ARC will operate KC8NR from 1600Z *Aug. 20* until 0400Z *Aug. 21* during the club's annual Mountain State Award expedition. Operation 25 kHz up from lower General class band edges and on 3.725/7.125. Certificate via B. Napier, RFD 1, Box 198, Chapmanville, WV 25508.

Podunk, Vermont: Nashua ARC will operate WB1FFZ from 1500Z *Aug. 21* to 2300Z *Aug. 22*, providing QSOs for the "I Worked Podunk" certificate. Operation 25 kHz up from lower General class hf phone and cw band edges. Certificate and QSL via K1JUL, 35 Northwood Dr., Nashua, NH 03060.

Chicago, Illinois: Hamfesters RC will operate W9AA on *Aug. 26-28* from the Chicago Ridge Mall to celebrate their 50th anniversary.

Rochester, New York: Rochester ARA will operate K2JD from 1500 to 2100Z *Aug. 27 and 28* from Camp Good Days and Special Times. Frequencies: phone — 3.900 7.230 21.350; cw — 3.525 7.025 21.025. Certificate via P.O. Box 1388, Rochester, NY 14603.

Porter, Indiana: Porter Co. ARC will operate N9RD from 1300 to 2300Z *Aug. 27-28* to celebrate the town's 125th anniversary. Operation on 14.245 21.370 28.520. Certificate via P.O. Box 453, Valparaiso, IN 46383.

Walnut Grove, Minnesota: WAØCED and WAØAUU will operate from *Aug. 27 to Sept. 4* from the "Little House on the Prairie" site. Operation near the low end of the 80- to 10-meter Novice and General class bands.

Chelsea, Michigan: Chelsea Communications Club will operate WD8IEL from 2300 to 0100Z *Aug. 30 to Sept. 3* during the Chelsea Fair. Operation on 80- and 40-meter phone. Certificate via 104 East Middle St., Chelsea, MI 48118.

Gloucester, England: Gloucester ARS will operate GB2ROG on *Sept. 2-3* to commemorate the 500th anniversary of the granting of the Royal Charter to the City of Gloucester by King Richard III. Operation on all hf bands. Certificate available via Gloucester Royal Charter Award, 7 Grasmere Rd., Longlevens, Gloucester GL2 ONQ, England.

Tombstone, Arizona: KB7KZ will operate from 1500Z *Sept. 3* until 2400Z *Sept. 4* from the OK Corral during the Second Annual Rendezvous of Gunfighters. Frequencies: phone — 7.280 14.280 21.380 28.680; cw — 7.130 21.130. Certificate via P.O. Box 36032, Tucson, AZ 85740.

QSLing Special Events Stations: To get your QSL or certificate from any of the Special Events stations listed here, follow these simple guidelines. (1) After working the station, carefully fill out a QSL card for the QSO. Show the date and time accurately using UTC. (2) Prepare a stamped, self-addressed envelope. If sending for a certificate, use a 9- × 12-in. envelope if you want an unfolded certificate, or a no. 10 business size envelope if folds are okay. Include enough postage for return of your envelope. (3) Mail both your QSL and your s.a.s.e. to the address listed, or to the address given on the air by the station you QSO. Be patient. Often, Special Events stations will print their cards and/or certificates after the operation is over so they will know how many to order.

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 August 15 to make the October issue.

*Assistant Communications Manager, ARRL

New Books

GUIDE TO RTTY FREQUENCIES

by Oliver P. Ferrell. Published by Gilfer Associates, Inc., Park Ridge, NJ. Second edition, 1983. Soft-bound, 6 × 9 inches, 192 pages, $9.95.

☐ Monitoring hf RTTY signals can be interesting, informative and just plain fun. Few in number, I'm sure, are Amateur Radio RTTY operators who do not attempt to copy other-than-amateur signals at one time or another. Personal computers and other microprocessor-oriented devices make it easier to access the information. These devices are aided by the general-coverage receivers that are more and more becoming a part of the radio amateur's equipment lineup. But even with all of the technological sophistication on hand, there are times when the signal you're attempting to receive defies all your efforts to decode it. At that point, you wonder "why?"

This guide can offer some answers to that question. At the same time, you'll have on hand a listing of RTTY stations that's long enough to keep you occupied for many hours. It will eliminate a lot of the guesswork you probably have been doing in your attempts to do some RTTY receiving.

What this book is *not* is an RTTY primer. You won't find pictures of RTTY gear and suggestions on what to buy, how to hook it up, and so on. It does offer you some information about the different approaches to encoding and decoding RTTY signals, short sections on the Russian (cyrillic) alphabet, the Hellschreiber teleprinter system and test signals used. Over 4500 RTTY stations are listed, including information on how to interpret the abbreviations used in the listing.

The guide provides you with station schedules, operating frequencies, antenna beam headings, "silent days," emission types, frequency shifts, power levels and transmission speeds used, call signs, locations, the type of service and other remarks.

An abbreviations list and an update of Z codes (Z signals) is included. Akin to Q signals (with which you should be somewhat familiar), Z signals are used by commercial and military services which, in many instances, use both codes.

Think the QBF (QUICK BROWN FOX) test message is the only one used? How about: VOYEZ LE BRICK GEANT QUE J'EXAMINE PRES DUE GRAND WHARF? That's: "Look at the giant brig that I am inspecting near the big wharf," a test "slip" now transmitted on occasion by the French Navy and by other French military services and commercial stations.

Do at least some of your shortwave listening interests lie in copying military, weather, aeronautical, embassy, press or commercial RTTY signals? If so, you'll want a copy of this guide on your operating desk. — *Paul K. Pagel, N1FB*

PRACTICAL REPAIR AND MAINTENANCE OF COMMUNICATIONS EQUIPMENT

by Albert D. Helfrick. Published by Prentice-Hall, Inc., Englewood Cliffs, NJ. First edition, 1983. Hard cover, 6 × 9 inches, 308 pages including index, $29.95.

☐ This book should be on the bookshelf, within easy reach of everyone who is in the business of repair and calibration of communications equipment. Both commercial and amateur gear are thoroughly covered, not by specific models or manufacturers, but in general. The repair methods and circuit analysis used will cover most of the equipment available today. For us "old-timers," a lot of this is "old hat," but for those new to the field of communications equipment repair, this book will surely lead you down the right path. I was very much impressed by the detail of the coverage.

Chapter 1 deals with equipment failure, repairs, safety and liability, record keeping, schematic diagrams and manuals, and one of the most important items — calibration of the test equipment used.

In Chapter 2, you're led through the analysis of electronic circuits from the basics of voltage, current, power, gain and frequency, all the way through ICs, digital systems and microprocessors. The coverage is complete.

Chapter 3 will probably be of greatest interest to radio amateurs. It covers transmitters, receivers and transceivers used in the frequency range of 3 to 30 MHz — how they operate and how to troubleshoot them. There's a generous supply of illustrations and diagrams; in fact, the entire book is well illustrated.

Vhf and uhf operators will enjoy Chapter 4. The coverage is almost exclusively about frequency modulation (fm) techniques, as this is the most-used method of modulation on these frequencies. Oscillators, mixers, frequency multipliers, distortion and equipment performance is covered thoroughly.

To me, Chapter 5 is the other more interesting chapter in the whole book. It is a thorough treatise on frequency synthesizers, starting with a single PLL and continuing through coverage of multiple PLLs, dual-modulus programmable dividers, presettable down-counters, mixers, phase detectors and the whole gamut of circuits necessary for frequency synthesis. Proper techniques for troubleshooting them are also presented.

Chapter 6 is specifically aimed at the radio amateur and the multitude of station accessories that may be found in the radio shack. Most emphasis is placed on the proper operation and troubleshooting of linear amplifiers. RTTY terminals, oscilloscopes and frequency counters are also covered.

Chapter 7 deserves considerable attention because it deals with preventive maintenance and restoration of equipment performance to manufacturer's specifications. One does not normally notice a gradual deterioration of one's equipment performance, but a regularly scheduled maintenance-and-calibration program will bring such malfunctions to light. Receiver sensitivity, gain, age action, distortion, spurious responses and frequency drift are some of the items covered, as are transmitter power output, spurs and frequency response. Intermittent problems and how to cure them (and who hasn't had them!) are also dealt with in this chapter.

All in all, I found this book very worthy of consideration for the home or workplace library. While I don't agree 100% with the troubleshooting methods offered, each of us has our own pet procedure. The author shows he has had many years of experience in this field, in order to present the clear, in-depth coverage of the material as he did. You'll find an answer somewhere in this book for most repair and maintenance questions that may arise. — *Norm Bradshaw, W8EEF*

BUYER'S GUIDE TO RADIO AND ELECTRONIC PARTS

by Edward Hall. Published by Hallward Products, St. Louis, MO. Third edition, 1983. Soft-bound, 8-1/2 × 6 inches, 95 pages including index, $6.95.

☐ How many times have you scratched the idea of a "homebrewed" project because you're faced with the seemingly insurmountable task of collecting the parts you need? Hallward Products has attempted to make the parts-collecting task a bit easier for you. Their buyer's guide contains a listing of 75 retail-order companies. To qualify for a spot on the list, the supplier must have a mail-order operation and be willing to sell in small quantities to individuals.

In addition to a two-page item index, the guide has two main sections: an 86-page Directory of Parts and a six-page Supplier Information Section. The Directory lists the parts alphabetically by generic name with a part number and a description. A number is included on each line that tells the reader the variety of parts that are stocked by the supplier for that listing, and is an indication of how complete a supplier's offering is for that part.

Once the desired part is found in the Directory and a supplier is chosen, the reader refers to the Supplier Information Section. In this section are the supplier's address and phone number, catalog cost, minimum-order information and whether the offered parts are new or surplus items.

A copy of this guide (formerly known as *Radio Electronics Buyer's Guide)* should simplify your parts purchasing and leave more time for circuit building. (When you complete the project, write it up for *QST* so others may benefit from your ideas!) You can obtain your copy from Hallward Products, 39 Sunset Ct., St. Louis, MO 63121. — *Paul K. Pagel, N1FB*

Silent Keys

It is with deep regret that we record the passing of these amateurs:

*KA1BTU, Norman R. Leveille, Greenville, RI
KA1HUT, Raymond H. Brown, Barrington, NH
W1IMY, Joseph C. Villandrie, West Warwick, RI
W1KFR, Henry Macaro, Cranston, RI
W1TRU, Alfred L. Berner, East Hartford, CT
W2FKQ, Gyzak "Guy" Kehaian, San Jose, CA
K2FX, Durwood "Dee" Finch, Lake Success, NY
WB2HZM, Albert G. Bull, Rochester, NY
W2IOC, Alfred F. Hanzl, Carlstadt, NJ
K2JWR, Donald C. Wohlgemuth, Fultonville, NY
WB2KCJ, Barney C. Meltzer, DeWitt, NY
W2KFO, Thomas G. Saunders, Atlantic Highlands, NJ
W2KLF, Robert T. Loveland, Hamburg, NY
K2KP, Frederick S. Powell, Marmora, NJ
W2LEL, Donald B. Masten, Newburgh, NY
K2LLP, Patsy T. Sacco, Middlesex, NY
W2LUS, William M. Ashman, Forest Hills, NY
W2MW, M. Everett Walker, Bloomfield, NJ
W2NVD, Everett W. Kulze, Sr., Spring Hill, FL
W2RTX, Silvanus J. Macy, Jr., Caledonia, NY
WA2WCW, Howard A. Gifford, Valley Stream, NY
WB3AEW, Charles E. Kauffman, Mertztown, PA
W3CKJ, Carlyle G. Dickens, Hagerstown, MD
KA3KSU, Eric H. Bronson, Darby, PA
W3LGD, Joseph Soroka, Carnegie, PA
*K3PNL, Manfred P. "Fred" Siebert, Fulton, MD
W3QR/K4GT, Frank J. Shannon, Sr., Tampa, FL
W3WHM, William F. "Mac" McMahon, Silver Spring, MD
K3WPG, John C. Holibaugh, Rockville, MD
WA4BRZ, Richard C. Welch, Arcadia, FL
W4DAU, Henry "Brad" Wood, Tampa, FL
W4EIK, Louis W. Carstensen, Bronson, FL
W4FC, H. Barton Yager, Palm Bay, FL
W4FCW, Charles E. McArthur, Cordele, GA
WA4ICB, Herbert Branham, Charleston, SC
K4KPW, Robert M. Kuhn, Sr., New Port Richey, FL
W4LUB, David B. Tooley, Owensboro, KY
W4NSA, James L. Stone, Shallotte, NC
K4WOR, Donald E. Trotter, Woodstock, GA
W4ZP, Charles W. Arnold, Weems, VA
W5AZE, Henry W. Strege, Albuquerque, NM
W5EKY, James P. Broussard, Lafayette, LA
WD5GDO, Jack B. Mahaffey, Tomball, TX
W5GQ, Eugene C. Bartholomew, Austin, TX
W5HCO, J. Otto Lotz, New Orleans, LA
W5HRH, T. W. Lewis, Galveston, TX
W5TYQ, George H. Sargent, Roswell, NM
KR5U, William W. Coldwell, Luling, TX
W5YX, Louis J. Zinterhofer, Midland, TX
W5ZG, Harry Clay Sherrod, Galveston, TX
W6CLS, John I. Steventon, Hillsborough, CA
WA6CQG, Marvin W. Olson, Paradise, CA
WA6DFJ, Irene K. Atkins, Pacific Palisades, CA
KA6EDS, Albert L. McCormick, Santa Cruz, CA
K6EPX, E. Walter "Doc" Sauermann, Bishop, CA
*N6ES, Frederick W. Ross, Del Mar, CA
WA6IIF, Mary E. Wilkerson, Lakeside, CA
WA6IJA, Norman E. Pearsall, San Francisco, CA
W6IJT, William I. Emmons, Pebble Beach, CA
N6JD, Joseph Dittrich, Jr., Redwood City, CA
WA6TNR Johnny V. Alves, Hanford, CA
W6TZO, Robert C. Hird, San Diego, CA
W6ZOP, Joseph A. Lieb, Jr., Anaheim, CA
N7ALM, John LaPay, Aloha, OR
WB7BJQ, Edgar A. McGuire, Willcox, AZ
N7EUU, Dellis V. Sutherland, Albany, OR
W7FTN, Milo "Mike" F. Placek, Boise, ID
W7HRM, Harvey J. Robertson, Cheyenne, WY
W7IKH, Josiah R. Nichols, Yuma, AZ
W7LE, Harold A. Farmer, Laramie, WY
W7LTG, Robert M. Clark, South Bend, WA
W7SLO, Neal, H. Brown, Tucson, AZ
KD7T, Carl F. Winter, Bellevue, WA
WB7TIJ, James "Hank" Christenson, Tigard, OR
W7VX, Gilbert V. Collier, Carson City, NV
*WA8ABN, Robert E. Wolverton, Holt, MI
W8CYW, Archie A. Billings, Grand Rapids, MI
WA8FVT, Shelby J. "Bud" Schroeder, Sylvania, OH
K8IAA, Harvey J. Baldwin, East Detroit, MI
W8JEQ, Emil O. Schuchardt, Jr., Columbus, OH
WD8JFF, Gary L. Lorenz, Farwell, MI
W8LOM, Thomas W. Bingham, Cincinnati, OH
WA8LZE, Wallace E. Richmond, Cameron, WV
W8MBO, Joseph A. Pittner, Ottoville, OH
WA8MPW, Darwin R. Vore, Seven Hills, OH
W8PEN, Royce O. Woodward, Mount Vernon, OH
K8TDA, Lawrence W. Lintern, Wooster, OH
W8ZLP, Reuben W. Rautio, Dayton, OH
KA9BVW, Leslie G. Kinne, Valparaiso, IN
K9CIY, Carl D. Smith, Frankfort, IN
W9ELK, Wemple Dodds, Crawfordsville, IN
W9ESR, Frederick J. Schmidt, Milwaukee, WI
W9FFD, George D. Hansen, Boca Raton, FL
W9IRP, Kenneth A. DePew, Carterville, IL
W9NY, Herbert F. Wareing, Milwaukee, WI
W9TSS, Willard L. "Bus" Howell, Livingston, LA
WØBBN, Wallace R. Smith, Grand Marais, MN
WØBGB, Robert V. Smith, Sioux City, IA
WØDC Willis L. Otto, Davenport, IA
WØDFX, Earl E. Rose, Red Lake Falls, MN
WØEVI, Ralph E. Moore, Iberia, MO
KØGHG, Charles E. Metcalf, Wichita, KS
WBØIUZ, Charles B. Hall, Topeka, KS
KØJEI, Russell P. Widlund, Denver, CO
WØWLV, Charles F. Rhodes, Matthews, MO
WØWM, Roger L. Olson, Minneapolis, MN
KV4CM, Frank E. Pelton, Jr., St. Croix, VI
VE2PJ, Albert E. Altherr, Beaconsfield, PQ
VE3BRU, Bruce Burden, Willowdale, ON
VE3HDA, Charles G. Clarke, Cambridge, ON

*Life Member, ARRL

In order to avoid unfortunate errors in the Silent Keys column, reports of Silent Keys will henceforth be confirmed through acknowledgment only to the family of the deceased. Thus, those who report a Silent Key will not necessarily receive an acknowledgment from Hq.

Note: All Silent Key reports sent to Hq. must include the name, address and call sign of the *reporter* as well as the name, address and call of the Silent Key in order to be listed in the column. Please allow several months for the listing to appear in *QST*.

50 Years Ago

August 1933

☐ At presstime, the Federal Radio Commission announced new regulations for amateurs, including new voice privileges in 1800-2000 and 28,000-28,500 kc. A pure d.c. power supply will be required for operations below 28 Mc. Any station may now operate as a portable under certain notification rules. More complete info next issue.

☐ Of 37,000 existing station licenses, 10,000 were issued specially for portable activity, spurred by 5-meter interest. One example is a hand-portable transceiver built in a metal tool box, including batteries, by W1CTM and W1CTW. Efficient communication is achieved with a Pickard antenna, a half-wave wire with untuned feeders, matched by a coupling device of three "pi" coils — sort of an auto transformer.

☐ W2AOE believes that recent progress in receiver stability has outpaced transmitter development, particularly on the higher frequencies, and describes an oscillator-amplifier rig for 5 and 10 meters with a pure d.c. signal free from drift.

☐ And just in time, too. Managing Editor W1SZ reports that after several years of lethargy, the 10-meter band is "hot" with DX.

☐ W3BJM uses the new pentagrid converter 2A7 as first and second mixers in his superhet design, and thus has six tubes doing the work of eight.

☐ G. Grammer suggests simple ragchewing in the 1750-kc. band as respite from battling QRM in more populated bands, and presents a breadboard rig with type 45 tubes in a push-pull series feed Hartley circuit to provide the signal.

☐ The World's Fair (Chicago) Amateur Radio Council has 2000 square feet of exhibit space in the Travel and Transport Building, for W9USA/USB as well as displays by manufacturers. Already 40,000 of the public have stopped by, and visiting hams from all 48 states have signed the guest book.

☐ Honeycomb coils are used by W2CMY in a two-tube receiver to achieve 200-19,000 meter coverage for listening to press, weather, time ticks and transoceanic traffic.

☐ The League's QSL Bureau system has now been expanded to include Canada, with five volunteer district managers in place. Incoming cards only, of course.

☐ The Federal Radio Commission has purchased 10 new AGSX superhet receivers with bandspread coils for the ham frequencies — a warning that more intensive monitoring of us is in the works.

☐ During the summer months, we can get *QST* and a *Handbook* for the special package price of $3.

25 Years Ago

August 1958

☐ Copthorne MacDonald has developed a slow-scan method of picture transmission by amateur radio. Output from a flying spot scanner is put through a 'phone transmitter, using a pass band of only 3 kc. At the receiving end, a long-persistence cathode ray tube reproduces the image every 6 seconds, with 120 lines definition.

☐ W5ZCC's transistor radio in his new car of course had no "B" supply for his short-wave converter, so he built another with 12-volt tubes — including 12 volts on the plate.

☐ The necessity for shielding and resultant tight compartments has resulted in heat buildup problems in much of today's gear. Ronald Ives says that simply adding a fan is not adequate, and explains the principles of thermal dissipation.

☐ W1ZEO's filtering and shielding modification of a commercial receiver reduced both stray pickup (especially for break-in operation) and unwanted radiation (TVI).

☐ Second harmonics from Novice 80-meter rigs are still causing 7-Mc. havoc. W1ICP has constructed a simple antenna coupler that will suppress the unwanted energy.

☐ W3GKP found commercial measuring devices for standing-wave ratios inadequate at 50 Mc. and higher, so built his own using RG-8/U cable lengths and standard coax fittings for capacitor connections.

☐ More than 500 observers in some 50 countries have been submitting v.h.f. activity reports for data processing by the League's Propagation Research Project for the U.S. Air Force laboratories. This is another part of the International Geophysical Year research.

☐ Perfect copy of the telegraphy transmission of the Armed Forces Day message was made by 78 participants around the country. On teleprinter, 140 received the special certificates of accomplishment.

☐ W4SUD's 813 amplifier runs a cool half-kilowatt and is adjustable to handle c.w., a.m. or sideband inputs.

☐ The League has asked the Federal Communications Commission to open 14,300-350 kc. for voice use by all amateurs, not just the higher classes of license.

☐ The list of prominent names as chairman or speakers promises to make the National Convention in Washington this month a really outstanding gathering. — *W1RW*

The World Above 50 MHz

Conducted By
Bill Tynan,* W3XO

Advisory Committees — They Work!

A prime example of how our League Advisory Committees can function to produce tangible and worthwhile results was demonstrated anew by approval of a new 6-meter band plan by the ARRL Board of Directors at their April meeting (see June 1983 *QST*, page 54). This plan represents several years of work by the VHF/UHF Advisory Committee (VUAC), and involved close cooperation and consultation with the VHF Repeater Advisory Committee (VRAC). The fact that these two committees, representing such diverse interests as solid local communication on the one hand and long-haul DX on the other, could produce a common set of recommendations is, I believe, a fine example of how hams can work together.

True, there are a few potential conflicts in the plan, which seems to be the case for almost everything in life these days. Three repeater inputs are designated in the 52-MHz Pacific DX window. There are also potential clashes between repeaters and model controllers. However, these should be resolved eventually. Through close liaison with the Academy of Model Aeronautics, plans have been made for the relocation of the radio-control channels that have been threatened over the past few years by the growth of 6-meter repeaters. This changeover will require three to five years to accomplish, and until the move is complete, potential conflicts with 10 prime repeater output frequencies remain. The repeater users will probably not notice any interference, but for the modelers it's a different story. For them, QRM may mean the loss of an expensive model or even personal injury.

In addition to the 53.1, 53.2, 53.3, 53.4 and 53.5 MHz designated for model control in the old 6-meter band plan, a few modelers have been using 53.6, 53.7 and 53.8 MHz, despite the fact that these frequencies were not so designated. Presumably, they will move their operations to the part of the band defined in the new plan also. Although these potential conflicts will exist for several years, cooperation and understanding on both sides should be adequate to prevent serious problems from developing. Even if wide berths are given to the DX window and the current model control frequencies, there remain 36 repeater pairs with no potential conflicts (30 if the 53.6, 53.7 and 53.8 frequencies are included). It's hard to imagine a time when there will ever be a need for that many 6-meter repeaters in any given area. When the model controllers accomplish the move to the new part of the band, these repeater pairs should be completely free of conflicts, leaving just three channels that might cause QRM to DXers attempting to work into Australia.

The reason for the DX window is that the VK 6-meter band includes only 52 to 54 MHz. While it is true that there will be a lot less of such work in the coming few years that there has been over the past four or five, the possibility of multi-hop E_s, which could support this kind of operation, remains, particularly for the western states.

There are simplex fm frequencies galore in the approved plan. Three exist in the 52.5 region, including the venerable 52.525 which, of course, doesn't fit the new 20-kHz spacing standard. But, I guess it will be with us forever, nevertheless. Although not stated, there should be three more at 53.49, 53.51 and 53.53 — or is it 53.525? I hope not! Looking at the 51- to 52-MHz segment, one sees nothing but wide open spaces. Even with 100 kHz devoted to ssb and cw work with the ZLs, whose band starts at 51 MHz, there remain 45 simplex fm channels between 51.1 and 52.0 MHz if 20-kHz spacing is assumed. That should be plenty for all of the "private" channels one can think of, and should provide for the new modes just coming on stream, such as packet and other forms of digital communication. It would be interesting to see some pioneering done in the way of fm simplex ragchewing and DX done in this part of the band. I suggest 51.210 as an appropriate rallying spot to start this activity. During band openings, when things get crowded, people can move off in both directions. With all of this available spectrum, there does not appear to be any logical reason for fm operation below 51 MHz, where the plan calls for other modes.

With regard to the 50- to 51-MHz segment, the Board included the recommendation that 50.2 be used as the domestic calling frequency, and the ever-popular 50.110 be used when attempting to work stations outside of the U.S. or Canada. Following this pattern, a group of Florida 6-meter enthusiasts have suggested that 50.100 to 50.125 be reserved for working DX.

Although it is difficult to get something as sweeping as this going right away, especially on a band as variable as 6 meters, I observe a greater tendency in this direction this season. I continue to urge those who do believe in the concept to lead the way and to do a good portion of their CQing around 50.2. The others will follow only when there are few people to talk to around 110. Incidentally, the plan suggests that, even at 50.200, local long-winded ragchews should move off on the high side, and longer-haul contacts should move lower in frequency. When you are moving, it makes sense to QSY 10 to 20 kHz, not just a few.

The accompanying table shows the new 6-meter band plan approved by the ARRL Board. It should be emphasized that any band plan is advisory in nature, as contrasted with FCC rules, such as phone/cw subbands and permitted emissions. Violation of these government-imposed regulations carry signficant penalties. Observing the provisions of band plans such as this one, although strictly voluntary, is merely a matter of helping to make life more pleasant for other band users. It also supports the oft-repeated claim that the Amateur Radio Service is largely self-regulating.

The plan makes good sense, and provides plenty of room for all interests and modes permitted on 6 meters by our FCC rules. It represents the suggestions of many people who made their thoughts known to the members of the two Advisory Committees. Thus, it would appear that most users of the band will find it perfectly acceptable, and therefore can be expected to abide by it. Doing so will prevent most complaints of crossmode interference from being carried to FCC, which should be very helpful in building our case that the Amater Radio Service requires a minimum of government-imposed rules and regulations and, therefore, a relatively low cost to administer.

The members of the VUAC and the VRAC should be commended for a job well-done in coming up with this new plan. Kudos must also go to those Headquarters personnel responsible for liaison to the two Advisory Committees, as well as W6EJJ, the Board liaison Director. Special recognition is due WD4FAB, a member of the VUAC. In addition to being an avid vhfer and satellite operator, Dick has also been serving on the Frequency Committee for the Academy of Model Aeronautics. It was he who was instrumental in convincing that group of the wisdom of moving to a less crowded portion of the 6-meter band.

Keep up the good work, VUAC and VRAC. There is lots more to be done. The 902-MHz

New 6-Meter Band Plan

50.000 to 5.100 CW and FSK Only (FCC Rule) with automatically controlled beacons permitted between 50.060 and 50.080

50.100 to 50.600 CW, SSB and A-M
- 50.110—DX Calling Frequency
- 50.200—Domestic Calling Frequency (suggest QSYing up for local QSOs, and down for longer haul)
- 50.400—A-M calling and working frequency

50.600 to 51.000 Experimental and Special Modes
- 50.700-RTTY calling and working frequency
- 50.800 to 50.980-Radio control (R/C) 10 channels with 20-kHz spacing

51.000 to 51.100 Pacific DX Window (ZL)

51.100 to 52.000 FM Simplex accommodates 45 channels with 20-kHz spacing

52.000 to 52.050 Pacific DX Window (VK)

52.000 to 54.000 FM Repeaters and Simplex

Repeater pairs (input/output)

52.010/53.010	52.330/53.330†	52.690/53.690
52.030/53.030	52.350/53.350†	52.710/53.710
52.050/53.050	52.370/53.370†	52.730/53.730†
52.070/53.070†	52.390/53.390	52.750/53.750†
52.090/53.090	52.410/53.410	52.770/53.770†
52.110/53.110	52.430/53.430†	52.790/53.790
52.130/53.130†	52.450/53.450†	52.810/53.810
52.150/53.150†	52.470/53.470†	52.830/53.830†
52.170/53.170†	52.550/53.550†	52.850/53.850†
52.190/53.190	52.570/53.570†	52.870/53.870†
52.210/53.210	52.590/53.590	52.890/53.890†
52.230/53.230†	52.610/53.610	52.910/53.910†
52.250/53.250†	52.630/53.630†	52.930/53.930†
52.270/53.270†	52.650/53.650†	52.950/53.950†
52.290/53.290	52.670/53.670†	52.970/53.970†
52.310/53.310		52.990/53.990†

Simplex Channels

52.490†
52.510†
52.525† (National Simplex Frequency)
53.490
53.510
53.530†

†Frequencies for which no crossmode conflicts are known to exist. R/C to vacate this part of the band over a three- to five-year period.

*Send reports to Bill Tynan, W3XO, P.O. Box 117, Burtonsville, MD 20866, or call 301-384-6736 to record late-breaking information.

band is coming up. It, too, will require a band plan. We are losing 1215 to 1240 MHz, and a satellite allocation was established between 1260 and 1270 MHz at WARC. These two events, along with a general increase in the amount and diversity of activity on the 23-cm band, certainly indicate a need to revisit the plan presently on the books for that band.

There are tasks other than the proposal of band plans to the ARRL Board of Directors that can be accomplished by active Advisory Committees. Among these are suggestions for operating procedures applicable to specific modes, such as EME and m.s., as well as standards and protocols for use with some of the new digital forms of communication.

With new developments in communication as well as new problems arising, we have a continuing need for active Advisory Committees to serve those of us who inhabit the world above 50 MHz. These committees cannot function in a vacuum, however. For them to be effective and responsive, the members must hear from us, the active users of the vhf/uhf bands. The VUAC and the VRAC members are listed in October 1982 *QST*, page 47. Let them know what you think.

ON THE BANDS

6 Meters — There is BIG news this month. What so many have speculated about has come to pass! The U.K. has been worked from North America on 50 MHz. After the normal deadline for this column, word reached me (first via W4CKD) that on the evening of June 19, beginning about 2130Z, W2CAP/1 on Cape Cod and K1TOL in Maine, along with VE1YX and VE1BNN, started hearing the GB3SIX beacon on 50.018. Calls on 6 by the two VEs brought forth a response from GU2HML on 28.885. Buzzy said that it would be 2230Z before the Gs could transmit on 50 MHz, and spent the next hour trying every available means to alert the U.K. 6-meter permit holders. The VEs were in luck. Instead of deteriorating as they did for K1TOL and W2CAP/1, signal levels actually increased, with VE1YX's signal reaching S 9 plus 30 dB at times. When the witching hour finally arrived, VE1BNN and VE1YX were able to work GU2HML, GJ3RAX, GI3RXV, GW3LDH and G5KW. To these, VE1YX added G4BAO. This represents five new countries for both Bob and Reg, and opens another fascinating chapter in the annals of the world above 50 MHz.

Only time will tell how many more transatlantic contacts will be made before this E_s season is history. Appreciation must go to the British licensing authorities and to the RSGB for their role in establishing the special outside-TV-hours permits. It is hoped that these monumental contacts will provide additional evidence that 50 MHz is a long-haul band, not too suitable for applications other than amateur. Everyone looks forward to the day when all U.K. hams, along with those of other European countries, will be allowed to operate on the 50-MHz band, as can most of the rest of the world.

I must apologize to those who have tried to use the answering maching over the past few weeks. Lightning put it out of action in early June. It, or a replacement, should be in operation by the time this appears.

2 Meters — News for this band is rather scarce this month. There have been few reports of outstanding tropo and only a scattering of E_s. NØLL in central Kansas notes some E skip the evening of June 7 local time. At 0156Z, Larry worked WA6LHD Fairfield, California, on a half-minute opening. An hour later, he hooked up with WA7GCS Tigert, Oregon, on a similar-length opening for state number 46. At 0406, WA6ZGS was heard briefly; 15 minutes later, Phoenix-area stations WD8MHM/7, WA7LYI and WA7YWM were worked and WB7SBX was heard. Apparently as part of the same E cloud system, KA6LDP Huntington Beach, California, reports working into Oregon, Washington and British Columbia beginning about 2130 local time on the 7th. That translates to 0430Z. Stations contacted were N7NW, WB7UZZ, K7ND, VE7ASS, K7LWE, WA7PVE and VE7CYB. Larry notes that 6 meters was hot around the same time, which one would expect for this type of propagation. K6GAO San Diego was also in on the fun, working N7BLS, W7GJS, WA7GCS, K7HST, W7ZI and WB7TEK — all in Oregon.

70 Cm and Down — From the June issue of the K2UYH *432 and Above EME News* we learn that the new 28-foot dish at K5JL (see photo in last month's column) is producing excellent results. In additon to many cw contacts with reports ranging well above the "0" level, Jay has completed ssb QSOs with I5MSH, YU1AW, N9AB, ZL3AAD, K2UYH and K8HUH. Signals both ways on most of these contacts average 5 × 5. The same issue of the *News* carries the disappointing news that Zimbabwe probably will no longer be available on 70- and 23-cm EME, as Peter of ZE2JJ/Z25JJ fame is due to depart for South Africa. The station should be dismantled for transport to the new QTH by the time this appears. The rest of us hams think we have problems moving. Imagine carrying with you a 32-foot dish and all of the other paraphernalia necessary for moonbounce on these two bands! Peter will be back on eventually signing a ZS call, so Africa will still be well represented.

2-Meter 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. In order to make the Standings a true reflection of current 2-meter activity, those not signifying continued activity or interest within the past two years have been dropped. They will be reinstated upon written presentation of a desire to remain in the listing. WAS holders are listed in any case. Compiled June 15, 1983.

1	KØMQS*	IA	12
2	K5CM*	OK	12
3	NØJA*	MO	12
4	K9HMB*	IL	12
5	K1WHS*	ME	12
6	WA4MVI*	NC	12
7	K5JL*	OK	12
8	WA9DOT*	WI	12
9	WBØZXU*	IA	12
10	K9CA*	IA	12
11	WØSD*	SD	23
12	K5BMG*	LA	12
13	K5GW*	TX	12
14	WB5LUA*	TX	23
15	K4GL*	SC	23
16	WØVB*	MN	14
17	WB5LBT*	LA	20
18	K4PKV*	NC	12
19	WØRWH*	MO	23
20	W8IDU*	MI	23
21	K1MNS*†	NH	48
22	WB9VEN*	IL	12
23	K5FF*	NM	16
24	W5FF*	NM	16
25	W7FN*	WA	12
26	W1JR*†	MA	20
27	WBØQMN*	CO	12
28	WB4EXW*	NC	18
29	K9KFR*	IN	12
30	K3VGX*	PA	12
31	SM7BAE*		21
32	WA7BJU*	OR	12
33	VE7BQH*		35
34	W6PO*	CA	12
35	WA3VSJ*	PA	27
36	WAØLPK/ KL7	AK	20
37	WBØYSG	NE	12
38	N7NW	WA	12
39	W5LUU	TX	12
	K1FO*	CT	49 18
	AA1A*	MA	47 20
	K1GVM*	MA	44 15

	K1BKK*	VT	43 14
	W1YTW	ME	36 12
	WA1OUB	NH	36 11
	K1PXE	CT	35 13
	N1AIS	MA	34 12
	WB1FVS	CT	34 11
	W1JSM	NH	33 8
	K1VMI	CT	31 12
	W1GXT	MA	30 11
	K1FWF	MA	29 11
	KA1DHO	MA	28 10
	W1AIM	VT	28 9
	K1SF	MA	27 11
	W1FJH	MA	26 8
	WA1JOF	MA	25 11
	KA1DHO	MA	24 9
	W1HDQ	CT	24 7
	W2CNS*	NY	47 18
	W2PGC*	NY	47 15
	WA2GSX*	NY	46 22
	K2OS*	NY	44 14
	W2AZL*	NJ	41 10
	W2ORI	NY	37 10
	W2CRS	NY	37 8
	W2RS	NJ	36 13
	K2OVS	NY	36 12
	WA2TIF	NY	36 11
	WB2WIK	NJ	35 12
	WA2PMW	NY	35 12
	K2QR	NY	35 11
	WB2CUT	NJ	34 12
	WA2FGK	NJ	34 8
	K2DNR	NY	32 8
	WA2SLY	NY	31 12
	WA2PVV*	NY	27 10
	W2MPK	NY	27 8
	KA2BTD	NJ	26 10
	W2DWJ	NJ	26 7
	WA2ABN	NY	25 10
	K2YCO	NY	25 10
	N2BJ	NY	25 10
	N2BMN	NJ	22 10
	WA2YWP	NY	22 7
	AB3D*	DE	48 22
	WA3USC*	MD	47 18
	W3OZ*	MD	38 12
	K3WHC	PA	37 9
	K3QCQ*	PA	37 8
	W3XO	MD	37 10
	W3BDP	DE	37 9
	W3IWI	MD	36 12
	WB3JHP*	MD	36 9
	W3RUE	PA	36 11

	K3MD*	PA	35 16
	AE3T	PA	35 8
	W3CLQ	PA	33 10
	K3MWV	PA	32 10
	WA3WUL	DE	32 10
	WA3DMF	MD	32 9
	W3ZZ	MD	31 11
	WB3LJK	MD	30 —
	K3HCE	MD	29 11
	W3OTC	MD	28 9
	WA4CQG*	AL	49 —
	WA4LYS*	FL	48 42
	WD4IIS*	GA	42 12
	WB4LHD	TN	40 11
	WA4PCS	KY	40 10
	W4GJO	GA	39 11
	K4CAW	NC	38 12
	WA4DKH	KY	338 11
	N4CD	VA	38 12
	W4HHK	TN	38 9
	K4CAW	NC	38 9
	W4MKJ	KY	36 12
	W4LNG	GA	36 8
	W4ZD	FL	35 12
	WD4CXU	VA	35 8
	KØRI/4	VA	34 11
	W4ISS	GA	34 8
	W4FJ	VA	34 8
	W3IY/4	VA	32 8
	WA4SBC	VA	31 12
	W4SMU	KY	30 9
	KC4P	AL	30 9
	K4CKS	GA	29 —
	K1FJM/4	FL	26 9
	NA4I	GA	24 10
	N4QH	GA	23 6
	W5JTL*	MS	49 13
	WD5CRK*	OK	49 12
	N5KW*	OK	49 12
	K5SW	OK	47 12
	WØRRY/5*	OK	47 11
	K5MWH*	AR	47 10
	W5RCI	MS	46 10
	KR5F*	TX	44 36
	K5WE	OK	42 12
	W5HN	TX	42 12
	W5HFV	OK	38 10
	WA5HNK	TX	35 12
	WB5JAR	AR	34 10
	WA5DBY	TX	34 10
	WA5EID*	AR	32 13
	W5UWB*	TX	32 9
	N4JS/5	MS	31 8

	K5DHU	TX	27 10
	WA5YOU	LA	26 8
	K5VVV	TX	25 8
	WA5TBE	TX	25 8
	W5NZS	OK	25 7
	K5QNM	OK	24 9
	WA5IYX	TX	19 9
	W6XJ*		29 12
	WB6NMT*		26 13
	K6JYO		19 5
	K6PVS*		17 —
	WA6LHD		14 6
	K6HMS		11 5
	K6GAO		9 6
	K6QXY		9 4
	N6CA		8 3
	WA1JXN/7*	MT	49 40
	W7HAH*	MT	46 23
	W7CI*	AZ	48 17
	WA7JUO*	NV	45 16
	W7JF*	MT	44 14
	WA7ADK	UT	24 6
	N7BHC*	UT	21 6
	K7ICW	NV	21 9
	WA7JTM	AZ	17 6
	WB7EPA*	AZ	16 6
	N7ART	WA	15 5
	N7EIJ	ID	13 6
	N7AKB	NV	12 4
	WB7QBC	WY	12 3
	WA7EPU	AZ	9 6
	WB8PAT*	OH	48 33
	W8WN*	MI	48 14
	K8EUR	OH	41 11
	WA8MIL	MI	39 9
	K8RZB	OH	39 10
	K8WKZ	MI	38 12
	W7EKI/8	OH	38 8
	KJ8S	MI	34 10
	WD8BRE	MI	33 10
	W8LCY	OH	32 8
	KB8SG	MI	27 8
	W8CAP	MI	26 11
	N8AXA	OH	26 9
	W8TN*	WV	24 11
	K9XY*	WI	49 26
	W9UD	IL	45 13
	K9EFX*	IN	44 13
	KB9NM	WI	43 14
	W9AAG	IL	42 9
	W9WZB	IN	41 13

	W3EP/9	IN	40 13
	W9IP	IL	40 9
	K9UNM	IN	38 8
	K9SM	IL	36 9
	AA9D	IL	31 10
	WB9TPV	IL	31 9
	WB9MSV	IL	30 11
	WBØTEM*	IA	49 22
	WØRWG*	MO	49 15
	WAØLSH*	CO	48 20
	KØALL*	ND	48 15
	WBØVYV*	IA	48 11
	WØEMS	NE	48 11
	NØLL	KS	46 10
	WØOHU	MN	45 12
	KØDAS*	IA	45 12
	KØSE*	MN	45 10
	WAØSJR	MO	41 9
	WØPN	MN	40 11
	KØAOD	MO	38 11
	WBØDGF	NE	38 9
	WBØIUT	NE	37 10
	WØRAP	IA	37 10
	WBØSIL	MO	36 13
	WØPW	CO	35 9
	KØAOD	MO	34 11
	KØTLM	MO	34 10
	KØUDZ	SD	33 10
	WBØZKG	IA	32 8
	KCØQR	NE	31 10
	KAØAYN	MN	28 10
	WBØZAH	MN	24 9
	VE1UT	NS	38 17
	VE2DFO*		48 30
	VE3EMS		38 11
	VE3FN		37 11
	VE3DSS		37 10
	VE3ASO*		35 12
	VE3FKX		35 10
	VE3DTQ		31 12
	VE3AIB		29 10
	VE3EQQ		20 12
	VE4MA		14 9
	VE4UX		8 5
	I2MBC		19 21
	I4EAT*		12 64
	G4DZU*		11 8
	XE2BC*		9 5
	VK5MC*		7 7
	SM6CKU*		5 4
	VK3ATN*		4 4
	ZL1AZR*		2 2

*One or more contacts made via EME.
†WAC.

Hamfest Calendar

Alabama: The Central Alabama ARA will hold its 6th annual hamfest on Saturday and Sunday, Aug. 27-28, at the picturesque Huntington College Delchamps Student Center in historic Montgomery. Free admission, free parking and 20,000 square feet of air-conditioned activities, including a flea market, a DX forum by Ed Richmond, W4MGN, a RTTY demonstration, and much more. Setup at 6 A.M.; doors open from 8 A.M. to 5 P.M. on Saturday and 'til 3 P.M. on Sunday. Saturday night Dutch treat buffet featuring Peter Weatherall, G3MLO, of Canterbury, England, as honored guest. On premises "homebrew" chow and special motel rates. Talk-in on 04/64, 31/91, 78/18 or 25/85. For further information or market reservations, write to Hamfest Committee, 2141 Edinburgh Dr., Montgomery, AL 36116, or call Phil at 205-272-7980 after 5 P.M. (CDST).

Arkansas: The 14th Annual Queen Wilhelmina Hamfest will be held atop scenic Rich Mountain, near Mena, at the Queen Wilhelmina Inn, on Sept. 10-11. Come as early after Labor Day as you can, and we will get things going. Swapfest, dealer displays, good fellowship and mountaintop relaxation. Registration is $2. Talk-in on 19/79. For information, contact Bob Holbert, K5UWL, Star Rte. 9, Box 168A, Mena, AR 71953, tel. 501-394-3070.

California: Parking Lot Hamfest and Giant Electronic Flea Market, Saturday, Aug. 13, 8 A.M. to 2 P.M., Parking Lot C, Foothill College, Los Altos Hills. Sellers $5 per vehicle; buyers free. Sponsored by Palo Alto ARA. Perennial Field Day champs with lots of Silicon Valley gear. Talk-in on 144.67/145.27.

California: The TCARA 13th Annual Hamfest and Picnic, sponsored by the Tri-County ARA, will be held Saturday, Aug. 13, 8 A.M. to 2 P.M., at the Los Angeles County Fairgrounds in Pomona. Tables available for ham/computer exhibits, displays, and miscellaneous electronics. Sandwiches and soft drinks. For more information, contact Tony Skvarek, W6ELZ, 1514 W. Mission No. 14, Pomona, CA 91766.

Connecticut: The 7th annual WELI/Hamden RC Flea Market is on Sunday, Aug. 14, at Radio Towers Park, Benham St., Hamden, 9 A.M. to 4 P.M., rain or shine. Vendor space $5; general admission $1. For further information, contact Darrow Loucks, WA1ZWA, 199 Wayland St., Hamden, CT 06518, or call 203-288-3765 after 6 P.M.

Delaware: The eight annual New Delmarva Hamfest will be held Sunday, Aug. 21, at Gloryland Park, 5 miles south of Wilmington. Admission is $2.25 in advance, $2.75 at the gate. Tailgating is $3.50. Bring your own table. Limited space available under the pavillion — first come, first served. Food and drinks available. Talk-in on 52 and 13/73. For more info and a map, send an s.a.s.e. to Stephen J. Momot, K3HBP, 14 Balsam Rd., Wilmington, DE 19804. Make checks payable to Delmarva Hamfest, Inc.

†**Georgia:** The first annual Confederate Signal Corps, Inc. Hamfest will be held at the Holiday Inn, I-20 at U.S. 441, Madison, on Sunday, Aug. 28, 8 A.M. to 2 P.M. Free admission. Tours of old Southern homes, swimming, video games — all free. Call Holiday Inn for special rates. Flea market and tailgaters free. Inside exhibitors — table and chair, $10; outside exhibitors — table and chair, $5. For information, write to Confederate Signal Corps, Inc., P.O. Box 90159, East Point, GA 30364, or call Dave Messex, N4AQV, at 404-636-1212.

Illinois: The Chicago Area Computer Hobbyist Exchange and Chicago ARC will hold a joint swapfest on Aug. 21, 10 A.M. to 4 P.M., at Triton College, Fifth Ave., just north of North Ave. in River Grove (8600W and 2000N). For info, call CARC at 312-545-3622.

†**Illinois:** The 49th annual hamfest sponsored by the Hamfesters RC, Inc., will be held at Santa Fe Park, 91st and Wolf Rd., Willow Springs, on Sunday, Aug. 14. Admission is $3. Information and advance tickets from Ernest L. Kaiser, N9BVT, tel. 312-284-7935.

†**Illinois:** The Vermilion County ARA hamfest will be held on Sunday, August 28, from 7 A.M. to 3 P.M. in Danville. Admission is $1. Flea market and other activities. Talk-in on 11/82 and 52 simplex. For information, contact Terry England, KA9DGS, tel. 217-442-4477, or Quinten Rouse, KA9LNJ, tel. 217-443-3843.

†**Indiana:** The Lafayette Hamfest, sponsored by the Tippecanoe ARA, Inc., will be held at the Tippecanoe County Fairgrounds on Aug. 21, from 7 A.M. to 7 P.M. Advance admission is $2.50; at the door, $3. Flea market, refreshments, overnight camping. Talk-in on 13/73 and 52. For info and reservations, contact Lafayette Hamfest, Rte. 1, Box 63, West Point, IN 47992, tel. 317-572-2755.

Indiana: The Marshall County ARC will hold their 8th annual hamfest at the Marshall County 4-H Fairgrounds on State Road 10 in Argos on Aug. 28. This year, we will have a second 60- × 120-foot building in addition to our 36,000-square-foot flea market area. Computers as well as ham gear will be on display. Lots of activities for women, including arts and crafts. Open for dealer setup at 6 A.M. Open for the public from 8 A.M. to 2 P.M. Food and drinks available. Table rental $4. Tickets are $2 in advance, $3 at the door. For information, write to Marshall County ARC, Box 151, Plymouth, IN 46563, or call Bob Nellans, KB9DE, tel. 219-892-5224.

Indiana: The 6th annual Bloomington Hamfest will be held on Sunday, Sept. 4, from 8 A.M. to 3 P.M., at 2335 Vernal Pike (1/4 mile east of Hwy. 37 bypass). Dealer and flea market setup starts at 7 A.M. Admission is $2, with no charge for flea market sales. Refreshments and lots of parking available. Talk-in on 78/18 and 04/64. For further information, contact Bob Myers, K9KTH, 2335 Vernal Pike, Bloomington, IN 47401, or send an s.a.s.e. to BARC Hamfest, 1010 Country Club Dr., Bloomington, IN 47401.

†**Iowa:** The Des Moines Radio Amateurs Assn. hamfest will be held at the Veterans Memorial Auditorium, Des Moines, on Sunday, Aug. 14. Admission is $4 less discounts. For further information, write to DMRAA, Box 88, Des Moines, IA 50301.

†**Kentucky:** The Central Kentucky ARRL Hamfest, sponsored by the Bluegrass ARC, will be held at Scott County High School, Longlick Rd. and U.S. Rte. 25, Georgetown (off I-64/75), on Sunday, Aug. 14, from 8 A.M. to 5 P.M. Advance admission is $3.50; at the door, $4. Technical forums, awards and exhibits. Outside flea market. No charge for flea market space. Food available. Talk-in on 16/76. For further information, contact Ed Bono, WA4ONE, 2077 Dogwood Dr., Lexington, KY 40504, tel. 606-277-3768.

Massachusetts: The Northern Berkshire ARC flea market will be held on August 28 at the Veterans of Foreign Wars, Dalton. Admission $1; women and children free. Free tables available on a first-come basis. Tailgating free. Refreshments. Please observe town parking regulations. Talk-in on 31/91.

Michigan: First of fall season — the seventh annual Five County Swap-N-Shop — will be held on Sunday, Aug. 28, from 8 A.M. to 3 P.M. (5 A.M. for dealers), at Bentley High School, 1150 Belsay Rd., Flint. Advance tickets are $2; at the door, $3; children under 12, free. For table reservations, contact Bill Cromwell, KU8H, 1204 Overland Dr., Lennon, MI 48449, tel. 517-288-5046. Sponsors are Genesee County RC, Bay Area ARC, Lapeer County AR and Rep. Club, Saginaw Valley ARA and Shiawassee ARA.

Mississippi: The Delta ARA Hamfest will be held on Aug. 13-14, in the air-conditioned Civic Center at the Greenville Mall, Greenville. Free admission. Sales tables are $5 per day. Women's flea market on Sunday only. Talk-in on 22/82. Contact Max McWharter, WB5FDI.

†**Missouri:** SCARC HAMFEST '83, sponsored by the St. Charles ARC., Inc., will be held at the Wentzville Community Center, Wentzville, on Aug. 28, starting at 7 A.M. Admission $1 per car. Advance tickets are $1 each, 4/$3; At the door, $1.50 each or 4/$5. Flea market, ARRL Forum, CW contest, cake walk. Various ham and nonham demonstrations. Free doughnuts and coffee to early birds. Talk-in on 67/07 and 52. For further information, contact Dale J. Stewart, KAØDKV, 111 Becky Thatcher, St. Charles, MO 63301, tel. 314-946-0521.

New Jersey: The Ramapo Mountain ARC, WA2SNA, presents its 7th annual flea market on Aug. 20 at the Oakland American Legion Hall, 65 Oak St., Oakland, 20 miles from the GW Bridge. Talk-In on 147.49/146.49 and 52. Indoor tables, $6.50; tailgating, $3. Admission $1; nonham family members free. For information, contact Tom Risseeuw, N2AAZ, 63 Page Dr., Oakland, NJ 07436, tel. 201-337-8389 (after 6 P.M.).

†**New Jersey:** The GCARC Ham/Comp Fest, sponsored by the Gloucester County ARC, will be held at Gloucester County College, Sewell, on Sunday, Aug. 28, from 8 A.M. to 4 P.M. Admission is $2 in advance, $2.50 at the door. Tailgate — $3 per space. Seminars, contests, computer demonstrations, flea market, commercial displays and other activities. DX seminar by "Mr. DXCC" — Don Search, of ARRL Hq. Food, facilities, parking and shuttle bus from parking area to hamfest. Talk-in on 18/78, 223.36/224.96 and 52. For further information and reservations, contact Milton Goldman, K3WIL, 801 Crown Point Rd., Westville, NJ 08093, tel. 609-456-0500, or John M. Fisher, K2JF, P.O. Box 370, Pitman, NJ 08071, tel. 609-338-4841 (day) or 609-589-2318 (evening).

New York: The Lake Erie International Hamfest Assn. will be holding its fifth annual Lake Erie International Hamfest at the Chautauqua County Fairgrounds, Dunkirk, on Saturday, Aug. 13. Gates open at 8 A.M. Admission is $3 at the gate or $2.50 in advance, plus $1 per flea market space. Indoor dealer exhibits and a large flea market. Talk-in on 25/85 and 52. For more information, write to Lake Erie International Hamfest, P.O. Box 455, Dunkirk, NY 14048.

New York: The annual Finger Lakes Hamfest will be held on Aug. 27 at the Trumansburg Fairgrounds on Rte. 96, 12 miles NW of Ithaca, from 8 A.M. to 5 P.M. There will be a flea market, commercial exhibitors, door prizes, boat-anchor auction, refreshments and craft show for the women. Admission is $2 at the gate. Talk-in on 37/97 and 52. Write to Dave, W2CFP, 866 Ridge Rd., Lansing, NY 14882, for further information.

†**New York:** Ham-O-Rama '83 will be held at the Erie County Fairgrounds (Buffalo Raceway) in Hamburg, just south of Buffalo, on Friday, Sept. 9, from 6 P.M. to 9 P.M., and Saturday, Sept. 10, from 7 A.M. to 5 P.M. Features include new equipment displays, technical and nontechnical programs, auction, video displays, computer displays, inside and outside flea markets, radio test bench, and lots more. General admission is $3.50 advance and $4 at the gate. Inside flea market is $10, and outside flea market is $3. Talk-in on 31/91. Sponsors are Buffalo ARRA, Radio Assn. of Western NY, South Towns ARS and ARA of the Tonawandas. More info? Contact N. Oldfield, WA2ZSJ, 126 Greenway Blvd., Checktowaga, NY 14225.

†**Ohio:** The Marysville Hamfest, sponsored by the Union County ARC, will be held at the Union County Fairgrounds, Marysville, on Aug. 20-21, from 8 A.M. to 3 P.M. daily. Admission is $3. Saturday night dance and floor show, free. Talk-in on 99/39 and 52. For further information, write to Union Co. ARC, 13613 U.S. 36, Marysville, OH 43040, tel. 513-644-0468.

Oregon: The Hoodview ARC will hold its first annual hamfest on Aug. 27-28 at Mount Hood Community College. Hours will be 9 to 6 on Saturday and 9 to 3 on Sunday. Admission will be $2; under 12 free. Swap tables will be $2.50 and $5. Food available, and children's activities will be provided. Talk-in on 88/28 and 52 simplex. For more information, please send an s.a.s.e. to Hamfair "83," P.O. Box 20264, Portland, OR 97220.

†**Pennsylvania:** The Mid-Atlantic ARC annual hamfest will be held on Sunday, Aug. 14, from 9 A.M. to 4 P.M., rain or shine, at Route 39 Drive-in Theater, 1/4 mile north of Rte. 63, Montgomeryville (6 miles north of the Fort Washington interchange of Pennsylvania Tpke.). Tailgate setup begins at 8 A.M. Admission is $2.50, with $1 additional for each tailgate space. Ample parking, refreshments and more. For further information, write to the club, P.O. Box 352, Villanova, PA 19085.

Pennsylvania: The Tioga County, PA, ARC 7th annual Amateur Radio hamfest will be held Saturday, Aug. 20, from 8 A.M. to 4 P.M., at Island Park, Blossburg, just off Rte. 15. Flea market, food and other activities. Talk-in on 19/79 and 52. For more information, write to Tioga County ARC, P.O. Box 56, Mansfield, PA 16933, or contact John T. Winkler, WB3GPY, RD 2, Box 269, Wellsboro, PA 16901, or on 19/79.

†**Pennsylvania:** The 10th Annual CPRA Hamfest/Computerfest, sponsored by the Central Pennsylvania Repeater Assn., Inc., will be held adjacent to Hersheypark, Chocolate Town, USA, on Aug. 28. Dealer setup at 6 A.M. (special Saturday afternoon arrangements can be made if requested in advance). General admission from 8 A.M. to 4 P.M. Admission is $3; women and children free. Special reduced admis-

sion to Hersheypark for families of registrants. Indoor spaces (10 ft), $8 each; 8-ft tables, $4 each; single electric plugs, $1 each. Large indoor dealer and flea market area. Food available. For further information and reservations, contact Timothy R. Fanus, WB3DNA, 6140 Chambers Hill Rd., Harrisburg, PA 17111, tel. 717-564-0897 (noon to 8 P.M.).

Quebec: Radio Amateur du Quebec will hold its annual convention at Compton on Aug. 12-14. Friday: cocktails and buffet. Saturday: lectures and banquet. Sunday: hamfest and flea market. Admission is $39 for the whole thing. For info and reservations, contact Club Sherham, c/o VE2FQZ, 750 Turcotte, Sherbrooke, PQ J1L 1N4.

Tennessee: The Lebanon Hamfest, sponsored by the Short Mountain Repeater Club, will be Sunday, Aug. 28, at Cedars of Lebanon State Park, U.S. Hwy. 231, Lebanon. Outdoor facilities only; exhibitors bring your own tables. Talk-in on 31/91. Food and drink available. For further information, contact Morris Duke, W4WXQ, 210 Disspayne Dr., Donelson, TN 37214.

†**Texas:** The Austin ARC/Austin Repeater Organization will sponsor Austin SummerFest '83, at the Marriott Hotel, I-35 and U.S. 290, Austin, on Aug. 12-14. Activities include Texas VHF-FM Society Summer Meeting and Convention, forums, meetings, indoor/outdoor swapfest, dealer exhibits, transmitter hunt. Saturday afternoon luncheon and tour of historic Austin houses and buildings; bus service to Austin AquaFest and 6th street entertainment area Saturday night. Talk-in on 34/94. Admission is $5 in advance, $6 at the door. Women's program basic registration, $1. Historic Tour, $20 in advance; 6th St/AquaFest bus rides, $2 at the bus. Advance swapfest table reservation, $1. Info and reservations: Austin SummerFest '83, P.O. Box 13473, Austin, TX 78711.

†**Vermont:** The annual BARC International Hamfest will be held on Saturday, Aug. 13, and Sunday, Aug. 14, at the Old Lantern Camp Grounds, Charlotte. Tickets will be $4 for both days, and flea market space will be $2. Indoor spaces will be $5. Overnight camping is available. Talk-in on 34/94, 01/61 and 52 simplex. You may contact Frank, W1CTM, President, Burlington ARC, P.O. Box 312, Burlington, VT 05402.

†**Washington:** Tacoma Hamfair, sponsored by the Radio Club of Tacoma, will be held in Olson Auditorium, Pacific Lutheran University, Tacoma, on Aug. 13-14. Doors open at 9 A.M. both days. Admission is $4.50. Seminars, flea market, commercial exhibits, contests, logger's breakfast, women's activities, Saturday night banquet. Trailer spaces (no hookups), dormitories available, snack bar. Talk-in on 147.28 and 224.52. For further information, contact Grace Teitzel, AD7S, 701 So. 120th, Tacoma, WA 98444, tel. 206-531-0166.

†**West Virginia:** Bluefield Hamfest '83, sponsored by the East River ARC, Inc., will be held at Brushfork (Bluefield) Armory, 1 mile north of Bluefield on U.S. 52, on Sunday, Aug. 28, from 9 A.M. to 3 P.M. Admission is $3. Food on site, inside flea market, Amateur Radio dealers, computer dealers, satellite TV dealers. Paved parking lot. Talk-in on 144.89/145.49 and 52 simplex. For further information, contact Donald L. Williams, Jr., WA4K, 412 Ridgeway Dr., Bluefield, VA 24605.

Wisconsin: The Green Bay Mike & Key ARC 8th annual HobbyFest '83 will be held at Pamperin Park, Green Bay, on Aug. 20, from 8 A.M. to 4 P.M. Radio swap, crafts and arts market, electronic innovations, computer hardware/software, experimental items, handyworks, radio/digital communications displays and demonstrations, and many other activities. Talk-in on 12/72 and 52. Donation $1; children under 12 free. Table reservations — $4 per 4-ft section: Send to K9EAM, c/o Steve Mommaerts, KA9KQB, 421 S. Ontario St., DePere, WI 54115. More information needed? Contact Pat Schwartz, KA9MHI, 1243 Crestwood Dr., Green Bay, WI 54304, tel. 414-499-1679.

Wyoming: Fourth Annual High Plains Ham Roundup, Saturday and Sunday, September 9-10, 10 miles east of Laramie, I-80, Lincoln Monument turn-off to Yellow Pine and Pole Creek Campgrounds, Medicine Bow National Forest. Reserved for hams and their families; no camping fee. Enjoy a real Western Ham Roundup. Bring your own food and drink, and stay as long as you wish. Roast beef furnished for potluck supper Saturday evening. Bluegrass band, barbershop quartet and sing-along. All hams invited, especially those in Colorado, Nebraska and Wyoming area. Talk-in on 25/85, 22/82 and 52 simplex. For further information, contact Mick Marchitelli, P.O. Box 731, Laramie, WY 82070.

†ARRL Hamfest

[Attention those who send in items for Hamfest Calendar and Coming Conventions: Postal regulations prohibit mention in *QST* of prizes of any kind and games of chance such as bingo.]

Note: Sponsors of large gatherings should check with the League Hq. for an advisory on possible date conflicts before contracting for meeting space. Dates may be recorded at ARRL Hq. for up to two years in advance.

Coming Conventions

By Marjorie C. Tenney,* WB1FSN

August 5-7
Rocky Mountain Division, Jackson, WY

August 6-7
North Florida Section, Orange Park

August 13-14
Delta Divison, Shreveport, LA

August 19-21
Pacific Division, Reno

August 20-21
Alabama State, Huntsville

September 2-4
Southwestern Division, Anaheim, CA

September 23-25
Dakota Division, Sioux Falls, SD

September 25
Great Lakes Division, Cleveland, OH

October 22-23
Tennessee State, Chattanooga

November 26-27
Florida State, Clearwater

ARRL NATIONAL CONVENTIONS

October 7-9, 1983
Houston, Texas

July 20-22, 1984
New York, New York

September 27-29, 1985
Louisville, Kentucky

1986 ARRL National Convention Applications Sought

Proposals are hereby solicited from ARRL-affiliated clubs for hosting of the 1986 ARRL National Convention. Any group wishing to submit a proposal should promptly contact The Secretary, ARRL, 225 Main St., Newington, CT 06111, as well as their Division Director. Ideally, to provide adequate opportunity for Board study, complete written proposals should be submitted at least 30 days in advance of the Second 1983 Meeting of the ARRL Board, scheduled for Houston on October 5. Application forms (designated for Division Convention use, but equally applicable to a National) are available from your Division Director or from Headquarters.

ALABAMA STATE CONVENTION
August 20-21, Huntsville

The Alabama State Convention will be held at the Huntsville Hamfest on Saturday and Sunday, August 20 and 21. All events and activities will be in the Von Braun Civic Center Exhibit Hall. The hamfest is open to the public from 10 until 5 on Saturday and from 9 until closing on Sunday. There will be many commercial exhibits and a large indoor flea market. Two concession areas will be available inside the Exhibit Hall, and several groups will have hospitality rooms at the Huntsville Hilton.

DX, computer and other technical forums are planned, and meetings for the QCWA, MARS and YL/XYL hams will be held. There will be an ARRL forum with Southeastern Division Director Frank Butler and representatives from League Headquarters. Activities for women and children are also scheduled. Tours of the Alabama Space and Rocket Center are available for the entire family. Big Spring Park is adjacent to the VBCC, and Point Mallard recreation area is located in nearby Decatur.

There is no hamfest admission charge for the public, though parking in the VBCC garage and lots will cost $1. Flea market tables will cost $4/day and should be reserved prior to the hamfest. Motel reservations may be made through the Huntsville Hilton (1-800-241-5838). Talk-in will be on 3.965 MHz and 34/94. For more information, write to Huntsville Hamfest, 2804 S. Memorial Pkwy., Huntsville, AL 35801.

SOUTHWESTERN DIVISION CONVENTION
September 2-4, Anaheim, CA

The 1983 ARRL Southwestern Division Convention will be hosted by the Orange County Council of Clubs. This convention will be held at the Marriott Hotel's newly constructed facilities in Anaheim, California. Technical sessons for amateurs on the latest in radio and computer technology will be presented all day Saturday. Also, non-technical sessions will be available Saturday afternoon. Booths will be open for viewing all day Saturday and Sunday morning.

Astronaut Dr. Tony England, WØORE, will be the featured speaker at the Saturday night banquet. Be sure to get your banquet reservations in early, as a full house is anticipated. Tables for the banquet may be reserved this year by purchasing a block of 10 to a table in advance. The much-talked-about Royal Order of the Wouff Hong ceremony will take place following the banquet at midnight. An ARRL forum is planned, featuring General Manager Dave Sumner, K1ZZ. A Ladies Luncheon will be held, including technical as well as nontechnical speakers. This year's convention offers many varied sessions covering packet radio to computers, and many things in between.

For information or reservations on the convention, please send an s.a.s.e. to HAMCON, Inc., P.O. Box 1582, Placentia, CA 92670. Pre-registration date ends August 15. When making reservations at the Marriott, be sure to mention the HAMCON convention for the convention rates.

Talk-in will be on 19/79 and alternate 145.40/144.80. We sincerely hope you will be able to plan your long weekend in comfort with us in Anaheim and take advantage of the many nearby attractions, such as Disneyland and Knott's Berry Farm.

*Convention/Travel Coordinator, ARRL

YL News and Views

Conducted By Jean Peacor,* K1IJV

It's A Small, Small World

Florida's Disney World features one exhibit in which you hear the song "It's A Small, Small World" over and over again. Once heard, the song has a way of popping into mind every now and then, forever after. It just did again in connection with news from YLs around the world.

Amateur Radio certainly assists in creating the small-world effect. Such is the case when a YL from Virginia USA found herself on the cover of the Turkish Amateur Radio magazine *TRAC*. Stella McPherson, WA4WPN, well known to many as "Custodian of the WAS/YL Certificate," worked TA1MB on 20-meter ssb in 1979. They exchanged QSLs. In September 1981, Stella again ran into Kadri on 20-meter cw. She accompanied this QSL with a picture taken of her by her OM, AF4C.

In April of this year, Stella was surprised to find a brown envelope in her mailbox, postmarked Istanbul, Turkey. Its contents were an even bigger surprise, for there was her picture on the cover of *TRAC*. TA1MD, obviously a member of the club, enclosed a note that read: "This is a gift from your Turkish friends." A local university has since translated some of the magazine's articles for Stella, who is still proclaiming the wonders of Amateur Radio.

Stella McPherson, WA4WPN

Grazia Sassu, IS0SFZ

Nozomi Gohara, JH3SQN

Letters from Afar

YLRL's International Membership Chairman, Verline Ferris, KI8V, receives interesting letters from YLs worldwide. Her willingness to share some of them makes the following excerpts possible.

• From Alghero, Sardinia, Grazia Sassu, IS0SFZ, writes that she is active on phone on 2, 20 and 40 meters. Grazia is very happy to be the YLRL adoptee of Liz Zandonini, W3CDQ. Grazia's work is in medicine — she's a surgeon — which she couples with teaching topographic anatomy in the Sattari University medical school. Her many hobbies include electronics, painting, travel and photography. Since parts of her letter were written in Italian, an enjoyable visit with Art Zavarella, W1KK, allows this letter-ending translation: "Un caro abbraccio (dear embrace)" from the Island of Sardinia.

• Olga Zamarieva, LZ1QG, of Sofia, Bulgaria, writes that she and her OM use homebrew transceivers (40 W) and W3DZZ antennas. Her OM does the homebrewing, and Olga is their QSL manager. Bulgaria does not as yet have a YL organization, but Amateur Family stations recently enjoyed their second meeting. Olga is QRV about 0600-0800 UTC on 14.210-14.250 MHz, and 2200-2300 UTC on 14.050 or 21.050 MHz.

• From Kyoto, Japan, Nozomi Gohara, JH3SQN, reflected on her trip to the 1982 YLRL convention in Washington, DC. It was a longtime desire fulfilled for both Nozomi and her OM Ken, JH3SQM. More excitement was forthcoming for them in 1982 when the Hubachers (Greta, HB9ARC, and her OM, Arno, HB9AJL, from Switzerland) visited the Goharas in Kyoto.

Nozomi and Ken and two of their children have been Amateur Radio licensees for 11 years; their daughter Sayuri is JH3SQP and their son Makoto is JH3SQO. A younger daughter, Ayumi, became JR3HIH a year later. Nozomi and Ken are physicians and work together in their Kyoto clinic. Extremely active hams, they've tried it all — hf, vhf and uhf on cw or phone (from home or mobile), SSTV, UHFTV, award hunting, satellite QSOs, DXpeditions, contests, fox hunting and holding classes to help others become licensed. Their most recent "craze" is programming for their microcomputer.

• Sister Margaret Bubb, P29NUN, writes that living at 5000 feet in the tropics has its advantages in climate — the days are warm, evenings are cool. Sr. Margaret, an Australian Sister of Mercy, is a teacher in Religious Education at a Catholic mission in the Highlands (near Goroka) of New Guinea. If you are fortunate enough to have her QSL card, you undoubtedly have one of the more original cards in the world. Picture a caricature of a nun riding on a broom stick with habit flowing and radio signals emitting from her head. Designed by a Gorokan friend, the "Nun on the Broomstick" originated from Sr. Margaret's early days in Amateur Radio. Licensed in February 1981, her original antenna was two pieces of wire attached to a broom handle. Ten meters is a favorite of hers, but you may also find her Saturdays around 2200 UTC, anywhere from 21.150 to 21.197 MHz.

• Sylvia Kirkland, ZL2LS, joined the ranks of the Old Timers Club in 1982. Sylvia lives with her son and his family 10 miles north of historic Napier, New Zealand. In the early days, Napier was a sheep station of several thousand acres. It was the first stopping place to change horses for coaches going north from Napier.

First licensed in 1954, Sylvia's interest in radio goes back to 1922, while at school in Oxford, England. There were no broadcasting stations and few wireless sets at the time. A demonstration at the school took two men almost two days to set up. One table exhibited a large number of glass accumulators; a second held the rest of the gear, including a speaker shaped like an ancient gramophone horn. A massive antenna was installed. The plan was for students to hear a stage musical relayed from London. With no selectivity, the receiver produced cw stations, weather stations, shipping stations and lots of static — but not much music. However, the demonstration and the talk that followed sparked Sylvia's interest.

Sylvia and her late OM, Bill, sat for the exams together and made their first contacts together. They debuted with an old battery-operated ZC1, but had a good receiver, an Eddystone 680X. An ssb rig followed — a huge thing, about the size of a large refrigerator, that warmed the whole shack. First licensed as ZL2QZ and later as ZL1BCM, Sylvia now uses a Kenwood TS-520. Sylvia's 14-year-old grandson has the old Eddystone 680X still going strong in his bedroom, night and day. The recent recipient of a Grade 1 license, Sylvia now operates on several bands. At the time of her letter, she had only an 80-meter antenna but big plans for expansion to other bands. Amateur radio operators in all corners of the world have good reason to sing "It's a Small, Small World."

YL NET DIRECTORY ADDITION

PY7AHJ submitted the following YL Net addition: Time: 1700 UTC daily; Frequency: 7060 ± 5 NCS: usually "Aunt" Hilda, PY7AVN; Net name: The Pink Woolen Adorn Net.

*Country Club Dr., Monson, MA 01057

Club Corner

Conducted By Sally O'Dell,* KB1O

RAISE THE FLAG; WE DID IT!

One of the clubs qualifying for Special Service Club (SSC) status has laid to rest an unfounded fear of some smaller clubs around the country: "We're *too* small!" Wilderness Road Amateur Radio Club did it. With only 16 members, they carry out all of the activities that any SSC is required to perform.

When Wilderness Road ARC of Berea, Kentucky, became an affiliated club on May 17, 1962, no bells rang to announce the event. After all, 38 other clubs were joining the select group of ARRL-affiliated clubs. There may have been a few delighted smiles of pleasure by club members; it had taken them two years from organization to affiliation.

There really wasn't anything different in becoming an affiliated club in 1962 than there is today. Affiliation has remained the same since 1919. It consists of maintaining 51% ARRL membership and submitting application forms available through Headquarters. In addition, these societies must express sympathy with and allegiance to the aims and policies of the League.

Wilderness Road ARC has maintained their affiliation over the years, but the size of the group has not increased. In fact, the club doesn't even have an "average" number of members. The average affiliated club today has 49 members. (A handful of *very* large clubs were removed from the count because they would skew the statistics: HANDI-HAMS and the YLRL, with over 1000 members each, are just two of these.)

Affiliated clubs are the only clubs that can become SSCs. (The new SSC program is described in an article in Dec. 1982 *QST*. Basically, affiliated clubs are recognized for participating in activities that well-rounded Amateur Radio clubs should be involved in.) The program began in March 1983, and many active clubs are in varying stages of becoming SSCs, from increasing their activities to submitting the forms to their local Affiliated Club Coordinator (ACC).

A Positive Approach

When Wilderness Road ARC was deciding if this was the direction for the club to follow, they had to take the size of the club into consideration. "Are we able to perform all these tasks with our tiny club?" was a recurring question. The overwhelming answer was "yes!" "Since we are a small organization, we considered it appropriate to discuss the SSC program with as many members as possible," a club member recalls. "After all, Special Service Club status carries not only benefits and prestige, but also responsibilities to Amateur Radio and the local community."

When the group decided to go ahead, they began gathering materials to document their active involvement in all the required areas of participation for the program. (Clubs interested in becoming SSCs must establish a meaningful program in six major categories and three miscellaneous activities. The areas of involvement are public relations, emergency communications, training, technical advancement, other activities and three miscellaneous activities.) Clippings had been saved over the years from the local newspaper. The fact that the club Treasurer and ARRL Club Liaison (Chauncey Alcock, W4CDA) writes club activities for the local newspaper also contributes to the activities of the club and the record-keeping task. The club was easily able to document public-relations activity.

Wilderness Road members are on constant emergency-communications standby. They assist the police and fire departments and the rescue squad when the need arises, and have confirming documentation. They conduct amateur classes and assist club members in upgrading. They maintain a technical library and make sure the local library also has access to current publications.

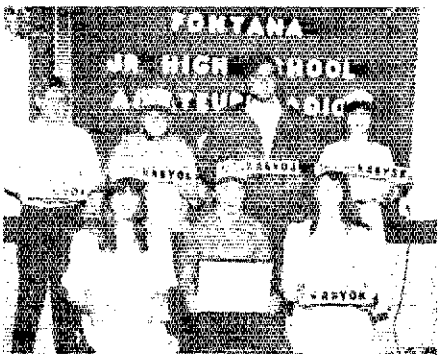
The club holds monthly meetings in the county courthouse and operates 2-meter nets every two weeks. All local amateurs, members or not, are urged to join the meetings and nets. At each meeting, the club treasurer asks anyone wishing to join the ARRL to do so through the club and, therefore, increase the club funds. (One ARRL-affiliated club benefit is the $2 kept by the club for each of its members' ARRL memberships. Write to the Club and Training Department for additional information on affiliated clubs or Special Service Clubs.)

When the local cable-TV company began making waves regarding expansion and changes, the club was on top of the situation. They contacted the city government, explaining some of the interference problems that exist, and requested that the city take strong measures to maintain interference-free channels. In each of these areas, the Wilderness Road members have cited an instance that demonstrates their well-developed capabilities; maintaining their active proficiency represents an ongoing program in each area.

Some of our affiliated clubs have been avoiding the SSC program, saying "I can't" and "We're too small." Look at the Wilderness Road ARC as an example. The *attitude* of your club will determine what you can and cannot do. If your club is small, you may have to work a little harder; but Wilderness Road has proved that it *can* be done. This club is involved in and is a vibrant part of its local community. It is a Special Service Club. Can your club say the same? QST

*Club Program Manager, ARRL

On behalf of the Bismarck (North Dakota) ARK, ARRL Section Manager Dean Summers, KQ0C, donated a set of ARRL publications to the local library. For details on how your club can keep your local library stocked with Amateur Radio books, contact the Circulation Department, ARRL, Hq.



Members of the newly affiliated Fontana (California) Junior High School ARC display the call-sign hats and plaques they received at a celebration dinner last April. Southwestern Division Director W6EJJ presented them with their charter of affiliation. Among the proud members are (back row, l-r) KA6YOI, KA6YOL, KA6YOJ and KA6YSE, and (front row, l-r) Vice President KA6ULW, President KA6RES and Secretary KA6YOK.

SSC Kudos and Contacts

Congratulations to the League's newest Special Service Clubs. These clubs are recognized for extended efforts on behalf of Amateur Radio and service to their communities. For further information on these clubs, contact them at these addresses.

Central Missouri Radio Association, WD0DVG
c/o P.O. Box 283
Columbia, MO 65205
Club Membership — 46

Muncie Area Amateur Radio Club, WB9HXG
c/o P.O. Box 3111
Muncie, IN 47302
Club membership — 90

Putnam Emergency & Amateur Repeater League, KG1O
c/o P.O. Box 501
Carmel, NY 10512
Club membership — 63

Wilderness Road Amateur Radio Club, WD4DZC
c/o 622 Apache Trail
Danville, KY 40422
Club membership — 16

Wilderness Trail Amateur Radio Club
c/o P.O. Box 384
Berea, KY 40403
Club membership — 26

Strays

I would like to get in touch with...

☐ anyone interested in joining the American Export and American Overseas Airlines net. Bill Stempel, W1BBJ, 57 Byram Rd., Greenwich, CT 06830.

☐ amateurs who operate QRP cw, particularly on 6 and 2 meters and on the Novice bands. Fran Dill, Jr., WA3GYW, 12409 Hennessy La., Kingsville, MD 21087.

☐ any foreign amateurs who are stamp collectors. Eldon May, WB7BCW, 1917 Willamina Ave., Forest Grove, OR 97116.

QST congratulates...

☐ Steve D. Smith, WA4VWV, communications supervisor of the City of Des Moines, on being elected to a second term as president of the Iowa Chapter of the Associated Public Safety Communications Officers.

☐ James McCauley, WA0VBF, manager of the Iowa Department of Public Safety Communications, on being elected vice president of the Iowa Chapter of the Associated Public Safety Communications Officers.

☐ Robert M. Popella, Jr., KA3HIE, on receiving the Citizenship Award from the faculty of Belle Vernon (Pennsylvania) High School.

☐ Hovey M. Cowles, W1FKF, of Delaware, Ohio, on receiving the Medal of Merit from the Boy Scouts of America for helping save the life of a coworker who accidentally came in contact with a power line.

☐ Samantha Jo Lilley, KA4PMQ, of Mobile, Alabama, on receiving the $40,000 Miller-Le Jeune Scholarship to Springhill College, Mobile, Alabama.

☐ Charles H. Samuel, K7NWM, of Tigard, Oregon, on receiving the 1983 First Citizen Award from the Tigard Area Chamber of Commerce.

The New Frontier

The World Above 1 Gig

Conducted By Bob Atkins,* KA1GT

New DX Record on 3300 MHz

The following report of the new DX record is from the New Zealand Amateur Radio journal *Break-In*, April 1983.

"On Sunday, March 6, two teams from the Wellington VHF Group succeeded in creating what is believed to be a new world DX record on this band of 545 km.

"Peter Williams, ZL2ARW, and John Yaldwyn, ZL2TRV, travelled to Te Paki trig station at a height of 1019 metres ASL and located just south of Cape Reinga at the tip of the North Island.

"At the southern end of the contact were John Shoreland, ZL2AQE, and John Wysocki, ZL2TWS, who operated from the Stratford plateau on Mount Egmont at 1200 m ASL.

"The contact took place at 9:30 A.M. when signals were heard by ZL2AQE; signals were so weak that initial contact was made on cw by Peter making and breaking one of the connectors in the transmitter line. Shortly after this time, band conditions improved and the claimed contact was on fm, with 5 by 9 signals reported both ways. The claimed distance is 545 km and, subject to confirmation, is a significant improvement over the G4BYV/DB5KS distance of 464 km on September 14 last.

"Equipment line-up at both ends comprised a crystal controlled multiplier chain of 1 watt output to a 4-foot dish; on receive the ZL2ARW team used a GaAs FET preamp to an interdigital converter (VHF comms design). The ZL2AQE team on Stratford fed the input signal straight into the converter without the preamplifier.

"Congratulations to both teams on a very fine effort, especially to Peter, ZL2ARW, and John, ZL2TRV, who drove all the way from Wellington to Te Paki at Cape Reinga, a round trip of 1130 km.

"The ZL2ARW team was equipped with all bands from hf through 2 m, 70 cm, 2300 MHz, 3300 MHz, 5 GHz and 10 GHz; however, of the microwave bands, only contact successful was on 3300 MHz.

"The ZL2AQE team was similarly equipped plus ATV equipment. A good tape recording was made by ZL2AQE.

"Congratulations again."

*103 Division Ave., Millington, NJ 07946

NOISE-FIGURE AND ANTENNA MEASUREMENTS

The ninth annual Eastern VHF/UHF conference was held this year in Nashua, New Hampshire, on May 15. The results of the antenna-gain- and preamp noise-figure-measurements sessions for the bands 902 MHz and up are given in the accompanying tables. From the figures given, it seems the loop Yagi is still the antenna to beat at these frequencies. It is also noteworthy that the worst preamp on 1296 MHz had a 0.78-dB measured noise figure! It just shows how far we have progressed in the last few years (tnx to W1JR for the data).

I also have noise-figure results from the Dayton Hamvention International VHF Conference. This information is from the Southeastern VHF Society newsletter edited by Charles Osborne, WD4MBK. These results seem to be in general agreement with those obtained in New Hampshire.

Dayton VHF Conference Noise Figure Results

902 MHz	*NF (dB)*	*Gain*	*Device*
Lunar	0.35	16.1	Dexel
Lunar	0.52	15.3	MGF1400
KC0W	1.09	15.0	DXL2502
K2VXO	1.37	10.0	MGF1402†
1296 MHz	*NF (dB)*	*Gain*	*Device*
K3MKZ	0.42	15.2	PARABOL†
W1JR	0.57	16.6	ALF1023
WB3LJK	0.62	12.8	PARABOL†
JH1UGF	0.70	14.1	MGF1400
JH1OFX	0.77	14.5	MGF1200
K2VXO	0.77	14.5	MGF1402
WD4MBK	0.77	10.8	NE72089
WB0TEM	0.79	16.4	MGF1402
WB4IZR	0.85	10.9	NE72089
WD4MBK	0.90	12.6	MGF1412
WB0TEM	1.00	16.2	MGF1402
KC0W	1.07	14.1	
K2UYH	1.10	24.0	1503
JH1BRY	1.10	18.7	NE72089
WB0TEM	1.10	12.4	MGF1402
WB0TEM	1.11	11.3	MGF1402
JA1VDV	1.26	15.0	NE388
W4VHH	1.37	11.4	NE72089
JR4BRS	1.49	12.6	MGF1400
K3QCQ	1.50	11.1	NE72089
K3WHC	1.66	14.1	MGF1402
JH1GYE	1.66	9.4	MGF1200
JR4BRS	3.07	15.8	MGF1400

†Commercial manufacturer

Antenna-Gain Measurements, 9th Eastern VHF/UHF Conference

902.1 MHz†		
W1JR	33-element loop Yagi 12 ft long	15.8 dBd
W1EJ	33-element "Super-Yagi" 11 ft long	14.2 dBd
W1EJ	15-element Yagi with 1/2 NBS boom correction	12.5 dBd
W1EJ	15-element Yagi with full NBS boom correction	9.7 dBd
W1EJ	EIA gain standard	7.7 dBd††
1296 MHz†		
W2VC	45-element W1JR-design loop Yagi	20.7 dBi
W1JR	45-element K9KFR-built loop Yagi with supporting braces	20.2 dBi
W1JR	45-element K9KFR-built loop Yagi without supporting braces	20.1 dBi
W1JR	38-element loop Yagi	19.3 dBi
W1XP	38-element loop Yagi with reflector screen	18.6 dBi
G3BVU	29-element loop Yagi	17.0 dBi
W1XP	33-element W1EJ-type super Yagi	16.7 dBi
AF1T	19-element Yagi scaled from 432 K2RIW Yagi	15.6 dBi
N1BWT	Reference horn	15.4 dBi††
G3BVU	15 over 15-element J-beam skeleton slot	12.7 dBi
AF1T	17-element NBS 4.2-wavelength Yagi	12.6 dBi
W1XP	EIA standard	9.9 dBi
W1JR	Polrad gain horn	9.6 dBi
N1DM	Quad helix, 11 elements per quad per K6UQH	7.7 dBi

†The antennas measured on 902.1 MHz are referenced to 7.7 dB over a dipole EIA standard gain antenna. The 1296-MHz antennas are referenced to a standard gain horn calibrated in decibels above isotropic. To compare the antennas, add 2.15 dB to the gain over a dipole for isotropic, or subtract 2.15 dB from the 1296-MHz antennas to obtain gain over a dipole.

††Reference standard

Noise-Figure Measurements, 9th Eastern VHF/UHF Conference

Call	*Preamp/Converter*	*Gain*	*Noise Figure*
902 MHz†			
W1JR	ALF 1023 GaAs FET PA	13.2 dB	0.40 dB
K3MKZ	Lunar D432 GaAs FET PA	14.7 dB	0.62 dB
K3MKZ	Lunar D432 GaAs FET PA	14.3 dB	0.69 dB
K2VXO	MGF 1402 GaAs FET PA	8.6 dB	1.35 dB
WA1TFH	2X ANZAC AM 153	23.0 dB	1.98 dB
W1JR	MRF 901	10.7 dB	2.70 dB
1296 MHz†			
W1GAN	MGF 1400 PA GaAs FET PA	16.8 dB	0.15 dB
K3MKZ	Parabolic MGF 1402 GaAs FET PA	13.9 dB	0.32 dB
K3MKZ	Parabolic MGF 1402 GaAs FET PA	14.8 dB	0.41 dB
NP4B	MGF 1412/1402/1412 GaAs FET PA	34.4 dB	0.52 dB
W1JR	ALF 1023 GaAs FET PA	15.8 dB	0.52 dB
K3MKZ	Parabolic MGF 1402 GaAs FET PA	12.7 dB	0.54 dB
NP4B	Converter with MGF 1412, 1402 and 1412 GaAs FET	27.0 dB	0.58 dB
K2VXO	MGF 1402 GaAs FET PA	14.3 dB	0.78 dB

†HP 8970 with corrected noise figure

Amateur Satellite Program News

Conducted By
Bernie Glassmeyer,*
W9KDR

AMSAT OSCAR-10 IS IN ORBIT

The long-awaited Phase III satellite has been launched (see page 52 for details). The spacecraft looks "very healthy" and many listeners are surprised how easy it is to monitor the beacon signals. The 145.810 MHz General-beacon status messages on the hour and the half hour are very helpful sources of information about satellite activity.

During August the SSC (Special Service Channel) will be activated (see page 48, *QST* May 1983), beginning a new information era. Daily news about Amateur Radio and the Amateur Radio Satellite Service will be available for nearly 16 hours each day to anyone in the northern hemisphere with a 2 meter SSB radio.

While we improve our communication capabilities and extend news service on a world-wide, real-time basis, Amateur Radio will become a leader in personal space communication. If you have any doubt about the exciting pages of history now being written, just tune in the action — AMSAT OSCAR-10 speaks for itself. To take an active part in this new era, we recommend that you join AMSAT and review the 1983 April and May *QST* articles about Phase IIIB.

AMSAT Needs Your Membership

AMSAT is a non-profit, tax-exempt 501(c)(3) scientific membership organization open both to radio amateurs and interested non-amateurs. AMSAT encourages the participation of all interested individuals in its activities regardless of membership, and invites licensed Amateur Radio operators of all countries to engage in communications through AMSAT's series of OSCAR satellites.

AMSAT's operating funds are derived largely from donations, membership dues and grants from such organizations as the ARRL, the ARRL Foundation and the IARU. Originally, AMSAT spacecraft construction and associated program management were centered in the Washington, DC area; as the program became more international, AMSAT affiliate organizations around the world began to share in these activities.

To become a member of AMSAT and receive *Orbit* magazine, send $24 ($26 outside North America) per year or $600 for Life Membership to AMSAT Hq., 850 Sligo Ave., Silver Spring, MD 20910. AMSAT welcomes VISA and MasterCard. The Phase III era has begun; your membership will ensure its success.

AMSAT Membership Drive

AMSAT has announced an aggressive membership drive. AMSAT members are urged to sign up their friends and neighbors, bringing them into the fold to be a part of this new communications era and to support the organization. In the six-month period from July 1 to December 31, the AMSAT member with the highest point total (one point for signing up an annual membership, two points for societies and three points for life memberships) will be awarded a new Yaesu FT-726R OSCAR transceiver! AMSAT, with currently just under 4000 members, is shooting for 7777 members by the end of the year. ARRL wishes AMSAT the very best of success and encourages everyone to support the organization.

Space Shuttle Amateur Radio Operation

Progress is being made at a steady pace and everything is on schedule for the September 30 flight of STS-9. See page 50 for the operating plan. The most recent event was the selection of equipment for the mission. Interested parties who submitted proposals were: Ten-Tec, Icom, Kenwood, Yaesu, Henry Radio and the Motorola Amateur Radio Club. With the joint approval by AMSAT and ARRL, the Motorola Amateur Radio Club proposal was selected on June 15: an MX300S series "Handie-Talkie" that was donated by Motorola. This radio will not be a production model, but one that will be modified and handbuilt by the Motorola Amateur Radio Club.

Three radios will be assembled for the mission. The first "training radio" will be delivered to Johnson Space Center for a training session so that Dr. Garriott can familiarize himself with its operation before the flight. The second and third "flight models" will be delivered on the 1st and 15th of August. Additional information about the mission will be announced in September *QST*. Get ready for the "event of the decade" — the first manned Amateur Radio operation from space.

*OSCAR Program Manager, ARRL

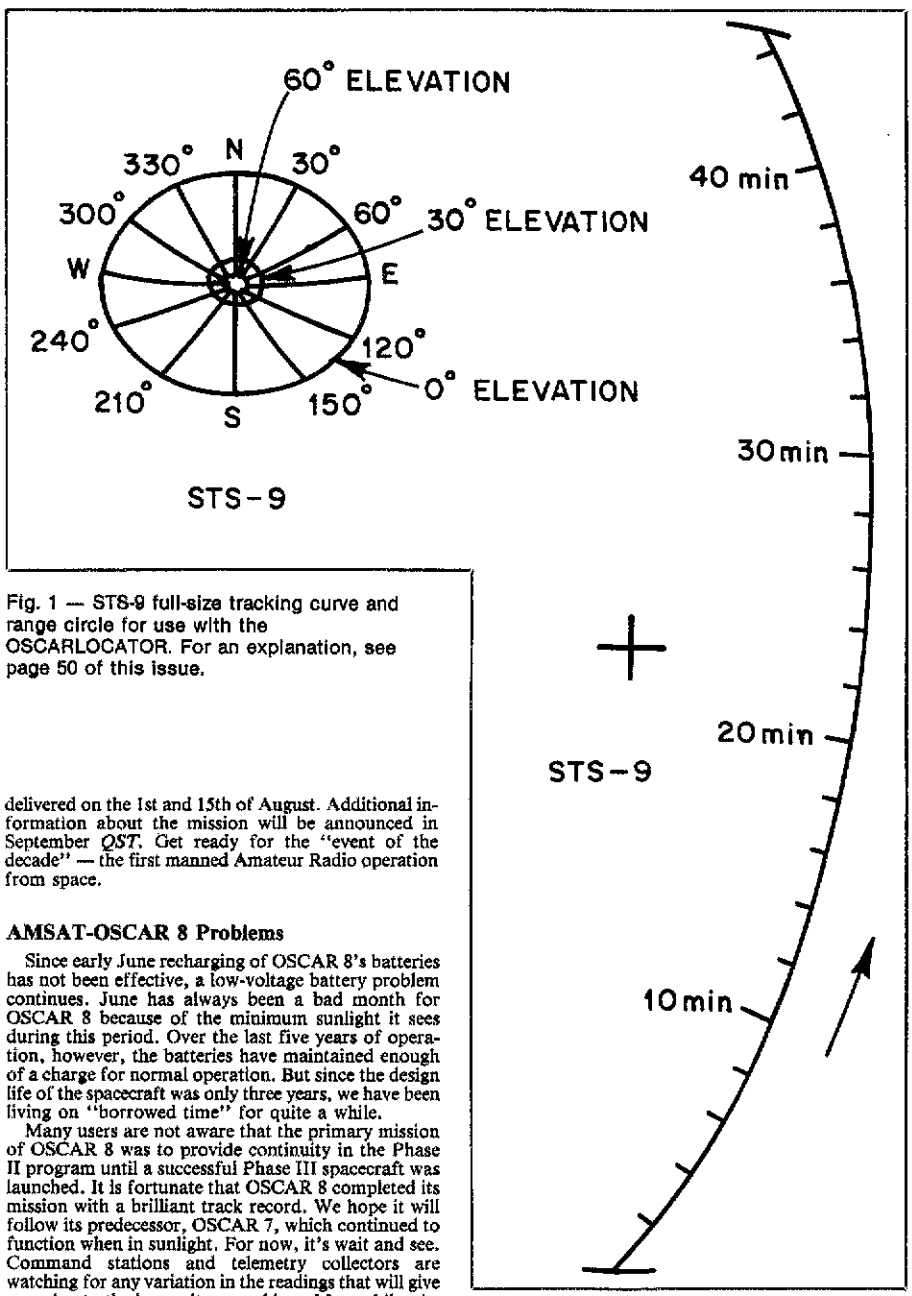


Fig. 1 — STS-9 full-size tracking curve and range circle for use with the OSCARLOCATOR. For an explanation, see page 50 of this issue.

AMSAT-OSCAR 8 Problems

Since early June recharging of OSCAR 8's batteries has not been effective, a low-voltage battery problem continues. June has always been a bad month for OSCAR 8 because of the minimum sunlight it sees during this period. Over the last five years of operation, however, the batteries have maintained enough of a charge for normal operation. But since the design life of the spacecraft was only three years, we have been living on "borrowed time" for quite a while.

Many users are not aware that the primary mission of OSCAR 8 was to provide continuity in the Phase II program until a successful Phase III spacecraft was launched. It is fortunate that OSCAR 8 completed its mission with a brilliant track record. We hope it will follow its predecessor, OSCAR 7, which continued to function when in sunlight. For now, it's wait and see. Command stations and telemetry collectors are watching for any variation in the readings that will give us a clue to the low-voltage problem. Meanwhile, the spacecraft is operating in Mode A and we ask that the transponder *not* be used.

All attempts to recharge the battery have failed so far, but command stations are trying to improve that situation. Since the spacecraft has been heard during periods of no sunlight it does indicate that the battery is still holding some charge. The battery will eventually fail; that is a fact of life. We hope the battery condition will allow current to flow from the solar panels to the transponder permitting use during periods of illumination by the sun, like OSCAR 7. Getting a charge into the battery will help the situation, and as soon as the spacecraft condition improves we will announce the status and any new operating schedule.

Monthly Listings

☐ *ASR* (Amateur Satellite Report) is available for $22 ($30 overseas) for 26 issues (1 year) from Amateur Satellite Report, 221 Long Swamp Rd., Wolcott, CT 06716.

☐ 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 OSCAR locator package (satellite plotters and details) is now available for $7 U.S., $8 elsewhere.

Public Service

Conducted By Robert J. Halprin,* K1XA

Rally 'Round Amateur Radio!

Amateur Radio operators have been involved in community and public-service support activities for many years. Weekends spent furnishing communications (usually via 2 meters) for walk-a-thons, bike-a-thons, joggers, parades and many other events have been prime vehicles for practicing the fine art of public service and emergency preparedness. Handling the organization, logistics and the sometimes "fly-by-the-seat-of-the-pants" coordination is good training ground for the members of various clubs and groups. Once hams become involved in these activities and feel their feet are good and wet, they tend to look for bigger and more exciting mountains to climb in the public-service arena.

Hams here in the Pacific Northwest, for example, provide communications support for the Reno National Air Races, National Hydroplane Racing and other high-energy, and usually scary, activities. A certain breed of guys and gals love to hurtle themselves through the daylight and hours of darkness strapped to high-speed projectiles (called rally cars). The object is to outguess maps, clocks and elements of weather so they cover a certain piece of countryside in the shortest time without totally destroying themselves or their car!

Starting out on a small scale about seven years ago, Washington State hams joined with rally enthusiasts and formed the nucleus of a very efficient radio network to assist major nationally sanctioned road rallies. The professional drivers and rally officials have given excellent marks to the amateurs and the elaborate communication network that utilizes almost (it seems) every Amateur Radio band in existence.

Three of the approximately 150 Amateur Radio operators who provide "front-line" communications for road rallies in the state of Washington are (l-r) WB7UEU, ARRL Northwestern Division Vice Director W7JIE and KA7BNS. *(K7CHG photo)*

The state capital, Olympia, and Thurston County were the recent target areas for the annual Nor' Western and Olympus Pro Rallies. April 8-17 marked a full week of Rally Week Northwest that started with high-speed action through the streets of the state capital (the streets were secured from regular traffic!), and was capped by the action using part of the local airport for the rally course.

Radio communications coordinator again this year was Steve Dightman, K7SSC, who led a dedicated group of about 150 hams from six counties. These highly skilled operators put in a total of nearly 1600 hours of practicing their art of communications from nice, warm ham shacks or while sitting in mountain snow with mobile units during the wee hours of morning darkness.

The radio network provided information on 53 cars at numerous check points, handling logistical support needs for rally officials, emergency medical response needs, reports on the status of the course or emergency-closure notification of the course if needed. Believe me, you don't want to meet a rally car in the darkness at 100 mph!

Some brave (crazy) hams were taken for demonstration rides so they could better understand the relationship of rally course geography and radio network planning. I soon discovered that my friendly driver was a deranged kamakazi pilot who thought our car should have wings.

Cooperation and Appreciation

Each year, rally organizers treat the hams to a terrific dinner to show how much they appreciate and understand the valuable service Amateur Radio provides. If you think this kind of "front-line" communications service is your cup of tea, contact Steve for pointers. If you live in the Pacific Northwest, you might even volunteer. I'm sure Steve can find a place for you, as he is already planning next year's action.

I want to thank Wayne Moddison, K6DOW, Washington Section Special Event Public Information Assistant, for helping with this story. And thanks to K7SSC and the 150 hams who made the story possible. — *John H. Brown, W7CKZ, ARRL Washington Section Public Information Officer*

AMATEURS ASSIST NWS IN LOUISIANA FLOOD

During early April, most of east and southeast Louisiana was inundated with very heavy rainfall. The principal area affected was near and along the Mississippi River, extending both northward and eastward well into Mississippi. With some locations receiving as much as 10 inches of rainfall in less than 12 hours, flooding was widespread.

On April 7, the main telephone exchange in New Orleans was flooded, with telephone service being disrupted over a large part of southern Louisiana. Although still operational, the National Weather Service Forecast Office, River Forecast Center and Satellite Field Service Station at Slidell, Louisiana, were isolated from their users because of the telephone line failure. NWS offices in Louisiana and adjacent states, as well as the National Hurricane Center in Miami, immediately assumed backup responsibilities for the services provided by the Slidell offices.

While a few local telephone lines remained in service, the only communications link between Slidell and the backup offices was an emergency hurricane radio system oprated by the NWS. Designed for another purpose, this system could not be relied upon to handle the volume of information that needed to be exchanged. Within minutes of the communications failure, Amateur Radio operators moved into action to establish communications between the NWS offices involved and with the Regional Headquarters in Fort Worth. Other amateurs volunteered to observe critical river forecast points and report stage heights to the River Forecast Center at Slidell. This service was provided for several days after normal communications were restored.

While amateur assistance with backup communications has been provided to individual NWS offices in the past, this was the largest multistate operation ever conducted. The highly efficient and professional manner in which the amateurs performed reflected very favorably on the individuals involved, and the Amateur Radio community as a whole. The backup procedures could not have been accomplished in such an effective manner without the exemplary assistance provided by the Amateur Radio Service. Without a doubt, the loss of lives would have been much greater. — *Larry E. Mooney, WB5PWY, Regional Preparedness, Meteorologist, NWS Southern Region*

HAM RADIO ASSISTS RESCUE

On Friday morning, April 15, Terry Surface, KB4EKB, experienced the value of having a 2-meter portable rig available at all times.

Terry had been a Technician class licensee only three weeks when he was at the right place at the right time to assist the victims of an accident by providing emergency communications. He works as the director of maintenance for a flying service based at Mercer County Airport in Bluefield, West Virginia, and was at his work location in one of the hangars that Friday morning. At about 11:30 A.M., he heard the crash of an aircraft that he knew was coming in for a landing. He and two other men who were nearby jumped into a truck and drove to the end of the runway from which the sound of the crash came. Terry had thoughtfully grabbed his 2-meter hand-held when he left the hangar. The trio began searching through the wooded area in the dense fog for the downed aircraft within minutes. Terry was at the scene of the crash, which was located about three-fourths of a mile from the end of the runway. Both the pilot and his passenger were concious but badly injured. Terry quickly called over the Bluefield 145.49 repeater for someone to make a call for emergency personnel to respond. K8WEY responded and placed the call.

By this time, the other two men arrived at the scene with the truck. They loaded the victims into the truck and drove to the airport terminal building, where the Bluefield Rescue Squad arrived within a couple of minutes. The rescue personnel administered emergency treatment and transported the victims to the hospital, where they recovered and were released within a week. Terry's quick action and the ability to contact the emergency crews quickly may have contributed to saving the two lives and speaks highly of his being a valuable asset to his community and the ranks of Amateur Radio.

We, as Amateur Radio operators, should all be aware of our great reaches with our communications networks that we have built and should always be prepared to assist if and when the time arises. Terry and his wife Judy, KB4EML, are both newly licensed hams. As EC of Smyth County, Virginia, I am proud to have them as a part of the local ARES group. — *Gary N. Sutherland, KM4X*

FAMILY TRAGEDY: EDMONDS, WASHINGTON

On a recent trip to Edmonds, Washington, a family tragedy occurred. Amateur Radio played a big part in this tragedy, which I would like to see publicized so that others may benefit from this experience. Perhaps it may save someone's life some day.

Intending to visit my brother-in-law in Edmonds for his wedding, my wife and I got a little more than we had bargained for. On April 11, 1983, as my brother-in-law, one of his neighbors and I were standing in the driveway talking, we heard a loud zap. Looking in the general direction of the sound, we saw a cloud of smoke rise from above a tree across the street. The neighbor

*Deputy Communications Manager, ARRL

was the first to announce that my nephew was up in the tree and got electrocuted by a 12-kV power line that was strung though the tree. Also arriving at the tree and seeing the 13-year-old boy lying on some branches 25-30 feet above the street in contact with the power line left all three of us in shock. After keeping my brother-in-law from climbing the tree, the neighbor ran into his house to call for the police, fire dept. and ambulance. Having my 2-meter hand-held with me, I broke a conversation on the 32/92 repeater, K7SZC/R in Everett, and asked for anyone who could make the necessary call. K7GOV answered; I gave him the info needed, he placed the call and all three Depts. had their units on the scene within 2 minutes. Just then the neighbor returned from his house announcing that the police had already received a call from a ham.

Even though it was too late to do my nephew any good, the swiftness with which K7GOV made the call is to be commended. News media personnel also arrived on the scene (the story of the incident was on every Seattle-area TV station broadcast). Unfortunately, the involvement of Amateur Radio never did surface in these broadcasts, primarily because the family, neighbors and I were in too great of a shock to talk with reporters. After all, how often do you have something like this happen before your own eyes and feel so helpless knowing there isn't a thing you can do?

For the remainder of that week, I tried getting in touch with K7GOV on this repeater, but to no avail. My thanks also goes to the gentlemen who were using the repeater and allowed me to break their convesation.

Three lessons can be learned from this experience:

1) When using a repeater, keep the transmissions short so someone can break in for emergency use, which was the case on this repeater.

2) Anyone having trees in their neighborhood with power lines routed through them should call your local power company, have them either come out and remove enough branches from the lower part of the tree to where a youngster cannot climb, or else have the entire tree removed.

3) If you own a hand-held rig, make it a point to take it everyplace you go. You never know when you'll need it. — *W. Vern Hajek, K6UGS, Concord, California*

PUBLIC SERVICE DIARY

☐ Rockcastle County, Kentucky — April 25-26. Members of the Wilderness Trail Amateur Radio Club, among them KI4B, WD4EKZ, WD4IUM, KA4BOK and WD4EYR, provided emergency on-site communications for a cave rescue. KA4MZY and KA4SAA provided liaison to the Kentucky Emergency Net on hf. The club repeater, KI4B/R (147.98/38), was the primary outlet for communications during the emergency, and WTARC received widespread praise for its efforts. (KA4SAA)

☐ Owensboro, Kentucky — April 30-May 1. The Owensboro Amateur Radio Club was called upon to help in the evacuation of a local nursing home following severe flooding. The amateurs provided communications while 90 patients were evacuated successfully. Local amateurs also furnished communications for the Kentucky Department of Emergency Services and the National Weather Service. (W4OYI, Vice Director, Great Lakes Division)

☐ Weedville, Pennsylvania — May 7. A fire was spreading through a forested area near the QTH of WB3DCZ, who reported the flames to N3DEO over the Dubois repeater, K3PS/R. Although fire towers were in use in the area, the fire had not yet been spotted. N3DEO notified the Bureau of Forestry and the Weedville Fire Company, both of which arrived at the fire within minutes. Half an hour after WB3DCZ's initial call, the fire was declared to be under control. (N3DEO)

AMATEUR RADIO EMERGENCY SERVICE REPORTS

☐ Decatur, Illinois — May 1. The local 2-meter emergency net, directed by Macon County EC KB9MR, was already taking severe-weather reports when a tornado touched down near the business district of Decatur. W9AES, a Red Cross Disaster Communications officer, advised that a communications link should be established between the RC building and the ESDA headquarters. W9OK went to the RC office with his gear and set up a vhf station, while N9DDA and W9AES operated from the ESDA Hq. When the RC operators began having trouble receiving the mobile unit, essential radio traffic was rerouted to the link on the K9HGX repeater until weather conditions cleared. (W9OK)

☐ Atlanta, Georgia — May 20-24. Georgia ARRL Leadership Officials, under the direction of Affiliated Club Coordinator (ACC) WA4ABY, organized Atlanta area amateurs for participation in the National Convention of the American Red Cross. The amateurs set up a display and supplied an outgoing message center for convention visitors. Special convention messages and forms were designed and supplied by WA4ABY along with signs announcing the message service. Messages were solicited from attendees and were sent over the 2-meter N4OD repeater to hams in the Atlanta area at their home stations. Messages that had not been passed by closing time each day were taken home by various hams to be sent on hf NTS nets. This was the first time that many of the hams had passed traffic on a REAL NTS net. (Approximately 150 messages were entered into the system by Convention attendees.)

One of the most important aspects of the hams' involvement with this convention was also very unexpected. Many representatives of the various Red Cross chapters approached us and described their liaison with local hams and told us how much hams were an integral part of the Red Cross emergency planning and operations. Especially grateful were the folks from states that have severe-weather problems (tornadoes, etc.), such as Indiana, Kansas and Ohio.

This convention was extremely important for amateurs, as many new contacts were made and old ones reaffirmed. Amateurs should make certain that all these kinds of activities are participated in and represented by Amateur Radio. (WB4HXE, SEC Georgia)

☐ Nelsonville, Ohio — June 8-9. A tanker truck carrying sulfuric acid began leaking along a major highway in the downtown section of Nelsonville, forcing the evacuation of about 2500 residents. After the American Red Cross set up shelters for the evacuees, nine local amateurs provided communications among the Athens County Emergency Operations Center (EOC), the shelters, the sheriff's office and the Salvation Army officials. An emergency net was set up on the WB8BSR repeater, while Welfare traffic and nonpriority interagency traffic were passed on W8VKD/R during the 12-hour-long crisis. (W8KVK, EC Athens Co.)

COMMUNICATIONS SERVICE OF THE MONTH

Mobile radios filled the communications gap when the telephone service of the small, independent Central Utah Telephone Co. was interrupted by the mud slide in Spanish Fork Canyon, west of Thistle, Utah. Mobile equipment was operated by radio amateurs, public safety agencies and by Mountain Bell. Ironically, the natural forces that had snapped the telephone cables were increasing the urgency and the potential volume of communications in and out of the canyon. However, the slide had also deprived Thistle of electrical service. Therefore, radio equipment brought into the canyon needed its own portable or mobile sources of electrical power.

The volunteer hams of the Utah County Sheriff's Communications Auxiliary Team (SCAT) were mobilized at about 9 A.M. on Saturday, April 16, by Lt. Gary Clayton of the Sheriff's Office of Emergency Management. Rick Whittaker, WB7RPF, of Orem, set out in his truck, packed with radio equipment and survival gear, on the 132-mile detour through Nephi and Manti to the isolated town of Thistle, arriving there shortly before noon. Mike Griffith, KFØQ, proceeded into the mouth of the canyon to the west side of the mudslide to assist where Lt. Clayton had parked his truck as a temporary command post. David Martin, WA7FFM, of Provo, moved to the Sheriff's Dispatch Office between Provo and Springville.

Jack Crannell, WB7BEG, at home in Provo, warmed up his hf and vhf rigs and pointed his BCAM toward Spanish Fork Canyon. Jack served as control station of the emergency network on Saturday. The amateurs of SCAT, familiar with the Sheriff's procedures, provided the most consistent two-way voice communication between the slide area and the Utah and Salt Lake Valleys from Saturday morning through Monday morning, by which time Mountain Bell had brought temporary telephone lines to the new command post at the Husky station west of the slide area.

These organized hams provided emergency mobile telephone service to officials of Utah County, the State of Utah and the Rio Grande Railroad, observers from the Union Pacific Railroad and the Red Cross by relay through a repeater atop Lake Mountain, west of Utah Lake. This repeater is owned and maintained by the Utah Amateur Radio Club, and allowed dialing directly to telephones in either the Salt Lake or Utah County exchanges of Mountain Bell. The amateurs served in the field for long hours in spite of initially inadequate drinking water, food and sanitation, especially on the remote eastern side of the mudslide.

Direct vhf mobile communications with the outside world were spotty because they propagated over paths that were within line-of-sight or nearly so. Thus, they were often obstructed by the walls of the canyon. Voice signals escaping from some locations in the canyon were weakened and their modulation was distorted. By trial and error, the mobile hams found successful "hot spots" that might be only a hundred yards from a "dead spot." Luckily, a parking place was found in the town of Thistle that allowed relaying through the Lake Mountain repeater. Thus, the hams of SCAT were able to provide emergency telephone service for Thistle.

In addition to vhf operation, 7.260 MHz was used to communicate with fixed stations in Provo or, later, in Kaysville (NA7G). The fixed stations forwarded emergency messages and obtained replies by making local telephone calls.

On Sunday morning, James R. Brown, NA7G, moved his hf and vhf operations to the State Emergency Operations Center (EOC), located beneath a forest of antennas in the Sunnyside Armory in Salt Lake City. Here he was assisted by two relief operators from the Utah Amateur Radio Club. The call sign NA7G was used from this location, as well as from Brown's home or vehicle, in the interest of continuity.

Later, Mountain Bell brought two temporary telephone lines into the command post for use by officials. But even then, the volume of message traffic with the canyon continued to occupy the Amateur Radio channels.

On Sunday, Ollie Branam, WA7RZO, of Provo, another member of the Utah County SCAT, drove his radio-equipped truck into Thistle from the southeast. Here he helped to communicate information for the evacuation of residents to the town of Birdseye, upstream from Thistle. Meanwhile, a helpful resident of Thistle monitored the relentless approach of the flood waters toward Ollie's escape route.

By 4:30 P.M. on Sunday, April 17, flood waters rising behind the mudslide had swallowed most of the old depot at Thistle and all but five of the houses. The water was now a foot deep over the second bridge south of town, which was Ollie's only way out. After transmitting a final status report, acknowledged by NA7G in Salt Lake City, Ollie drove gingerly out over the submerged bridge to safety. — *Richard B. Leining, W7DML, Salt Lake City, Utah*

ARRL SECTION EMERGENCY COORDINATOR REPORTS

☐ For May, 44 SEC reports were received, denoting a total ARES membership of 22,931. Sections reporting were: AK, AB, AZ, AR, CO, CT, EMA, IL, IN, IA, KS, KY, LA, ME, MI, MN, MS, MO, NE, NH, NLI, NC, NFL, NTX, OH, OK, ON, ORG, PAC, RI, SDG, SJV, SC, SD, SFL, STX, TN, VA, WA, WV, WMA, WNY, WPA and WI.

NATIONAL TRAFFIC SYSTEM

Congratulations go out to WA4CCK who has succeeded WD4CNQ as manager of 4RN/c2. Also, congrats to RN7/c2 manager WB7WOW on completing his tour of duty with the Navy and retiring (finally!) after more than 20 years of service.

May Reports

1	2	3	4	5	6	7
Cycle Two						
Area Nets						
EAN	31	1115	40.0	.827	97.8	
CAN	31	1049	33.8	.648	100.0	
PAN*	57	1060	18.6	.537	90.9	
Region Nets						
1RN	53	274	5.2	.294	75.3	100.0
2RN	62	397	6.4	.365	89.3	100.0
3RN	31	264	8.5	.429	96.8	100.0
4RN	62	756	12.2	.465	68.0	100.0
RN5	62	744	12.0	.415	84.9	100.0
RN6	62	605	9.8	.352	92.7	92.7
RN7	93	1202	12.9	.865	84.5	91.9
8RN	62	438	7.1	.331	97.8	100.0
9RN	62	429	6.9	.346	100.0	100.0
TEN	31	511	16.5	.474	87.5	100.0
ECN						87.1
TWN	62	225	3.6	.284	70.0	88.7
TCC						
TCC Eastern	118[1]	715				
TCC Central	84[1]	416				
TCC Pacific						
Cycle Four						
Area Nets						
EAN	31	1926	62.1	1.560	94.6	
CAN	31	965	31.1	1.004	100.0	
PAN	31	1354	43.7	1.104	98.9	
Region Nets						
1RN	62	712	11.5	.524	98.4	96.8
2RN	94	658	7.8	.568	92.5	83.9
3RN						100.0

4RN						100.0
RN5						100.0
RN6	62	785	12.7	.617	100.0	100.0
RN7	62	1269	20.5	.824	95.4	98.4
8RN	56	399	7.1	.428	89.0	87.1
9RN	62	493	8.0	.473	99.6	100.0
TEN	58	289	5.0	.287	73.0	100.0
ECN						100.0
TWN	56	459	8.2	.390	80.2	98.4
TCC						
TCC Eastern	122[1]	777				
TCC Central	58[1]	343				
TCC Pacific	116[1]	963				
Sections[2]	7383	31,558	4.3			
Summary	8749	53,150	6.1			
Record	10,319	50,268	18.4			

*PAN operates both cycles one and two.
[1]TCC functions not counted as net sessions.
[2]Section and local nets reporting (254): APSN ATN (AB), ACN MG (AK), ACN ATEN HARC (AZ), BCEN (BC), NCN NCTN SCN/1 SCN/2 SCN/V SVTN (CA), DTN SEN (DE), BEN DEN ENMC FMSN FMTN FPON GN LCEN NFPN PBTN PEN PRVAN QFN QFNS SEFTN SPARC SVTN SWFTN TPTN (FL), CIARES ISE ISN ITEN JCEN PCARES TLCN (IA), ILN ITN (IL), ICN ITN QIN (IN), CSTN KMWN KPN KSBN KWN QKS QKS-SS (KS), 3ARES 4ARES 5ARES 11ARES BARES CARN KEN KNTN KRN KSN KTN KYN KYPON MKPN PAEWTN TSTMN WTEN (KY), CI2MN EM2MN EMRI EMRIPN EMRISS HHTN (MA/RI), MEPN MMN MTN WRIN (MB), AEN CMEN MPSN OXRACES PTN SGN (ME), MACS MITN MNN QMN UPN (MI), MNAWTN MSN MSPN MSSN PICO (MN), ACE CMEN HBN IFAEM JCEN MEOW MOKAN MON MOSSB MTTN NARN NEMOE RRBN SARN SLARES (MO), MTN (MS), CEN CMN CNCTN PCTN (NC), CN CSN (NC/SC), BVAN CCTMN ENARES MNARES NCHN NE40 NE75 NHN NMPN NQCWA NSN PV2MN SBARES TCARES WNN (NE), HCATEN MCN NJM NJN NJPN NJSN OBTTN SJVN TCETN (NJ), NSN (NV), CDRN CNYTN EPN HVN NCVHFTN NLI NLIPN NYPON NYS NYS/M OCTEN SCVHFTN SDN STAR WDN (NY), ALERT BN BNR BRTN BSSN HCARES LCNWOARES LCTN MCN NCTW NEON OSN TATN VWN (OH), NOSN OPEN OLZ ONON OTN OTWN QCWA STN (OK), KTN OLN OPN OSN1 OSN2 OSND TIN (ON), BSN ORARES OSN PDXARES PTTN SOFM WCN (OR), NWPA2MTN WPA WPA2MTN (PA), PTN (PAC), QSN WQVUARESN (PQ), GPD2MN LC2MN SCNTN SCSSB (SC), SDEEN SDEN SDN SDTIN SDWN (SD), TNCW TNPN TNVN TSRN (TN), DFW HATN TEX TSN TTN (TX), BUN DCN UCN (UT), STARES SVEN VLN VN VSBN VSN VTN (VA), VTN (VT), EWTN NTN NWSSB PSTS SCARES WARTS WSN (WA), BEN BWN NWTN WCWTN WIN WNN WSBN WSSN (WI), WVARN WVFN WVMDN WVN (WV).

1 — NET
2 — SESSIONS
3 — TRAFFIC
4 — AVERAGE
5 — RATE
6 — % REP.
7 — % REP. TO AREA NET

Transcontinental Corps

N2CER decided to hand over the no. 1 slot for TCC-E/c2 to AF8V. Thanks to Ed for his help, and congratulations to Len. Kudos and thanks go out to WA2SPL for his help with the Groton (CT) Expo. A TCC-E/c2 certificate was awarded to WD8LRT.

1	2	3	4	5
Cycle Two				
TCC Eastern	124	95.2	1434	715
TCC Central	93	90.3	855	416
TCC Pacific				
Summary	217	92.7	2289	1131
Cycle Four				
TCC Eastern	155	78.7	1555	777
TCC Central	62	93.5	665	343
TCC Pacific	124	93.5	1906	963
Summary	341	88.6	4126	2083

1 — AREA
2 — FUNCTIONS
3 — % SUCCESSFUL
4 — TRAFFIC
5 — OUT-OF-NET TRAFFIC

TCC Roster

The TCC Roster (May) *Cycle Two* — Eastern Area (AF8V, Director) — AA4AT N1BHH N2CER K1EIC VE3GOL WB3GZU KO2H WA2HEB WB1HIH VE3HTL WA4LJI WD8LRT AH2M W8PMJ WB4PNY W1QYY W2RQ KB3UD AF8V AK1W N2XJ W1XX WB8YDZ. Central Area (W9JUJ, Director) — N5AMH N5AMK K5BNH N5BT N5CRU W5CTZ N5DFO WØFRC W4JL W9JUJ K5KJN W5KLV KD5KQ KA4MZY W9NXG KA4SAA KB5TC WB9WGD WF4X WB5YDD. Pacific Area (WØHXB, Director) — NI6A KT6A NØACW N7AFZ N6ANL VE6CHK N7CSP NØCXI KU6D W7DZX WØEJD KB7FE W7GHT N6GIW K6HAD WØHXB KM6I W5JOV KBØMB WBØMTA K6OWA WA7OYI KF7R ND5T W7TGU WB7TQF KV5U K6UYK W7VSE WB7WOW KM7Z. *Cycle Four* — Eastern Area (W2CS, Director) — W3ATQ VE3AWE W3BBN KI3C WA4CCK W2CS VE3CYR WB2EAG W1EFW K1EIR W2FR WD4FTK W2GKZ VE3GOL WB3GZU KO2H KN1K N4KB K2KIR K8KQJ AH2M WB8MTD N1NH K8OZ W8PMJ WB4PNY W3PQ W1QYY K3RZR WA2SPL KA1T W4UQ VE1WF WB8WKQ 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) — ADØA WDØAIT KN7B KØBN KCØD KØDJ W7DZX N2EC W6EOT W7EP W7GHT WA7GYQ WØHXB WA7KHE K7KSA W7LCF W7LG W7LYA KAØNLI ND5T WA7TEH W7VSE W6VZT VE6ZK.

Public Service Honor Roll May 1983

This listing is available to amateurs whose public service performance during the month indicated qualifies for 60 or more total points in the following nine categories (as reported to their SM). Please note maximum points for each category: (1) Checking into cw nets, 1 point each, max. 30; (2) Checking into phone/RTTY nets, 1 point each, max. 30; (3) NCS cw nets, 3 points each, max. 12; (4) NCS phone/RTTY nets, 3 points each, max. 12; (5) Performing assigned NTS liaison, 3 points each, max. 12; (6) Delivering a formal message to a third party, 1 point each, no max.; (7) Handling an emergency message, 5 points each, no max.; (8) Serving as emergency coordinator or net manager for the entire month, 5 points, max. 5; (9) Participating in a public service event, 5 points, no max. This listing is available to Novices and Technicians who achieve a total of 40 or more points. Stations that are listed in the Public Service Honor Roll for 12 consecutive months, or 18 months out of a 24-month period, will be awarded a special PSHR certificate from Hq.

328
KUØG
203
WB7WOW
188
K7VW
157
WD8LRT
W2AHV
154
KA1GBS
153
KA3DLY
141
K4SCL
138
WF4Y
131
K4JST
130
W9YCV
128
KA8CPS
127
WF4X
126
WA4QXT
KCØOO
125
WB1GXZ
119
N7DNG
118
WB4WYG
W7VSE
116
WA5RVT
W5DTR
K7GXZ
K2ZM
115
WB3GZU
W1EOF
114
W2MTA
113
WD8RHU
WØOYH
N2AKZ
112
NA2N
111
K4ZK
110
WB2UVB
WA4EIC
KF8J
109
KU4W
KA5KRI
107
WB2IQJ
WB2EAG
KC9CJ
KC5NN
106
WBØZEN
N4FQD
105
WB1HIH
WA4JDH
KA3GJT
104
WB2VUK
KS7I
103
WB2ZJF
WA4CCK
W4ANK
W9JUJ
KK1E
102
WB5YDD
101
WB2RBA
WØKJZ
VE3BDM
AA4AT
KZ8Q
K4VWK
100
WD9ESZ
N8EES
N2XJ
KA1AVU
99
WB2MCO
N3CKQ
KI1M
KA4GFU
AF8V
98
WD4ALY
WA1YNZ
VE3HTL
KBØMB
KA8GJV
KA5HDT
97
W1PUO
N6AWH
N2DPN
KC2QQ
96
WD4CNQ
WA4YPQ
WAØTFC
W6NTN
W3YVQ
W2AET
N8DSU
AK1E
95
WA7LGN
K2GCE
94
WA2FJJ
W9DM
W6INH
N1BJW
KA1EPO
K2VX
AL7W
AG9G
93
WB7TQF
WA4EIC
W2YJR
KT6A
KA9IKR
AK1W
92
W5KLV
W4CKS
KT6D
KB3UD
KA4GUS
91
W6RNL
W1TN
VE3GT
N6GIW
90
WD4AWN
WA3WIY
N3COY
KX2L
KD5FR
KB4OZ
89
W7LG
W5CTZ
VE3DPO
N4PL
KS5V
88
WA7GQO
87
WB8MTD
WA2HEB
W2BIW
KC2TF
KA8IAF
86
WB2OWO
KA4BCM
K1JHC
85
WD8MIO
WD5GKH
WA2KOJ
WA2CUW
W6VOM
N5TC
KR4V
KA4SAA
KA4IUM
84
NØCXI
KA2BHR
KAØNLI
KAØARP
83
WB1ABQ
W1RWG
KB2WI
KBØZ
K9CMO
K2ZVI
82
W3VA
KA4MTX
K4IWW
81
KY2P
80
WB4TZR
WB2GHN
WA4EYU
W9NXG
N4GDT
KE6NO
KD9K
KB4WT
79
WB4AID
W5GHP
VE3GOL
N8BQK
KA7ELI
K3JL
78
WB2KLF
WA4LXP
K4ZN
N5EZM
KTØU
77
WD9FRI
W7LNE
76
N7BGW
N1AJJ
KC2SW
75
WB2QMP
WA2ARC
W6IPL
NN4I
KA5AZK
74
WB5MMI
WB3FKP
WA3UNX
KL7IJG
KA3EJG
K7LCA
73
W8MVE
KB4LB
72
WDØAIT
KJ3E
71
WD4OCW
WA8DHB
VE3KK
N2CER
KA1T
KAØBWM
KØSI
70
WB6QBZ
WA5QFD
W4HON
N8DNC
KD4TY
AK2E
69
WB2IDS
W3DKX
W2XD
WØFRC
VE3HGJ
NØCFS
KY4U
KB4OG
K4EV
AG2R
68
WB7WVD
WB4GHU
WA6QCA
KA4AUR
W9TLU
K4WJR
W5KMF
KC5GM
KC4WN
KA3DTE
KAØBCB
67
VE2EDO
NI6A
N9ATP
KS2G
66
WD4HBP
WA1TBY
N1BGW
K8JDI
65
WAØSCP
N9BYK
KO1O
KC3DW
64
WB5LBR
WB4NTW
WBØHOX
WA6ZUD
W5TI
W4ZJY
KA2MBP
K6TWJ
AC3N
63
WØKK
NØEEH
KF7R
KB7FE
KA1BBU
K3CR
62
WB8YTD
WA4LJI
N5BT
N4UF
N3CJP
KD7G
KB3FW
KA8MEB
KA2OPG
61
WØOUD
N6GZB
N3ADU
W7LBK
N2BLX
KN3B
KA4BBA
60
WD4BSC
WA4JTE
W4FMZ
WØLAE
KAØE
AI6E
AE1T
57
N1CLV/T
55
N5FDL/T
51
N6EPG/T
KA8GGZ/T

Brass Pounders League May 1983

The BPL is open to all amateurs in the United States, Canada and U.S. possessions who report to their SM a message total of 500 or a sum of originations and delivery points of 100 or more for any calendar month. All messages must be handled on amateur frequencies within 48 hours of receipt in standard ARRL form.

1	2	3	4	5	6
W3CUL	651	998	1298	88	3038
KA9CPA	39	1311	166	1003	2519
NØBQP	33	1314	180	783	2310
WAØHJZ	11	1183	31	74	2019
WB7WOW	28	708	892	87	1715
WA2SPL	15	625	681	73	1394
W7DZX	17	557	516	4	1094
W9JUJ	2	545	461	7	1015
W7VSE	3	502	484	12	1001
KL7LA	1	644	272	5	922
W1EOF	1	304	510	19	834
KCØAS	9	680	112	19	820
KL7JKW	0	214	582	0	796
K8NCV	26	350	269	6	751
KT6A	4	417	313	15	749
WA4JDH	4	381	340	4	732
W3VR	219	206	244	15	684
AA4AT	25	274	288	18	605
WF4X	3	289	281	31	604
N4PL	64	210	284	35	593
KBØMB	110	187	276	17	590
KA1GBS	1	275	250	53	579
VE3HTL	2	277	290	9	578
W5CTZ	1	308	265	0	574
N7AFZ	2	300	259	10	571
WD8MIO	18	307	230	16	571
WA4QXT	10	269	266	25	570
WB5YDD	40	244	222	28	534
KA8CPS	33	200	229	68	530
WA4CCK	0	262	253	2	517
W5KLV	48	251	192	24	515
K8OZ	10	206	282	7	505
KA9CPA (Mar.)	36	1331	210	1024	2601
KBØMB (Apr.)	145	272	364	29	810

BPL for 100 or more originations plus deliveries:

KA1BHT	174
WF4Y	130
WD8LRT	114
WB4TZR	112
WB5FQU	109
VE3KK	106
KH6B	105

Multioperator station:

K4KDJ	111

1 — CALL
2 — ORIG.
3 — RCVD.
4 — SENT
5 — DLVD.
6 — TOTAL

Independent Nets (May 1983)

1	2	3	4
Amateur Radio Telegraph Society	31	493	283
Clearing House	31	91	312
Early Bird	31	1038	371
Empire Slow Speed	29	48	352
Golden Bear	31	272	1772
IMRA	26	648	1249
Midwest RTTY	31	37	244
Mission Trail	31	162	1182
New England Novice	31	79	318
North American SSB Traffic	26	82	255
Vermont Sideband	31	203	485
West Coast Slow Speed	31	114	420
20-Meter ISSB	26	885	433
75-Meter ISSB	31	529	1162
7290 Traffic	46	807	3264

1 — NET NAME
2 — SESSIONS
3 — TRAFFIC
4 — CHECK-INS

Operating News

Conducted By John F. Lindholm,* W1XX

Is It Time to Extend the OBS Concept?

For years, the Official Bulletin Station (OBS) has been the Amateur Radio version of the Town Crier. From the League's master station, W1AW, down to the individuals who relay the information to your section, or area, when it is time to "get the word out," the OBS is the conduit of official information. This concept has worked very well for years. Times have changed, to be sure, but the system continues to work on cw, ssb, fm and RTTY. Why has it continued to be one of the League's most successful programs? Let's examine the Communications Department's own guidelines for this service.

> Rapid dissemination of information is the lifeblood of an active, progressive organization. The ARRL Official Bulletin Station network provides a vital communications link for informing the amateur community of the latest developments in Amateur Radio and the League. These bulletins are issued as soon as news breaks by W1AW. The primary mission of the OBS is to copy these bulletins directly off the air from W1AW and retransmit them locally for the benefit of amateurs in the OBS coverage area. Inasmuch as W1AW operates on all bands (160-2 meters), the need for OBSs on hf has lessened somewhat in recent times. Importantly, to serve a maximum audience, OBS appointees who can send ARRL bulletins over vhf or uhf repeater systems are of maximum usefulness and much in demand. Bulletins should be transmitted regularly, perhaps in conjunction with a repeater net, on a repeater "bulletin board" or via a RTTY mailbox, if one is functioning locally.

The program is successful because the concept is so good. However, we will address ourselves to the "mailbox" situation. Today's OBS copies W1AW, and goes to hf or vhf to "deliver" the bulletin to the mailbox. The OBS sends the proper command signals, and the mailbox responds by asking what the originating station would like to do — sort of like rubbing the bottle that contains the genie. The OBS then sends the commands to tell the mailbox to record the bulletin that will come its way. If all is successful, the mailbox will respond to the OBS by letting the bulletin station know that the "download" was recorded. Now anybody who opens up the mailbox will be able to read the bulletin. The modern-day OBS has been successful in the task.

One of the FCC's recent statements in support of a no-code license is that many younger people have a primary interest in computer technology. They neglect to mention that computer technology has been the Amateur Radio operator's interest for quite a few years. This may be the time to take the youngster's interest and the OBS program and tie them together. The benefits could be great!

Most computer owners have a modem. This device is similar to a RTTY terminal unit; in fact, the word is a synthesis of the words *mo*dulator-*demo*dulator. It converts tones to on/off pulses, and pulses to tones. The computer needs the pulses, and the means of transmission, whether radio or telephone line, needs the tones. Lacking a radio to transmit the information from computer to computer, computerists use the telephone. The computerist also has a mailbox system, but it is called the "Computer Based Message System," or CBMS. The CBMS is what the computerist calls into to leave and retrieve messages, get general information and find out about club meetings. This system is analogous to our on-the-air systems, the only difference being the means of transmission. In each case, only one person can access the system at a time.

It is also possible for the computerist to call another computerist and talk from computer to computer directly, just as we talk from radio to radio directly. But the fact remains that the CBMS is the popular place to exchange group information.

Our plot now thickens. Most people agree with the goal of recruiting computerists, or anyone else, into Amateur Radio. Many Amateur Radio operators who own computers either have tried the local bulletin board, or may even own one. The CBMS tends to be as popular as any Amateur Radio network, and maybe more so. The computerist doesn't have another frequency he can QSY to if the line is busy, although he may try another CBMS. It is all they have.

Recognizing that the computerists' focus on the CBMS is the central point to our theme, let's put the ARRL bulletins on the computer bulletin board. This accomplishes two things: It gets information across to the ham who may not have heard it on the air, and it gets our story onto the

W1AW Schedule

April 24 — October 30, 1983 **MTWThFSSn = Days of Week** **Dy = Daily**

W1AW code practice and bulletin transmissions are sent on the following schedule:

UTC	Slow Code Practice	MWF: 0200, 1300 2300; TThSSn: 2000; Sn: 0200
	Fast Code Practice	MWF: 2000; TTh: 0200, 1300; TThSSn: 2300; S: 0200
	Cw Bulletins	Dy: 0000, 0300, 2100; MTWThF: 1400
	RTTY Bulletins	Dy: 0100, 0400, 2200; MTWThF: 1500
	Voice Bulletins	Dy: 0130, 0430
EDT	Slow Code Practice	MWF: 9 A.M., 7 P.M.; TThSSn: 4 P.M., 10 P.M.
	Fast Code Practice	MWF: 4 P.M., 10 P.M.; TTh: 9 A.M.; TThSSn: 7 P.M.
	Cw Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	RTTY Bulletins	Dy: 6 P.M., 9 P.M., 12 P.M.; MTWThF: 11 A.M.
	Voice Bulletins	Dy: 9:30 P.M., 12:30 A.M.
CDT	Slow Code Practice	MWF: 8 A.M., 6 P.M.; TThSSn: 3 P.M., 9 P.M.
	Fast Code Practice	MWF: 3 P.M., 9 P.M.; TTh: 8 A.M.; TThSSn: 6 P.M.
	Cw Bulletins	Dy: 4 P.M., 7 P.M., 10 P.M.; MTWThF: 9 A.M.
	RTTY Bulletins	Dy: 5 P.M., 8 P.M., 11 P.M.; MTWThF: 10 A.M.
	Voice Bulletins	Dy: 8:30 P.M., 11:30 P.M.
PDT	Slow Code Practice	MWF: 6 A.M., 4 P.M.; TThSSn: 1 P.M., 7 P.M.
	Fast Code Practice	MWF: 1 P.M., 7 P.M.; TTh: 6 A.M.; TThSSn: 4 P.M.
	Cw Bulletins	Dy: 2 P.M., 5 P.M., 8 P.M.; MTWThF: 7 A.M.
	RTTY Bulletins	Dy: 3 P.M., 6 P.M., 9 P.M.; MTWThF: 8 A.M.
	Voice Bulletins	Dy: 6:30 P.M., 9:30 P.M.

Code practice and cw bulletin frequencies: 1.818, 3.58, 7.08, 14.07, 21.08, 28.08, 50.08, 147.555 MHz.

RTTY bulletin frequencies: 3.625, 7.095, 14.095, 21.095, 28.095, 147.555 MHz.

Voice bulletin frequencies: 1.89, 3.99, 7.29, 14.29, 21.39, 28.59, 50.19, 147.555 MHz.

Slow code practice is at 5, 7-1/2, 10, 13 and 15 wpm.

Fast code practice is at 35, 30, 25, 20, 15, 13 and 10 wpm.

On Monday, Wednesday and Friday, 1300 through 2100 UTC, transmissions are beamed to Europe on 14, 21 and 28 MHz.

Code practice texts are from *QST*, and the source of each practice is given at the beginning of each practice and at the beginning of alternate speeds. For example, "Text is from February 1983 *QST*, pages 9 and 84" indicates that the main text is from the article on page 9 and the mixed number/letter groups at the end of each speed are from the contest scores on page 84.

On Fridays, UTC, a DX bulletin replaces the regular bulletin transmissions.

Cw bulletins are sent at 18 wpm; Teletype bulletins are sent at 60 wpm with 170-Hz shift, then repeated on 110-baud ASCII.

Experimental transmissions on AMTOR, FEC mode, may follow RTTY/ASCII transmissions, with details given at the beginning of the RTTY/ASCII transmissions.

W1AW is open for visitors Monday through Friday from 7:30 A.M. to 1 A.M. EDT and on Saturday and Sunday from 3:30 P.M. to 1 A.M. EDT. If you desire to operate W1AW, be sure to bring a copy of your license with you. W1AW is available for operation by visitors between 1 and 4 P.M. Monday through Friday.

In a communications emergency, monitor W1AW for special bulletins as follows: voice on the hour, RTTY at 15 minutes past the hour, and cw on the half hour.

W1AW will be closed on September 5.

Station staff: Chief Operator/Asst. Communications Mgr. C. R. Bender, W1WPR; Charles Chadwick, K8AXL; Bruce Kampe, WA1POI.

*Communications Manager, ARRL

screens of the computerists who might otherwise not have any access to Amateur Radio information. Instant public relations!

In the New York City/Long Island Section, Jeff Michaels, WB2PYC, and Gabe Weiner, KA2JJS, both run CBMSs. Section Manager John Smale, K2IZ, has made each an OBS. Each will copy W1AW using his computer as an RTTY terminal, and then transfer the bulletins to their systems. In addition, they add this statement to each bulletin: "For more information on Amateur Radio, write ARRL, 225 Main St., Newington, CT 06111." This has free public relations value for Amateur Radio, and it gets the bulletin out to those without the ability to copy W1AW.

We have now extended the OBS concept to become the COBS, or computer OBS.

While I realize that some of the purists among us may say this doesn't really amount to Amateur Radio, as it is over a telephone line, the benefits to be had by getting our information before the public outweigh such comments on the means of transmission. Another gain is getting more people involved in the League's field structure. Computer magazines predict that over 4 million computers will be sold in 1983. Twenty percent of the people will get modems and try the bulletin-board systems. If only 10% of those people see our bulletins and inquire about the hobby, we will have gained new converts at the cost of only a few hours of work each week.

If you own a computer, how about finding a CBMS in your area that will allow ham radio bulletins? And if you are a Section Manager, why not consider giving out a COBS appointment? And if you are the rare combination of a public-service-oriented ham who owns a CBMS, then it is up to you to do everyone in the hobby a big favor and help tell our story through useful information on your board. See you on the gray keys? — *Stephen Mendelsohn, WA2DHF*

MIDNIGHT SPECIAL RESULTS

The April 1983 Midnight Special saw the first W/VE contest use of the grid square system as part of the contest exchange. If nothing else, it is an interesting change from the old section/state routine, and is the coming thing as the exchange in some future ARRL vhf/uhf contests. It is also the basis of the popular VUCC award. The top scorers are shown below. Complete results have been sent to all participants who submitted an s.a.s.e. with their entries. Each line score lists call, score, 20-meter QSOs plus grid squares, 40-meter QSOs plus grid squares, and state. — *Bill Jennings, K1WJ*

KA1R	171-75-96-MA
W1XX	107-44-63-CT
K1VUT	106-46-60-MA
KA2KVZ	140-52-88-NY
K2GBH	116-48-68-NY
K2HVN	111-65-46-NY
K3WGR	108-42-66-PA
K4JEX	195-82-113-NC
NO4R	121-29-92-KY
W4XD	108-24-84-VA
K5LZO	288-135-153-TX
N5DDO	205-94-111-TX
WB5VZL	194-90-104-TX
N5XA	176-25-151-MS
KB5UL	119-26-93-TX
WB5MJK (N5CTK, opr.)	113-37-76-TX
KE5C	112-37-75-TX
K6YK	139-23-116-CA
N6NF	133-49-84-CA
A17B	244-85-159-OR
K8NZ	226-114-112-OH
KW8N	220-123-97-OH
K8MR	118-26-92-OH
W9RE	212-115-97-IN
K9KM	202-103-99-IL
WØLZ	100-35-65-IA
VE5GF	94-27-67-SK

In Training

AN EXPANDING EXAMINATION PROGRAM FOR RADIO AMATEURS

Volunteer instructors, take note! The self-help tradition of the Amateur Radio Service is about to take a quantum jump. Volunteer instructors have long been responsible for training newcomers to our hobby. Some have worked one-on-one as "Elmers," helping individuals get their licenses and set up stations. Other instructors have worked with Scouts, in schools or with their own classes to teach larger groups of aspiring radio amateurs.

The volunteer instructor corps has also carried the bulk of the responsibility in administering the code and theory tests to applicants for the Novice license, and have helped with special examination sessions for persons with handicaps. Now you are being challenged to take on the supervision and administration of the tests for *all classes* of Amateur Radio licenses.

How the Stage Was Set

A certain amount of terror has always been associated with the trip to the FCC examiner. For many people, that trip to the Field Office also meant missing a day of work and a long trip (of several hundred miles for some applicants) to an unfamiliar place. Clearly, a change has been needed in the radio amateur examination program.

In the very early years of the radio art, the radio spectrum resembled a wide-open prairie. Police, military, commercial and amateur transmitters vied for the unfenced rangeland. Chaos and interference were the order of the day. By 1934, through several legislative stages, the Federal Communications Commission was established to regulate and guide the radio art. Some would say this stifled the inventiveness of radio amateurs, while others would point out that the protection and official recognition of the Amateur Radio Service was beneficial in allowing us to learn and grow.

The past 10 years has seen a drastic shift in the political climate in Washington, DC, with a resultant dramatic shift in the policies of the FCC. Both President Reagan and former President Carter ran successfully on a "governmental deregulation" platform. Since the Commissioners are appointed by the President, the Commission reflects this "do-it-yourself" approach to radio regulation. Many Congressmen also share these views. All this combines to make the Amateur Radio Service look pretty good — we've been "doing it ourselves" for a long time, and we can be especially proud of the job done by our volunteer instructors. Now you can do even more.

More-Convenient Test Sessions

The ever-dwindling FCC examination schedule has become a near stranglehold on the Amateur Radio Service, severely restricting the opportunities for newcomers to advance beyond Novice. The Commission's Field Offices have been able to do nothing about this situation because of budget restrictions, over which they have no control. Finally, the FCC invited the ARRL to propose a solution to the problem. This resulted in the Volunteer Examiner Program, provided for by the "Goldwater-Wirth Bill," Public Law 97-259, which was passed by Congress and signed into law by President Reagan last year. See November 1983 *QST*, page 11, for details.

Sometime this fall, we anticipate that the FCC will have adopted a Report and Order on PR Docket 83-27, establishing the Volunteer Examiner Program. At that point, Amateur Radio will take a giant step toward ensuring its own good future while calling on its own rich traditions of self-reliance, self-improvement and self-instruction. The Commission's Field Offices will soon turn over the job of administering Amateur Radio license examinations to a corps of accredited Volunteer Examiners. With this new procedure, any radio amateur may apply to be *accredited officially* as a Volunteer Examiner, a process explained below.

The Volunteer Examiner Program brings with it some tantalizing new facets to taking the test. With your help, FCC examinations will be given in many more locations around the country, making tests in or near *your* town much more likely. Since radio amateurs will be volunteering their services as test administrators, the test sessions are likely to occur in the evening or on the weekend, a further convenience to the applicant. As we expect that many hamfests and clubs will offer test sessions as a part of their programs, people unfamiliar with the location of the examining room will have the advantage of using the call-in frequency to guide them. When was the last time the FCC led you to the Field Office on 146.52 MHz?

The Examiners' New Duties

Until now, volunteer examiners have worked on a fairly informal basis and have served the needs of Novice and handicapped applicants well. While these programs will continue with some changes, the qualifications for being an examiner for Novice or handicapped applicants will remain essentially the same. For Technician, General, Advanced and Extra Class applicants, however, the new Volunteer Examiner Program will involve *formal accreditation* of each examiner. The qualifications for being an examiner are stiffer, too. Accredited VEs may not be employed by or have financial interests in a business involved with Amateur Radio. (The FCC has assured us that it will not be unreasonably strict in interpreting this rule.) A VE must also meet the other traditional criteria for volunteer examiners: You must be at least 18 years old, you may not be directly related to the applicant taking the test, and you must hold a valid radio amateur license that is higher in class than the test being administered. All examiners who give Advanced and Extra Class examinations must hold Extra Class tickets. Unlike the previous volunteer examiners, the new accredited VEs will work in teams of three. (All of this is explained in the Happenings column of April *QST.)*

The new program will also involve a bit more forethought and planning than is needed in the present Novice program. It is likely that the new examinations will be given "by appointment only." The Examiner Team Chief will need to advertise the session for 30 days before closing the registrations, and the test session will occur 30 days after that. Planning two months in advance should not be a major inconvenience, since most test sessions will probably be given in conjunction with hamfests or club meetings. The extra planning involved is a small price to pay for the huge advantage of having the radio amateur tests given in your town or at your hamfest or club meeting.

The work of all these new Volunteer Examiners will be coordinated and guided by a new entity called the Volunteer Examiner Coordinator (VEC). As of mid-June, only the ARRL had expressed interest in being a VEC; the FCC prefers to work with as few VECs as possible to keep the procedures simple. As VEC, the ARRL will be prepared to offer training materials and guidance to the Volunteer Examiners to help their test sessions go smoothly.

Becoming a Volunteer Examiner

If you are interested in being involved as a Volunteer Examiner for *all classes* of Amateur Radio licenses, you can register your interest now. Write to the ARRL and give us your name, call, license class and mailing address. We will add your name to our list of prospective VEs and contact you after the FCC adopts the Report and Order on PR Docket 83-27 establishing this program.

Instructors: You have done a lot to build up the Amateur Radio Service. Now you can help newcomers to our group even more by providing additional license examination sessions. Let us hear from you! — *Curt Holsopple, K9CH, Manager, ARRL Volunteer Examiner Program*

Rules, September VHF QSO Party

The ARRL Ad Hoc Committee for VHF/UHF Contesting has made a few changes for this year's September contest. The big news is that the exchange will be 2° × 1° Maidenhead grid-square locators, as in the Spring Sprint and UHF contests. The multiplier will be the number of different grid squares worked per band. See rules 4 and 5. Information on determining your grid-square locator can be found in January 1983 *QST*, starting on page 49. Grid-square maps are available from ARRL Hq. for $1.

The other two changes are in the contest period (rule 2) and in the QSO-point structure (rule 5A). The new time frame is the same as for the June contest, starting one hour earlier and ending three hours earlier, with no mandatory off-time. In rule 5, contacts on 2.3 GHz and up are worth an additional point.

Official summary sheets and log sheets are available from ARRL Hq. for an s.a.s.e., and all entrants should send for a set. We are interested in knowing what you think of these changes, so please send your comments along with your entry. Good luck!

VHF-UHF-EME LOG

log sheet 1 of 2

CALL USED KB9NM

ARRL SECTION or COUNTRY WISC

50 QSOs per side
Number each new multiplier as worked

FREQ.	MODE	DATE TIME UTC	STATION WORKED	COMPLETE EXCHANGE SENT	COMPLETE EXCHANGE RCVD	LIST NEW MULTIPLIERS	POINTS
144	A1/A3	10 Sept 1900	K9MRT	EN55	EN70	EN70 - 1	1
		02	WA9SDA	↓	EN53	EN53 - 2	↓
		04	WA9SWD	↓	EN40	EN40 - 3	
		04	WA9ZJJ	↓	EN44	EN44 - 4	
		07	K9TMM		EN53		
		13	K9AKS		EN50	EN50 - 5	
		16	K9RC		EN51	EN51 - 6	
		17	WD9MSV		EN50		
		18	N9KC		EN52	EN52 - 7	
		19	WB9WMM		EN51		
		22	WA9CQA		EN34	EN34 - 8	
		25	K9TS		EN34		
		27	KA9HKL		EN53		
		29	N9CDT		EN43	EN43 - 9	

Properly completed sample log sheet for the September VHF QSO Party.

Rules

1) **Object:** To work as many amateur stations in as many different 2° × 1° grid squares as possible using authorized amateur frequencies above 50 MHz.

2) **Contest period:** Begins 1800 UTC Saturday, Sept. 10 and ends at 0300 UTC Monday, Sept. 12.

3) **Categories:**

(A) Single operator: One person performs all operating and logging functions.

(1) *Multiband.*

(2) *Single band:* Single-band entries on 50, 144, 220, 432 and 1296-and-up categories will be recognized both in *QST* score listings and in awards offered. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported. Also see Rule 9, Awards.

(B) Multioperator: Multioperator stations must locate all equipment (including antennas) within a circle whose diameter does not exceed 300 meters.

4) **Exchange:** Grid-square locator (see Jan. 1983 *QST*, page 49). Example: W1AW in Newington, CT would send FN31. Exchange of signal reports is optional.

5) **Scoring:**

(A) *QSO points:* Count one point for each complete 50- or 144-MHz QSO. Count two points for each 220- or 432-MHz QSO. Count three points for each 1296-MHz QSO. Count four points for each 2.3-GHz-or-higher QSO.

(B) *Multiplier:* The total number of different grid squares worked *per band.* Each 2° × 1° grid square counts as one multiplier on each band it is worked.

(C) *Final score:* Multiply the total number of QSO points from all bands operated by the total number of multipliers for final score. Example: K3ONW works WA2GBG in FN12 on 50, 144, 220 and 432 MHz. This gives K3ONW 8 QSO points (1 + 1 + 2 + 2) and also four grid-square multipliers. Final score is 8 QSO points × 4 multipliers, or 32 points.

6) **Use of FM:**

(A) Retransmitting either or both stations, or use of repeater frequencies, is not permitted. This 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.

(B) Use of the national simplex frequency, 146.52 MHz, or immediate adjacent guard frequencies, is prohibited. Contest entrants may not transmit on 146.52 for the purpose of making or soliciting QSOs. The intent of this rule is to protect the national simplex frequency from contest monopolization. There are no restrictions on the use of 223.50 MHz.

(C) Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55 and .58, and 147.42, .45, .48, .51, .54 and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of (A) or (B) above or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory may* be used for contest purposes.

7) **Miscellaneous:**

(A) Stations may be worked only once per band for credit, regardless of mode. Crossband QSOs do not count.

(B) Partial QSOs do not count. Both calls, the full exchange, and acknowledgment must be sent and received.

(C) Fixed, portable or mobile operation under one call from one 2° × 1° grid square only is permitted. A transmitter used to contact one or more stations may not be used subsequently under any other call during the contest period (with the exception of family stations where more than one call is assigned to one location by FCC/DOC); one operator may not give out contest QSOs using more than one call sign from any one location. The intent of this rule is to accommodate family members who must share a rig, not to manufacture artificial contacts.

(D) Only one signal per band (6, 2, 1-1/4, etc.) at any given time is permitted, regardless of mode.

(E) While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least 1 km).

(F) Multioperator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

(G) A station located *precisely* on a dividing line between grid squares must select only one as the location for exchange purposes. A different grid-square multiplier cannot be given out without moving the complete station (including antennas) at least 100 meters.

(H) Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

8) **Reporting:** Entries must be postmarked no later than 30 days after the end of the contest.

9) **Awards:**

(A) Single operator

(1) Top single operator score in each ARRL section.

(2) Top single operator on each band (50, 144, 220, 432 and 1296-and-up categories) in each ARRL section where significant effort or competition is evidenced. [Note: Since the highest score per band will be the award winner for that band, an entrant may win a certificate with additional single-band achievement stickers.] For example, if WBØTEM has the highest single-operator all-band score in the Iowa section and his 50- and 220-MHz scores are higher than any other IA single op's, he will earn a certificate for being the single-operator section leader *and* endorsement stickers for 50 and 220 MHz.

(B) Top multioperator score in each ARRL section where significant effort or competition is evidenced. Multioperator entries are *not* eligible for single-band awards.

10) **Disqualifications:** See January *QST*, page 85.

Contest Corral

A Roundup of Upcoming Operating Events

Conducted By Mark J. Wilson,* AA2Z

AUGUST

2

West Coast Qualifying Run, 10-35 wpm, at 0400Z Aug. 3 (9 P.M. PDT Aug. 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 include your full name, call sign (if any) and complete mailing address. A large s.a.s.e will help expedite your award/endorsement.

6-7

ARRL UHF Contest, July *QST*, page 85.

Illinois QSO Party, July *QST*, page 86.

SWOT Open QSO Party, July *QST*, page 86.

11

W1AW Qualifying Run, 10-35 wpm, at 0200Z Aug. 12 (10 P.M. EDT Aug. 11). Transmitted simultaneously on 1.818 3.58 7.08 14.07 21.08 28.08 50.08 147.555 MHz. See Aug. 2 listing for more details.

13-14

European DX Contest (WAEDC), cw, July *QST*, page 86.

New Jersey QSO Party, July *QST*, page 86.

20-21

KCJ Single Operator CW Contest, sponsored by the Keymen's Club of Japan, from 1200Z Aug. 20 until 1200Z Aug. 21. Single operator, cw only. All-band and single-band categories. No crossmode, crossband, repeater, satellite or multioperator QSOs. Work stations once per band. Exchange signal reports. JA stations also send two-character prefecture code. Others send two-character continent code (AF, AS, EU, NA, OC or SA). Count one point per JA QSO and multiply by the number of different JA prefectures (max. 47) worked per band. Mail entry by Nov. 30 to Kikuo Takamitsu, JA9FT, 4-16-22 Izuminomachi, Kanazawa, Ishikawa 921, Japan.

New Mexico QSO Party, sponsored by the Albuquerque DX Assn., from 1800Z Aug. 20 until 2100Z Aug. 21. All amateur bands except 30 meters. No repeater QSOs. Cw QSOs in the cw bands only. Work stations once per band and mode. NM mobiles and portables may be reworked as they change county. NM stations operating from county lines count as one QSO but multiple multipliers. Single op and multiop categories. Exchange signal report and QTH (county for NM stations; state, province or country for others). Suggested frequencies: phone — 1.835 3.985 7.230 14.280 21.370 28.570 147.510; cw — 1.805 and 60 kHz up from low end; Novice — 25 kHz up from low end. Count two points per phone QSO, three points per cw QSO. NM stations multiply by total NM counties, states, VE provinces and DXCC countries worked. Others multiply by total NM counties (max. 33) worked. Mail entry by Oct. 1 (include large s.a.s.e. for results) to Ed Graham, N5HH, 12449 Regent NE, Albuquerque, NM 87112.

North American ATV DX Contest, sponsored by *A5 Magazine*. Contact Mike Stone, WBØQCD, P.O. Box H, Lowden, IA 52255-0408, for details.

Alaskan QSO Party, sponsored by the Alaska DX Assn., from 0200Z Aug. 20 until 0200Z Aug. 21. Work stations once per band and mode. KL7 stations send signal report and judicial district. Others send signal report and serial number. Suggested frequencies: phone — 3.895 7.260 14.285 21.360 28.660; cw — 1.807 3.560 7.060 14.060 21.060 28.060. AK stations count two points per 10-15-20 meter QSO and five points per 40-80-160 meter QSO. Multiply by total states, VE/VO provinces and DXCC countries worked per band. Others count five points per KL7 QSO on 10-15-20 meters and 10 points on 40-80-160 meters. Multiply by total KL7 judicial districts worked per band (max. 4 per band). Mail entry by Oct. 1 to KL7AF, P.O. Box 1614, Kodiak Island, AK 99615.

SARTG World-Wide RTTY Contest, sponsored by the Scandinavian Amateur Radio Teletype Group, from 0000 to 0800Z and 1600 to 2400Z Aug. 20, and 0800 to 1600Z Aug. 21. Single op, multi-single and SWL classes. Work stations once per band; two-way RTTY only. 80-10 meters (no WARC band operation). Exchange signal report and serial number. Count five points for QSOs within your own country; 10 points for different country but same continent; and 15 points for different continent. In the USA, Canada and Australia, each call area counts as a separate country. Multiply by the total number of DXCC countries plus W/K, VE/VO and VK call areas worked. Logs must be mailed in time to be received by Oct. 10. Mail to C. J. Jensen, OZ2CJ, P.O. Box 717, DK 8600 Silkeborg, Denmark.

21

W1AW Qualifying Run, 10-35 wpm, at 2000Z (4 P.M. EDT) Aug. 21. See Aug. 11 listing for more details.

27-28

All Asian DX Contest, cw. See June *QST*, page 82, for details.

Alabama QSO Party, sponsored by the Chattahoochee Valley ARC, from 1600Z Aug. 27 until 2300Z Aug. 28. Work stations once per band and mode. Work mobiles again as they change county. AL-to-AL QSOs permitted. Exchange signal report and QTH (county for AL stations; state, province or country for others). Suggested frequencies: cw — 65 kHz up from low end; phone — 3.965 7.265 14.285 21.365 28.565; Novice — 25 kHz up from lower band edge. Count one point per QSO. AL stations multiply by total states, provinces and countries worked. Others multiply by total AL counties worked. Mail logs by Sept. 30 (include large s.a.s.e. for results) to Johnny Royster, WA4VEK, P.O. Box 494, Fairfax, AL 36854.

Occupation Contest, sponsored by the Radio Assn. of Erie, from 1800Z Aug. 27 until 2400Z Aug. 28. Exchange signal report, occupation and state, province or country. Suggested frequencies: phone — 3.920 7.250 14.300 21.400 28.600; cw — 40 kHz up from lower band edges. Count three points for each QSO with a station giving a new occupation. Count one point per QSO with stations sending a similar occupation to one already worked. Count two points for each retiree worked. No multiplier. Mail logs by Oct. 1 (include large s.a.s.e. for results) to Chris Robson, KB3A, 6950 Kreider Rd., Fairview, PA 16415.

31

West Coast Qualifying Run, 10-35 wpm, at 0400Z Sept. 1 (9 P.M. PDT Aug. 31). See Aug. 2 listing for more details.

SEPTEMBER

1

RTTY Art Contest, sponsored by the Southern Counties Amateur Teleprinter Society, from Sept. 1 through Nov. 30. Open to amateurs worldwide. Complete details are available from Norm Koch, K6DZL, P.O. Box 1351, Torrance, CA 90505.

3-4

Corona 10-Meter RTTY Contest, sponsored by the Deutscher ARC, from 1100 to 1700Z Sept. 3. See May *QST*, page 82, for more details.

Four-Land QSO Party, sponsored by the Brightleaf ARC, from 1800Z Sept. 3 until 0600Z Sept. 4, and 1300Z Sept. 4 until 0100Z Sept. 5. Work stations once per band and mode. Work stations again as they change county. Four-land stations may work each other. Exchange signal report and QTH (county and state for four-land stations; state, province or country for others). Suggested frequencies: cw — 3.575 7.055 14.070 21.070 28.090; phone — 3.940 7.260 14.290 21.360 28.600; Novice — 3.710 7.110 21.110 28.110. Four-land stations count one point per QSO. Multiplier is the total states/provinces/countries worked. Others count two points per four-land QSO. Multiplier is the number of different fourth-district states plus counties worked. QSOs with BARC club station W4AMC count five points. Mail entry within 30 days (include large s.a.s.e. for results) to Bob Knapp, W4OMW, 105 Dupont Circle, Greenville, NC 27834.

LZ DX Contest, sponsored by the Bulgarian Federation of Radio Amateurs, from 0000 to 2400Z Sept. 4. Cw only. Work stations once per band. Entry classes: single op, multiband; single op, single band; multiop, all band; SWL. Exchange signal report and ITU zone. Suggested frequencies: 3.510-3.590 7.005-7.040 14.010-14.090 21.010-21.125 28.010-28.125. Count six points per QSO with LZ stations, one point per QSO with stations on the same continent (including the same country) and three points per QSO with stations on other continents. Multiply by the sum of different ITU zones worked per band (max. 375). Mail logs within 30 days to BFRA, P.O. Box 830, Sofia 100, Bulgaria.

10-11

ARRL September VHF QSO Party, this issue, page 85.

European DX Contest (WAEDC), phone, July *QST*, page 86.

IARS/CHC International Contest, sponsored by the International ARS and the Certificate Hunters Club, from 0000Z Sept. 10 until 2400Z Sept. 11 (phone, Sept. 17-18). See March *QST*, page 88, for details.

Late Summer QRP CW Activity Weekend, sponsored by the G-QRP Club. See March *QST*, page 88, for details. Activity is concentrated around 3.560 7.030 14.060 21.060 28.060.

YL Howdy Days

12

W1AW Qualifying Run, 10-35 wpm, at 0200Z Sept. 13 (10 P.M. EDT Sept. 12). See Aug. 11 listing for details.

17-18

IARS/CHC International Contest, phone. See Sept. 10-11 listing.

CAN-AM Contest, phone, sponsored by the Ontario Contest Club and the Canadian DX Assn., from 1800Z Sept. 17 until 1800Z Sept. 18. Entry classes: Single operator, all band; single op, single band; single op, QRP; multiop, single transmitter. Single-op stations must be operated by the station licensee. Multiops may use entire 24 hours. Single ops may use a maximum of 20 hours; the off-time may be taken in one or two periods and must be noted in the log. 1.8 through 28 MHz. Work stations once per band. Exchange signal report, serial number and two-letter QTH abbreviation. U.S. stations send postal abbreviation of state name (e.g., TX, CA). U.S. Caribbean possessions send CN; Pacific possessions send PC. Canadians send province name abbreviation (e.g., NF, PE, SK). Stations outside their normal call area must sign portable designator. VE-to-W QSOs count three points. VE-to-VE and W-to-W QSOs count two points. Multiply by the number of states (50), possessions (2), VE provinces (10), VE territories (2) and islands (St. Paul or Sable — 1) worked per band (max. 65 per band). Cw and phone sections are separate, but total of both weekends will be used for overall competition. Clubs may compete, and the club secretary must send a list of eligible members. Mail entries within 30 days to CAN-AM Contest Chairman VE3BMV, Box 65, Don Mills, ON M3C 2R6, Canada.

Kansas State QSO Party

Washington State QSO Party

21

W1AW Qualifying Run

24-25

CAN-AM Contest, cw.

Delta QSO Party

Maine QSO Party

*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, DEC, NM (APSN & ATN): VE6ABC. NARC covered two bicycle races with communications. One race had 112 cyclists & one had 55. Six hams at each event. Coming up in June, the 4th Annual Relay Race — teams from Canada and the USA numbering 1700 runners will run from Jasper to Banff starting at noon June 12 and finishing at noon June 13. A computer van will be in attendance and about 47 hams from NARC and CARA are to keep tabs. A banquet will follow. Some foreign teams were to have entered, but no notice to date. Traffic: VE6CHK 271, VE6ABC 28, VE6EO 5.

BRITISH COLUMBIA: SM, H. Emie Savage, VE7FB — British Columbia Emergency Net, NM VE7CSI, reports that even with poor conditions the net was very active. British Columbia Public Service Net, NM VE7QC's report check-in 4249 — high 182, low 108. Burnaby ARC celebrated their twenty five years with a party including the cake with 25 candles. It is the Chinese Year of the Pig, so ham was the meat course for the hams. Door prizes and awards were made. They print a very newsy paper. Surrey ARC's newsletter *COMMUNICATOR* is also good. Sorry that so many club papers have met their demise, through postal costs, etc. Traffic: VE7BNI 108, VE7CDF 92, VE7EDN 74, VE7ZK 68, VE7FB 20.

MANITOBA: SM, Peter Guenther, VE4PG — ASM: AJE. SEC: HK. OO: JK. NMs: VJ ACX TE NM. The Manitoba Marathon was again handled solely by Amateur Radio. This is a yearly event and gets better all the time. Congrats to all those who participated. VE4TT is active again after a stay in the hospital. Our thanks to VE4AFO for keeping the MEPN roster in shape via his computer. Also VE4TL and VE4YE are doing a great job on the Swap and Shop net. MEPN QNI 894, QTC 13, sess. 31. MTN QNI 104, QTC 28, sess. 18. MMN QNI 525, QTC 33, sess. 31. WRIN QNI 525, QTC 43, sess. 18. Traffic: VE4AJE 75, VE4SSS 40, VE4ACX 34, VE4TE 33, VE4PG 23, VE4AAD 18, VE4AX 12, VE4AFO 7, VE4FK 7, VE4DT 5, VE4ADS 4, VE4CF 3, VE4LB 3, VE4AGT 2, VE4NE 2, VE4TL 1.

ONTARIO: SM, Larry Thivierge, VE3GT — BM: VE3IBV. PGL: VE3AR. SEC: VE3GV. STM: VE3HTL. I am pleased to announce the appointment of VE3IBV as the section's Bulletin Manager. Slowly the new appointment structure within the section is taking shape. The Seaway Valley ARES Net, meeting on rptr VE3SVC on Tuesday at 2030 local, has added three additional nights, Mon/Wed/Fri at 1830 local. This group, promoted by VE3HLU and led by EC VE3GTF, has made great strides during their first year of operation. VE3BDM and VE3LBU have been presenting a course on traffic handling on the Thousand Island Net (TIN). The endorsement of all the section's appointees has been completed. Congrats to London's Amateur of the Year, VE3WM. Nice to see the OVMRC FD group on the June cover of *QST*. VE7AKW is sponsoring the "West Coast Canada Award" for the 1983 CARTG RTTY Sweep-takes under the classification for the operation of "Mechanical Monsters." This will give the 15, 19, 28 etc., printer operators a chance to show their mettle. Contest is on the weekend of October 15. Ex-VE3HM, now VE3NQR, is the newest member of the KWARC Coffee Club. VE3BAS, well known Hamilton VHFer, has moved to the Belleville area. Members of the Quinte ARC VE3s HON HBR IVC CJG HZZ KBP GSI BGY along with VE3CJJ recently supplied communications for the 418 Wing RCAF Assn's Walkathon. VE3KSP and VE3AMS are the newest members of the North Shore ARC. A growing number of amateurs including yours truly have joined the rank of Vic-20 owners. It is becoming quite popular for RTTY work with the Kantronics interface. VE3BX is planning a trip to China. I managed to meet quite a few area amateurs at Rochester's Hamfest. The RSO Annual Convention will be held at the Toronto Inn on the Park Sept. 23 and 24 — see you there. Traffic: VE3HTL 578, VE3KK 277, VE3GOL 217, VE3GT 168, VE3HGJ 152, VE3CYR 93, VE3KCZ 93, VE3BDM 88, VE3DPO 66, VE3GFN 57, VE3FGU 50, VE3WG 40, VE3AJN 34, VE3MPF 34, VE3KXB 25, VE3EFX 13, VE3KLX 13, VE3EHL 10, VE3EWD 8, VE3WM 8. (Apr.) VE3KXB 26.

QUEBEC: SM, Harold Moreau, VE2BP — SEC: VE2DEA. STM: VE2EDO. NMs: VE2EDO VE2FSA. New appt: VE2FCS OES. Few appointments are still open; if interested, contact your SM. Your SM was in hospital for five days, hernia operation. Thanks to all for good wishes. Felicitations a VE2DKH, qui a ete elu president de RAQI. Plusieus ont participe au Hamfest de Sorel, tres bien reussi, et esperont que ce sera une activite annuelle. Traffic: VE2ALE 296, VE2EDO 64, VE2BP 48, VE2EC 41, VE2EKC 33.

SASKATCHEWAN: SCM, W.C. Munday, VE5WM — SEC: VE5RP. TC: VE5GF. NMs: VE5HG VE5OI. PWXN, 31 sess., 440 QNI; MJARC 2, 27 sess., 259 QNI. The Saskatchewan Amateur Traffic Net ceased operation for the summer months and will resume sessions on Sept. 5th. The Regina ARA provided communications at four public service events with 21 amateurs assisting. Congrats to the new amateurs that were successful on the DOC exams, and also to those amateurs that upgraded to Advanced Amateur. Though the weather is cool, thoughts are turning toward forthcoming hamfests and summer activities. Traffic: VE5BAF 16, VE5UX 3.

ATLANTIC DIVISION

DELAWARE: SCM, Harold K. Low, WA3WIY — STM: W3DKX. SEC: W3PQ. PSHR: WA3WIY K3JL W3DKX. John A. Hughes, Mayor of Rehoboth Beach, proclaimed the week of June 20-26 as Amateur Radio Week. SARA new members KA3HAZ KA3KMQ. Upgrades: KA3IXV General, WA3RBP Extra. New Novice KA3LBD. Congrats. First State ARC planning a dinner for the fall; details later. AWARE new officers: N3DFY, pres.; WB3DPJ, v.p.; N3CWE, secy.; KA3GTM, treas. New members K3TVI and KA3FUB. Keep an open place on your calendar for the Delmarva Hamfest, Aug. 21. Your attendance will be greatly appreciated. DTN: QNI 387, QTC 42, 22 sess. SEN: QNI 45, QTC 1, 5 sess. KCARC: QNI 42, 4 sess. DEPN: April, QNI 68, QTC 9, 5 sess. Traffic: WB3DUG 61, W3DKX 48, WA3WIY 44, W3QO 41, K3JL 15, WA3PWT 11, W3WD 5, W2AGR 4, K3ZXP 2.

EASTERN PENNSYLVANIA: SM, Karl W. Pfeil, W3VA — ACC: KB3NE. SEC: WA3PZO. SGL: N3CJP. STM: KB3LF. DEC: AA3C K3QXC KB3QW KB3UD N3BFL N3CJP W3EEK.

Net	Freq.	Time	QNI	QTC	Sess.
EPAEPTN	3917	6 P.M. Dy	526	208	31
EPA	3610	7/10 P.M. Dy	437	235	61
PTTN	3610	6:30 P.M. Dy	187	73	29
PFN	3958	5 P.M. Dy	191	226	31

PTTN for April QNI 210 QTC 54 in 30 sess. Local and VHF nets reporting (QNI/QTC/Sess.): D3ARES 182/10/5; D6ARES 28/6/4; Luz Cty ARES 70/8/10. OO report W3FAF. OBS reports: K3EBZ KA3EJG W3CL W3VA WA3ENE. PSHR: KA3DLY KA3EJG KA3GJT KB3FW KB3UD N3CJP N3COY W3VA WB3FKP. N3COY appointed to ORS; welcome aboard. New calls: KC3HH (N3DCE); KN3V (WB3ZZ). Upgrades: KA3KGT and WB3FVJ to Extra. KA3EJG to Adv. N3CVH to Gen. Congrats to all. WB8KPE has new gear and is now active on phone nets. EPAEPTN welcomes N3DKC. KB3LF made first satellite QSO thru RS6. New officers Warminster ARC: KA3CHB, pres.; W3ZAA, v.p.; KA3FBP, secy.; KB3XO, treas. Schuylkill ARA: K3SLJ, pres.; KC3HH, v.p.; WB3CRM, secy.; KA3CXM, treas. K3JA was guest of Lenningrad ARC on a recent trip to UA1, UA2, UP2 and UR2-land. Club activities: Murgas ARC furnished communications for Lions Convention Parade in Wilkes-Barre. Mid-Atlantic ARC provided communications for 3 special events during April & May. Schuylkill ARA furnished communications for Reading Dirt Riders Motorcycle Enduro with over 160 cycles taking part. DL-ARC completed Novice classes, and we should be hearing a bunch of Novice ops from that area soon. N3AIW QNI EPAETN from MM in the Chesapeake Bay. Nice to hear N3BHF as NCS on phone net again. K3EU also active on phone nets, thanks to a change in work sked. Once again I wish to remind all appointees, net managers and tfc handlers to get their reports into this office before the 10th of the month. New gear: W3PTM TS 830, AF3Z IC2AT, WA3OFD & VE3HOH/3 TS430, WA3NVK IC3AT, KB3GB FT230, WB3LQM IC2AT, W3DZH ST144UP. Traffic: KB3UD 283, KA3DLY 176, W3IPX 160, N3COY 144, KA3GJT 134, KB3FW 109, WA3WQP 105, W3VA 86, N3CD 84, WA3EHD 77, WB8KPE 76, AA3B 73, KB3LF 71, KE3U 51, WB3FKP 33, N3BHF 29, WA3QN 27, W3DP 25, KA3EJG 25, N3AIW 21, N3BFL 20, W3TWV 18, N3CJP 15, W3CL 14, N3AKQ 10, W3ADE 8, K3QXC 7, N3CMC 6, W3FAF 6, W3HK 3, K3EBZ 1.

MARYLAND-DISTRICT OF COLUMBIA: SM, Karl R. Medrow, W3FA — SEC: WA3TAI. STM: WB3GZU. SMARC has: KE3Z, pres.; W3HVM, veep; WA3SMO, secy.; N3CAF, treas.; N3DZK, activities; WB3AEQ, EC; W1ZX KK3F W3IEZ, directors. KJ3T does the newsletter. WA3EOP got a drivers license after all these years! Anne Arundel and Howard Cos. held a joint civil defense drill with WA3TOY and 16 AARC members and WA3VUQ and 8 CARA members active participants. FAR administers 12 scholarships totaling some $7600. W3CDQ is tripping to NYC between skeds. KA3EWV had a mini-vacation. W3ZNW is loud and strong on 80 meters. KJ3E adds 75ISSB to his active skeds. KC3D's fancies turn to antennas. K3NNI is a stalwart on MSN. KA3R is busier now with the 20-meter phone band expansion. KC3AV is pleased with MSN now meeting daily on 3717 kHz at 1930 local for training and traffic. KC3W has the Mt. ARC interests at heart. WB3KJT has his eye on those summer picnics. WB3BFK opines daytime 80-meter skeds are tuff. KC3DW's antenna is a Hustler mounted on a lawn chair! W3FSV had MDD's biggest load of QNS reports. W3UT is renovating his daughter's house. KC3Y is sometimes mobile CW from his truck. W3LDD has been retired 3 years, not 1. Seems like only yesterday! KK3F will get that dipole up when everything lines up just right. K3OMN and KB3WL keep the north counties on all bands. W3YVQ is surveying RACES groups as well as being a regular on MDD. MEPN and many other local ham activities such as walkathons, horse trials and 2-meter RACES NCS jobs. N4DR sports a new phone panel and is learning Espanol — a happy combination! N4DLA/3 is joining the MEPN. N3IT is a commercial cw op, but has been handling ham traffic as well! WB3GZU is into video cassettes. WA3TAI has the tower up and 20-meter beam perking. News received and appreciated from SMARC, CARA, CBRA, AARC, GSFC and FAR. With the nets: (sessions/traffic/QNI average). MSN/KC3AV 31/139/7.2; WR PON/WB3BFK 22/24/11.3; MDC PON/W3OYY 4/4/12.5; WC 2-Mtr/KC3DW 5/0/20.6; Mar MDD/W3PQ 62/192/8.6; Apr MDD/W3PQ 60/226/9.6. Brass W3QQ KC3Y and W3FA. Look for Laurel ARC/W3DQI Thursday 147.54 MHz 2030 local-Balto-WDC area. Traffic: WB3GZU 396, W3FA 183, KC3DW 182, W3YVQ 108, K3NNI 102, KC3Y 102, KK3F 69, KJ3E 53, W3FZV 37, KA3EWV 34, KC3AV 32, W3LDD 24, N3IT 19, WB3BFK 17, WB3KJT 17, W3UT 13, KC3D 12, W3ZNW 11, KB3WL 11, K3OMN 10, N4DLA/3 5, N4DR 4.

SOUTHERN NEW JERSEY: SM, Edward E. Wood, N2CER — SEC: K2NE. STM: WA2HEB. SGL: W2XQ. BM: WB2UVB. We have a new SEC and BM. Owing to work and family commitments, W2HOB resigned his SEC post and WB2BWL had to give up his BM post. The new SEC is Vince Quaresima, K2NE of Chatsworth. Gene Bond, WB2UVB of Moorestown is our new Bulletin Manager. Both of these gentlemen have their work cut out for them, so please give them your support. Atlantic, Camden, Ocean and Salem Cos. are still without ECs, and WB2UVB is in need of additional volunteers for OBS. Both EC and OBS appointments are open to Technician class licensees. Don't forget the 24th annual New Jersey QSO Party on Aug. 13 and 14. Join in the fun. Traffic outlets are still needed for the Long Beach Island area. If you live within local calling distance of those communities, check in to NJPN, NJN, NJM or JSARS and pick up that traffic when needed. Support your local net! JSARS is on 146.310/910, Mercer Co. (MCN) is on 147.675/075, and South Jersey vhf net (SJVN) is on 146.055/655. Traffic: WB2ZJF 238, WB2IQJ 229, WB2UVB 221, WA2HEB 217, N2CER 83, WB2PKG 83, WA2CUW 57, KC2TM 53, KC2PB 52, WB2PXD 35, KY2T 28, KM2E 22, WA4JRP 21, W2IU 12, KA2ANJ 8.

WESTERN NEW YORK: SM, William W. Thompson, W2MTA — SEC: W2BCH. STM: W2ZQJ. BM: W2GLH. ACC: N2EH. OO/RFI: W2AET. PIO: WA2PUU. SGL: KO2X. TC: K2QR. DEC: WA2AIV KA2BHR WB3CUF W2GJ(a) WB2NAO. Appts: (EC) K2LKH, (ORS) VE2FMQ, (OO) WA3PXH. CONGRATS: WA2RXO chosen Ham-of-Year at Rome fest; K2GXT outstanding club on RIT campus; WA2UGE chosen Ham-of-Year Rochester; Western New York over 2900 League Members with 51 affiliated clubs; RARA selected as Special Service Club.

Net	Freq.	Time/Day	QNI	QSP	QND
NARASEN	75/15	0930/Sn	81	0	4
NYS/1*	3677	1000/Dy	221	103	31
Mike Farad	3925	1300/M-S	199	64	26
THIN	3913	1600/Sn	51	—	5
NYPON*	3913	1700/Dy	551	270	31
NYSPTEN	3925	1800/Dy	604	75	31
ESS	3590	1800/Dy	354	48	29
OCTEN*	34/94	1830/Dy	546	48	30
Q Net	31/91	1830/Dy	377	14	31
STARE*	99/39	1830/Dy	31	6	15
WDN/E*	04/64	1830/Dy	574	101	31
Blue Line	93/33	1900/Dy	395	15	31
NYS/4*	3677	1900/Dy	479	259	31
JCARCN	10/70	2000/Dy	439	18	30
OARCN	25/85	2000/W	72	1	4
VHF THIN	04/64	2000/Tu	44	—	4
WNYECN	3955	2000/3S	(ARES)		
BRVRN	055/655	2100/Dy	338	51	31
CNYTN*	90/30	2115/Dy	477	53	31
STAR/L*	325/925	2130/Dy	50	20	21
WDN/L*	04/64	2130/Dy	557	105	31
NYS/5*	3677	2200/Dy	423	335	31

*NTS. PSHR: W2AET KA2BHR N2BLX WA2FJJ WB2IDS WA2KOJ W2MTA WB2OWO KC2QG WB2RBA KC2SW. Tnx newsletters: ARATS BARA GRAM LARA Orleans Otsego RAGS RARA RAWNY SVARA Utica — be glad to hear from others too! Officers: Orleans WA2QDV N2CUK KA2BCE KZ2R; RAGS WA2URK K2SDD WA2VSU WB2HGO WA2PUU; Rochester VHF WB2ZJY WA2UBD KA2QHF; RARA K2KGE WA2SSU AC2K KA2NBK. May 2 tornadoes Binghamton, Booneville and Jamestown saw several comm efforts; especial thanks for job well done to Lewis and Oneida Co. ARES folks, and the nearby supporting ARES too! May 10 Ni-Mo exercise follwed real thing. Clinton Canoe Regata, numerous Run(s) for Life and other public service events have blossomed. COM K2CWD at Owego Fest. HAMFESTS: HAM-O-RAMA Sept. 10; Seaway Valley Hamfest Sept. 10; Elmira Sept. 24; Syracuse Oct. 1. THANKS to the five new asst Section Managers AND you three other guys, too! Traffic: W2MTA 351, W2AET 329, WA2FJJ 233, WB2IDS 196, WB2OWO 196, WB2RBA 174, KC2QG 142, WB2QIX 112, WA2KOJ 103, W2FR 99, VE2FMQ 93, WA2HSB 65, KG2D 60, KC2SW 57, W2ZOJ 52, N2BLX 40, KC2XD 40, KU2N 39, KA2BHR 33, KA2BCH 26, AF2K 24, WA2RXO 21, WB2NAO 14, N2ABA 13, KA2HRS 12, WB2PID 10, KA2DQA 9, KA2DBD 7, WA2OEP 7, K2VR 7, WA2AIV 6, K2IUT 6, K2RN 5. (Apr.) K2GJ 4, W2PHQ 2.

WESTERN PENNSYLVANIA: SM, Otto L. Schuler, K3SMB — SEC: AB3Q. STM: AC3N. OO/RFI Coord.: KN3B. ACC: N3EE. PIO: WB3CEW. SGL: W3OKN. Tech Coord.: W3FE.

Net	QNI	QTC	Sess.	kHz	T/D
WPACW	373	180	31	3585	7:00 P/D
WPAPTN	563	188	31	3983	6:15 P/D
WPA2MTN	409	69	31	146.28/88	8:00 P/D
NWPA2MTN	530	3	29	146.28/88	9:00 P/D
PFN (Ind.)	191	226	31	3958	5:00 P/D

I regret to announce that W3PHD and K3YVU are Silent Keys. New novices are KA3KDT & KA3KOS. To Advanced KC3GO (was N3CKC); to Extra KC3CY. New call KC3HJ (was WB3ICC). Congrats to the Indiana club on their special participation in the special event for Actor James Stewart's 75th birthday in his birthplace. Our new Technical Coordinator is W3FE, Don Henry of Greensburg. He is an extra, has been for 18 years and is 36 old. He is willing to help with any technical problems. STM AC3N has written an excellent guide for handling traffic and for net procedures. She gives references where else to look for more info. I have given my approval to her efforts and hope all section traffic ops will read it. We all can learn, no matter how old we are and how much we operate. There will be a Q & A session one half hour before the WPAPTN on Wednesdays; I hope we can have good participation. KA3JIX of Butler Co. received the Penn Tech Instr. Scholarship; Congrats. Traffic: N3ADU 494, K3CPI 218, AC3N 187, N3CKQ 124, W3OKN 100, WA3UNX 65, W3IQD 60, W3RUL 57, KN3B 54, WA3QNT 53, K3NPW 52, K3SMB 51, KI3C 40, W3KMZ 29, W3TTS 29, W3MML 28, KB3UO 28, W3NGO 23, K3TUA 19, KA3HSV 15, KF3V 14, K3VQV 14, KA3COX 13, W3KUN 12, W3GVI 10, M3KB 8, N3CYV 7, K3LTV 7, W3SN 7, W3TTN 6, W3LOD 5, WB3HBE 4, KA3HDL 4. (Feb.) WA3UNX 50.

CENTRAL DIVISION

ILLINOIS: SM, David E. Lattan, WD9EBQ — SEC: W9QBH. STM: KB9X. OO/RFI: K9MX. BM: K9ZDN. PIO: WD9EED. SGL: W9KPT.

Net	Freq.	Time(s)Z(Win)	Day(s)	QNI	QTC	Sess.
ILN	3690	0030/0400	Dy	492	211	62
IPN	3915	2230	Dy (xSn)	60	102	31
NCPN	3915	1300	Dy	506	70	26
NCPN	7270	1815	Dy	147	107	26
ITN	3705	0100	Dy	271	89	31
IEN	3940	1500	Sn	146	6	5
ILARES	3915	2230	1+3 Sn	26	0	2

9RND stns: W9HOT W9HOT W9NXG W9HLX K9CMO K9EHP WA9BXB WB9WGD WB9NVN WB9ODN. CAND stns: W9NXG W9HOT WB9WGD WB9NVN WB9ODN. 9RN

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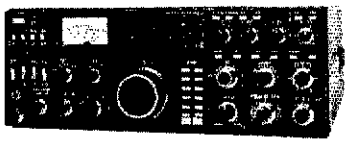

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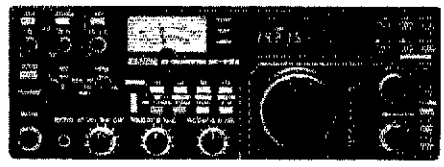

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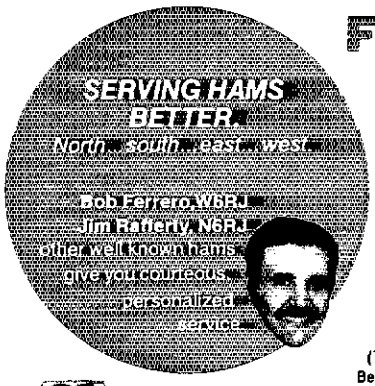

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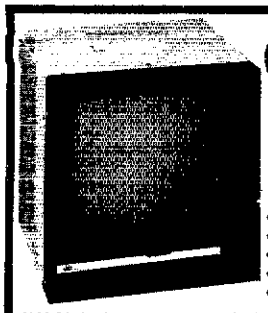
100% rep stns: K9AZS K9BVE K9CMO K9PNG K9QEW K9SW KB9X KD9K N9TN W9INZ W9NXG WB9NVN. Congrats to KA9NZI on upgrading to General this month! EC WB9CWE reports that he, WB9RJY WB9OOI and WB9QMO are establishing RTTY operations on both HF and VHF. EC WB9YVE says that his group will be providing communications for the Cancer Society Bike-a-thon, and that the local club is starting up another Novice class. EC WA9RUM and his group were also in on the Cancer Society bike-a-thon and he reports that WA9SXK led an Amateur Radio demonstration on May 3rd for the local Boy Scout troup. Some of the boys were impressed enough to start studying for their tickets! It is a great pleasure for me to announce the appointment of W9KPT to the position of State Government Liaison (SGL) for the Illinois section. He is also the EC for Sangamon Co., and has been active in public service communication both in Amateur Radio and with the State of Illinois for many years. It is an honor to have him serving Illinois & ARRL in this capacity. WELCOME ABOARD! Hams with an interest in or contacts in the mass media may be interested in becoming PUBLIC INFORMATION ASSISTANTS (PIAs). If you are, this is a good way to help insure that the public is made and kept aware of the good public service work that hams are doing. Call Public Information Office WD9EED for details. Looking for a good way to get your CW speed up? Here's a way to do it while having some fun and serving the public. Check out the Illinois Training Net (ITN) which meets every night at 7 P.M. local time. ITN is also an excellent place to learn or brush up your message traffic skills. Frequency is 3705 so if you have a license, you can participate. THERE'S NO SUCH THING AS A FREE LUNCH!! You've all heard 'ol EBQ soapboxing on how we all need to participate to some extent in the public service aspects of ham radio in order to be able to continue to justify our existence and spectrum both now and in the future. General Counsel N3AKD brought this home to the hams that heard him speak on the problems, precedents, and current litigations with respect to local tower ordinances, at the SRRC hamfest. He was assisted in this by W9WU who is representing the amateurs in the tower litigation in Burbank IL. Both N3AKD and W9WU indicated that it would be unlikely that a municipality would consider such unfavorable legislation against a group that was involved in a positive way with the local police or ESDA in terms of providing public service. Get involved with ARES, NTS, and local public service events . . . the radio service you save may be ours!! Traffic: K9ZDN 245, W9NXG 219, K9CMO 218, W9JIJ 210, W9HOT 170, W9OK 136, KB9X 125, KA9NWO 98, W9HLX 91, KD9K 74, W9TLU 64, K9AZS 53, K9PNG 52, WA9SHE 37, KN9BAM 36, K9OEW 31, W9KR 24, N9TN 16, WA9BXB 15, K9BVE 14, K9EHP 14, W9VEY 12, WA9RUM 9, WD9IBH 8, W9LNQ 8, KA9NBH 8, N9DIX 7, WD9CBJ 5, WD9EED 4, KA9NZI 2.

INDIANA: SM, Bruce Woodward, W9UMH — SEC: WB9ZOE. STM: W9JUJ. OO/RFI: KJ9G. SGL: WA9VQQ. PIO: K9DIY. SDXC: N9MM. BM: KC9TA. SRC: N9WB. ACC: K9TUS. SCC: W9OBF. TC: WD9ADB. NMs: ITN-W9QYY; QIN-KJ9J; ICN-KA9CZD; VHF-W9PMT; IWN-N9BHT.

Net	Freq.	Time/UTC/Daily	QNI	QTC	QTR	Sess.
ITN	3910	1330/2300	1907	271	1569	62
QIN	3656	1430/0100/0400	835	403	2088	93
ICN	3708	2315	102	29	540	29
IPN	3910	2130	1025	103	817	31
IWN	3910	1310	2967	—	525	31

Hoosier vhf nets: QNI 3945, QTC 230, QTR 8219, bulletins 65 for 22 nets. D9RN 100% 429 messages in 1239 minutes. IN stns W9JUJ W9URQ K9CGS KJ9J KB9NR KA9EIV. 9RN 100% QNI 402, QTC 493, QTR 1043 for 62 sess. IN stns N9AEI W9EI K9FW N9HZ KJ9J W9JUJ WA9QCF W9QLW WB4RNT WB9UYU K9WWJ. CAND 100% 1049 messages in 31 sess. IN stns W9JUJ W9URQ. Appointments: OOs-KA9BOZ KB9XA. Renewals: OBS-W9EPT N9TV: ECs-K9FAR WA9AWG W9TDI. Silent Keys: W9DN Fort Wayne, W9LDL Fort Wayne N9AHC Muncie. The Indianapolis Red Cross ARC again this year did a fine job providing communications for the ARC during the 500 Festival Parade. K9UMQ and N9AUP are back from a 10,000 mile trip in their new motorhome. Thanks to KC9OG W9BS W9EL KA9DOO N9AJM WB9TXV and WB9CER for the month-long Amateur Radio display at the Warren Library. I am very interested in their plans for the Indianapolis Children's Museum. W9JUJ lost her mother last month; our condolences. W9JUJ attended the Evansville Hamfest. She was pleased at the large crowd for the ARRL Forum. K9KM (Central Division Vice Director), W9JUJ and W9UMH had a large crowd at the ARRL Forum at the Muncie Hamfest. The audience got to listen to me gripe about Headquarters. I was on a real kick after just getting a letter from W6INI. I received the Pike County ARC *THE CAPACITOR* for the first time this month; it is a great newsletter. Thanks to editor K9KRN. It's nice to know that W9UL and WB9YWZ are grandparents. Congrats to WD9GHI for being chosen Army MARS Operator of the Month. WA9RAP received the Fort Wayne ARC Service Award for 1982. The Clark Co. Amateur of the Year award went to N9TV. Their Elmer of the Year was KB9LQ. I heard some people working the "Indy 500 Sprint" but do not have a report. Hopefully will have one from W9OBF for next month's edition. Traffic: W9JUJ 1015, KJ9J 220, W9QLW 209, WB9UYU 160, W9EI 156, W9URQ 148, WA9QCF 114, N9AEI 91, W9QYY 84, W9UEM 57, K9WWJ 48, KA9OIU 42, WD9HII 40, KC9TA 40, KK9N 39, W9JZV 35, KC9ED 34, WB9JUV 33, KA9FFO 31, N9HZ 30, AB9A 27, KA9LAU 26, KA9DHL 25, WB9MIK 23, N9CQS 21, WA9OKK 16, KC9F 14, KI9R 13, WD9CIV 12, WB9OZZ 9, WB9PFZ 8, K9OUP 8, WA9KWH 7, KK9D 6, WD9DWD 6, WA9JNC 6, W9RTH 6, W9ZGC 6, W9BDP 5, KB9XM 5, N9DHX 3, W9UPI 3, WB9AJY 1, KB9DE 1, W9URS 1. (Apr.) KB9HH 57, N9HZ 10, W9IOH 3.

WISCONSIN: SM, Roy A. Pedersen, K9FHI — SEC: W9OAK. STM: K9UTQ. BWN 3984 1100Z QNI 1364, QTC 1467 WB9YPY. BEN 3985 1700Z QNI 662, QTC 214 WB9ESM. WSBN 3985 2230Z QNI 900, QTC 296 K9ANV. WNN 3723 2300Z QNI 121, QTC 14 KA9HPQ. WSSN 3645 2330Z QNI 206, QTC 67 KC9CJ. WIN-E 3662 0000Z QNI 289, QTC 102 W9YCV. WIN-L 3662 0300Z QNI 251, QTC 114 K9LGU. XPO 3925 1731Z QNI 279, QTC 18 WA9YVC. NWTN .34/.94 2330Z QNI 488, QTC 37 WB9YPY. Gr. Bay .72/.12 Thurs. 0145Z QNI 19, QTC 2 WB9NRK. WCWTN .31/.91 2330Z QNI 473, QTC 40 N9AUG, KA9OPV & KA9KUG have General. KV9U & WA9TZR have Extra. K9DWS has DXCC 103 countries on phone. KO9Q has WAZ. WA9TZR has 129 DXCC countries. KR8S has DXCC endorsement 127 countries mixed mode, DXCC for countries on phone. KE9A has DXCC endorsement 290 countries mixed mode. KA9PMY has Novice. KA9NVB has Advanced. WB9ULB is now KC9ZL. KA9IRE is now KV9U.



USI Computer Products

Pi-Series Video Monitors

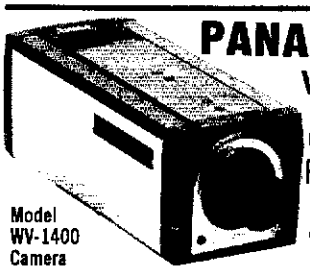
- 9" or 12" Diagonal
- Green or Amber Screen
- 80 Characters × 24 Lines
- 1000 Line Resolution
- 20MHz Horizontal B/W

USI Pi-Series monitors are design and plug compatible with most Amateur RTTY/CW Communication Terminals and small Business or Personal Computers. Clean, crisp character generation with easy-on-the eyes GREEN or AMBER screen displays reduce eye strain even after long periods of use. Amber screen models have a video-invert switch. **Metal cabinet**; 115vac-60Hz; 100-hour factory burn-in. 9" models: 8⅝"w × 8⅛"h × 9⅛"d, 14½ lbs; 12" models: 12⅝"w × 11⅛"h × 12"d, 23¼ lbs.

Model		Regular	SALE
Pi-1	9" GREEN screen monitor	$149.00	$119.95
Pi-4	9" AMBER screen monitor	215.00	149.95
Pi-2	12" GREEN screen monitor	210.00	149.95
Pi-3	12" AMBER screen monitor	249.00	179.95

New! **1400/C** 14" Composite video **COLOR** monitor. Use with Apple, Atari, IBM, Commodore, etc. computers Built-in speaker & audio circuit; metal cabinet. 14¼" × 13¼" × 14¼", 28 lbs. (Regular $399.00)... **SALE $349.95**

USI CompuMod4 Video modulator. Use regular TV for video display. Channel 3 or 4 output; Transfer switch for normal TV operaton; Input/output connectors & power supply included. (Regular $59.95)..... **SALE $49.95**



PANASONIC WV-1400 CCTV Camera Reg. $270

$189.95

Model WV-1400 Camera

For closed-circuit systems, amateur television, etc. 2/3" vidicon; f/1.6 C-mount lens; 550-lines resolution; 1v p-p output - 75 ohms; 120V ac. 3⅝"w × 3⅜"h × 8⅜"d, 3.7 lbs.

Model TR-930 Black & White TV monitor for closed circuit systems, amateur television, RTTY, SSTV, home computers, etc. 9" screen; 700-lines resolution; 1.0v p-p video input - hi impedance or 75 ohms; 120V ac. 9"h × 8¾"w × 9¾"d, 11 lbs. (Reg. $185)... **SALE $159.95**

Special!

New EIMAC 3-500Z's

List $155 - **$99.95 each**

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YAESU Closeouts

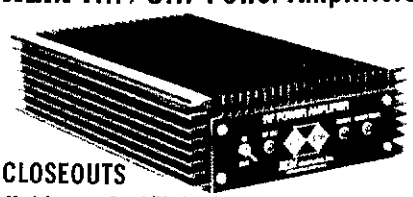
Misc. accessories		Regular	NOW
FV-101Z	101ZD/902 external VFO	$175.00	$129.95
FV-101DM	101ZD Scan VFO	359.00	199.95
FV-901DM	101ZD/902 Scan VFO	415.00	249.95
SP-107P	FT-107M speaker/patch	65.00	45.00
SP-901P	101ZD/902 speaker/patch	76.00	59.95
Misc. transceivers		Regular	NOW
FT-707	8-band digital transceiver	$810.00	$599.95
FT-627RA	6m SSB/FM Transceiver	399.00	299.95
FT-680R	FT-720RU 10w 440 FM xcvr	520.00	389.95
FT-404R/TTP	440 FM Hand-held	325.00	189.95

KENWOOD Closeouts

Model		Regular	NOW
TS-520SE	HF transceiver	$629.95	$569.95
DK-520	Adaptor kit; DG-5/TS-520	20.00	5.00
AT-180	Antenna tuner	179.95	149.95
SP-180	Speaker w/audio filters	69.95	49.95
VFO-180	External VFO for TS-180	19.95	99.95
DF-180	Digital frequency control	164.95	99.95
YG-88A	AM filter for R-820	59.00	39.95
AM-599	AM filter for R-599		24.95
VFO-700S	VFO for TS-700S/E	135.00	59.95
MB-1A	Mobile mount for TR-2200	13.00	4.95
RM-76	Microprocessor control	125.00	69.95
ST-1	Desk for TR-2400 hand-held	86.95	79.95
BH-1	Belt hook for TR-2400	4.95	
LH-1	Leather case for TR-2400	37.95	
BC-5	Mobile quick charger for TR-2400	39.95	
TR-7600	10w synthesized FM xcvr	375.00	229.95
TR-7800	25w 2m FM transceiver	369.95	299.95
BO-9	System base for TR-9000	42.95	32.95
R-300	Shortwave receiver	279.00	229.00
TS-600	6m multi-mode transceiver	799.00	569.95

KENWOOD DFC-230 20 Hz step Digital Frequency Controller with four memories. Frequency controlled from UP/DN mic. (supplied) or panel switch. Scans, speed selectable in single, slow, or fast steps. Transfer frequency from VFO-memory or memory-VFO; split-freq with xcvr VFO on TX and DFC-230 on RX. For KENWOOD TS-120S, 130S/SE, 530S, 830S ... **CLOSEOUT $169.95**

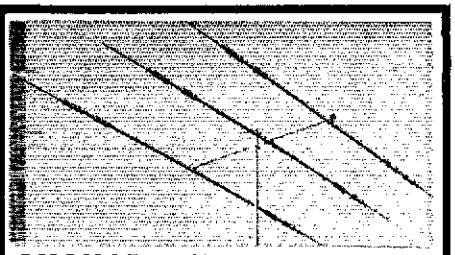
KLM VHF/UHF Power Amplifiers



CLOSEOUTS

Model	Band/Mode	In	Out	Reg.	NOW
PA15-40BL	2m FM/SSB	5-15w	40w	149.95	89.95
PA4-80BL	2m FM/SSB	1-4w	80w	229.95	169.95
PA15-80BL	2m FM/SSB	5-15w	80w	179.95	119.95
PA4-40CL	450 FM/SSB	1-4w	40w	279.95	199.95

Receive 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

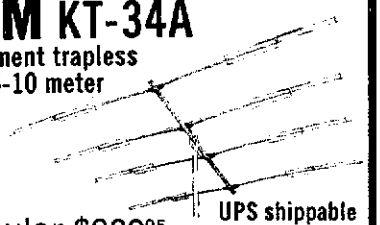


CUSHCRAFT Multiband Beams

Model		Regular	SALE
A-3	20/15/10m, 3-el, 14' boom	$249.95	179.95
A-743	40 or 10 MHz add-on kit	89.95	69.95
A-3SK	Stainless steel hardware kit	49.95	39.95
A-4	20/15/10m, 4-el, 18' boom	329.95	229.95
A-744	40 or 10m add-on kit	89.95	69.95
A-4SK	Stainless steel hardware kit	54.95	44.95

KLM KT-34A

4-element trapless 20-15-10 meter beam



Regular $389.95

Special $299.95

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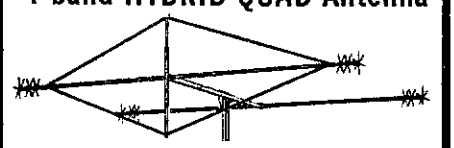
Mini-Products HQ-1 4-band HYBRID QUAD Antenna



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TBR-160HD	High power 160m adapt.	55.50	49.95
RMK-II	Roof mount kit w/radials	47.00	42.95
STR-II	Radial kit, only	33.50	29.95

BELDEN 8214 RG-8 (foam-type) coaxial cable
100' bulk roll - $36.95; other lengths, 42¢/ft.

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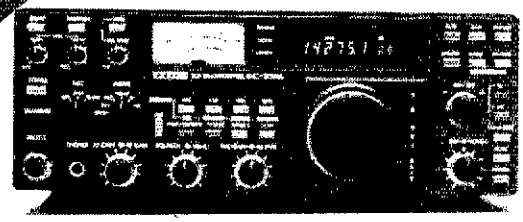

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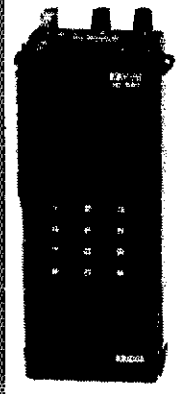

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SUPER BUYS!

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ICOM HT Accessories shipped from stock, UPS Brown Prepaid!

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BP-3 250ma 8.4V Batt	29.50
BP-4 Alkaline Batt. Case	12.50
BP-5 425ma 10.8V Batt	49.50
HM-9 Speaker Mic	34.50
CP-1 Cig. lighter cord	9.50
DC-1 DC op Pack	17.50
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DC-25 13.8VDC Adapter	19.95

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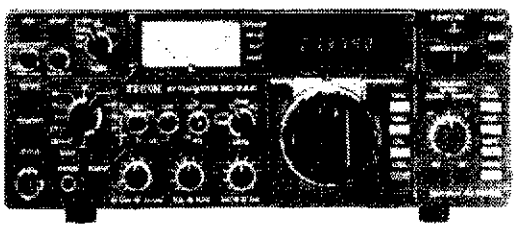

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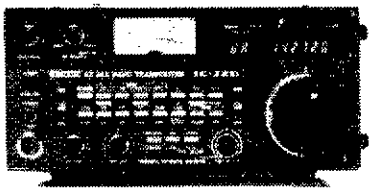
IC-740

ICOM



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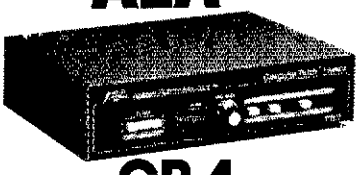
AEA



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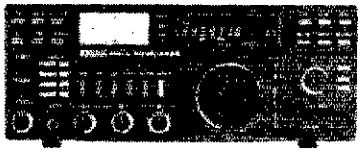

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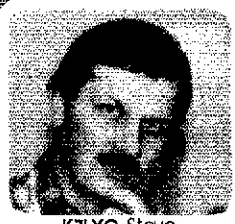

K7LXC Steve

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N9BYK received degree in electrical engineering at UW-Madison. KA9OVS from Park Falls has General. Mancorad banquet was well attended. Mark May 19, 1984 on your calendars for this banquet next year. New officers W9YT: N2NU, pres.; KAØBZK, v.p.; WB9YSD, secy.; K9EC, treas.; WB9YSE, station eng. KA9OQR, KA9DQT have Tech. BPL to KA9CPA. Traffic: KA9CPA 2519, W9YCV 215, WB9YPY 184, W9CBE 170, WA9WYS 134, K9FHI 130, W9UCL 130, KC9CJ 121, WD9FRI 119, K9GDF 116, W9IEM 116, W9LDO 116, W9DND 103, K9SAO 101, KC9KO 100, WB9ESM 86, W9SO 79, AG9G 71, KA9BHL 68, WB9NRK 66, K9AKG 64, N9AUG 58, WB9ICH 55, WB9JSW 54, KA9IKR 53, N9BYK 48, K9ANV 40, N9BCX 40, WD9IID 36, W9IHW 34, KA9HPQ 33, N9BGE 32, N9ATP 31, KB9NG 31, N9DCF 28, K9UTQ 28, K9JPS 27, WA9YVC 25, WA9ZTY 24, KC9MX 23, N9BDL 22, W9UW 21, K9BED 20, KA9BHK 19, KA9NKQ 18, KG9B 16, W9FDY 16, KB9GO 16, KB9FM 13, KA9GYD 13, KA9NOT 12, KV9U 12, N9CP 9. (Apr.) K9GDF 159, N9BGE 28, KA9ODJ 15.

DAKOTA DIVISION

MINNESOTA: SM, Helen Haynes, WBØHOX — SEC: KNØJ. STM: KDØCI. Hello again! There were two major gatherings during May. The first one was on the 7th at the Holiday Inn, Duluth, for the annual hamfest sponsored by the Arrowhead RAC. The affair was well attended by amateurs from all over the region, retail vendors were present and there was an abundance of used gear at the flea market. ADØS gave a presentation on his Kingman Reef/Palmyra DXpedition during the Happy Hour. Our hats off to ARAC for making this event a success. By the way, May 7 was designated Amateur Radio Day in Duluth by Mayor John Fedo in recognition of ARAC's service to the area since the 1920s. The second event was the annual Camp Courage Weekend May 20-22, one of the Courage Centers' activities. I was unable to attend but my tnx to KTØU, who did and filled me in on highlights. WØEQO was in operation as a special events station. Seminars included one on talking computers given by KAØNGO, and one on The Old Days of the Handi Hams by KØHR and WØTLE. KBØAE was presented the Founders Day Award as Handi Ham of the year. We add our congrats to him as well. The next major hamfest is Sunday August 14 at St. Cloud; CU there! WØMGI informs me that the St. Paul RC will be operating a special events station aboard a steam powered excursion train. KØAGF/RR will be railroad mobile on Sept. 10-11. Watch for details in the special events section of *QST*. Congrats to the following: New Novice-KAØQAV; upgrades-Tech. to Gen.-WBØZAH; Tech. to Adv.-NØBNG WBØVCT; Gen. to Adv.-KAØFXA KAØJLF. Callsign change: WBØCNC is now NAØG. Net news: On May 18, KCØT officially resigned as net mgr of the Evening Phone Net. We appreciate the outstanding job he has done in the last four years. His resignation was accepted with a great deal of reluctance. The new net mgr is KCØUJ; we wish him well and congrats on his assignment. KYØX has worked all states on the new 30-meter band, and KØIEA has 322 countries under his belt. If you have news, share it with us. This is YOUR section news. Finally, I regret to inform you that WØBBN WØMFR and WAØUIT are Silent Keys. They will be missed by us all. Our sincere condolences to their families.

Net	Time	Freq.	QNI	QTC	Sess.
MSN/1	6:30 P	3685	341	104	31
MSN/2	10:00 P	3685	248	94	31
MSSN	7:00 P	3710	87	5	—
MSPN/N	12:05 P	3945	653	84	31
MSPN/E	5:30 P	3929	992	201	31
MNAMVXN	6:15 P	3929	567	401	29
PICONET	Daily	3925	2329	293	26

Traffic: KBØMB 590, WAØTFC 434, WD9ESZ 393, KTØU 212, KAØJUX 195, KAØEPY 170, KDØCI 162, WØHZU 160, W9DM 125, NØCL6 82, WBØUKI 73, WBØHOX 70, KAØARP 67, KØCSE 61, WØGRW 47, KTØR 47, KØOGI 30, NØJP 23, KN9U 10, KAØODJ 7, KYØX 7. (Apr.) KBØMB 810.

NORTH DAKOTA: SM, Dean R. Summers, KQØC — ACC: WDØDAI. BM: WØDM. SEC: WBØTEE. CO/RFI: NØCYT, KCØRR and XYL new harmonic. Upgrades: WDØCQA-Adv.; KAØNUH NUJ-Tech.; NØEPS-Gen. Goose River club had a nice picnic in June. KAØCBW was selected for high academics of 1000 students nationwide. Goose River club sporting nice new jackets. WDØATI hospitalized; WBØFDY WBØJMK and XYLs moved. NØCYK new job and QTH. TRARC was at Heart Butte Dam for Field Day. WRARC meets every 3rd Thursday. KSØG is editor of *RRR Flyer*. Goose River QNI 81, QTC 3; DATA QNI 133, QTC 25.

DATA	3.9965 Dy	2230Z	KAØFSM
Goose River	1.990 Sn	1300Z	WØCDO
ND Slow Net	7.145 Sa	2200Z	KOØL

Traffic: KAØFSM 55, WØCDO 3.

SOUTH DAKOTA: SM, Fredric Stephan, KCØOO — STM: WØKJZ. SEC: WØYMB. TC: KØAS. SGL: NØCDX. ACC: WBØPWA. Novice Roundup highest score congrats go to KAØLPW. So. Dak. Section Manager's Public Service Awards of one year's ARRL membership have so far been awarded to WØZWL and WBØKWX. Two more will be selected next month. The UHF Contest will have two groups trying for the honors this month on the bands 220 MHz and above. For the very latest in expert QRP DXing information, contact WØRSP in Vermillion. Wx spotter training course was held in Deadwood for Northern Hills amateurs by National Wx Service. NTS TEN and DTEN liaison stations were WØKJZ KØFRE WBØKWX WBØSUM KCØOO. SD Traffic Info Net 83 QTC, 140 QNI; SD CW Net (SDN) 32 QTC, 87 QNI; SD Evening Emergency Net 10 QTC, 145 QNI; SD Sun Morn Emg Net 7 QTC, 126 QNI; NJQ Independent Net 34 QTC, 531 QNI. PSHR: WØKJZ NØCFS KCØOO NØEEH. Traffic: KCØOO 138, KØAIE 105, WØKJZ 98, WØHOJ 68, WAØUEN 62, WØDVB 58, NØCFS 55, WØMZI 53, WBØKWX 49, KØFRE 40, KCØAE 36, WAØVRE 36, WBØOMF 32, WØRWE 27, W7UDB 26, NØEEH 21, WBØSUM 18, KAØHMI 13, WBØLTY 12, WØZWL 8, NØCDX 6, WØYMU 6, WAØBZD 2, NØABE 1.

DELTA DIVISION:

ARKANSAS: SM, Joel Harrison, WB5IGF — SEC: N5BPU. TC: W5FD. SGL: W5LCI. Don't forget our cw net on 3760 kHz at 7 P.M. each evening. Congrats to W5TUM on his appointment as DEC for NE Ark. A section computer committee is in the organization stage. Their purpose will be to give technical assistance to newcomers to the computer field. If you have something that might be of interest to the membership, let me know and I will enclose the information in this section. WB5FDP is the Arkansas Frequency Coord. Contact him concerning your 2-meter rptrs. Hope everyone has recovered from Field Day. All appointments have just been updated. If you did not receive yours, contact me. Traffic: W5QFU 50, W5TUM 41, W4AZJ 30, K5BIL 26, WB5IGF 18, W5UAU 18, WB5GWU 17.

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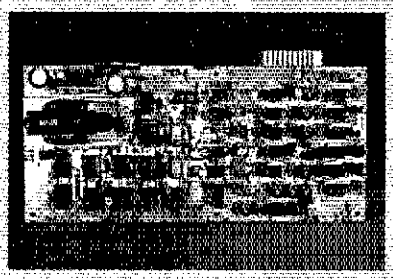

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LOUISIANA: SM, John Meyer, N5JM — ASM: KC5SF. STM: W5GHP. SEC: WA4MUW. At the 450 member NOVHF Club, summer brings a changing of the guard. W5VBX, prexy; W5ZPA, v.p.; WB5VJT, secy.; WD5IAA, treas.; K5KR N5ENV W5RNH W5TVW WA5BLG WA5TNV WB5VMR WB5VMR WB5WPL, board mbrs. Good luck. GNOARC's impressive station at Red Cross Hq got a face lift for the hurricane season; and WD5HQC, the club EC, became EC for Orleans Parish. W1DOY/5, a Mass. transplant, is the new EC for St. Tammany, but an oldtimer at PS work. Welcome to both! SARA's annual August Ham-extravaganza on the 13th & 14th is usually one of the best around, so don't miss it. The AARA's 22/82 machine's new home is Carencro with the autopatch on 81/21. The BRARC gang is making major repeater changes to handle the World's Fair chatter and the CLARC folks also have tower climbing fever. May you all be S-9! Hurricane season is here so check-in the LEN!

Net	Freq. kHz	Time	Mgr.
LAN	3615	Daily 7 & 10 P.M.	OPEN
LTN	3910	Daily 6:30 P.M.	N5ANH
LSN	3703	M-F 7:30 P.M.	WD5CWK
LRN	3587.5	Sn 5:30 P.M.	W5GHP
LEN	3910	M-S P.M.	WA4MUW
CCTN	146.01/61	M-F 6:45 P.M.	GNOARC

Traffic: W5LQ 174, W5GHP 141, KA5DHT 117, K5TL 111, WD5JFY 75, WA5TQA 39, WB5LBR 26, W5TVW 25, N5ANH 24, WA4MUW 16, W5VMY 16.

MISSISSIPPI: SM, Thomas Hammack, W4WLF — SEC: N5DDV. STM: KB5W. Congrats to N5AMK on reelection as Net Mgr on MSBN, KD5TY has accepted as NM for for MS. Slow Net. We need volunteers or nominees for appt. as State Gov't Liaison, OO/RFI Coord., Affiliated Club Coordinator, Tech. Coord. & Bulletin Mgr. Come on. It's your section. Let's make a group effort, not just your leadership deciding things. Sorry to hear of W5CH's loss of his mother. Traffic: N5AMK 324, N5EZQ 68, W5LSG 29, N5XA 3. (Apr.) K5OAR 179, KT5Z 68, W5WZ 54, N5EZQ 47.

TENNESSEE: SM, John C. Brown, NO4Q — ACC: WA4GLS. SGL: W4WHN. SEC: K4TKQ. STM: K4YOL. TC: W4HHK. The section has been notified by ARRL Hq. that the Delta ARC of Memphis has been appointed as a Special Service Club. The congrats of the section are extended, and the section staff is looking forward to several more clubs in the section attaining this elite status. It has again been noted during visits to hamfest and clubs that the word is still not out about the DX bulletins being sent out from W1AW on Friday UTC. Goes out at all regular schedules of CW, baudot, ASCII and AMTOR (when employed). Check the bulletins for the latest DX openings. By the way the top 50 kHz of 20M is still available to all Generals and above. It is mighty quiet since the expansion of the band. The TSN honor roll is active again with W4DDK NG4J K4UJZ W4ZJY and K9IMI receiving honors. DRN5 was covered 100% again this time. That's good, except only a few were doing the covering. Still had four nets without reports. NMs, give your stations a little credit. The new section net directory is out. We have a total of 23 nets available for the many amateurs in the section to participate in and/or to move traffic and support local community programs. You just might need the services of one of the nets if Mother Nature gets frisky around your QTH. One of the high reporting is not in this time, what happened. Net summary: LF sess. 94, QNI 3637, QTC 163; VHF sess. 94, QNI 2500, QTC 712; CW sess. 60, QNI 380, QTC 113; RTTY sess. 22, QNI 70, QTC 6. Support your local hamfest for 1983. Traffic: W4ZJY 237, K4WWQ 151, W4DDK 64, K4VM 35, W4MRD 33, WD4GYT 28, K4WOP 23, W4PFP 22, W4PMP 16, KI4V 13, KE4LS 12, WD4SIG 12, NN4S 10, WA4HKU 8, WA4GLS 7, NM4W 6, WW4TYV 3. (Apr.) W4MRD 23.

GREAT LAKES DIVISION

KENTUCKY: SM, Ann Sloan, KA4GFU — STM: KA4BCM. SEC: WA4JAV. OO: N4GD. TC: KJ4W. BM: WA4AGH. ACC: W4OYI. Louisville Hamfest Sept. 24 and 25 with ARRL and traffic forums.

Net	QNI	QTC	Net	QNI	QTC
KRN	192	18	KEN	95	6
MKPN	1065	135	BARES	152	18
KTN	941	118	CARN	103	13
KYN	211	91	KYPON	59	8
KSN	206	99	PAEWTN	278	25
KNTN	216	71	TSTMN	405	43
WTEN	37	8			
3ARES	36	6			
4ARES	57	1			
5ARES	87	11			
11ARES	57	4			

Stations Active: W4TPB, KU4A-OES, WA4AGH-OBS with 30 bulletins read in 15 nets. Traffic: WA4JTE 241, WD4IYI 121, WA4YPQ 93, KA4GFU 83, KA4BCM 78, KC4WN 78, WD4BSC 69, KA4SAA 68, KA4SKV 66, KB4OZ 62, KZ4G 57, KA4MZY 53, K4MHL 42, K4HOE 28, KA4MTX 26, WD4RWU 24, W4OYI 22, KD4TY 22, WD4CJO 19, WA4AGH 19, WA4AVV 16, WD4CQF 16, N4GD 15, WA4JAV 13, N4HZT 12, W4PKX 8, WD4IYH 7, W4WOV 7, KA4YIV 7, W4RHZ 6, KA4MBF 5, WA4NOG 5, NW4P 5, K4ZWB 3.

MICHIGAN: SM, James R. Seeley, WB8MTD — ASM: WA8DHB. SEC: WA8EFK. STM: WD8RHU. OO/RFI Coord.: K8JH. ACC: K8SB. PIO: WA8PII. SGL: N8CNY. TC: WB8BGY. BM: KZ8V. Join the MI ARES net, Sn, 3932 @ 1730, and the Traffic Workshop, Sn, 3953 @ 1600 (times local). 3932 is MI HF emer. freq. Silent Key, with deep regret: WA8WMT. New OOs: N8ARB and W8EMD (returning). MI Meritorious Service Award to K8KMQ. I note that our PSHR reporting has fallen off in the last few months. It can't be because of the lovely spring we had! Nor can it be from lack of activity, judging from all the reports I have been getting — drills, parades, runs, etc., and a few real weather emergencies (one of which has had our BM, KZ8V, knocked off the air all summer). A new rptr in the U.P., W8FWG/RPT, 147.93/.33 MHz, is located at Calumet Air Force Station on Mt. Horace Greeley. At 1500 ft. MSL, Isle Royal to Ishpeming with hts is normal. This is a gap that needed filling. Kudos to the Copper Country gang on the success of this project, and thanks to the USAF personnel who helped get the clearances that made it possible. The Chelsea swap was great. They worked some magic with the weather and came up with their usual good organization and friendly atmosphere. What's remarkable is the size of the Chelsea club — about 20 — to put on a show of this quality. Excellent! I feel it's time for a progress report on the implementation of the SM program in MI. There have been no sweeping changes, but the atmosphere, six months into it at this writing, seems different. Discussions at meetings and swaps have turned more toward critique sessions than the usual gripe sessions, which to me indicates that the members actually

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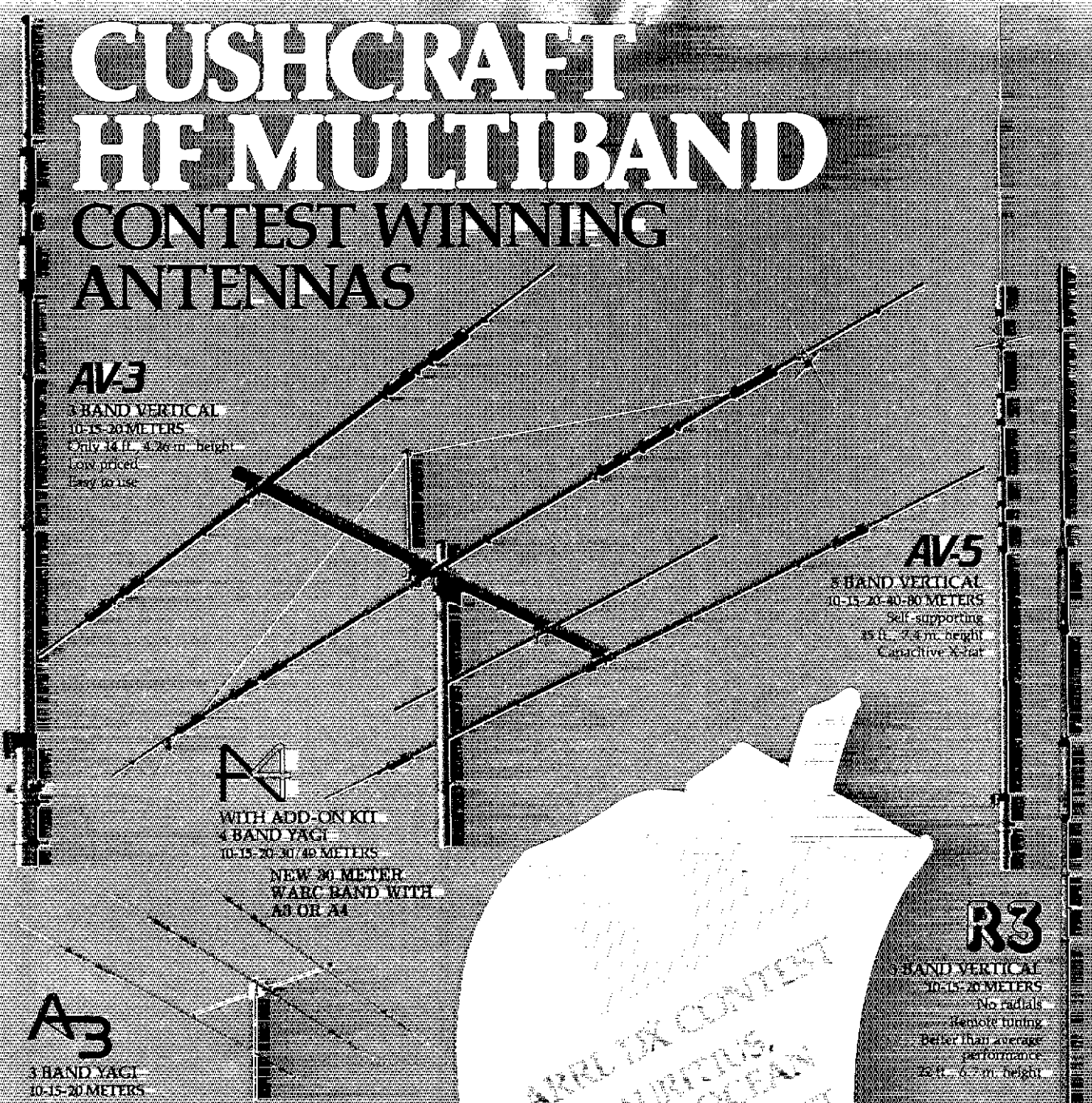

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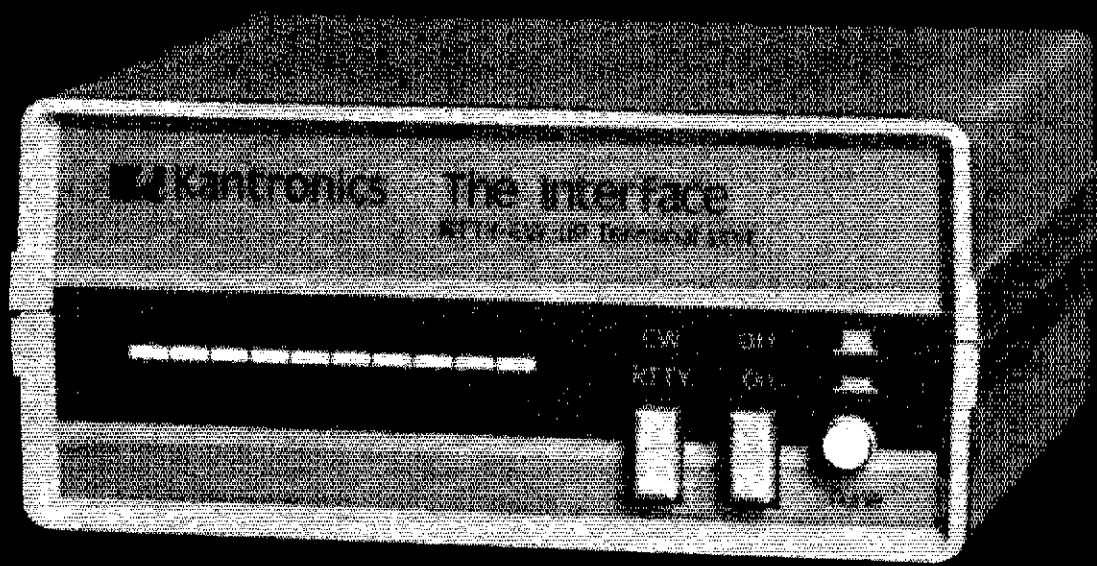

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are thinking about the new programs, and have some expectations and hopes. EC and STM business goes on as usual — as expected. The ACC has been active, processing SSC applications (none successful as yet; four in process, with one pending at Hq.), collecting data from affiliated clubs via questionnaire, etc. The SGL has been quietly but effectively monitoring — and he has the contacts — pending changes in state law which might affect amateurs. The TC has made several presentations at clubs and is becoming more widely known. The OO/RFI Coord. has added two new appointees and is beginning to organize for possible added monitoring responsibilities in the future. Our people are working; the process has begun. BPL: KA8CPS WD8LRT.

OHIO: SM, Allan L. Severson, AB8P — SEC: K8AN. STM: K8OZ. ACC: K8US. PIO & SGL: N8CVK. TC: KB8MU.

Net	QNI	QTC	Sess.	Time (local)	Freq.
BN	416	262	60	6:45/10 P.M.	3.577
BNR	312	140	31	6:00 P.M.	3.605
BSSN	346	285	59	9:45 A/7:15 P	3.927
ONN (Apr.)	133	30	24	6:30 P.M.	3.708
(May)	117	50	26		
OSN	281	106	30	6:10 P.M.	3.577
OSSBN	2412	935	93	10:30 A.M., 4:15 & 6:45 P.M.	3.9725
OSSN	176	84	31	6:45 A.M.	3.577
O6MN	395	13	28	9:00 P.M.	50.160

One last plug for newsletter editors. I guess one has to sit in a spot like mine to realize and appreciate the terrific job our fellow Buckeyes are doing. Two more examples of excellence arrived this last month: The *Q-Fiver* (OH-KY-IN ARS, Editor WD8JAJ) and Westpark *Radioops Log* (Editor N8AUH). If your club doesn't have a newsletter, or does a second rate job with what you have, your club is missing a tremendous opportunity to create increased interest and a knowledgeable membership. We need informed, involved amateurs in this hobby of ours. As I write this (early June), public service events are in high gear and, as usual, COARES (DEC W8BKO), followed closely by Hamilton Co. ARPSC (DEC W8JE), is the numerical leader in a number of events. Congrats to both groups on demonstrating what it's all about. Plans and organization for this year's Great Lakes Convention (September 24 and 25) are amazingly far along for this early in the game. On the program: a great banquet (M.C.'d by local media personality Ted Alexander, K8VPL), super commercial exhibits, a flea market, forums, speeches, and spousal activities. It will be held at Aviation High School on Burke Lakefront Airport, Cleveland. (Yes, you can fly in). It is definitely a "don't miss" affair. Appointments: KB8IZ, EC Ashtabula Co. Upgrades: to Extra-WB8HIW WD8BYS WA8FHF. Congrats to all.

Local Nets	QNI	QTC	Sess.
ALERT	98	6	4
BARF	137	34	25
BRTN	212	159	31
Lorain Co.	66	6	13
Maser	150	7	4
NEON	102	17	24
NCTW	44	90	22
RARA	60	3	4
TATN	227	189	31
TSRAC	1040	61	37
VWCEN	50	4	5

Traffic: K8NCV 751, WD8MIO 571, K8OZ 505, W8PMJ 403, WD8KFN 368, W8OZK 239, N8DSU 234, K8YUW 231, N8EES 208, K8JDI 195, KF8J 167, WB8DMF 161, KA8NFD 167, W8SKP 166, AB8P 158, K8EM 124, N8BQK 110, KA8HUZ 110, KA8IAF 108, KA8GJV 106, WA8GMT 102, KA8MEB 101, WB8UBR 97, W8HVA 90, WD8KBW 85, WB8JGW 83, WA8SSI 83, N8EBA 82, N8CSL 76, KA8ICB 72, WD8IKC 72, W8EK 68, N8EMR 66, K8TVG 64, W8MVE 63, WB8YTD 63, W8WEG 60, N8EBC 58, WD8AYH 55, N8CWU 52, W8MOK 52, WA8HED 49, WD8NEC 48, K8DL 45, K8AN 40, WA8QYJ 40, WD8RGT 36, WB8YYS 35, WA8BUW 34, WB8KWD 34, KA8GGZ 32, WB8HHZ 28, W8TXV 28, N8AEH 27, KV8Q 25, W9CXM 24, WB8SIQ 23, KW8X 23, W8ZM 23, N8CJS 21, WB8MRL 20, WD8ODV 20, K3RC 20, W8BHL 19, KA8GMF 18, WB8KCJ 18, WA8ZID 17, K8NJQ 16, WD8RZG 16, N8CGM 15, WB8NHV 14, WB8VOA 13, WA8MIH 12, WA8HGH 11, W8UQY 11, K8VOY 11, N8CW 10, K8CKY 9, WD8RGS 9, K8LQM 8, WD8EKI 7, WD9HDZ 7, N2NS 7, W8FUP 6, N8AJU 5, NC8Q 4, WB8SRC 3, W8LZE 2, WB8OFR 2, W8OQL 2, WB8QHU 2, (Apr.) W8PMJ 355, N8XX 290, N8EMR 183, WB8QYT 117, W8MVE 43, WA8MIH 36, W8FUP 31, K8LQM 12, W8RG 11, WD8NED 9, W8OQL 7, WD8KKI 4, WB8QHU 4.

HUDSON DIVISION

EASTERN NEW YORK: SM, Paul S. Vydareny, WB2VUK — STM: WA2SPL. ACC & SC: N2BFG. BM: WB2EAG. SEC: KB2KW. Club News: Albany ARA had program on packet rptrs, reports new member KC2VZ. They had 7 grads from Novice class: KA2SBK KA2SAY KA2SBF KA2RTX KA2RTY KA2RTW KA2SBL. Schenectady ARA's member W2BKW was presented with plaque and pin for 50 years ARRL membership by K1ZZ. Westchester ARA had W2KFB speak on new compact audio disc players. It is particularly important to keep input coming during summer months. News gets rather sparse. Let's all help on traffic nets at this time when attendance is down. Ulster RACES and Overlook Mt. ARC helped with communications for World Hunger walkathon with KA2KVZ KA2AHW WA2ONN WA2KLV N2AVN WA2KPF WA2MBB N2FS AK2H KE2A WA2RUW KC2L W2XL. Still looking for volunteers for some of ENY staff! W2DW reports increased activity as OO. NA2N reports new ham in family-brother KA2RTL. Sorry to report WB2TDN is Silent Key. NYS all sessions, EPN and NYPON all report quite active months. BPL: WA2SPL. PSHR: K2ZM NA2N WB2EAG WB2VUK WB2MCO W2YJR KC2TF W2BIW K2ZVI AK2E KA2MBP KA2OPG. Traffic: WA2SPL 1394, NA2N 192, K2ZM 182, WB2EAG 171, AG2X 151, WB2MCO 150, KC2TF 120, W2BIW 88, W2YJR 66, WB2SON 62, WB2VUK 53, AK2E 49, K2ZVI 44, KA2MBP 40, WA2JQL 38, KC2T 34, KA2OPG 28, AA2Y 26, WA2YBM 13, N2BFG 11.

NEW YORK CITY-LONG ISLAND: SM, John H. Smale, K2IZ — SEC: WA2KKJ. STM: K2GCE. ACC: WB2IAP. OO/RFI: WA2PMW. TC: W2JUP.

Net	Freq.	Time	Mgr.
NLI CW*	3630	1900/2200	W2LWB
NLIPN*	3928	1815	KS2G
NCVHF	6.145/745	1939 M-F	K2MT
SCVHF	4.775/5.37	2030 M-F	WA2ARC
BAVHF	6.07/67	2000 M-F	N2BQD
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

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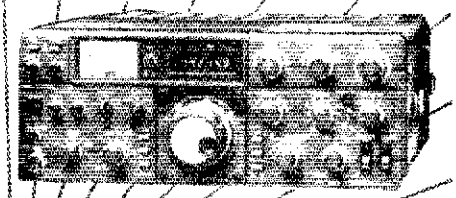

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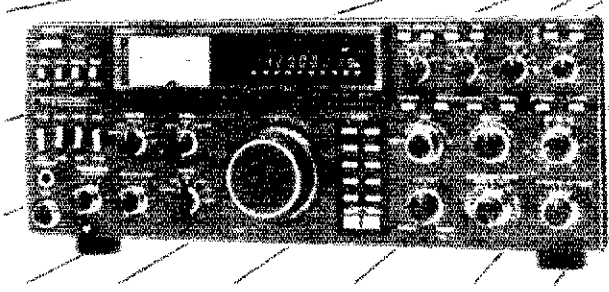

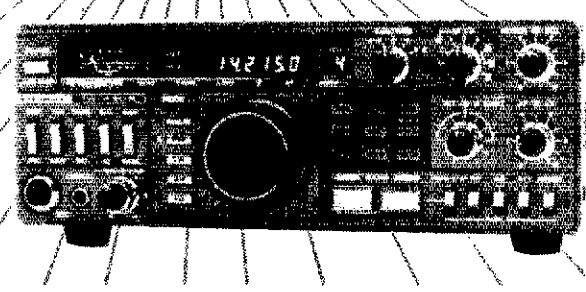

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CK-2 Contest Keyer	$ 125
MM2 Morsematic	$ 150
MBA-RO Reader...Special	$ 269
MBA-RC Reader-Sender	$ 399
Moscow Muffler for XCVR	$ 135

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RS7 A 5 amp cont-7 amp ICAS	$ 49
RS20 A 16 cont-20 amp ICAS	$ 87
RS20 M above w/meter	$ 105
RS35 A 25 amp cont-35 ICAS	$ 134
RS35 M above w/meter	$ 145
RS50 A 37 amp cont-50 ICAS	$ 186

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BY-1 Key Paddles	$ 39
BY-2 Keyer Paddles, Chrome	$ 49

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CT2100 RTTY Terminal	$ 689
K82100 Keyboard for Above	$ 141
CWR 6850 Telereader Term	$ 849

CWR-6850 Telereader -- $ 849

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We have a sidewalk sale on the first Saturday of each month. Come early to get the bargains. There are several restaurants and other shops in the area, too.

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Used gear available, and changes periodically. Call or write for list. This month's special is the FT-207R. They all work but don't necessarily have all accessories. $125 each . . . . . we have only two.

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We're open until one on Saturdays just for you. We're in Keystone Park Shopping Center, off Central Expressway, just across from Texas Instruments. Look for the two towers on top of the building.

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HG-33 MT2	$ 779
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All accessories available. Call. Tower packages drop-shipped from factory pre-paid. Sales tax may apply. Please call.

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Aptly named, because it is No. 1	$ Call
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FT708 R 450 mhz handheld	$ Call
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FT480 R 2 m all mode	$ Call
FT730 450 mhz mobile w/tt	$ Call
FT780 R 430 mhz all mode	$ Call
FT290 R 2 m portable all mode	$ Call

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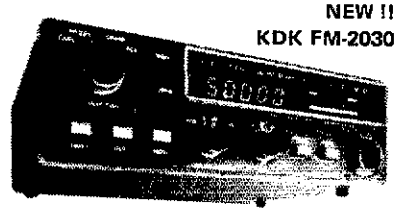

2m Fm -- 25 Watt XCVR with TTPAD

FT-230 now with TT MIC

NEW!!
Matching FT-730 450mhz Transceiver
Available Soon!

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ICOM IC-740 (+ $50 Factory Rebate) Limited Quantity	$ 857
DRAKE TR-5 Limited Quantity—Cash Only	$ 599
SANTEC ST440	$ 299
SANTEC ST-220	$ 292
SANTEC ST-144	$ 269
Tokyo HY-POWER HL30V (2 in-30 out) $50 w/purchase of 2m H.T.	
KWM-380 Cash only—(One Only)	$2,625
ETO Alpha 374A (One Only)	$1975
Robot 800H Cash only — (One Left)	$ 447

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We have plenty of each to serve you. Call for pricing on Hy-Gain, Cushcraft, KLM, and Telrex Antennas, and for Rohn and Hy Gain towers.

ROHN TOWER

HDBX 40	$ 249
HDBX 48	$ 305
HBX 56	$ 315

SPECIAL!!

Rohn 25G	$ 41/section
Rohn 45G	$ 93/section

Note: Our BX series towers include the rotor plate and base stubs. Some dealers charge extra for them—beware!!

ROHN TOWER FOLD-OVERS

FK 2548	$ 789
FK 2558	$ 879
FK 2568	$ 959
FK 4544	$ 1099
FK 4544	$ 1219
FK 4564	$ 1329

Foldovers will be drop-shipped from Rohn in Peoria, freight pre-paid. Price 10% higher west of the Rockies. Sales tax may apply. Please call.

ROTATORS

HDR 300	$ 439
T2X	$ 249
HAM-IV	$ 199
HD73	$ 99
220V. HAM IV	$ 229

KLM

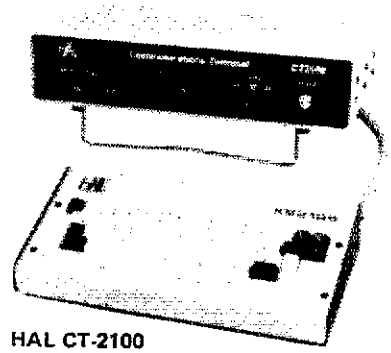
7.2-2A	$ 289
7.2-3A	$ 439
7-7.3-4	$ 599
13.9 - 14.4	$ 319
21-21.5 - 4	$ 135
28 - 30 - 4	$ 129
KT34A	$ 309
KT34XA	$ 469
144-148-13LBA	$ 79

HY-GAIN ANTENNAS

TH7DXS	$ 379
TH5MK2S	$ 319
HQ2S	$ 279
203BAS	$ 139
204BAS	$ 229
205BAS	$ 299
155BAS	$ 179
153BAS	$ 79
105BAS	$ 119
103BAS	$ 59
402BAS	$ 199
Explorer 14	$ 279
18 HTS	$ 339
12 AVQS	$ 40
14 AVQS	$ 49
18 AVTS	$ 89
2BDQ	$ 49
5BDQ	$ 99

TELREX ANTENNAS

15M532	$ 432.25
20M536	$ 535
TB5EM	$ 445



HAL CT-2100 with Keyboard

Many people thought we had died when we disconnected our WATS Line. We are happy to report that we are alive and well! We dropped the WATS Line because it cost about $1,000 per month. Some people liked to call on it to pass DX info., ask about the weather and generally shoot the bull. We don't mind shooting the bull, but we don't think our paying customers should pay higher prices so someone else can Bull Shoot! So from now on, call on your nickel. If you place any order with us that totals more than $100, we will credit you with $1.50 on that order, which is the national average for a 3-min. call.

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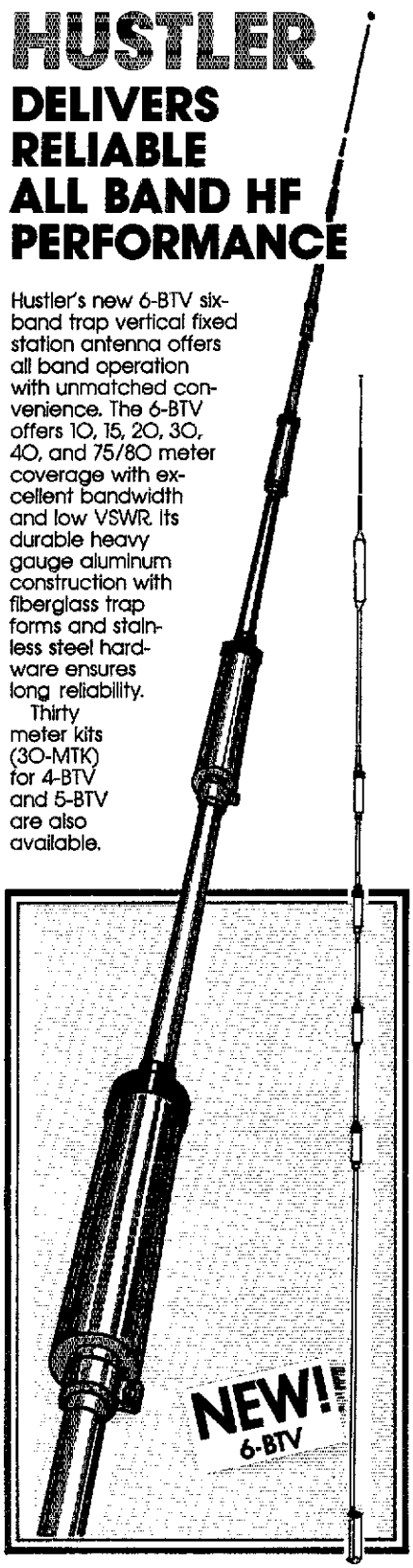
DELIVERS RELIABLE ALL BAND HF PERFORMANCE

Hustler's new 6-BTV six-band trap vertical fixed station antenna offers all band operation with unmatched convenience. The 6-BTV offers 10, 15, 20, 30, 40, and 75/80 meter coverage with excellent bandwidth and low VSWR. Its durable heavy gauge aluminum construction with fiberglass trap forms and stainless steel hardware ensures long reliability.

Thirty meter kits (30-MTK) for 4-BTV and 5-BTV are also available.



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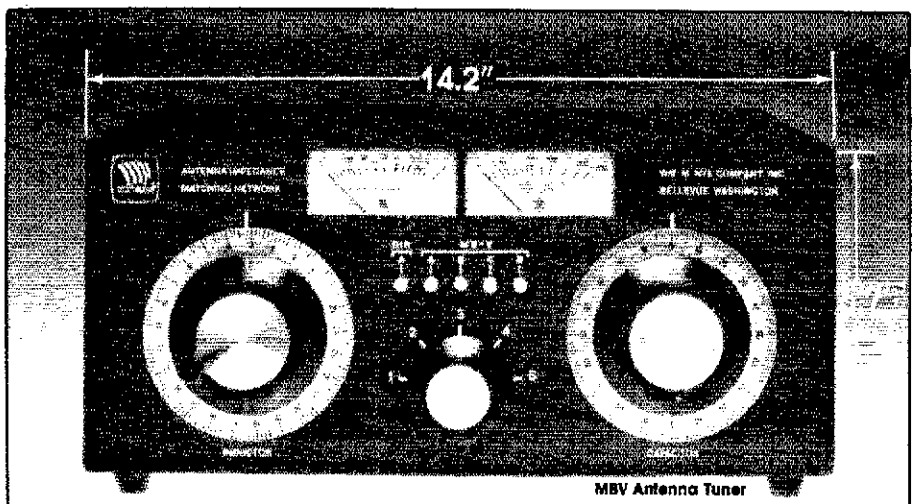

MBV Antenna Tuner

NYE VIKING 3KW MASTER TUNER

Maximize Power Transfer . . .
Match your transmitter output impedance to almost any antenna system for maximum power transfer.

3KW Matchbox . . .
Low Pass Pi Network tuning — 1.5 to 30MHz. Heavy duty, silver plated continuously variable inductor with 25:1 vernier tuning. 7000 volt variable capacitor and 10,000v switch selected fixed capacitors on output side. Tunes 40 to 2000 ohm antennas.

Automatic SWR . . .
Hands free metering of SWR. No reset or calibration needed. Separate power meter — 300 or 3000 watts. Easy to read 2½" recessed, backlighted meters show SWR and power continuously.

Antenna Switch . . .
Pushbutton antenna switching to 4 antennas (2 coax, single wire and twin lead). Tuner bypass on one coax output. We designed this rugged switch to handle the power.

3KW Balun . . .
Trifilar wound, triple core torroid gives balanced output to twin feeders from 200 to 1000 ohms and unbalanced output down to 20 ohms.

Model No. MBIV . . .
MBIV-01 available without antenna switch and backlighting. Double torroid available as optional equipment (MBIV-02).

You Also Get . . .
■ Harmonic Suppression ■ Receiver Impedance Matching ■ Heavy Gauge Aluminum Cabinet Shielding ■ Nye's TWO YEAR Warranty.

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FOR ALL MAKES & MODELS OF AMATEUR TRANSCEIVERS - TRANSMITTERS - GUARANTEED FOR 2000 WATTS SSB 1000 WATTS CW. INPUT FOR NOVICE AND ALL CLASS AMATEURS! IMPROVED DESIGN!

COMPLETE AS SHOWN with 90 ft. RG58U-52 ohm feedline, and PL259 connector, insulators, 30 ft. 300 lb. test dacron end supports, center connector with built in lightning arrester and static discharge - molded, sealed, weatherproof, resonant traps 1"X6"- you just switch to band desired for excellent worldwide operation - transmitting and receiving! Low SWR over all bands -Tuners usually NOT NEEDED! Can be used as inverted V's - slopers - in attics, on building tops or narrow lots. The ONLY ANTENNA YOU WILL EVER NEED FOR ALL DESIRED BANDS -WITH ANY TRANSCEIVER - NEW - EXCLUSIVE! NO BALUNS NEEDED!

80-40-20-15-10-6 meter - 2 trap --- 104 ft. with 90 ft. RG58U - connector - Model 998BUC . . . $89.95
40-20-15-10 meter --- 2 trap --- 54 ft. with 90 ft. RG58U - connector - Model 1001BUC . . . $88.95
20-15-10 meter --- 2 trap --- 26ft. with 90 ft. RG58U - connector - Model 1007BUC $87.95

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SAVE - ORDER NOW! All antennas guaranteed for 1 year. 10 day money back trial if returned in new condition!
Made in USA. FREE INFO. AVAILABLE ONLY FROM
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help out by checking in whenever possible. W2LWB reports that the CW net has a few open NCS spots; contact him if interested. Make plans now! The ARRL National Convention will be held next July 20-22 (yes, that's a weekend) at the New York Statler. Contact Mike Troy, AJ1J, RR 4, Box 19 C, Pound Ridge, NY 10576. Five hams helped the Hempstead Cluster of United Methodist Churches conduct a "Cropwalk" to earn funds for the hungry. The event coordinator was K2TNN, and assisting were KA2EJD N2CCF WB2JKZ & KB2WT. The Wantagh ARC has expanded their Sunday morning training to include training for higher classes, besides novice. Contact KB2HK for further info. On Sunday, May 15, five members of LIMARC N2RQ WB2DIN WB2QDS K2CFG and WA2NIC provided communications for the Tri-State Wheelchair Athletic Association track meet at Elmont Memorial HS. This was the first time that Amateur Radio had been used and the officials were very impressed. N2RQ has already been approached about possible assistance for the 1984 International Games for the Disabled. Metroplex celebrated its 5th anniversary in May. June is the 4th Anniv. of the Big Apple vhf Net. NLIPN welcomes W2GZD to its ranks. Suffolk Co. ARC had K2GCE for a guest speaker. If any clubs have a need of a speaker for the meetings or want info on the SSC program, please contact WB2IAP for further details. Please note that all OO reports will now be sent to WA2PMW, the OO/RFI coordinator. Hall of Science ARC has WA2DHF as a guest speaker at their April meeting. The club also set up a display at the Queens Day celebration. Traffic: N2AKZ 325, W2AHV 266, W2GKZ 148, K2GCE 103, K2MT 90, W2DBQ 70, WA2ARC 51, KA2FFC 34, KS2G 28, K2IZ 24, WB2BNA 12.

NORTHERN NEW JERSEY: SM, Curtis R. Williams, W5DTR — SEC: WB2VUF. STM: W2XD. BM: N2BOP. ROC: W2CC. SGL: W2KB. PIO: WB2NQV. TC: AD7I. ACCs: KK2U KY2S. NMs: W2CC AG2R N2BNB KA2GSX KA2HNQ WB2IQJ KY2D N2XJ W2PSU.

Net	Freq.	Time	Sess.	QNI	QSP
NJM	7063	1000 Dy	31	183	76
NJPN	3950	1800 Dy 0900 Sn	36	521	188
NJSN	3735	1830 Dy	31	241	82
NJN/E	3695	1900 Dy	31	422	161
TCETN	147.255	1930 Dy	26	183	62
OBTTN	147.12	2000 Dy	31	390	82
NJN/L	3695	2200 Dy	31	296	102
NJVN	49/49	2230 Dy	—	—	—
NJRTTY	147.51	Autostart			

Uplink News Number: 201-735-8550

The 24th annual NJ QSO Party, sponsored by the Englewood ARA, will be held from 2000 UTC Sat. Aug. 13 to 0700 UTC Sun. Aug. 14, and from 1300 UTC Sun. Aug. 14 to 0200 UTC Mon. Aug. 15. Details from Englewood ARA, PO Box 528, Englewood 07631. NJPN stats for April: sess. 34, check-ins 490, QSP 175. A unique Amateur Radio news service is now available in the section, thanks to PIO WB2NQV and PIA WB2ZHP. Dial 201-735-8550 for details and the latest news. Congrats to: WB2SHK on upgrading to Extra; K2MHP KA2MCM WB2UUC W9NFD KC2YG to Advanced; N2EDF to Gen.; KA2PTZ to Tech. The new officers for the Old Bridge RA are: KB2DX, pres.; KB2UC, KC2CA, treas.; KB2HM, secy.; KC2s AM AH & RL, trustees. The Cherryville RA received a Certificate of Appreciation for supporting the Police Benevolent Assn. Blue Grass Festival. The Mayor of the City of Englewood designated June 19-25 Amateur Radio Week recognizing Field Day activities. WB2QMP has earned a Net Certificate for TCETN activities. ORS KX2I. has moved to Fla. He will be missed on the nets. K2BSA operated at a Scouting Cavalcade at Bergen Community College. Please send your nomination (500 words or less) for NNJ "Elmer-of-the-Year" Award to the NNJ Chapter of QCWA, c/o N2IN, 8 Winding Way, Denville 07834. W2NPT won this award in 1982. Old Bridge RA members under leadership of KA2AHS supported the Middlesex hand-in-hand operation for handicapped children. A group led by KA2ERG and W2NKD supported the Westfield Soccer Tournament. PSHR: W5DTR N2XJ N2DPN K2VX KX2L KB2WI WB2GHN KY2P WB2KLF WB2QMP AG2R W2XD. Traffic: W2RQ 240, N2XJ 228, K2VX 112, KB2WI 105, AG2R 98, W2XD 91, KX2L 89, KY2P 78, WB2GHN 69, KA2GSX 65, N2DPN 53, WB2QMP 49, W2ZEP 35, W5DTR 31, W2UH 28, WB2KLF 27, KC2YG 25, WA2FZJ 24, W2CC 14, N2BC 12, N2BNB 5, N2EBA 2. (Apr.) KC2YG 13.

MIDWEST DIVISION

IOWA: SM, Bob McCaffrey, KØCY — SEC: WA4VWV. STM: KAØX. PIO: KBØZP. ACC: KBØZP. ACC: WBØQAM. SGL: AKØQ. TC: KØDAS. BM: KØIIR. Congrats to KAØNA for placing 2nd nationally in Novice Roundup. Welcome back to KAØX as STM, and thanks to KØGP for filling in. Fairfield rptr now at 240 ft on DPS tower. You will be hearing KEØY & KMØQ on OSCAR soon. New name in SooCy "Siouxland Amateur Radio Repeater Assn." New ECs WDØFOY & KAØNBI. Give them your support. "Old Threshers" stn planned in Mt. Pleasant Sept. 1-5 and Cider Days in Mason City Sept. 24-25. Good active FD efforts. KAØPZM to Tech. New officers in DSM are WDØCPD KAØJQG WBØOEU WDØOOK WBØQAM WBØUGO. "War Eagle" 10X chapter rechartered in SooCy. SARRA host for 3900 quarterly Mtg. Still looking for state fair operators. AARDVARK (DeWitt) RC has new rptr on 147.33/93-Cent. Iowa Tech. Society open to all hams; contact WØRPK. Lites out meeting featuring the FCC in DSM. Fall classes planned in SooCy. Those groups interested in linking with teleconference network via rptr feed, contact WØRPK or me. Keep the report grams coming, have a good summer!!!!!

Net	Freq.	Dys	UTC	QNI	QTC	Sess.
75M Phone	3970	M-S	2300-1730	1895	104	52
TLCN (CW)	3560	Dy	2330-0300	333	118	62
ITEN	3970	Sn	2230	52	3	5
ICN:	3713	TThs	0000	35	18	13

Traffic: WAØAUX 292, KØGP 145, WØSS 131, WDØFWB 95, WØYLS 86, KØCY 56, WBØJFF 54, KAØJQG 48, KDØER 38, W4JL 35, KAØADF 35, KCØSC 33, WBØAVW 24, WØBW 23, KQØI 18, KBØOZ 18, WA4VWV 18, KAØGBG 13, KEØY 6, WØFQ 4.

KANSAS: SM, Robert M. Summers, KØBXF — To those of you who handed me reports at the Salina hamfest, I must confess, I left them on a table in a motel when I left, and the maid threw them away before I found them missing. If you can remember the totals, let's try again via either radiogram or the mail, sorry. The Johnson Co. Radio Amateur Club elected: KAØGPU, pres.; WDØDZE, v.p.; WDØDQJ, secy.; KBØG, treas. Many tnx agn to the liaison stations on DTRN representing Kansas, WØFRC WØQMT

AL-80 Compact QSK CW and SSB Kilowatt Amplifier

At the suggested retail price of $699.50, the Ameritron AL-80 is one of the lowest priced kilowatt amplifiers available.

- For CW and computer enthusiasts, the AL-80 is the only amplifier in its price range to offer QSK (full break-in).
- Individually tuned broad band pi network input presents a 50 ohm resistive load to the transceiver.
- The AL-80 incorporates the rugged 3-500Z tube.
- Compact size: 12"W x 6.6"H x 11.8"D. Weight: 43 lbs.

Frequency Coverage: 1.8-21.5 MHz amateur bands. Export model includes 10 meter amateur band.
Power Input: 1500W PEP SSB, 1000W CW and RTTY.
Drive Required: typically 65W PEP on SSB and 55Won CW.
Intermodulation distortion Products: In excess of – 33 dB below PEP.
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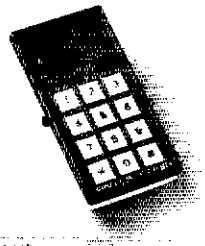
AEA produces the finest Morse keyers and trainers in the world. All AEA keyers operate with any standard keyer paddle and offer selectable monitor tone, selectable dot and dash ratios, full weighting and selectable dot and/or dash memory. In addition, all our keyers offer full, semi-automatic or straight key modes. The keyers and trainers are keypad controlled which significantly reduces the complexity of operation for all the features offered. Each keyer has separate + and - keyed outputs for keying any modern transmitter. All keyers and trainers operate from 12 VDC (or 117 VAC with optional model AC-1 wall adaptor) which makes them ideal for portable operation. AEA microcomputer-based products are all subjected to a full burn-in and test prior to shipment, as well as being designed for maximum R.F. immunity.

NEW BT-1

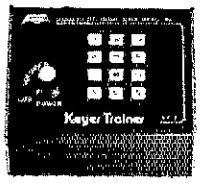


The **BT-1 Basic Trainer** is a hand-held computerized unit which teaches the code one character at a time at 18 or 20 words per minute. The BT-1 contains a self-paced training program that allows serious students the possibility of learning Morse to 20 wpm in as little as one month! Each character represents a separate practice session in which the character is first introduced by itself, and then presented 50% of the time along with all previously learned characters. There are no tapes to memorize, wear out, or break. No programming skills are necessary; the BT-1 is very easy to use. The tone oscillator can also be keyed for sending practice. An earphone jack is provided for private listening. The BT-1 will go as high as 99 WPM in 1 WPM increments. A battery operated version, the BT-1P, is available with wall charger and internal NICAD batteries.

NEW KT-3

The **KT-3 Keyer-Trainer** unit uses the teaching program used in the BT-1 trainer. In addition, the KT-3 features a full function Morse automatic keyer for keying any modern transceiver, or for sending practice. Speed range is 18-99 wpm for transmitting and 1-99 wpm for training.

KT-2 Keyer Trainer

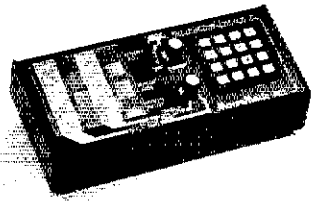


The **KT-2 Keyer-Trainer** is a computerized keyer with all the features shown above, plus a Morse proficiency trainer. It is designed to increase your existing code as quickly as possible. The unit can be set for beginning practice speed, ending practice speed, and duration of practice. The microcomputer does all the rest by gradually increasing the speed during the practice time selected. You can even select between fast code (Farnsworth) or slow code methods. The characters are sent in 5 letter groups, or random word lengths. Two levels of difficulty can be selected; common Morse characters or all English Morse characters. A 24,000 character answer book is provided for the 10 separate starting positions. There is also random practice mode for which no answers are available.

CK-2 Contester™

The **CK-2 Contester™ Keyer** is the lowest cost automatic keyer available featuring an automatic serial number generator for contesting. The CK-2 keyer features a large 500 character message memory that can be soft-partitioned into as many as 10 sections. An exclusive AEA edit mode makes it possible to correct mistakes made while entering messages or to insert words into previously established messages. Two different speeds can be set for fast recall in addition to a stepped variable speed control. The CK-2 features an automatic message repeat mode with variable delay-before-repeat for automatic CQ transmissions or TVI testing.

MM-2 MorseMatic™



The **MM-2 Morsematic Keyer** represents the most sophisticated paddle keyer ever designed and features two powerful microcomputers. The Morsematic incorporates virtually all the features (except the preset and stepped variable speeds) of both the CK-2 and KT-2 shown above. In addition, the MM-2 offers an exclusive automatic beacon mode which is invaluable for meteor scatter, moonbounce scheduling, or beacon operation.

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and WAØTJU. New manager of QKS-SS is WØMYM of Wichita. WDØFIT WBØRHR and WØMYM have been doing the NCS duty. Join them 3735 kHz MWF. WØKL reports that progress is being made on the *disaster-team* organization, and each member should soon be receiving his/her ID card. Net activity: KSBN QNI 1097, QTC 184; KPN QNI 359, QTC 40; KWN QNI 853, QTC 809. KMWN QNI 730, QTC 619. CSTN QNI 1850, QTC 120; QKS QNI 259, QTC 66; QKS-SS QNI 34, QTC 11. WØNYG is to resign as EC for Zone 5B, Leav. and Atch. Co. A new EC will soon be appointed. Resignations seemed to be the thing on a number of peoples minds this past month. KCØGL also had to let the Public Information Officer spot slide by. Anyone else interested??? Traffic: WØFRC 516, WØHI 145, WAØLBB 128, WBØZEN 117, WØOYH 102, WØFIR 85, KSØU 78, WØFDJ 70, KØBXF 38, WØQMT 19, WØKL 18, KØGSC 12, WØRBO 10, KAØE 8, WØNYG 4.

MISSOURI: SM, Ben Smith, KØPCK — SEC: WBØKUW. STM: KØSI. ACC-PIO: KT5Y. SGL: KA6CSJ. BM: NØBKH. TC: K4CHS. OO/RFI Coord: WBØRHK. I have listed the ARRL section leadership positions so everyone will know their section officials. We are anxious to help all amateurs in the Missouri section. If your club needs help on a program, information on how your club can become affiliated, or how individual stations receive ARRL field appointments; contact your section Leadership Officials. Five-Band WAS certificate #1172 goes to NØAQC. Congrats. Spring storms have been keeping weather spotters, ARES and Skywarn groups busy in Missouri. The Mo-Kan Skywarn System was activated April 27 in the Kansas City area. KUØG (Communications Officer of MO-KAN Skywarn System), NØAJI (Dec), NØAAP and KØHYM (ECs) assisted in the call up. KAØFNQ was cited by the Windsor, MO Emergency Preparedness Unit for contributing his time toward both tornado spotting and using his expertise in the radio field to keep area authorities advised of approaching violent weather. We are glad to hear of amateurs receiving recognition for serving their community. Anytime an amateur or club receives an award or recognition, send us a report. New field appt.: WBØMTX, OBS. The MTTN now meets Mon-Sat, 7:30 P.M. on 3730. If you know any Novices that have not heard of MTTN, suggest they check in.

Nets	Sess.	QNI	QTC	Mgr.
MON/MON2	62	411	142	KØSI
MoKAN	9	66	49	KUØG
CMEN	6	149	1	KØPCK
RRASB	32	454	10	NØCXM
HBN	21	396	33	KØDSQ
MEOW	25	365	32	KØDSQ
MTTN	24	175	14	NØDDZ
NEMOE	12	78	12	WØOTF
ACE	12	44	2	WØOTF
JCCN	7	132	0	KCØSF
NARN	5	25	0	NØAJI
IFARN	4	48	0	WØKNF
SARN	5	68	0	WØENW
NOSSB	31	647	107	KT5Y
STARN	5	267	2	NØBKH

WASMAZ is leaving MO for NY after several years here. He appreciates the friendly reception he received from MO hams. We will miss him, especially in the traffic nets. Traffic: KCØAS 820, KUØG 175, KØSI 142, WØBMA 134, WAØYJX 99, AIØO 88, KØBM 71, NØDDZ 59, WASMAZ 52, WØOUD 52, K2ONP 49, WBØSSB 43, KØPCK 41, WBØCPR 31, KØDSQ 31, NØSS 12, WØNUB 10, NØBLB 8, KYØU 8, WBØMTX 6, WØOTF 6, NØCEE 2.

NEBRASKA: SM, Reynolds Davis, KØGND — I hope you have had a chance to catch the RTTY Section Bulletin at 1715Z on 7085 kHz. Currently am receiving newsletters from the following clubs: Elkhorn Valley ARC, Lincoln ARC, Aksarben ARC, Pine Ridge ARC, Central Nebraska ARC, Grand Island ARS, Blue Valley ARC, Midway ARC and Scottsbluff ARES. Please add me to yours if you are not listed above. New rptr at Aurora is on 147.78/18. Grand Island's new 34/94 machine should be up by now with extended coverage. Scottsbluff ARES is planning a big picnic at Gardner Park on Sat. Aug. 20; plan to arrive after 3 P.M.; dinner will be served starting at 5:30; sounds like fun! Two new appointments this month: KCØDB as OO, and WBØGQM as EC for Saunders Co. The two Nebraska CW nets are a fun way to up your CW speed: nightly at 7068 kHz at 0000Z and 3737 kHz at 0315Z. Traffic: KØDKM 115, WØKK 61, WØSGA 56, WAØSCP 32, WØHOP 31, KAØBCB 27, KØIXY 26, WØZNI 19, KØGND 14, KAØBWM 12, WAØDXY 11, WAØBOK 6, WØNIK 6, WBØGWR 5, KØODF 4, KAØFXS 3, WBØGMQ 3, KØSFA 3, KØUDW 2.

NEW ENGLAND DIVISION

CONNECTICUT: SM, Pete Kemp, KA1KD — SEC: K1WGO. STM: K1EIC. ACC: N1AZF. TC: W1HAD. BM: WA1DWE. PIO: WB1AIU. SGL: K1AH. OO/RFI: KA1ML. CT's Purple Heart activities commemorating the 200th anniversary of this most honored award, have been greatly enhanced by the hard work of many CT amateurs. A big tnx go out to all who assisted. Upgrades: Adv-N1CEU KA1IUM WB1GUX KA1FWD K1IKE KB1GS N1CUS; General-KA1EEZ N1CNL KA1IXO WB1DBQ KA1HWX; Tech-KA1JZR. Call changes: KA1HJK/KN1J; WB1FJM/KA1KGO. W1FHP and the Hen House Gang put on a demonstration at the Cavalcade of Boy Scouts with over 5,000 scouts present. K1PLR has QSYed to PA; his OO efforts will be missed. The Greater Norwalk ARC will have a special events station in operation for the Oyster Festival Sept. 9/11. The new officers of SARC: WB2INE, pres.; KA1CCH/KA1HYG, v.p.; K1UVR, KA1BHT, treas.; W1BDN, chap.; KA1GMI, MA. I regret to inform the section that N1COR and WA1TJB have become Silent Keys. K1CE, from Hq, spoke to the ICRC on the subject of current FCC and amateur happenings. WA1WOM has finally attained DXCC status. The new officers of Tri-City ARC are: WA2RYV, pres.; KA1BB, v.p.; KA1FSP, treas. R. Sec: KA1DFI, r. secy.; N1AMD, c. secy. Tri-City has also been busy providing communications for the Connecticut Bicycle Championships. TNX go out to all who participated in the recent NRC emergency test drill. New Middlesex ARS officers: WB1DQY, pres.; KA1ST, v.p.; WB1ADO, treas.; WB1GUX, secy. KB1BJ recently put on a fine presentation of computer graphics for the CARA club. K1BR recently returned from a trip to PA/HB land. Exotic mode operators should take note of the new FCC ID regulations. Stamford ARA to be commended for their fine special events station and exhibition at the Bruce Museum. They made contacts on many modes and have a display of antique amateur equipment, courtesy of the ARRL Museum. Traffic: KA1BHT 472, W1EFW 354, WB1GZX 320, WB2PJU 156, K1EIR 109, W1XX 93, W1YQL 74, N1CLV 72, K1EIC 63, WB9IHH 63, KA1EGE 59, K1AQE 56, KA1XG 55, WB1ESJ 51, W1BDN 30, K3ZJJ 10, N2BQA 6, W1CUH 5, W1QV 3.

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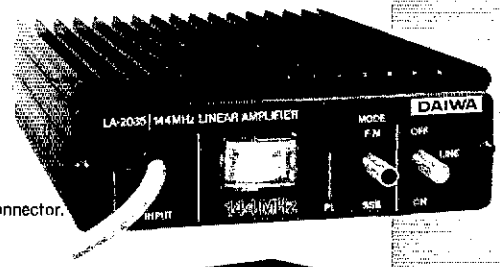
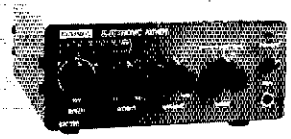
Output connector: SO 239





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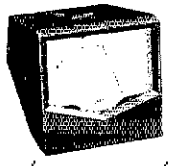

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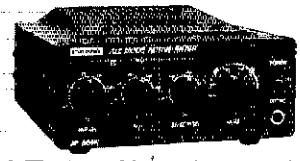

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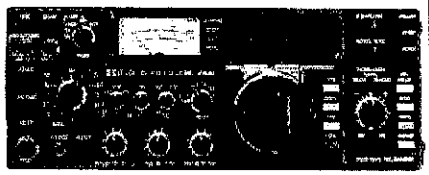

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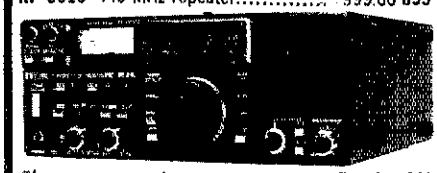

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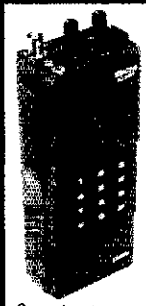
EX-299 (CK-70) 12V option	9.95	
MB-12 Mobile mount	19.50	



ICOM Handhelds

The Transceivers. The IC-2A features full coverage of the 2 meter ham band. The IC-3A covers 220 to 224.99 Mhz, and the IC-4A, 440 to 449.995 Mhz. Each comes with BP-3 rechargable battery, AC wall charger, flex antenna, earphone, wrist strap, and belt clip. Accessories are interchangable. Slide on, removable battery pack allows quick change and may be charged while removed from transceiver.

2 meters:	Regular	SALE
IC-2A .15/1.5w 2m HT/batt/wall cgr	$ 239.50	214.95
IC-2AT .15/1.5w 2m HT/batt/cgr/TTP	269.50	219.95
220 MHz:		
IC-3A 220 HT/batt/wall cgr	269.95	229.95
IC-3AT .15/1.5w 220 HT/batt/cgr/TTP	299.95	239.95
440 MHz:		
IC-4A .15/1.5w 440 HT/batt/wall cgr	269.95	229.95
IC-4AT .15/1.5w 440 HT/batt/cgr/TTP	299.95	239.95

Hand-held Accessories:	Regular
BC-25U Extra 15-hour wall charger	$10.00
BC-30 1/15-hour drop-in charger for BP-2/3/5	69.00
BP-2* 450 ma, 7.2v 1w ext. time battery	39.50
BP-3 Extra std. 250ma 8.4v 1.5w battery	29.50
BP-4 Alkaline battery case	12.50
BP-5* 450 ma, 10.8v 2.3w hi-power battery	49.50
BC-30 required to charge BP-2 & BP-5	
FA-2 Extra 2m flexible antenna	10.00
CA-2 Telescoping ¼-wave 2m antenna	10.00
CA-5 ⅝-wave telescoping 2m antenna	18.95
CA-3 Extra 220 flexible antenna	9.12
CA-4 Extra 440 flexible antenna	9.12
CP-1 Cigarette lighter receptacle chgr for BP-3	9.50
DC-1 DC operation module	17.50
HM-9 Speaker/microphone	34.50
LC-2A Leather case without TTP cutout	34.95
LC-2AT Leather case with TTP cutout	34.95
ML-1 2m 2.3/10w HT amp. (Reg. $89)..	SALE 79.95
ML-25 2m 20w HT amp. (Reg. $199.50)	SALE 179.95
IC-M12 12 ch Marine hand-held..	SPECIAL $199.95

Misc. accessories:	Regular
24-PP 24-pin accessory plug	$ 4.00
BC-10A Memory back-up; 551/720/730/740	8.50
BC-20 Nicads & DC-DC charger for portables	57.50
BU-1 Memory back-up; 25A/290A/490A	38.50
EX-2 Relay box w/marker; 720A/730/701	34.00
HM-3 Deluxe mobile mic, specify radio	17.50
HM-5 Noise canx mobile microphone, 4 pin	34.50
HM-7 Amplified mobile microphone, 8 pin	29.00
HM-8 Touch-tone mic; 255A/260A, 8 pin	49.50
HM-10 Scan mic.; 255A/260A/290A/25A	39.50
HM-11 Scan mic.; 490/25A/290A	39.50
HM-14 Scanning/TTP mic; IC-25A/45A	49.50
SM-2 4-pin electret desk microphone; 551D	39.00
SM-5 8-pin electret desk mic.; 251A/451A	39.00
Mobile mount, specify radio	19.50
GC-4 World clock	99.95

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EASTERN MASSACHUSETTS: SM, Rick Beebe, K1PAD — STM: WA1TBY. SEC: W1IAY. ASM: K9HI. ACC: K1AZE. OO/RFI & BM: WA4STO. TC: KA1IU.

Net	Freq.	Time (loc)/Dy	QNI	QTC
EMRI	3.658	1900/2200/Dy	461	365
EMRIPN	3.959	1730/Dy	285	207
EM2MN	23/63	2000/Dy	468	75
NEEPN	3.945	0830/Sn	70	25
HHTN	04/64	2230/Dy	495	240
EMRISS	3.715	2030/Dy	159	52
CI2MN	045/645	1930/Dy	220	65

A meeting on Packet Radio was held recently, which was attended by 25 people. A number of them showed enough interest to establish regular meetings on the air and in person. The on-the-air net meets on Thursdays at 8 p.m. on the 72/12 rptr. K1OJH is the informal coordinator and joins us all in welcoming KD2S to EMass from the Tucson area where he was instrumental in getting a Packet group active there. For more info, contact K1OJH. Council of East Mass Amateur Radio Associations had another organizational meeting. All clubs are invited to participate, especially non-affiliated clubs whom we may not know about. The next meeting will be Sat. Sept. 24th in Framingham. Contact ACC K1AZE for details. ARRL is looking for any attorneys that would be willing to consult gratis on a one-time basis for hams who have or think business as usual. If you're an attorney and are willing to help, contact me or Hq directly. STM WA1TBY put out another edition of the NETWORKS, and we're all wondering "Who is Larry Lunchbucket?" Massasoit rptr in Bridgewater on 78/18 sends bulletins from ARRL every Tuesday night at 8 P.M. N1DM gave an interesting talk on OSCAR at Middlesex club meeting. K1YHM upgraded to Extra and is the new president of the Framingham Club. W1HBB gave an interesting talk on Cellular Radio at the Billerica club meeting. Wellesley Club is now meeting at the Red Cross Chapter House on Washington Street in Wellesley Hills. Norwood Club members W1ZSA WA1NCY K1CB KA1IRJ K1HRV W1LUG KA1HMW WA1YIC K1SEC WA1ZLQ and KA1FQT assisted Walpole CD with AR demo at 4H Fair. New Algonquin Club officers are: K1ZFH, pres.; KA1MX, v.p.; W1BK, secy.; W1SLH, treas.; K1KTW, act. mgr. Greater Lawrence Club had AI1H talk on computer programs. If you have news of YL activities, please send them to K1IJV. Traffic: KA1GBS 579, WA1TBY 350, N1BGW 164, KO1O 159, N1AJJ 148, KA1EPO 147, W1AF 134, W1CE 94, WB3FOC 81, K1BA 75, KA1MI 63, KE1U 61, KA1BBU 60, N1BYS 54, WA1FNM 50, WA1DXT 46, K9HI 39, KI1I 39, K1BZD 36, W1ZHC 28, WA1OEZ 16, W1QLL 16, KA1KF 14, KA1EXJ 13, K1LCQ 9, N1BUY 8, KA1DJV 7, WA1FCD 7, KA1R 6, KA1AMR 4. (Apr.) KO1O 179, K1GN 61.

MAINE: SM, Cliff Laverty, W1RWG — SEC: KL7IJG/1. STM: AK1W. ACC: KA1EIW. OO/RFI: W1KX. SGL: K1NIT. PIO: KA1TJ. TC: K1YFY. BM: W1JTH. Official Bulletin Stations now include W1GTR W1GKJ KA1GCW. K1NIT has been added to the Official Observers. KL7IJG needs additional ECs. KA1TJ is calling for a public relations person in every club.

Net	Sess.	QNI	QTC	Mgr.
PTN	59	503	274	AC1G/N1BJW
SGN	28	968	190	K1GUP
CMEN	9	147	29	W1WCI
AEN	5	58	1	WA1YNZ
MPSN	5	53	4	(KL7IJG)
RACES	4	38	7	W1RWG

PSHR: KA1AVU WA1YNZ N1BJW AK1W W1RWG KL7IJG. Traffic: AK1W 311, W1ISO 141, N1BLZ 130, N1BJW 122, KA1TJ 91, KA1AVU 86, WB1BYR 82, W1RWG 82, W1BMX 77, N5YX 50, W1KX 43, KL7IJG 33, W1JTH 29, KA1GCW 28, WA1YNZ 27, N1BME 22, W1AHM 20, W1WCI 11, W1VEH 10, KA1FTL 8, KB1AQ 8, K1PV 5, K1NIT 4, KA1ENL 3.

NEW HAMPSHIRE: SM, Robert C. Mitchell, W1NH — SEC: AK1E. STM: W1TN. NMs: N1NH W1VTP KI1M. Remember Deerfield again in Oct. K1PQV Swan 350 now tunes all bands. ZL4QN, New Zealand, looking for Drake 2B rcvr. KA1IWA now General. W1HJF & JA1ZO DXing thru Russian RS-6 satellite. W1LQQ & W1UN now on DXCC Honor Roll. KK1E & W1VTP top check-ins for NHN. W1GS gave up 2 meters for 220. K4NEH rptr now K1KA. N1CHY has new Vic-20. Seen on hyways & byways: K1NUQ W8AOT WB1DDH & WA1EFN. WA1YQQ now Advanced. Welcome back to W1GUX. That's it for this month. Guess everyone is enjoying the rainy season. Traffic: W1TN 223, N1NH 197, KK1E 147, KI1M 130, AK1E 114, K1YMH 74, WB1CFP 57, W1GUX 56, W1CUE 46, W1ALE 42, K6UXO 36, W1MHX 34, N1AKS 21, N1ALM 20, WA1YZN 19, WA1PEL 14, W1FYR 14, K1UQX 10, K1PQV 7, N1AHN 6, K1OIQ 5, KA1ZO 3, N1BVI 2, KA1DSC 2, WA1FUG 2, W1HJF 2, KA1IIP 2, W1LQQ 2, K1UMB 2.

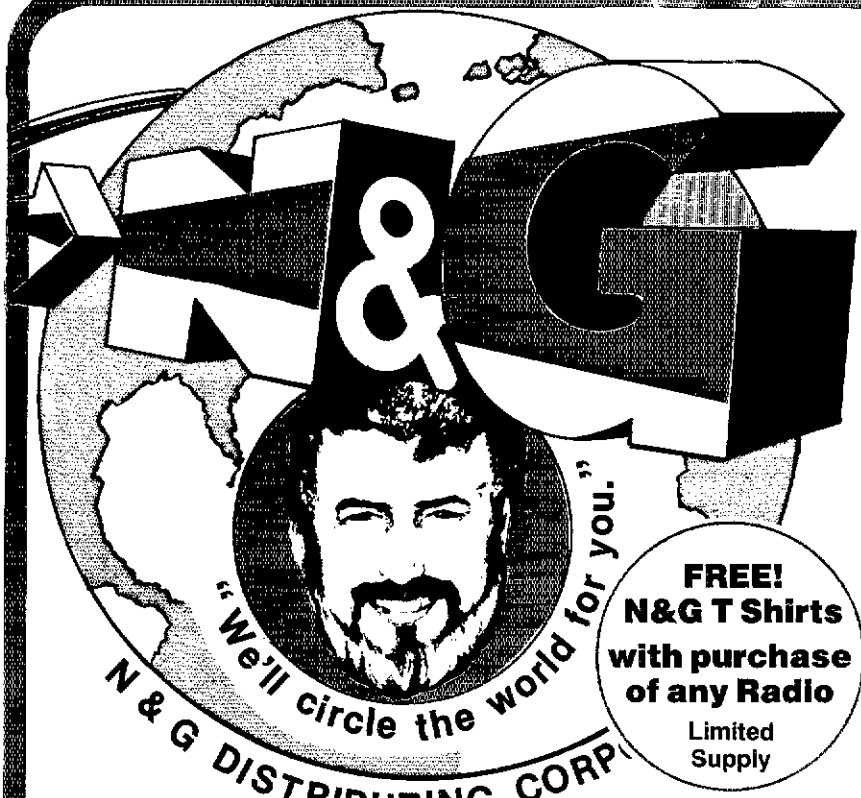
RHODE ISLAND: SM, Gordon F. Fox, W1YNE — SEC: KA1EHR. STM: W1EOF. This will be a short column this month as I received reports from only KA1EHR and W1EOF. Traffic: W1EOF 834, KA1EHR 17.

VERMONT: SM, Reed Garfield, WB1ABQ — STM: N1ARI. BM: AE1T; PIO: W1RNA. New rptr in Enosburg K1VKN/R 146.295/895. Congrats to all the members of VFMN on its 1st anniversary. N1CQE new upgrade to Advanced. Looking forward to BARC hamfest at Charlotte Aug. 13-14. Hope to see lots of you there. Very 73.

VTN	31/123/92
GMN	26/369/32
Carrier	26/498/28
VTRFD	5/95/29
VSBN	31/485/203
VFMN	31/509/82
VPN	5/90/6
CVFMN	5/41/1

Traffic: K1BQB 258, N1COB 121, W1OAK 97, N1ARI 88, AE1T 76, WB1ABQ 55, W1KRV 55.

WESTERN MASSACHUSETTS: SM, William J. Hall, W1JP — STM: W1UD. PIO: WA1MJE. ACC: W1YI. SEC: WB1HIH. It pays to contact legislators! I got a fast response from Hon. Wm. Moriarty, Public Safety Comm. to my letter regarding the Mt. Greylock tower. Let's get more active in the politics which affect amateur affairs. *Talk it up on 2 meters.* Just rcvd. a CD-210 from WA1FCD, who operates the UMass club stn W1PUO. As a relatively new member of NTS, he & the gang have come up to speed and gone supersonic. W1PUO is active in WMTN, WMFN, WMN, WMEN, WMEN/cw, NENN, FRN & IRN — whew. W1YI, a super source of activities, tells me that Provin Mt. ARA is very active in computers and is continuing its computer net on 10/70. From CMARA, news that W1VLN was honored at the WNEC commencement. The club has graduated 11 new Novices who have started a net on 15M. From the Montachusett ARA, congrats to W1GUI and W3TTV voted life membership of club owing to outstanding service. PSHR: WB1HIH W1PUO K1JHC KA1T. Traf-



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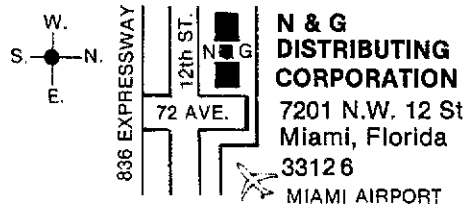

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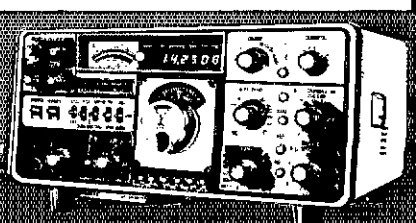

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fic: WB1HIH 148, W1PUO 129, KA1T 129, W1KK 128, W1UD 128, K1JHC 52, W1JP 31, K1PUG 29, KA1CDC 21, K1IJV 20, W1ZPB 12, WB1HKN 8, KA1EQK 7, WB1GTO 5.

NORTHWESTERN DIVISION

ALASKA: SM, Will Darsey, AL7AC — I hope the reduction of activity on the 75-meter band here in Alaska is indicative of how well Alaska amateurs are enjoying the summer. When summer comes to Alaska, can Field Day be far away? Juneau, Anchorage and Fairbanks all expecting record numbers of contacts for the state. I'd like to pass an "Atta-Boy" this month to KL7JFT of Juneau. He is the Southeast District Emergency Coordinator and has done a remarkable job. He doesn't wave a flag or stand on a soap box; as a matter of fact, you seldom hear from him on the radio. But, he has one of the best ARES plans I've seen, and I'm sure he has burned some late evening oil. He should be proud. Thanks! SPARK of Kodiak has declared their ARES trailer project "functional." Upon completion of some minor finish work, the communications trailer will be "first class" with AC generator, formica counters and toilet facilities. A lot of work well done for Dave Popkin, Casey Hooper, Joe Stevens, Pat Lods and many others. Traffic: KL7LA 922, KL7JKW 796, AL7AC 10.

MONTANA: SM, Les Belvea, N7AIK — PIO: WA7GQO. ACC: WB7TWG. SGL: W7JMX. TC: KØPP. BM: KB7SE. Upgrades: W7MAF is now Extra and new call is NB7Q; to General is KA7OJC. Sorry to report that W7BYX is a Silent Key. The Lewiston Special Olympics competition was provided with communications by KS7U KA7OJC and W7NXZ. Was very nice to see a good Montana section turnout at the NW Div. convention last month in Spokane; hope you all had a good time. W7OIO from Butte donated $5 to the Eaglehead RA (Bozeman) during a fund raising drive, and it was sold at auction for more than $100. The five dollar bill is now in the SM's shack!!! K7JZO is the editor of the Flathead Valley ARC newsletter, and does a very good job. Our ACC WB7TWG is making the rounds to lots of clubs promoting the Special Service Club program. Is your club one of them? RACOM held a meeting in Helena and elected new officers: WB7ETT, chairman; WA7FLG, vice chairman; KB7SE, secy/treas. PSHR: W7LBK WB7WVD WA7GQO KF7R.

Net	Sess.	QNI	QTC	Mgr.
BSN	12	206	8	WB7UTJ
MSN	4	37	0	KØPP
MTN	—	—	—	KB7SE
IMN	21	183	55	K7RX

Traffic: WB7WVD 155, N7AIK 54, WA7GQO 44, KD7EG 32.

OREGON: SM, William Shrader, W7QMU — STM: W7VSE. SEC: N7CPA. PIO: KC7YN. SGL: KA7KSK. ACC: WB7WTD. RFI: AK7T. OO: N7SC. Appts. for Bulletin Manager and Technical Advisor are still available. Upgrades: Tech-KA7NOX KA6RDV KA7PRR WB7OXK KA7OFV KA7PVQ KA7NTC KA7PVP KA6WUN KA8ADJ; General-KA7OFM N7DTX WB7DQG KA7NEP; Advanced-KA7KPC N6CVU WB7RBZ KA8ACG WA7WGP; Extra-KC7IR KA7ELI WB7TXF W7IMZ KA7IUY KA7ARC KD7AD; Class UK-N7CSH. Congrats to the biggest bunch in a long time. W7AHP celebrated his 93rd year in style. MANY MORE. KA7KDU made number "1" in the Novice Roundup in Technician Class. KA7AID is now manager for the Prime Time Traffic Net. K7TDX was selected as "Amateur Operator of the Month" by the Klamath Basin ARC. AL7W is the father of a new boy harmonic named Joseph. The Oregon State Convention is now old news. The whole crew under W7GWC and WB7SIC did a real tremendous job and those who missed it missed a real fine show including the weather. Mt. Hood Community College and Hoodview ARC will present "Amateur Radio Futuristics" (a unique ham fair) on 24-25 Sept. at Mount Hood C.C. SUPPORT YOUR LOCAL CLUB!! Traffic: W7VSE 1001, W7ZB 171, WA7LGN 155, K7GV 118, KA7ELI 98, AL7W 52, KA7AID 34, N7BGW 34, W7LNE 23, W7DAN 5, W7LT 1.

WASHINGTON: SM, Joe Winter, WA7RWK —

Net	Freq.	Time(Z)	QNI	QTC	Sess.
WSN	3590	0145/0445	603	247	62
WARTS	3970	0100	2829	377	31
NTN	3970	1900	854	51	31
NWSSB	3945	0130	604	59	31
NWSSB	(April)		658	42	30
EWTN	146.64	0030/0430	106	86	53
PSTS	145.33	0030/0530	176	208	61
SCARES	147.18	0230 Wed.	28	10	4

Wash. State Amateur Radio Week is set for Sept 12th thru 18th. Wash. State QSO Party is Sept 16-18 (PST) sponsored by Boeing Emp. ARS. K7RS has rules and logs. Clallam Co. ARC rpts Pt. Angeles/Victoria Int'l picnic Aug. 14 in Victoria, BC. Ten mbrs of CCARC & XYLs help Evergreen ARS with 26-mile marathon in Port Townsend on May 22nd. Clark Co. ARC says Vancouver HF was big success despite the weather. Winners were KA7HNY KA7HGA N7ARY W7DFN's XYL, W7ZUQ KA7MLW & WA7TIC. Jefferson Co. EC K7RBT "would like to thank Evergreen ARS mbrs for their participation in the Community activities this season. Well done." Radio Club of Tacoma held a joint mtg. with WWDXC on May 25 to see and hear VS6CT's slide program on Hong Kong & Macao, etc. Good show; Tnx. Tacoma Hamfair is Aug. 13-15. Co-chairmen W7BUN & KG7V promise this to be the biggest and best ever. WWDXC is hosting the NW DX Convention July 29-31 at the Doubletree Plaza Hotel at Southcenter btn Seattle & Tacoma. A good program is promised. The June mtg of the Rebels was held at WA7BLE & WA7BLF's place in Moclips on June 11-12. PIO W7CKZ is very busy recruiting Pub. Info. Assts (PIAs), writing and sending an auto rally story to *QST* & *Worldradio*, preparing for a media seminar at Northwest '83, and meeting with local county/city officials promoting ham radio. He has sent letters to affiliated clubs & individuals asking their help with info in their area. I recommend that clubs suggest PIAs to W7CKZ for appt to publicize the good things hams accomplish. We must tell the public. Bulletin stns are needed to inform all hams of the latest news and developments. To become on OBS, contact BM KD7G. Tnx to all the rptr ops who joined in on the teleconference radio net (TRN); it was a great success. The next net in Sept. will feature Sen. Goldwater, K7UGA. W7LUP rcvd 55-yr QCWA award. He is a director of Evergreen chptr. WA7RVA hosts MINOW's picnic; 13 attend, also 10 OMs. Forty Pierce, King & Snohomish hams provided excellent work on Special Olympics near Tacoma. Traffic: WB7WOW 1715, W7DZX 1094, N7AFZ 571, WB7TQF 452, KS7I 381, N7DNG 290, K7GXZ 287, W7HNA 189, N7ANE 178, W7LG 171, W7GB 164, N7AFY 162, KR7F 97, K7CTP 63, KD7G 54, WA7BDD 53, W7APS 48, KA7INX 34, K7AJT 29, N7DDP 14, W7LUP 11, K7OXL 7, W7AIB 2, N7CT 2. (Apr.) N7DDP 48, KR7F 31, W7AZU 12, K7OXL 6.

PACIFIC DIVISION

EAST BAY: SM, Bob Vallio, W6RGG. ASMs: W6ZF N6DHN VE2AQV/W6. SEC: W6LKE. STM NI6A only managed a ttc count of 153 this month, all done from his mobile owing to relocating his home! OO K6ARE still keeping an ear on the kHz. HARC's members have been busy upgrading! Congrats to: KA6YKY, now Tech; N6ICL KA6NQT KA6IBD KA6IBG, now Gen.; WB6TPA KA6EBZ KA6RAU now Adv. MDARC mourns the loss of N6EYX. Their members W6PFW WA6OFI WA6MWU WA6QAZ W6UAW KA6DPW WA6DKG & WA6AWG provided communications for a trail ride on Mt. Diablo. Their RACES/ARES members N6GQ KD6DY WD6GDG W6QEN & W6ZHY participated in a simulated emergency with Kaiser Hospital, Walnut Creek. LARK provided talk-in service for the Pacific Division meeting, and their member KD6DT warmly greeted all the attendees. Their members KD6SS W6GDM W6BNG WA6SYE WB6CFD W6UKW N6HZG WB6ALR WA6SDA KA6OOJ N6HPO & N6HZG provided communications for Livermore Fitness Day & the Livermore 8-1/2 Mile Run. EBARC welcomed new members N6IIW K6GEP N6HZO KA6NZB N6EEG. Traffic: NI6A 153, W6VOM 150, K6APW 134, WB6DOB 77.

PACIFIC: SM, Army Curtis, AH6P — Aloha and hafa adai to all of the Pacific. AH6AM WH6C KH6H KH6HA KH6MD KH6MQ and KH6UO provided public safety comm for the Valley Isle Triathalon on Maui. KH6LE upgraded to Extra from Tech. in one sitting. FB! KH6JHK and WB4FCC/KH6 active on Pacific Traffic Net. Can you help? Sure can. Call me or KH6HIJ for details on how. I'm sure everyone has heard by now, but I would like to add my congrats to Katashi Nose, KH6IJ, on his being honored at Dayton as the "Ham of the Year." An outstanding award to an outstanding amateur. Hawaii Afternoon Net totals: 31 sess., QNI 184. Check it out on 7290 at 0200Z. Traffic: KH6B 211, KH6HIJ 142, KH6S 46, W6ORS 28, KH6H 23, KH6CGL 2.

SACRAMENTO VALLEY: SM, Norman Wilson, N6JV — SEC: N6AUB. STM: KE6NO. ASM: KI6T. Congrats to KE6NO N6EPG and WA6ZUD on again making PSHR. WD6DCF presented a talk on communications at the State Dept. of General Services at the meeting of the Sacramento ARC. STM KE6NO reports that the Sacramento Valley Traffic Net had 271 check-ins in 31 sessions. Traffic reports may be sent to him at this new address: 3025 Forresthill Dr., Redding, 96002. Petitions for Section Manager are due; we should know more next month. Traffic: WA6WJZ 133, KE6NO 42, WB6SRQ 23, WD6FEH 22, WA6ZUD 16, N6CVF 14, N6EPG 13, WA6ERZ 13, WA6NVY 7, N6CHU 6.

SAN FRANCISCO: SM, Bob Smith, NA6T — SEC: N6BLN. STM: K6TP. Congrats to all the traffic handlers in the section: RN6 NM W6IPL, W6NL W6RNL K6TWJ K6TP to mention just a few. RN6 handled more traffic than any other net in the nation!! Want to get into another facet of Amateur Radio? Try traffic. See one of the biggies listed above. HARC-FWRA participated in four PS events during June. MARC birthday party will be a BBQ at HAFB Clubhouse on August 11. See N6IDF for details. Best wishes to KA6ZDB and N6DBZ on tieing the knot on May 14; one more ham duo for SCRA. SFRC rptr is back working on 145.15 MHz at KYUU. The SF marathon will give the new machine a work-out on July 24. SFRC will provide communications for the event. Tnx to WA6DNR for the "mailbox" software for the Marin Co. ACS rptr. SCRA Homebrew Contest was again won by N1AL, who was a good choice for the section Tech Coordinator. Traffic: W6NL 352, W6RNL 306, W6IPL 241, K6TWJ 130, K6TP 125, WB6RTE 13, W6GGR 6. (Apr.) W6NL 265, W6GGR 21. (Feb.) WB6RTE 23.

SAN JOAQUIN VALLEY: SM, Charles McConnell, W6DPD — SEC: WA6YAB. STM: N6AWH. ASMs: W6TRP K6YK. Stockton amateurs, representing all clubs, supplied communications for the "Stockton Run." KD6FS and WD6GFC are Silent Keys. WD6HDN and KA6QVW are Advanced. KA7AJJ and KA6JKA are Generals. KA6WYT KA6UFJ KA6ZXO and KA6TBT are Techs. KA6YOM KA6YST KA6YSW KA7YSS KA7ZRP KA6YSU KA6YSV KA6YUX KA6ZYD KA6ZYM are Novices. K6YK and KA6BIM were active in the Midnight Special. KA6FCH K6YK and KA6CZR are on OSCAR and RS. KT6G has DXCC. KB6YC has 20M WAZ and 5BWAS. At the Fresno Hamfest the XYL of WA6KZV won the IC730. AH6CO won an IC2AT. WB6ITM won an IC3AT. WA6UOR won a 220-MHz amp. W6MEL has a TS930. AE6G and KA6JOB have TS430s. W6MMH has a TR2500. AD6V and KU6A have computers. N6AWH continues to make PSHR each month. Traffic: N6AWH 175, W6DPD 34, WA6YAB 32, W6SX 11, WA6JDB 4.

SANTA CLARA VALLEY: SM, Ross Forbes, WB6GFJ — SEC: KA6R. PIO: WB6BPU. ACC: W6MKM. Don't forget the Pacific Division Convention on the 19-21 in Reno. From the sounds of activity, you'd never know we are as far down the decline side of the current sunspot cycle. Have heard many stations in the section on the air taking advantage of our "summer conditions". For those interested in propagation, don't forget the NCDXF beacons on 14.100 (see June *QST*), and don't write off 10 meters, either! There are many beacons between 28.200 and 28.400 to help you check the propagation on this band, too. While I was operating from FO8, it was interesting to listen to the number of stations in the U.S. saying the band was "dead", yet they were S9 in FO8! If we ALL listen, who will be on to let us know the band is really OPEN? Let loose with a CQ every now and then. If you know of any computer groups (any type of computer) that meet regularly on, or just monitor, a certain repeater, please let me know the information. There is interest in what others in the section are doing with their computers. Congrats to recent upgrades: KE6PQ, N6GDN KA6YYT. New EC for Santa Cruz Co. is WA6OCV. The Santa Cruz Co. ARC has been working on a loaner program for Novices who need to get started. Also, a number of SCCARC members have been working with the Del Mar School in setting up a very comprehensive Amateur Radio program; contact N6KO for details. WB6GFJ spoke to LERA Club and spent time in FO8 and VK last month. W6PRI busy helping out on PAN/C2. W6RFF busy with NCTEA. Traffic: W6YBV 350, W6KZJ 184, W6PRI 87, W6RFF 51, WA4HAD 2.

ROANOKE DIVISION

NORTH CAROLINA: SCM, Jan C. Black, WD4CNR — STM: W4EAT. SEC: KU4W.

Net	Time	Freq	QNI	QTC	Mgr.
CMN	1245Z	3927	541	244	W4EAT
CSN	1200Z	7114	146	34	NJ4L
CEN	1245Z	3893	630	186	WB4MJH

CN E/L 2300Z/ 0200Z 3574 559 244 AB4S

Enjoyed the mail this month. In amongst the bills and notifications that I was eligible to win cars, homes and huge sums of money, were some very nice club newsletters. Many thanks. Some samples: From JFK, via WB4WII, a good report on the net with space given for some words from our illustrious STM. And from KD4DU and co. in Kinston, the news about Field Day site selection, bank balance and contacting ACC about League affiliation; High Point ARC had an interesting month with visit from Phil Lacey, a Mayfest and a transmitter hunt. That's an active club. Of interest, because of the special conditions in High Point, the SEC has appointed two ECs in that county, Jim Williamson has agreed to take the job in your area. Please support him — remember, pay scale for ECs does not reflect their worth to the community. I like Forsyth ARC editor N4ANE's style. Good sense of humor too. *Ham Chatter* from the Brightleaf Club came with a couple of surprises. A timely warning about hi-power cordless telephones and a plug for the section's new NTS phone net. Thanks for both. By the way, how about the editor or whoever is responsible for a newsletter giving himself or herself or itself (you can't tell nowadays — it may be a computer) credit. You do your club and the section a service and should be recognized. There were other good publications from around the section as always but space won't allow mention of all. Thanks again and keep them coming. Traffic: WD4CNR 256, WA4OBR 238, WD4LRG 210, KU4W 202, WD4CNQ 174, K4NLK 139, W4GRO 136, W4EAT 132, AB4S 121, KA4KJI 119, NT4K 92, KZ4A 80, WB4WII 73, WA4FKY 64, WB4YZF 56, WB4N 51, WD4CEB 46, WD4LOO 46, WB4CYN 38, W8JUP 38, WB4HRR 36, KB4CUI 34, NE4J 33, K4IWW 22, WA4SRD 18, WA4YTQ 17, AK4X 14, WD4HTE 12, KA4ATK 10, W4TWD 10, N4GGI 10, N4UE 10, WD4JFR 7, KD4PJ 7, W4EHF 6.

SOUTH CAROLINA: SM, Jimmy Walker, WD4HLZ — Congrats to the Grand Strand ARC for hosting the Roanoke LPM '83. Those who didn't attend missed W4KFC. Other major speakers were W4UG N4MM K1XA and W4GF. A major event for the SC Section was KA4LRM accepting on behalf of the SCSSB Net a CERTIFICATE OF MERIT for 25 years of service to the NTS from W4KFC. Anderson ARC provided communication for the Savannah River Cycle Enduro. In addition, they assisted the Hartwell, Ga. Club with communication for a foot race event. Do you know the OOs in our section? They are W4DRF W4NTO and K4ZN. If you have heard strange sounds or operations on any of the bands and wondered what was going on, ask Lee, Fritz or Chuck; they know. Congrats to all the amateurs that have upgraded. Traffic: K4ZN 346, W4ANK 108, W4NTO 108, K4WJR 100, W4FMZ 104, KA4AUR 67, K4FRX 39, WD4NMF 30, WB4UDK 29, KE4WC 25, WD4FJP 21, K4ZB 19, KA4LRM 16, WA4JWS 15, WO1KT 11, WD4PLB 9, WA4MIY 7, W4DRF 2.

VIRGINIA: SM, Phil Sager, WB4FDT —

Net	Freq.	Time	NM
Va Traffic Net	7260	1 P.M.	WD4FTK
Va Sideband Net	3947	6 P.M.	NN4I
Va Slow-Speed CW Net	3690	6:30 P.M.	K4VWK
Va CW Net	3680	7/10 P.M.	K4JST/W3ATQ
Va Late (SSB) Net	3947	10:15 P.M.	KA4IUM

STM: WD4ALY. SEC: WB4UHC. Chief OBS: K3RZR, Chief OO: W4HU. ACC: WD4KQJ. SGL: W4THV. TC: Vacant. PIO: Vacant.
BPLs this month to AA4AT WA4CCK and K4KDJ. PSHR to K4JST WA4CCK AA4AT K4VWK WD4ALY KA4IUM KR4V KB4WT NN4I WD4OCW KB4OG KA3DTE and WA4LJI. Fifty three Virginia amateurs reported their traffic totals to WD4ALY this month; their traffic total was over 5100 message points. STARES net reports 40 sessions and 84 QTC, while SVEN reports 31 sessions and 36 QTC. Congrats to KA3DTE/K3RZR for high score in the 1983 Va QSO Party. Twenty four Richmond area amateurs assisted in the control of a James River canoe race during the city's Jubilee Celebration. A mobile rptr was set up by WD4SDC and KA4VYD during the race. The flea market was so large at the Manassas hamfest that it's starting to look a little like Dayton! WD4ALY computerizing traffic reports. K4EJ active on air from New Mexico and says hello to the Virginia gang. WB4FDT has new L4-B linear. N4HAK moving to the Midwest. W4ZYT moving to Danville. Congrats to new ORSs N4HAK NF4T and W4JLS. Traffic: AA4AT 605, WA4CCK 517, W3ATQ 358, K4KDJ 301, K4JST 262, WA4LJI 243, WB4PNY 235, WD4ALY 209, KA3DTE 204, WD4FTK 193, WD4OCW 173, KA4IUM 158, KR4V 156, W3BBN 142, NN4I 111, N4TE 75, W4UQ 74, W4NWM 67, K4VWK 67, K4JM 62, N4YQ 60, KB4OG 57, KA4JXZ 52, WB4KIT 48, W4PVA 45, NT4S 41, KC4HN 38, KB4WT 37, W4JLS 34, WB4DQZ 32, WB4UHC 30, K4AET 29, WA1VRL 29, W4HIR 27, N4HAK 25, NF4T 21, W3BBQ 20, N4FNT 20, W4LXB 14, KI4W 14, WB4FDT 13, W4ZYT 13, W4NFA 11, K4MLC 10, WB4MAE 8, WA4TVS 8, N4BJX 8, W4KXE 6, N4HYO 5, W4TZC 3, W4KX 2, N4LE 2, W4DM 1.

WEST VIRGINIA: SM, Karl S. Thompson, K8KT — SEC: K8QEW. STM: KD8G. ACC: WA8CTO. TC: K8CG. SGL: K8BS. WA8KCJ had perfect attendance on the TSTMN. There was nice attendance at Hunt HF on 6/12; nice flea market and beautiful wx. W8CWY is recovering nicely after bypass surgery. Thru ham radio, KA1FKV KA8OGF K3FY WA3NUI and KZ8Q helped old friends get reunited when all other means had failed.

Net	Freq.	Time	QNI	QTC	Sess.	NM
WVN	3567	7:00	44	34	31	W8LYY
WVFN	3990	6:00	491	83	31	N8AJC
WVMD	7235	11:45 A	588	47	31	W8FZP
KFC 2/M	87/47	8:30 M	101	5	5	WD8RHL
Hillbilly	14290	1600Z	103	5	5	KC8YU

Traffic: KZ8Q 202, K8KT 38, W8FZP 37, N8AJC 27, WA8KCJ 27, K8QEW 17, W8CAL 8, WD8DHC 5, NC8G 2.

ROCKY MOUNTAIN DIVISION

COLORADO: SM, Bill Sheffield, KQ8J — SEC: KQ8W. STM: WD8AIT. SGL: WB8FQB. BM: W8MDT. Greetings from your new SM! Thanks for all the help & encouragement. Many positions are open in the section to use your ability and Amateur Radio to help your community. Let me know. The summer run off is over, and it was a bear as we had expected. My compliments to everyone that helped and handled the problems; you all did an excellent job. BARCfest/83 coming (Boulder ARC). A good one . . . Go . . . Sept. 25. Speaking of good ones, everyone enjoyed RMRL Field Day demo and picnic at Guy Hill, Woodland Park Swapfest at Red Rocks, Ski Country Swapfest-CCARC & ARES meetings at Glenwood Springs. Met many

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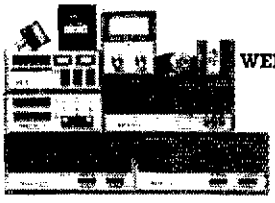
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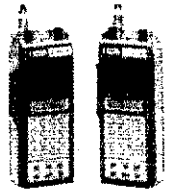
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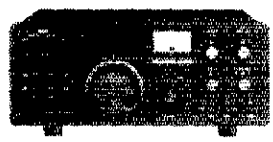
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new and old ham friends. ARA has a new rptr site out on the eastern slope with good coverage into the mountains, 144.65/145.25. Some traffic reports have not made publication the past few months. Contact me if yours was important, don't break the string. From this month forward (name dropping) will appear in this column for extra effort & performance. This month congrats go to KØQBA, KAØCZW, NØEA. Reminder . . . send me your news. Nets: CWN 30 sess. QNI 1554, QTC 106, inf. 279, QNF 1538, CWXN: 31 sess. QNI 2773, QTC 4815, QNF 930. Traffic: NØBQP 2310; WAØHJZ 2019, KØJAN 484, WAØOYI 374, KØDJ 283, NØCXI 205, WDØAIT 155, KAØNLJ 130, KBØZ 100, WØLAE 76, WØNFW 28, WBØNHA 28. (Apr.) KØDJ 210.

NEW MEXICO: SM, Joe T. Knight, W5PDY — DEC: KB5XD. STM: KV5U. NMs: WA5UNO KB5LI W5VFQ. Southwest Net (SWN) meets daily on 7099 at 1930 local and handled 107 msgs with 317 stations in. New Mexico Roadrunner Net (NMRRN) meets daily on 3939 at 0100 UTC and handled 83 msgs with 998 stations in. New Mexico Breakfast Club meets daily on 3939 at 0630 local and handled 88 msgs with 955 checkins. Yucca 2-Mtr net 78/18 & 93/33 handled 3 msgs with 753 checkins. Caravan Club 2-Mtr net 66/06 handled 14 msgs with 121 checkins. Caravan Club sponsored the amateur station at the International Science Fair and did a FB job. An article and pictures were sent to *QST*. Sorry to report the passing of WD5BLS and W5AZE. Traffic: W5DAD 246, W5JOV 177, N5SJ 123, W5ENI 81, KA5KYR 5.

UTAH: SCM, L. M. Norman, W7PBV — Thanks to all who supported me and the ARRL for the past two years, as this will be my last report as your SCM. I have been drafted by the Nevada radio amateurs to serve as their new SM. WIMU is Aug. 4-5-6. Utah VHF Society officers: KD7BA, pres.; N7EFP, v.p.; WA7GIE, rptr. engr.; WB7TSY, freq. coordinator; KD7FR, NM; N7BDZ, secy./treas. K7UM has a new ham shack. KA7DUS out of hospital and doing FB. N7BQE new EC for Kane Co. WB7RPF new EC for Utah Co. Congrats NM to W7BE and W7FSC. W7KIP WA7TNZ WB7AMR and KA7AFG, NCSs of the VHF weather net and to those who regularly participated. Traffic: K7HLR 190, WA7KHE 160, WA7MEL 112, W7OCX 12, K7CKF 11, W7PBV 11.

WYOMING: SM, Dick Wunder, WA7WFC — SEC: W7TVK. STM: WØOGH. BM: KD7AN. TC & OO/RFI Coord.: KC7QY. PIO & ACC: KC7QJ. Still looking for a State Government Liaison. KD7AN activated the State EOC during the first week of June to help with communications to Evanston for the Disaster and Civil Defense Agency during the threat of flooding. ARES/RACES drills are improving our skills, but I would like to see more counties participating. Only 50 to 60 percent do now. WB7NHR reports the Wyoming Cowboy Net held 22 sessions with 803 QNI & 26 QTC. WAØPFJ reports the Wyoming Jackalope Net held 26 sessions with 475 QNI & 1 QTC. Traffic: WB7NHR 296, K7SLM 18, KD7AN 2.

SOUTHEASTERN DIVISION

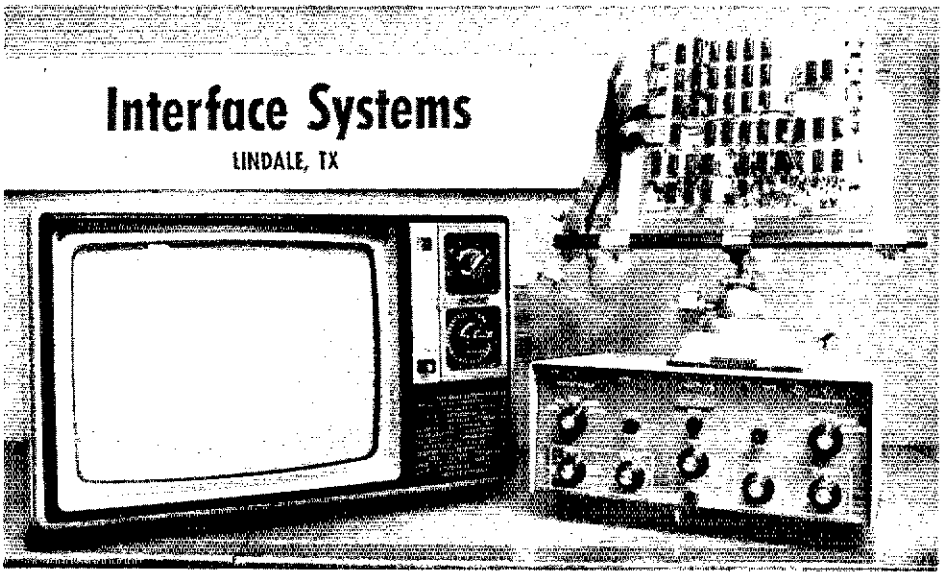
ALABAMA: SCM, Hubert H. Wheeler, W4IBU — Hurricane season started 1 June. Hopefully the season has brought no recurrences of storms like Camille and Frederick. However, don't become complacent; there may be another just around the corner. Field Day has come and gone by reading time. It was just fifty years ago that the first Field Day was held, and at that time a special license was required to participate. If you want to know how your director voted on matters of importance, it will require a change in the ARRL By-Laws. Write your director requesting that he offer a motion to effect this change of a recorded vote on each motion. Director Jay Hollaway, W6EJJ, will serve as chairman of the Forward Planning Committee. The group will include three active Section Managers. If you have suggestions, these are the folks to contact. They will be especially interested in difficulties arising in implementing the reorganization of the field structure. Still in need of ARES members. Why not volunteer? It really doesn't hurt!!! Alabama represented on DRN5 97% by NW4X W4WJF N4FQD WB4IXA W4CKS KC4GS WA4JDH W4IBU & WB4H, 100% on CAND by W4CKS & N4FQD. Traffic: WA4JDH 732, N4FQD 140, W4CKS 128, NW4X 100, WB4IXA 80, WA4LXP 47, W4IBU 46, WA4JPK 25, K4GXS 13, W4DGH 8, KC4GS 8, K4AOZ 8, WB4TVY 8, K4UMD 1.

GEORGIA: SM, Eddy Kosobucki, K4JNL — SEC: WB4HXE. ASEC: K4SWJ. STM: W4WXA. ACC: WA4ABY. PIO: WA4PNY. BGL: W4BTZ. TC: K4UDR. OO/RFI: K4VHC. NWS: WA4PZD. Red Cross: NC4E. The first Confederate Signal Corps Hamfest will be held in Madison at the Holiday Inn on Aug. 28th from 8 A.M. to 2 P.M. Many tnx to the following for all their efforts in manning the ARRL booth at the tercentennial Red Cross Convention held in Atlanta. One hundred thirty five originations left the booth to all parts of the U.S. WA4ABY WB4HXE KD4EB WB4ABY WA4PNY NG4I WB4DDN N4DXX N4CXF NC4E N4FBN. There are audio & video public service announcements available from the League for use at your local radio & TV stations. If you have close contact with either of these & they are willing to run them, please contact PIO WA4PNY. If your club desires ARRL affiliation & your membership is 51% League members, contact WA4ABY. Many clubs & local groups furnished communications for the Special Olympics. The CG ARC at Warner Robins reported that there were 1300 competitors from various parts of the state, & 25 club members were on hand to help. It's election time for most clubs in the section so please have your secy send me a new list so that we can put them in the column as well as have them for my records. The "Georgia Amateur of the Year" will be announced at the Warner Robins Hamfest in Sept. It is sponsored each year by the Georgia SSB Assn. For further info, listen to the net on 3975 each nite at 7:30 EDT, or contact pres. KF4EH. Computers are beginning to pop up all over the section, all makes and models. We have in our fraternity many computer engineers who do this for a living. Wonder if we can't organize some sort of a computer net so the beginners can get some info they need. Have a gud summer.

NORTHERN FLORIDA: SM, Billy Williams, N4UF — The Gulf Coast ARC operated two traffic display stations at local malls. WB4TZR and AA4FG had nice origination counts for the month as a result. GCARC also had club picnic. KB4T gave program to Daytona Beach ARA about lightning. DBARA rptr controller fund growing. The new net manager for QFN is WB4GHU of Deland. He has previously served as QFN NM (1977-78) and also is a very active EC for West Volusia Co. His new term is effective July 1. Thanks to outgoing QFN NM WD4AWN for a very fine job this past year. Among projects for the new

Don't Get Stuck With Low Resolution & Only One Memory

This Is The Unit That Can Be Upgraded



COLOR CONVERSION FOR ROBOT 400*

Interface System's new 12 memory conversion offers picture perfect high resolution color. This new system is the 3064-C Series. Its twelve 64K RAMs, video input multiplexing and timing circuits provide excellent results in both receiving and transmitting. Four modes of operation are available at the operator's fingertips. Its compatability with existing on-the-air transmissions is outstanding. It provides more memory storage capability than any other unit currently available to SSTVers.

Modes of Operation

1. 8.5 sec. frame sequential
2. 17 sec. high resolution frame sequential
3. 128 line sequential (25.5 sec.) single frame transmission
4. 256 line sequential (51 sec.) single frame transmission

Storage Capability

1. 12 B/W pictures (128 x 128) world standard format now in use
2. 6 high resolution B/W pictures (128 x 256)
3. 4 full color pictures (128 x 128) 4,096 hues of color
4. 2 high resolution full color pictures (128 x 256) 4,096 hues of color

Total Capability

1. Used with B/W camera and RGB filters
2. Instantly snatch color pictures using color camera
3. Instantly snatch a commercial or public color television picture
4. Single snatch capability from a VCR composite or RF outputs
5. Interface any computer (B/W or color) using the I/O port
6. Displays, transmits and receives 4 x 3 or 1 x 1 aspect ratio in any mode. 4 x 3 aspect ratio is full screen.
7. Compatible with systems now in use worldwide
8. Overlays graphics (snatch & receive modes) over any picture in memory

Any future modifications will be sent to you free of charge providing order is received on or before September 30, 1983.

BASIC SYSTEM NECESSARY TO GET ON COLOR

You may purchase either High Resolution or Standard Resolution, which you may later upgrade.

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3000-C Conversion. This system contains twelve 16K memory chips. This board is completely assembled, aligned and tested. Kit includes all installation parts and instructions. Kit $485

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3064-C Conversion. This is the 3000-C system upgraded for high resolution. It contains twelve 64K memory chips. Kit includes all installation parts and instructions. Kit $560

Television Interface

ISTV-3. This system is installed in your television set. It provides interfacing to the first video amp and the red, green and blue guns of the television set. It also provides red, green and blue video outputs from the TV set providing correct color separation. This modification makes an ideal monitor for both standard and high resolution color video. Kit $134

Additional Modification Available

1. Single frame (line sequential) and color bar generator $65
2. Full screen (4 x 3 aspect ratio) $134
3. First sync modification and graphic overlay N/C
4. CIM 4000. This is a computer interface module for any computer with an I/O port. Video is transferred from the memories of the ROBOT 400* to the memories of the computer. All types of image processing and graphic overlays are possible (software not included) $120

The following TV sets can be used with this system:

Gold Star 13", model #CR407
K-Mart 13", model #KMC 1311G
And Others

All modifications can be installed by **Interface Systems.** For further information or to place an order, call (214) 882-9908.

INTERFACE SYSTEMS

Route 4, Box 634K, Lindale, TX 75771

WE REVOLUTIONIZED COLOR SLOW SCAN TV

*Robot 400 is trademark of Robot Research,Inc.

management is a possible rebirth of the *QFN Bulletin*. WO4M (ex-KF4EU) is busy with N4ADI in organizing and managing ht and vhf nets for the Orlando ARC. WA4PUP, Public Information Officer for N Fla, is looking for PIAs in the population centers. If you are interested, let him know. KB4LB reports that occupants of a submerged vehicle were discovered by hams and authorities were summoned via two meters after the vehicle wrecked on a remote stretch of highway near Sanford. The Seminole Co. emergency group is finishing construction of a trailer to be used for public service events. The Seminole Co. RACES net now meets at 2000 local on Tuesdays on 145.52 MHz. The Hernando Co. ARA adopted new by-laws. WA3YMV upgraded to Advanced. N4US gave nice program on computers at HCARA Meeting. HCARA finance committee is composed of KB9LT WD4JXH & KB4ETW. RANGE Rabbit Hunt participants now headed up by N4GIH. Recent winners include WD4NYT N4AFE N4GBY N4EPD and KA4FPO. EC KC4N and TARS members took part in a surprise county-wide emergency drill. OPARC has completely overhauled rptr on 146.07/.67, tnx to NU4Y. KD4XP loaned his machine to the club so that the main rptr could be taken down and reworked. NOFARS homebrew contest is set for Sept. meeting. Traffic: WF4X 604, N4PL 593, WA4QXT 570, WF4Y 388, WB4TZR 307, AA4FG 285, WA4EYU 235, N4GDT 214, WB4ADL 196, NY4E 168, KA4RVQ 167, W4MGO 137, KB4LB 131, WD4HBP 107, WD4IIO 102, WB4GHU 86, KD4KK 74, W4GUJ 67, NF4O 52, W3IDO 41, KD4QZ 40, NS4C 39, KB9LT 38, KA4VXT 36, N4ADI 31, WO4M 28, WD4RIQ 27, KF4U 27, WB4DTS 24, WD4ORO 24, KB4T 18, KA4RBY 14, WA4STZ 14, NQ4P 11, KA4ETX 10, W4LUW 9, WB4AWG 8, WB4YQP 8, KF4GY 7, N4HGD 6, KA4RMH 4.

SOUTHERN FLORIDA: SM, Richard D. Hill, WA4PFK — SEC: W4SS. STM: K4ZK. ACC: AA4WJ. BM: WA4EIC. TC: KI4T. The number of station activity reports decreased significantly in May. Thanks to those who do submit them so faithfully. WD9AEP of the Fort Myers ARC continues to be instrumental in originating SAR'S from that area. May was a busy month for the Fort Myers hams — K4FQU writes that their activities included the annual club picnic, as well as providing communications for the Power Boat Regatta and boat races in the Gulf. There was also an area-wide radio drill held, and the Fort Myers club is sponsoring an explorer troop with ham radio as its specialty. WA4EIC reported his total bulletin traffic for the month was 6 received and 36 sent. No other OBS reports. WA4EIC would like a short report from each OBS each month so that we know you are active. If there is any area with no OBS, let WA4EIC know and he will help arrange for an appointment. KE4O said he has just passed the 200 mark for DXCC countries confirmed. Many thanks to W4NFK who started the Southeast Florida Traffic Net. He has been manager since it was formed, but turned it over to KF4RL as of June 1. The Broward ARC and the Fellowship club held a joint picnic in May — lots of hams and good food! W4JM wrote that DL9CC visited Lakeland in May. Thus far in 1983, DJ3TQ DL3ME DL9CC and F6KW have visited in Lakeland as a result of the weekly QCWA aked on 14380 at 1400Z every Thursday. WB4BZL writes that the SARA, Inc. voted yes on a club rptr, 146.31 In/146.91 out. He also reports they have confirmed cooperation with the Sarasota Civil Defense. Was sorry to hear that W4DL's XYL passed away in May. 73 de WA4PFK. Traffic: W3CUL 3033, W3VR 684, WA4PFK 379, K4SCL 312, K4ZK 303, K4IA 261, WA4EIC 236, K4EUK 232, W4NFK 177, WB4WYG 169, KA4GUS 160, KA4ASZ 119, KE4O 107, WD4AWN 105, WB4AID 105, W8BZY 91, W4CL 88, KY4U 84, WD9AEP 83, W4ESH 83, KA4NXF 52, WD4KBW 46, NJ4O 42, K4LCA 42, W4DVO 41, KF4RL 39, WA4HXU 37, W3TLV 37, AA4BN 36, K4JLL 36, W4PKP 35, K5IHH 34, N2WX 33, WB4GCK 32, W4SME 32, KA4BBA 29, W1DLP 27, KB4KB 24, KA4FZI 21, WK4F 21, VE3BSY 20, WA4LKY 16, K4FQU 14, W3IJC 13, W4MPV 12, KA4YHS 8, KA4GDU 6, KA4AKY 6, W3IJR 5, WB2OUK 5, KX8T 5, KA4RWV 4, K4UX 4, N4BXU 3, WB4GJH 3, K4KKP 3, W4MFD 3, NX4X 3, KM4G 3, KA4CXQ 2, WD4MCC 1, KF4JA 1, K4OVC 1, WD4PPA 1. (Apr.) KA4WSY 3, N4BXU 2.

WEST INDIES: SM, Gregorio Nieves, KP4EW — Plans for the June Field Day are being elaborated at the Puerto Rico ARC, and final meetings for coordination will be held early during the month of June. Congrats to our active WINC NM, WP4BCV, who upgraded to General class. He got his well deserved new ticket during this month. Do not let your temperature cool down, and keep going to the next. It is with deep regret that we report the passing away of KP4BHM, who was very active in the Navy Mars Net every day at 6 P.M. and is being missed by us. In his last report as SCM, KP4CV reported the passing away of KP4GH erroneously when it should be KP4GI, brother of KP4GH. Traffic: KP4DJ 49, KP4ABK 25.

SOUTHWESTERN DIVISION

ARIZONA: SM, Erich J. Holzer, N7EH — The month of May has passed and the thoughts of all the ARCs in the section are turned to Field Day. It looks like there will be a really good showing by the AZ clubs. W7KAX reports that WB7BVV talked with a fellow who had shot himself in the Music Mts to keep him awake till the DPS helicopter arrived and transported the individual to the Mohave General Hospital. K7RDH reports that he will be in Europe through July 4th. To date there have been no applications for recognition as a Special Service Club by any of the affiliated clubs in the section. I will be looking forward to hearing from your club in the near future. Plans also are progressing well for the Ft. Tuthill Hamfest. I hope to meet as many members as possible there. There are still openings in the revised field organization within the section for further details, please contact me. PSHR honors this month go to KB7FE and W5KMF. ATEN: QNI 1063, QTC 167. Cactus Net: QNI 871, QTC 115. Traffic: W7EP 138, K7UXB 96, KB7FE 86, W6KMF 81, W7AMM 38, WA7KQE 38, WB3LQQ 32, N7CVT 24, KA7HEY 22, N7CQY 20, K7RDH 14, K7NMQ 12, W7LBW 11, K6LL 10, K7POF 5, N7EH 4, WA7YUL 4, WA7NXL 2, KB8YQ 2. (Apr.) W7OIF 34.

LOS ANGELES: SM, Stan Broki, N2YQ — SEC: N6UK. STM: W6INH. ACC: NF6D. May was an exciting month with talks given by me at the West Coast ARC, SCATTS, and an appearance at the TWR Swap meet with ARRL books and stuff. Club News: Thirty operators from the South Bay ARC provided communications for the March Of Dimes walkathon on Sunday April 24. Ramona RC is starting a Novice class soon. Ongoing licensing classes are being held by the San Fernando Valley ARC. Ten operators from the JPL ARC provided communications for the March of Dimes Walkathon. United Radio Amateurs Club is holding regular monthly T-Hunts. Hughes El Segundo ARC held an auction on 30 April, netting enough to buy a TH3 Jr beam for Field Day. Many LAX clubs are gearing up for Field Day. Ares News: N6ZH is now the EC

in charge of all Los Angeles city-related matters. He is presently implementing the city plan for disaster communications. K6CL reports conditions so poor that he had no OO report for the first time in a long time. K6UYK has big rpt after being away for 15 days. Los Angeles section needs more check-ins on SCN and more monthly rpts. Come on, gang. Traffic: K6UYK 394, W6INH 231, AD7G 152, KT6D 119, AD8A 70, N6GZB 59, K6CL 26, N6DZQ 24, WA6LVO 24.

ORANGE: SM, Sandra Heyn, WA6WZN — Congrats to NS6W on appt of Public Information Officer (PIO), who will be looking for PR person to appoint Public Information Asst. (PIA). SEC W6UBQ (and OC DEC WB6JBI) have appointed WA6OPS EC for Intra Hospital Comm. Group of OC. The hospital group recently held a FB SET with 5 hospitals. STM WA6QCA appointed KA6HJK Net Manager (NM) of RTTY; HJK manages RTTY traffic net held daily 10 A.M. on both W6IWD/R 146.7(-.6) and WB6JIR/R 145.12(-.6) linked with other RTTY rptrs. K6LJA is managing new ARES emergency net that meets Wed 12 noon on W6CNL/R 146.14(-.6) on Santiago Peak; the purpose of the net is to develop a pool of ARES members available for service work day hours. EC WB6QHB reports much ARES/RACES activity that includes display at REDI Earthquake preparedness, Upland Earthquake Drill, and 5K/10K "Good Health Run." ARES/RACES supported Riverside Co.-wide Earthquake exercise with over 50 participating. W6UBQ headed up ARES comm support at March AF Base for "Exercise Night Owl;; sponsored by the National Comm System. Riverside Co. ARA sponsors "Shop & Swap net" Tues 7:30 P.M. and "Potpourri Net" Wed. 7:30 P.M. on W6TJ/R 146.889(-.6). New Orange Co. free "Swap Meet" held 2nd Sundays starting at 7 A.M. in Anaheim behind VSC Electronics with talk-in on 147.51 MHz. For list of local rptrs and WestLink schedules, send SASE to OBS N6BVU. EC WD6BNG reports successful ARES/RACES disaster drill and comm support for "Second Annual Barstow Daze" celebration. New club officers — So Ca ATV Club: WB6VVV, pres.; WB7AJC, v.p.; WB6FLG, secy./treas.; W6AZV, freq. coord; Leisure World RC (Seal Beach): KW6I, pres.; KD6GA, secy.; WA6OWL, treas.; K6GCT, PR; WCARS (7255 kHz): K6KZI, pres.; KD6FS, v.p.; W6HDV, secy.; W6KGN, treas. So Counties Amateur Teleprinter Society (SCATS): WB6FFW K6YCS KA6HJK, secy.; WB6INV, treas. Riverside ARC: KA6TUO, pres.; KN6U, v.p.; N6DNS, secy.; WA6EBH, treas. Catalina Rptr Assn.: W6PPY, pres.; WB6HTH, v.p.; K6SJX, secy.; KA6RAE, treas.; East Whittier RC: KB6X, pres.; WD6EIF, v.p.; KA6SED, secy.; WA6JCQ, treas. Org. Hill Contesters: WA6JAH, chairman; Japanese American ARS: K6CBN, pres.; W6AN, v.p.; WA6ZYB, secy.; WA6SSM, treas. For advanced registration for banquet to ARRL/SW Division convention Sept. 2-4, send $23 to Hamcon, POB 1582, Placentia, 92670. With deep regret, I must report the passing of TASMA Chairman WA6KOS. PSHR: W6NTN N6GIW WA6QCA WB6QBZ AI6E. Traffic: N6GIW 392, WA6QCA 271, W6NTN 212, KA6HJK 192, K6XI 135, AI6E 107, K6GGS 91, WB6QBZ 85, W6RE 80, K6ZCE 66, N6GOT 59, W6TKV 4.

SAN DIEGO: SM, Arthur R. Smith, W6INI — ACC: WA6COE. PIO: WA6CUP. BM: WA6HJJ. STM: N6GW. SEC: W6INI. To develop a section public info program, clubs are encouraged to designate a member for public information. Public Information Assistant (PIA) appointments are available in the new field organization. Contact PIO Jerry Boyd, WA6CUP, P.O. Box 1234, Coronado 92118 (435-3123), for details. Also, send him copies of press releases and clippings. SD Co. Emerg. Med. Svc. held a mass casualty drill with two separate events occurring within a few minutes of each other. To handle 150 simulated casualties, ARES provided 40 operators to 12 hospitals, 2 casualty collection points, Red Cross Hq., two accident scenes and for exercise coordination. Contact SEC W6INI (273-1120) if you would like to get involved in this activity. Convair ARC awarded Certificates of Recognition to K6DBJ N6FNQ K6QJP KD6QK & KM6R at the club's annual dinner. New ARES members: N6IGP N6IIM N6IMN W6KOW WA1OOH. Traffic: KT6A 749, KM6I 286, KU6D 220, K6HAP 175, KB6AI 74, N6AT 27, WA6IIK 22, N6GW 2.

SANTA BARBARA: SM, Robert N. Dyruff, W6POU — Coalinga "communications" study report given to Calif. Seismic Safety Comm. by W6POU. Amateur Radio filled essential roles well. SBAR SCTN supported mutual aid drill for Riverside Co. via W6FJA SBAR, W6HWK Vent. Co. Ret. Fire Chief KA6YCF joins Oxnard ARES. WB6TMF re-elected pres. Simi Settlers. WA6ZOJ & KE6WH awarded EXTRAs. Paso Robles ARC raffled Vic 20 at BBQ — changing times. Kiwanians-Carpinteria given illustrated talk by WB6UNH/N6FZO. N6AJA given volunteer emerg. svcs award by Assemblyman O'Connell. Silent Key: W6JYK. Annual Sea-to-Summit Bike-a-thon comms. by 25 Ventura Co. ARES/RACES ops over 100-mile course led by WB6RVA & WD6EVT. Baja AR Racing Assn. supplied annual comms for 2-day Baja Int'l "500" mi. Ensenada to San Felipe, MX. Two checkpoints manned by Paso Robles/Lompoc/SM; ops W6MSG W6YD2 KJ6R WA6YZR W6OLE KA6O. Now on RTTY: KQ6I W6RDY. Conejo Valley, N6MA & WA6UEO operating first SCTN packet radio on vhf. W6HWK developing Oxnard ARES/RACES plan. EC-KA6JWK led 5 field teams on 24 hr back country RF mapping exercise. SBAR So. Co. field team scrambled on 3 ELT searches plus lost person hunt by WD6BNH & WD6ESU into wee hrs. K6FI, Cambria, completed one wk emerg. mgmt. course on quake preparedness at CSTI in SLO. Oxnard's WD6BKF holds cw ragchew net 21.150± MHz. Santa Ynez ARC installing 220 rptr. Blood banks in Ventura/SBAR connected on 40-mtr test statewide by WB6RVA vhf/KA6VOY hf; KA6JWK SBAR So.

WEST GULF DIVISION

NORTHERN TEXAS: SM, Phil Clements, K5PC — ASM/ACC: WA5QFD. SEC: W5GPO. STM: W5VMP. PIO: N5FDL. OO/RFI: WB5JBP. TC: WB5IIR. BM: W5QXK. SGL: W5UXP. As you can see, the section staff is now complete, and I feel very fortunate to have the finest group of dedicated amateurs that could be assembled; each is an expert in his field of responsibility. PIO N5FDL reports his appt. of the following as PIAs (Public Information Assistants): N5DRZ WA5GNT KD5FL K5HGL. The goal is a PIA for each active club in the section. Contact N5FDL to volunteer your services, or to report newsworthy items @ 214-348-3718 in Dallas. This column is really a misnomer. This "news" you are now reading was mailed by me 2 months ago! In other words, I have to write the column looking two months into a crystal ball! I have suggested to our director, and have sent radiograms to all SMs urging that at least half of the alloted space for *Section News* be sold to advertisers, and the additional income be alloted directly back to the field organization. I have personally pledged to cut from my allowed 55 lines to 25 lines or less each month. If all 73 SMs did this, we

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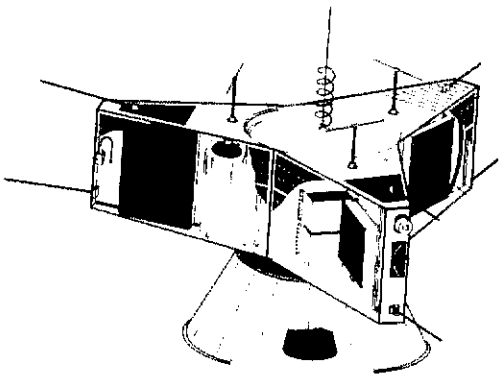

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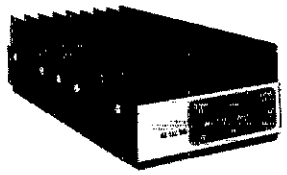

Model	Band	Pre-amp	Input	Output	DC Pwr	Sale Price
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B108	2M	Yes	10W	80W	10A	$159
B1016	2M	Yes	10W	160W	20A	$249
B3016	2M	Yes	30W	160W	17A	$199
C22	220	No	2W	20W	5A	$ 79
C106	220	Yes	10W	60W	10A	$179
C1012	220	Yes	10W	120W	20A	$259
D24	440	No	2W	40W	8A	$179
D1010N	440	No	10W	100W	20A	$289

RC-1 Remote Control for Mirage Amplifiers..... $24
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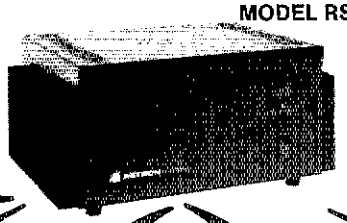
ASTRON POWER SUPPLIES

Heavy Duty - High Quality - Rugged - Reliable

- Input Voltage: 105-125 VAC Output: 13.8 VDC ± .05V
- Fully Electronically Regulated—5mV Maximum Ripple
- Current Limiting & Crowbar Protection Circuits
- M-Series With Meter—A-Series Without Meter

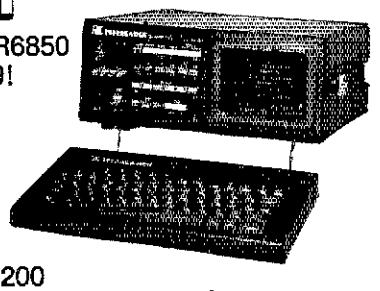
Model	'Cont. Amps	ICS Amps	Price
RS4A	3	4	$ 39
RS7A	5	7	49
RS12A	9	12	69
RS20A	16	20	89
RS20M	16	20	109
RS35A	25	35	135
RS35M	25	35	149
RS50A	37	50	199
RS50M	37	50	229

MODEL RS-50A



HAL Communications Sale!

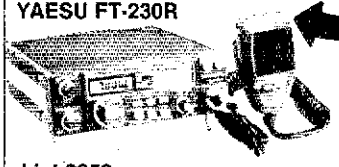
CWR6850 $849!



CT2200 KB2100 $959!

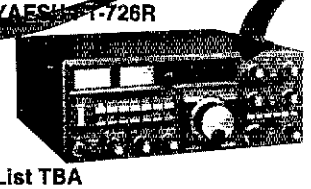
CWR6700 Receive Only Telereader	$439
CWR6750 Receive Only Telereader	629
DS3100ASR Deluxe RTTY Terminal	1699
MPT3100 Message Processor Terminal	2199
RS2100 1* Scope w/Loop Supply	289
ST5000 RTTY Demodulator	219
ST6000 Deluxe Demodulator/Keyer	649
DSK3100 Disc Storage Unit	829
ARQ1000 Amtor Error Correcting Terminal	649
KG-12 12" High Resolution Monitor	169

YAESU FT-230R



List $359
Call For Your Special Price

YAESU FT-726R

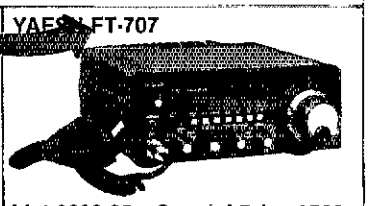


List TBA
Call For Your Special Price

KDK FM2030

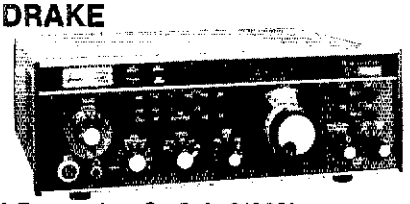
SALE PRICE $269!

YAESU FT-707



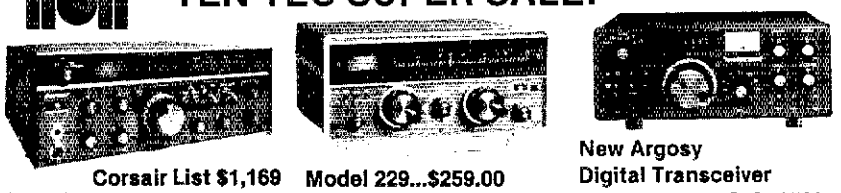
List $699.95 Special Price $589

R.L. DRAKE



TR-7A Transceiver On Sale $1389!
Accessories In Stock - Call!
L7 HF Amplifier Only $969 (Less Tubes)
Eimac 3-500Z Tubes $199/pair

TEN-TEC SUPER SALE!



Corsair List $1,169
Your Special Price $1,029

Model 229...$259.00
Model 4229 Kit...$189.00

New Argosy Digital Transceiver
List $599.95 Sale $539

ALL ACCESSORIES IN STOCK—CALL!

SANTEC

ST144AP Handie Talkie ON SALE! Only $279

IN STOCK FOR IMMEDIATE DELIVERY
- 142-149.995 MHz
- 3.5W/1W/.1W Output
- 24 Hour Clock
- Liquid Crystal Display

OTHER SANTEC ITEMS

ST-440AP 440 MHz H.T.	$299
SM-3 Speaker Mic	33
ST-LC Leather Case	29
ST-6RC Base Charger	29
ST-50083 Ni-Cad Battery	29

TOKYO HY-POWER LABS

Regular $69.95 SALE $59!

HL-30V 2 Meters, 2W In - 30W Out

OTHER TOKYO HY-POWER ITEMS

HL-82V 2 Mtr. 2-12W In - 35-85W Out	$139
HL-160V 2 Mtr. 1-15W In - 160W Out	299
HL-20U 440 MHz 1-3W In - 20W Out	99
HL-90U 440 MHz 10W In-80W Out w/Preamp	339
HC-200 HF Ant Tuner w/Wattmeter	89
HC-2000 Deluxe 2KW HF Antenna Tuner	299

AEA CP-1

Computer Patch Interface
List Price $239.95
Call For Special Price
On All AEA Products.

RF POWER LABS AMPLIFIERS

A1000	160-15 Mtr KW w/AC Supply	$1329
V76	6 Mtr 8-15W In - 120W Out w/AC Supply	499
V360	6 Mtr 5-10W In - 450W Out w/AC Supply	1189
V70	2 Mtr 10-15W In - 90W Out w/AC Supply	499
V71	2 Mtr 1-3W In - 90W Out w/AC Supply	519
V180	2 Mtr 5-15W In - 200W Out w/AC Supply	599
V350	2 Mtr 10-20W In - 400W Out w/AC Supply	1189

Fan Kits and Rack Adapters Also Available—CALL!

JANEL QSA5 PREAMP $38!

QSA-6	$41	432PL	$53
PB-30	$21	PB144	$31
PB-60	$21	PB220	$31

DAIWA CN-620B $111!
160/2 mtrs
20/200/2000 wts

BENCHER PADDLE
BY-1 Blackbase $30
BY-2 Chrome $40

MFJ MODEL 184 On SALE For Only $128

202B Noise Bridge	$54
250 2KW Dummy w/Oil	31
260 300W Dry Load	25
262 2KW Dry Load	59
422 Keyer w/Paddle	89
482 4 MSG Mem Keyer	89
484B 12 MSG Keyer	125
494 Keyboard	249
496 Keyboard	299
525B RF Processor	109
624 Phone Patch	59
901 300W Tuner	54
940B Tuner w/Meter	72
941C Tuner w/Meter	79
949B Deluxe Tuner	129
989 Deluxe 2KW Tuner	289

KANTRONICS

THE INTERFACE Reg. $169.95 SALE $149.00!

OTHER KANTRONICS ITEMS

Mini-Reader	$39	Hamtext VIC-20	99
Mini Terminal	79	Hamtext Model 64	99
Apple Hamsoft	49	Atari Hamsoft	49
VIC-20 Hamsoft	49	TRS 80C Hamsoft	49

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

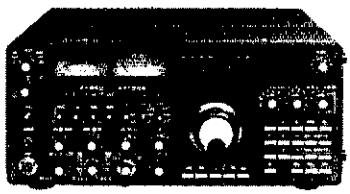
1108 Summit Ave., Suite 4 / Plano, Texas 75074

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Mon.-Fri.: 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

TELEPHONE: (214) 422-7306

YAESU SALE!

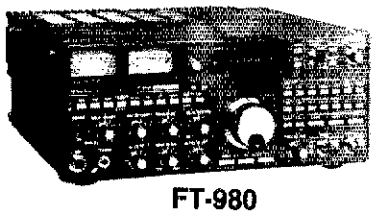


FT-ONE

GENERAL COVERAGE—ALL MODE DELUXE SOLID STATE TRANSCEIVER

Buy Now and Receive These Accessories Free:
300Hz CW Filter..$FREE 600Hz CW Filter..$FREE
800Hz CW Filter..$FREE 6Khz AM Filter..$FREE
Memory Backup..$FREE Installation.....$FREE

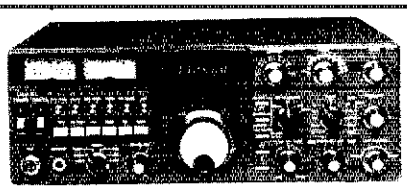
List Price $3074. CALL FOR YOUR SPECIAL PRICE!
Quantities Limited — Hurry!



FT-980

CAT SYSTEM—Computer Aided Transceiver
- Wide Dynamic Range
- Low Noise Front End
- General Coverage
- 10Hz Digital Readout
- All Mode Transceive—CW/SSB/AM/FM/FSK!
- Full Break-in CW
- RF Speech Processor
- Variable Bandwidth
- IF Shift
- APF/Notch
- AC Power Supply
- Adjustable Noise Blanker
- 12 Internal Digital VFO's with Memories
- Much, much more—call or write for info

Computer Interface now in development—
Own Tomorrow's HF Transceiver—Today!!
Manufacturer's Suggested List Price $1499
Call For Your Special Price Today!!

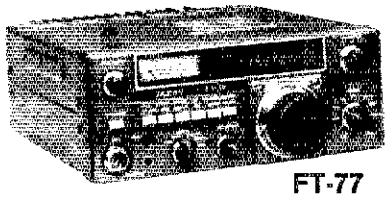


FT-102

160-10MTR WITH WARC BANDS TRANSCEIVER

- Digital Readout
- Built-in AC Supply
- Variable Bandwidth
- IF Shift
- CW/SSB/AM/FM Modes
- RF Speech Processor
- Noise Blanker
- Much, much more—

List Price $1149—Call for Special Low Texas Towers Discount Price and Save $$$



FT-77

New 80-10mtr Compact HF Transceiver

- Digital Readout
- Adj Noise Blanker
- CW/SSB/FM Modes
- CW Wide/Narrow
- Optional AC Supply, CW Filter, FM Unit
  External VFO, Antenna Tuner Available

List Price $599—Call for Special Low Texas Towers Discount Price and Save $$

FT-230R 2mtr FM.....$359
FT-730R 440Mhz FM.....$399

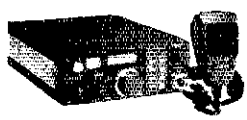
- 10 Memories
- Two VFO's
- LCD Readout
- 25W Out
- Memory or Up/Down Scan

Call today for Special Discount Price & Save $$

FT-726R VHF/UHF
All Mode Tri-Band Transceiver

- 50-54 Mhz
- 144-148 Mhz
- 10 watts output on all bands
- 430-450 Mhz
- 21, 24.5 & 28 Mhz option available soon

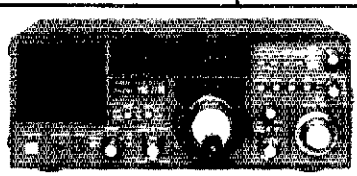
Please Call For Price & Delivery Information



VHF/UHF Multimode Portables

FT-690R 50Mhz.....$379
FT-290R 144Mhz.....$399
FT-790R 430Mhz.....$399

Call today for Special Discount Price & Save $$



FRG-7700

All Mode Digital Communications Receiver .15 to 29.99Mhz—Receives SSB/AM/FM/CW, Built-in S Meter, Speaker, Noise Blanker, Timer, FM Squelch, AC Supply and More!

Manufacturer's List $499—Call today for Your Special Discount Price!!

FT-208R 2mtr HT.....$319
RF Out: 300mw/2.5W

FT-708R 440Mhz HT....$319
RF Out: 200mw/1.0W

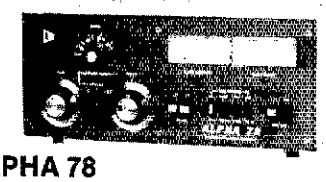
- LCD Display
- 10 Memories
- Up/Down and Memory Scanning
- Complete w/Nicad Battery, Charger and Rubber Duck Ant

Accessories Available:
LCC-8 Leather Case.....$35
YM24A Spkr/Mic.....$39
FNB-2 Nicad.....$29
NC-8 Base Chgr.....$99
Call for Special Yaesu Discount Prices!!

!IMPORTANT — Prices shown are suggested by the Manufacturer. You can Save Money with a Big Texas Towers Discount! Call today for our Special Yaesu Sale Prices and Save $$$!!

ETO ALPHA

76PA $1699



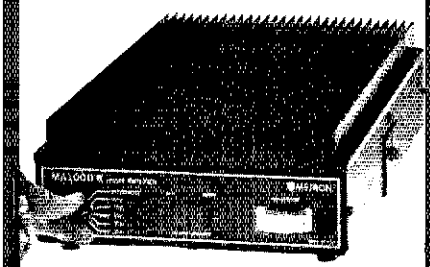
ALPHA 78

ALPHA 374A

SPECIAL SALE PRICES

Model	List	Sale
77DX	$5450	*
78	$3495	*
374A	$2595	*
76A	$1985	*
76PA	$2395	*
76CA	$2695	*

***Sale Prices Too Low To Print!!**
Call For Your Special Prices!!



METRON MA1000B AMPLIFIER

1 KW Mobile Or Portable!

- All Solid State—13.6 VDC Operation!
- No Tuning—Switch bands and Operate!
- Bandswitching can be Remotely operated to allow Trunk installation!
- Use separate battery and existing auto charging system for reliability!

There fine units in stock now at special price of only $895 delivered anywhere in Continental U.S.A.!—Call for yours!

TEXAS TOWERS

Div. of Texas RF Distributors Inc.
1108 Summit Ave., Suite 4 • Plano, Texas 75074

Telephone
(214) 422-7306

MasterCard VISA

would realize a significant increase in advertising sales and increased section budgets! PSHR: KA5AZK WA5QFD N5EZM KC5NN N5FDL KD5FR N5BT W5TI. Traffic: N5BT 209, W5TI 201, KA5AZK 150, KD5FR 95, K5SOR 73, WA5QFD 69, KC5NN 47, KB5UL 42, N5FDL 38, N5EZM 32, WA5EZT 22, WB5NRN 15, AE5I 14, KC6LW 14, W5CUE 12, K5PC 11, AJ5F 4, W5YK 4.

SOUTHERN TEXAS: SM, Arthur R. Ross, W5KR — Asst. SM/TM: N5TC. SEC: WA5RVT. NOTICE!!!! TEXAS CW TRAFFIC NET MOVED TO 3697 kHz on June 15!!! QQ report: K5DL, BPL: WB5YDD W5KLV WB5FQU. ORS WD5GKH active on 5 traffic nets. SEC WA5RVT reports many South Texas hams involved in public service as a result of many STX storms and tornadoes; he sends his thanks and compliments to all concerned for excellent work. ORS N5CRU still walking on air after arrival of 8 pound 15 ounce grandson! Cliff dweller WB5FQU says outdoor antenna sure works great. CAND mgr W5KLV reports STX represented 100% on CAND by N5AMH N5CRU W5URN KD5KQ N5DFO WB5YDD W5KLV N5EPG ND5G; he is also busiest OBS in USA with six bulletins, 29 satellite bulletins, 5 propagation forecasts, 5 CRRL bulletins, made 155 readings on 8 nets. DRN5 mgr WB5YDD reports STX represented 100% on DRN5 by K5KJN KD5CB N5AMH K5WOB W5KLV N5DFO N5CRU WB5EPA WB5FQU K5WEQ WA5OYS WB5YDD. The San Antonio ARC bulletin reports San Antonio Rptr. Org. provided public service communications for the Pepsi Challenge, a 10-kilometer run, on April 16. Ft. Bend ARES responded in excellent fashion to request from Nat'l Weather Service and Harris Co. CD for weather watch duty May 15. Traffic: W5CTZ 574, WB5YDD 534, W5KLV 515, N5DFO 362, WB5FQU 226, ND5C 198, W5TFB 141, KV5W 132, KC5GM 111, KA5KRI 88, N5TC 86, WB5MMI 83, K5GM 60, W5KR 54, KS5V 46, K5QWK 30, WD5GKH 23, K5HZR 21, W5BGE 18, WA5RVT 12, N5CRU 8. (Apr.) K5GM 66.

Ham-Ads

(1) Advertising must pertain to products and services which are related to Amateur Radio.

(2) The Ham-Ad rate is 85 cents per word. A special rate of 25 cents per word applies to hamfest and convention announcements, to individuals seeking to dispose of or acquire personal equipment, and to other advertising which, in our opinion, obviously qualifies for the individual rate.

(3) Remittance in full must accompany copy since Ham-Ads are not carried on our books. Each word, abbreviation, model number, and group of numbers counts as one word. Entire telephone numbers count as one word. No charge for postal Zip code. No cash or contract discounts or agency commission will be allowed. Tear sheets or proofs of Ham Ads cannot be supplied. Submitted ads should be typed or clearly printed on an 8-1/2" × 11" sheet of paper.

(4) Closing date for Ham-Ads is the 20th of the second month preceding publication date. No cancellations or changes will be accepted after this closing date. Example: Ads received August 21 through September 20 will appear in November *QST*. If the 20th falls on a 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 permitted in *QST* advertising.

(6) New "commercial" advertisers must submit a production sample of their product (which will be returned) and furnish a statement in writing that they will respond appropriately to customer complaints and will stand by and support all claims and specifications mentioned in their advertising before their ad can appear.

The publisher of *QST* will vouch for the integrity of advertisers who are obviously commercial in character, and for the grade or 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.

CQ and QST 1950-1982 also 73 and Ham Radio issues for sale. Two dollar minimum order. Cost 50 cents each 1976 and later issues, all other 30 cents each including USA shipping. Send SASE, chronological order and payment to W6LS, 2814 Empire Avenue, Burbank, CA 91504. Available issues and refund sent within one month.

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.

MUSEUM now open for radio historians and collectors. Free admission. Old time amateur (W2AN) and commercial station exhibits, 1925 replica store and telegraph displays. 15,000 items. Write A.W.A. for details: Bruce Kelley, W2ICE, Holcomb, N.Y. 14469.

HAMFESTERS 49th Annual Hamfest and Picnic. Sunday August 14, 1983, Santa Fe Park, 91st and Wolf Road, Willow Springs, IL, Southwest of Chicago. Exhibits for OM's and XYL's. Famous Swappers Row. Tickets; at gate, $3, advance $2. For advance tickets, check or M.O. and S.A.S.E. to Hamfesters, P.O. Box 42792, Chicago, IL 60642.

THE CENTRAL Kentucky ARRL Hamfest, sponsored by The Bluegrass Amateur Radio Society, will be held Sunday, 8:00 AM to 5:00 PM August 14, 1983 at Scott County High School, Longlick Road and US Route 25, Georgetown, Kentucky (Offl-75/64). Technical Forums. Awards and Exhibits in A/C facilities. Outside Flea Market space, no charge. Tickets $3.50 advance and $4 @ gate. For more information or tickets write Edward B. Bono, WA4ONE, P.O. Box 4411, Lexington, KY 40504.

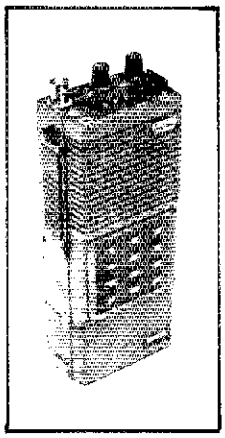
YAESU Owners — join your International Fox-Tango Club — now ending its eleventh year. Calendar year dues still only $8 US, $9 Canada, $12 airmail elsewhere. Don't miss out — get top-rated FT Newsletters packed with modifications monthly, catalog of past modifications, free advertisements, technical consultation, FT Net (Saturdays, 1700Z, 14.325MHz), more. 1982 or 1983 sets $8 each; both $15. Send dues to FT Club, Box 15944, W. Palm Beach, FL 33416.

WHEN changing your address or call sign, don't forget to notify the Circulation Department at ARRL Hq. Enclose a recent address label from a *QST* wrapper, if at all possible. Please allow six weeks for the change to take effect.

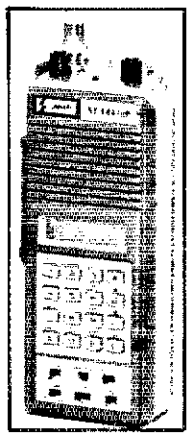
812-422-0231

808 N. Main
Evansville, IN 47711

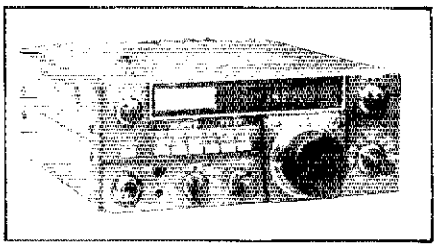
The HAM SHACK



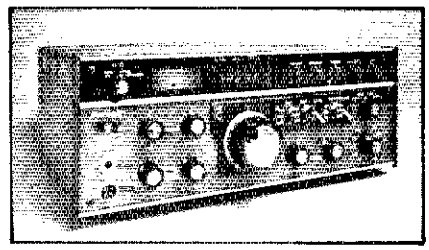
ICOM-2AT



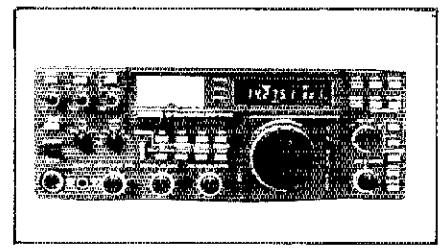
ENCOMM/SANTEC
ST-144/μP



YAESU-FT77



TEN-TEC CORSAIR



ICOM-751

AEA
CP-1 New Computer Interface ..... call
CK-2 Contest Memory Keyer $139.00
144 Isopole Antenna 40.00

ALLIANCE
HD73 (10.7 sq ft) Rotator $99.00
U-110 Small Rotator 49.00

ASTRON
RS7A 5-7 Amp Power Supply $49.00
RS12A 9-12 Amp Power Supply 69.00
RS20A 16-20 Amp Power Supply 89.00
RS20M 16-20 Amp w/meter 109.00
RS35A 25-35 Amp 135.00
RS35M 25-35 Amp w/meter 149.00
RS50A 37-50 Amp 199.00
RS50M 37-50 Amp w/meter 225.00
VS-20M Variable w/meter 125.00
VS-35M Variable w/meter 175.00
VS-50M Variable w/meter 249.00
RS-12S w/speaker 74.00
RS-20S w/speaker 104.00

B&W
Folded Dipole 80-10 Meter, Only 90' Long,
No Tuner Necessary $135.00

BENCHER
BY-1 Paddle/BY-2 Chrome $36.00/45.00

BUTTERNUT
HF6V 80-10 Meter Vertical $119.00
ZA-1A Balun 16.50

CUSHCRAFT
A3 Tribander 3 EL $179.00
A4 Tribander 4EL 229.00
R3 Motor Tuned Vertical 229.00
214B Boomer 14EL 2M 69.00
214FB Boomer 14EL FM 69.00
228FB Power Pack 28EL 2M FM 189.00
32-19 Super Boomer 19 EL 2M 83.00
220B Boomer 17 EL 220 MHz 75.00
ARX-2B Ringo Ranger II 2M 39.00
Rotatable Dipoles ..... call

DAIWA
CN-520 1.8-60 MHz SWR/Pwr Mtr $63.00
CN-620B 1.8-150 MHz SWR/Pwr Mtr 110.00
CN-630 140-450 MHz SWR/Pwr Mtr 129.00
CS-201 2-position switch 22.00

DRAKE
TR7A Xcvr w/PS7 ..... $1,435.00
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RADIO EXPO 83, sponsored by Chicago FM Club, will be held Saturday and Sunday, September 24th and 25th at the Lake County Fairgrounds, Routes 120 and 45, Grayslake, Illinois. Flea market opens 6:00 AM. Exhibits open 9:00 AM. Displays by major manufacturers and largest-ever outdoor flea market area. Indoor flea market tables available at $5 per day. Seminars and technical talks. Ladies programs. Many awards. Tickets good for both days, $3 in advance, $4 at gate. Talk-in on 146.16/76, 146.52 and 222.5/224.10. Send SASE to Radio Expo 83, Box 1532, Evanston, IL 60204, or call 312-582-6923.

ATTEND "The Big Event of the Summer Hamfest Season!". The Original Forty-Sixth Annual 1983 Cincinnati Hamfest, Sunday September 18, 1983 at Stricker's Grove on State Route 128, one mile west of Venice (Ross), Ohio. Exhibits, Awards, Food and Refreshments available. Flea Market (radio related products only), Music, Talks, Hidden Transmitter Hunt and Sensational Air Show. Admission and Registration $5. For information - Lillian Abbott, K8CKI, 317 Greenwell Road, Cincinnati, Ohio 45238.

ILLINOIS: Sept. 17 & 18, The Peoria Area Amateur Radio Club presents Peoria Superfest '83 at Exposition Gardens, W. Northmoor Rd., Peoria, IL. Tickets $3 advance $4 gate. Gate opens 6:00 AM, commercial building 9:00 AM. Talk-in 146.16/76 call W9UVI. Latest Amateur & computer product displays, huge free flea market, Free Ladies Bus to Northwoods Mall on Sunday. Full camping facilities. Sat. night informal get together at Heritage House Smorgasboard, 8209 N. Mt. Hawley Rd. For tickets and info SASE to Superfest '83, 5808 N. Andover Ct, Peoria, IL 61615.

8th ANNUAL Amatuer Radio Hamfest-Computer Convention Electronic Flea Market Oct. 8 & 9 at the Virginia Beach, VA. Pavillion. Dealers, special displays, forums, computers, satellites, XYL bingo. Free jitney bus to the beach. Also visit the specialty shops and restaurents at the new Waterside Marketplace in nearby Norfolk. Awards. Admission $4 both days. Flea market tables $5 one day, $8 both days. Commercial table space in exhibition area $15 both days, Commercial booths $30 both days. Info and tickets, write Jim Harrison, N4NV 1234 Little Bay, Norfolk, VA 23503, 804-587-1695.

DELTA DIVISION ARRL Convention - Shreveport, Louisiana Convention Center on the riverfront, August 13-14, 1983. Free admission, free parking, free video entertainment and free ladies' arts - crafts flea market. Amateur activities include — ARRL forum with Vic Clark, President of ARRL and DXCC forum (QSLs verified), plus technical, home computer, Skywarn, satellite TV, MARS and other sessions. Special program on handicapping the races, followed by chartered bus to Louisiana Downs. Exhibitors, dealers, and flea market all under one roof. For further info - contact: SARA Convention, 129 Herndon St., Shreveport, LA 71101 318-222-5885.

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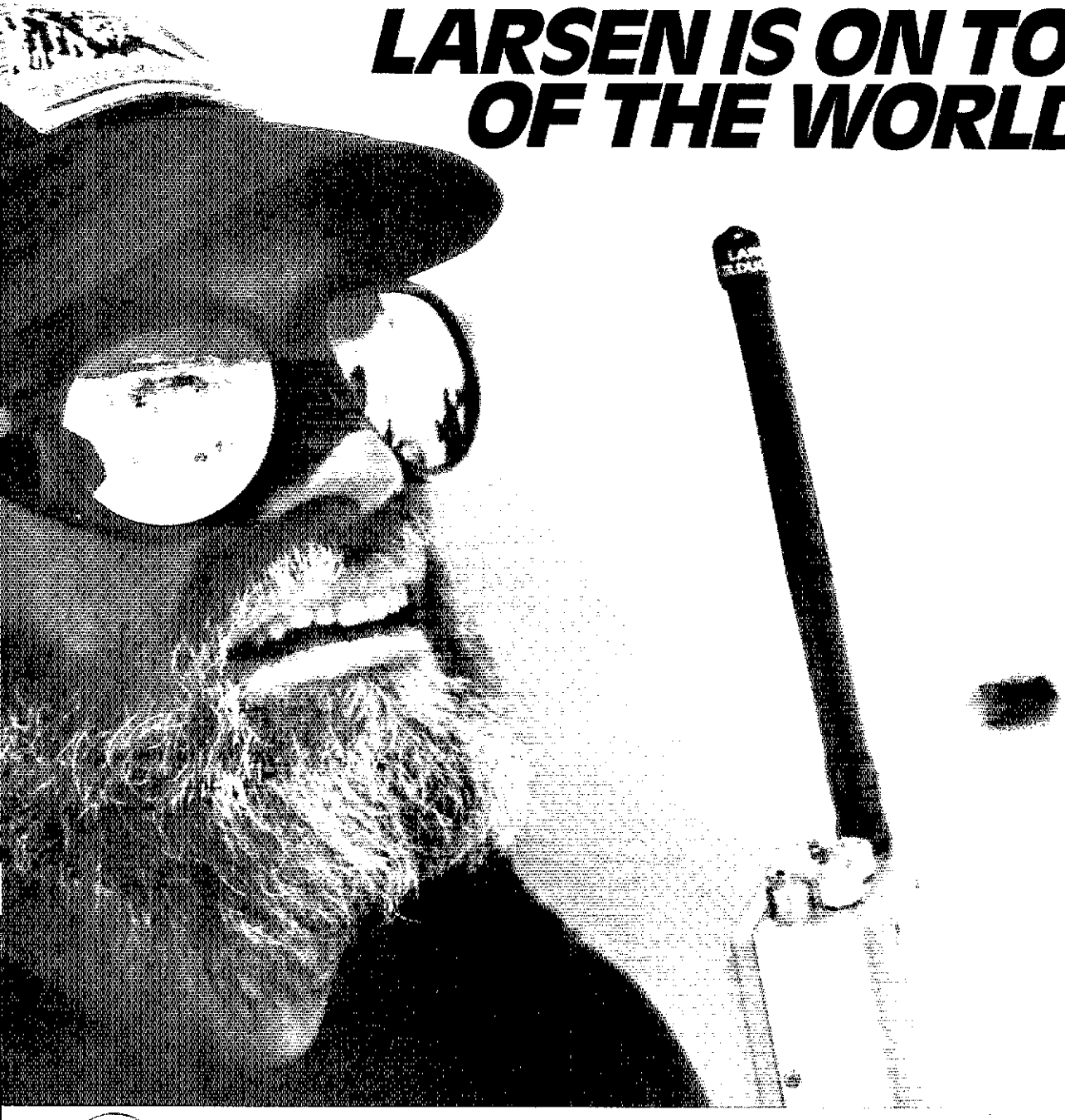

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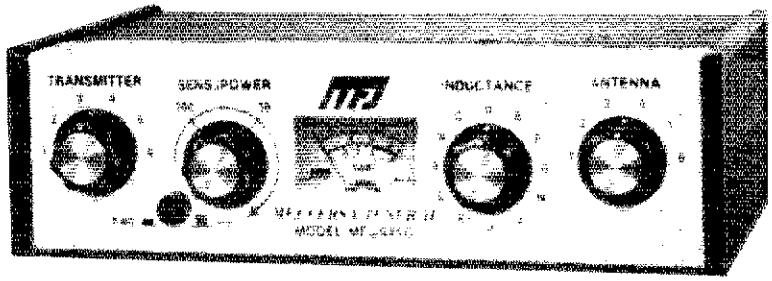
MFJ ANTENNA TUNERS 16 MODELS

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.



Ham Radio's most popular antenna tuner. Improved, too.

$89.95 (+ $4)

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.

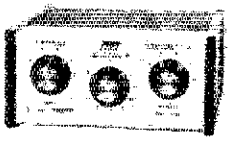
Built-in 4:1 balun for balanced lines. 1000V capacitor spacing.

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.

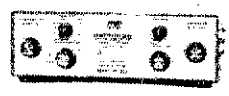
Operate all bands with one antenna.

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.

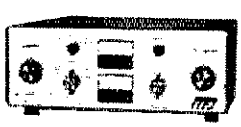
6 position antenna switch handles 2 coax lines (direct or through tuner), wire and balanced lines.

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.

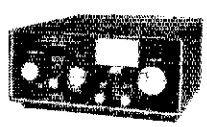
18 position dual inductor, ceramic switch.

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 10-3/4Wx4-1/2Hx14-7/80".

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.

Built-in lighted 2¾ meter reads SWR plus forward/reflected power. 2 ranges (200 & 2000W).

6 position ant. switch. Al. cabinet. Tilt bail.

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For tech. info., order or repair status, or calls outside continental U.S. and inside Miss., call 601-323-5869.

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Write for FREE catalog, over 80 products

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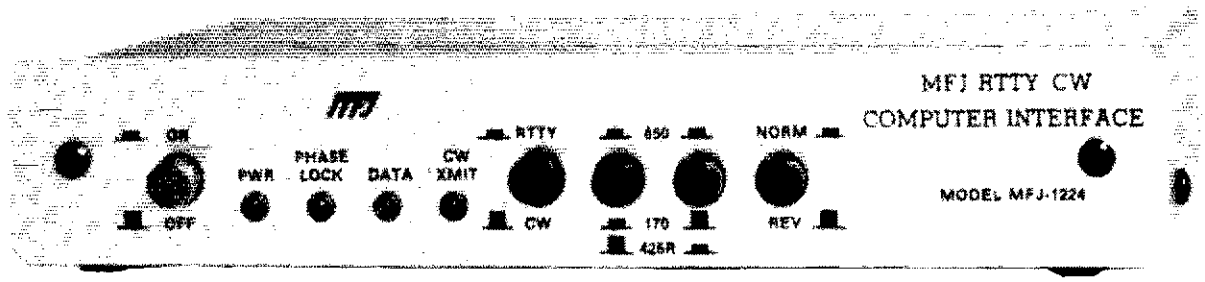
Box 494, Mississippi State, MS 39762

MFJ RTTY / ASCII / CW COMPUTER INTERFACE

Lets you send and receive computerized RTTY/ASCII/CW. Copies all shifts and all speeds. Copies on both mark and space. Sharp 8 Pole active filter for 170 Hz shift and CW. Plugs between your rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 or most other personal computers. Uses Kantronics software and most other RTTY/CW software.



- *Copies on both mark and space tones.*
- *Plugs between rig and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.*
- *Uses Kantronics software and most other RTTY/CW software.*

$99.95
MFJ-1224

This new MFJ-1224 RTTY/ASCII/CW Computer Interface lets you use your personal computer as a computerized full featured RTTY/ASCII/CW station for sending and receiving.

It plugs between your rig and your VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64, and most other personal computers.

It uses the Kantronics software which features split screen display, 1024 character type ahead buffer, 10 message ports (255 characters each), status display, CW-ID from keyboard, Centronic type printer compatibility, CW send/receive 5-99 WPM, RTTY send/receive 60, 67, 75, 100 WPM, ASCII send/receive 110, 300 baud plus more.

You can also use most other RTTY/CW software with nearly any personal computer.

A 2 LED tuning indicator system makes tuning fast, easy and positive. You can distinguish between RTTY/CW without even hearing it.

Once tuned in, the interface allows you to copy any shift (170, 425, 850 Hz and all shifts between and beyond) and any speed (5 to 100 WPM on RTTY/CW and up to 300 baud on ASCII).

Copies on both mark and space, not mark only or space only. If either the mark or space is lost the MFJ-1224 maintains copy on the remaining tone. This greatly improves copy under adverse conditions.

A sharp 8 pole active filter for 170 Hz shift and CW allows good copy under crowded, fading and weak signal conditions. Uses FET input op-amps.

An automatic noise limiter helps suppress static crashes for better copy.

A Normal/Reverse switch eliminates retuning while stepping thru various RTTY speeds and shifts.

The demodulator will even maintain copy on a slightly drifting signal.

A +250 VDC loop output is available to drive your RTTY machine. Has convenient speaker output jack.

Phase continuous AFSK transmitter tones are generated by a clean, stable Exar 2206 function generator. Standard space tones of 2125 Hz and mark tones of 2295 and 2975 Hz are generated. A set of microphone lines is provided for AFSK out, AFSK ground, PTT out and PTT ground.

FSK keying is provided for transceivers with FSK.

High voltage grid block and direct outputs are provided for CW keying of your transmitter. A CW transmit LED provides visual indication of CW transmission. There is also an external hand key or electronic keyer input jack.

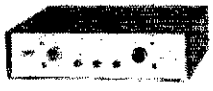
In addition to the Kantronics compatible socket, an exclusive general purpose socket allows interfacing to nearly any personal computer with most appropriate software. The following TTL compatible lines are available: RTTY demod out, CW demod out, CW-ID input, +5 VDC, ground. All signal lines are buffered and can be inverted using an internal DIP switch.

For example, you can use Galfo software with Apple computers, or RAK software with VIC-20's. Some computers with some software may require some external components.

DC voltages are IC regulated to provide stable AFSK tones and RTTY/ASCII/CW reception.

Aluminum cabinet. Brushed aluminum front panel, 8x1¼x6 inches. Uses 12-15 VDC or 110 VAC with optional adapter, MFJ-1312, $9.95.

RTTY/ASCII/CW Receive Only SWL Computer Interface



$69.95
MFJ-1225

Use your personal computer to receive commercial, military and amateur RTTY/ASCII/CW traffic.

The MFJ-1225 automatically copies all shifts (850, 425, 170 Hz shift and all others) and all speeds.

It plugs between your receiver and VIC-20, Apple, TRS-80C, Atari, TI-99, Commodore 64 and most other personal computers.

It uses Kantronics software which features CW receive 5-99 WPM, RTTY receive 60,67,75,100 WPM, and ASCII receive 110, 300 baud, plus more.

An automatic noise limiter helps suppress static crashes for better copy, while a simple 2 LED tuning indicator system makes tuning fast, easy and positive.

In addition to the Kantronics compatible socket, a general purpose socket provides RTTY out, RTTY inverted out, CW out, CW inverted out, ground and +5VDC for interfacing to nearly any personal computer with most appropriate software.

Audio in, speaker out jacks. 4½x1¼x4¼ in. 12-15 VDC or 110 VAC with adapter, MFJ-1312, $9.95.

ORDER ANY PRODUCT FROM MFJ AND TRY IT-NO OBLIGATION. IF NOT DELIGHTED, RETURN WITHIN 30 DAYS FOR PROMPT REFUND (LESS SHIPPING).
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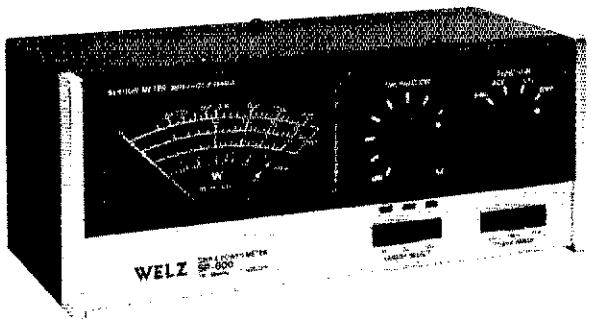
WELZ



SP-600

THROUGH LINE POWER METERS

SP-600 Select 1 of 3 sensors by soft touch switch. Three wide bandwidth sensors cover 1.6-500MHz. **$159.00**
RS-1: 1.6-60MHz 0-2kW
RS-2: 1.6-150MHz 0-200W
RS-3: 130-500MHz 0-200W

SP-200 Two position antenna switch and indicators. Three power ranges to 1kW, 1.8-160MHz. **$107.00**

SP-400 Three band sensors (2m, 220, 450MHz), 10 percent accuracy, 0-150W CW, LED power range indicators. **$109.00**

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WELZ

SP-250

SWR & POWER METERS

SP-250 Low-profile, economy 2kW wattmeter. 1.6-60MHz bandwidth. 3W SWR sensitivity. Three ranges. A Best Buy! **$75.00**

SP-15M 1.8-150MHz, 200 watt, low-profile wattmeter. VSWR, FWD PWR, REF PWR, 1.5W SWR sensitivity. Great for mobile HF. **$60.00**

SP-45M VHF-UHF to 100 watts. 3W sensitivity for SWR, 10 percent accuracy. All metal shielded construction. **$85.00**

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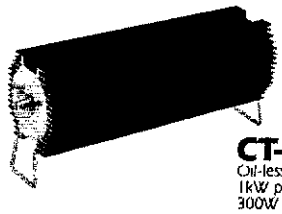
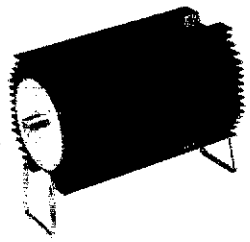
DUMMY LOADS



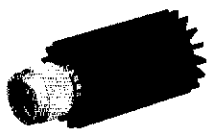
CT-300
Oil-less aircooled.
1kW peak for 3 min.,
300W avg. DC-250MHz
$68.00

CT-150
Oil-less aircooled,
400W peak for 3 min.,
150W avg. DC-250MHz
$46.00



CT-15A
50W peak, 15W avg.
SO-239 Screw-on dummy
DC-500MHz, VSWR<1:1.2
$12.00

CT-15N
50W peak, 15W avg.,
Type N Dummy Load.
DC-500MHz, VSWR<1:1.1
$21.00



SURGE SUPPRESSOR

CA-35A
Contains replaceable, chip-type surge voltage protector.
Low loss, low VSWR.
DC-500MHz, 350V breakdown.
$22.00

COAXIAL SWITCH

CH-20N
Two-way coaxial switch.
SO-239 type connector.
DC-900MHz, 1kW power.
$54.00

TERMINATION POWER METERS

TP-05X
BNC connector,
5W talkie checker.
Field calibratable,
3W avg. Dummy Load,
1W center. 50-500MHz
$21.00

TP-25A
25 watt version of TP-05X for mobile use
Larger Dummy Load.
50-500MHz
$40.00

All prices are suggested retail and subject to change.

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WANTED: VHF and UHF repeaters, must be Motorola, G.E., R.C.A. and in good shape. N0CAM, 303-632-8413.

COLOR COMPUTER software. Send for list. KV5M, TNT Software, RT2 Box 76D, Manor, TX 78653.

FAST, ACCURATE, readable, nonsensational — The ARRL Letter! Every two weeks, we fill you in on what's happening in Amateur Radio. But, you have to be an ARRL member to get it. For a one year subscription, send $19.50 (U.S. funds) and we'll send you the Letter first class mail anywhere in the U.S. and Canada. The ARRL Letter, 225 Main St., Newington, CT 06111.

WANTED: Pre-1950 TV sets and old TV Guide magazines. W3CRH, Box 90-Q, Rockville, MD 20850. 301-654-1876.

MLA-2500B, 2kw amp, 160-10, $625. Filter capacitors, 130mfd-330v, 25/$15 shipped prepaid. Stan Stockton, 902 W. Holt, Harrison, AR 72601.

KEYER KITS. $15. SASE for information MSC, 1304 Toney Drive, Huntsville, AL 35802.

CUBICS: Astro 102BXA/PSU-6 - $750. Yaesu FT-720R/U, 440MHz synthesized, FM, PL, Touchtone - $425. Hammurland HQ-170 - $125. Radio Shack DX-300 - $250. 440A's - $25ea. KZ5E 405-743-2366.

WANTED speaker horn K4NBN "No Bad News"..

HALLICRAFTERS $$$ Serious Collector needs Hallicrafter and other ham equipment manufactured before 1940 for restoration and eventual museum exhibit. Need Hallicrafters, National, Hammarlund, Patterson, RCA, RME, Grebe etc. Condition not important. Also need QST mags Vols I & II and old tubes. All letters answered. Write Dave Medley, 6621 Duffield Drive, Dallas, TX 75248. WA5YXA.

EIMAC-3-500Z's. New-very limited quantity! $85 each, cash, COD, MO. Add $3.50 per tube for shipping and handling. I pay cash or trade for all types of transmitting or special purpose tubes - Mike Forman, 3740 Randolph, Oakland, CA 94602 415-530-8840.

WANTED: Early telegraph instruments for my collection. Keys, sounders, relays, meters, and related items including pre-1910 paper. Larry Nutting, WD6DTC, 5957 Yerba Buena, Santa Rosa, CA 95405.

CDE ROTOR Owners - You need a "D-Lay-5"! This easy-to-install circuit protects the rotor from damage caused by accidental braking. Works with the Ham II, Ham III, Ham IV, and Tail Twister models. Provides a five-second safety factor in your rotor brake. Incredible value at $19.95 - postage paid world wide. Lance Johnson Engineering, P.O. Box 7363, Kansas City, MO 64116.

IBM-PC Software. LOGGER/DUPER programmable any log format $39.95. QSLer for automatic QSL cards $19.95. DATA BASE DXCC bearings and records $49.95. For information write Micro Electronic Systems, 19 Annette Park Drive, Bozeman, MT 59715.

CLEANING house after 50 years S.A.S.E. for list 3CX2500A3 never used original sealed carton make offer. need 8122's. W2GQA RD2 Box 537, Jersey Shores, PA 17740 717-745-7668.

COLLINS KWM-2, round, mint ser. #15892 and 516F-2 round, mint $800. AA6S 209-732-7163.

FREE money saving bulletin on popular brand name programs and books for your small computer. Superior, WD8BTK, 8030 Westchester Road, Westchester, OH 45069.

FOR IMPROVED DX contacts! Beamheadings for 450 cities including ham prefixes specifically for your QTH. Send $5 to N6DYU, P.O. Box 81341, San Diego, CA 92138.

WANTED: DX-60B, HR-10B, and Slinky Dipole. William Blair, 909 E. Emerson, Morton, IL 61550.

COLLINS KWM-2, 516F-2, winged, good condition, $550. KB6GK, 619 Hearst, San Francisco, CA 94112.

YAESU-102 & 902DM, Henry-3KA, J.W. Miller AT-2500, Nye-Matchbox, wattmeters, microphones, TH6DXX, etc. 214-680-9750 Greg Mann.

1984 CALLBOOKS. Prepublication orders before August 31, $19 either, $35 both, any 10 or more, $17 each. Postpaid. CA 6% tax. Century Print, 6069 Essex, Riverside, CA 92504-1599. 714-687-5910.

LOOKING FOR HT-37 HT-41. and 5X-115. Mike WA4FRB, P.O. Box 229, Riverton, VA 22651.

HW-8 Mods: reprints of the HW-8 series from CQ: Test Report and two-part modifications series, plus miscellaneous improvements. Proceeds support MILLIWATT DXCC QRP trophy program. $7. Ade Weiss, W0RSP, 83 Suburban Estates, Vermillion, SD 57069.

WANTED: ARRL Handbooks, pre-1950; QST, pre-1930. N6AW, Jan Perkins, 11942 Bos St., Cerritos, CA 90701 714-732-7155.

NEW 2kW Roller Coil, 26 micro-H, limited quantity at $47.50 p.p. USA, Kilo-Tec - P.O. Box 1001 - Oakview, CA 93022 - tel: 805-646-9645.

HELP - without your support the kids at Junior High School 22 on Manhattan's Lower East Side may not have English Through Amateur Radio in September. Contact WB2JKJ via Callbook.

WAVEMASTER™ - Complete and assembled multiband antenna. "Highest quality technology" 80-10M, 2kWPEP, 2-trap dipole, 110 feet. Includes balun, 90 feet Mini RG-8, connectors. Nylon guy ropes and 90-day warranty. Only $79.95 postpaid. HAWK Technical Products, P.O. Box 36384, Dener, CO 80236.

KP2 DXpeditions. Contests/clubs. Waterisle Shangri-La. Yaesu FT-101-B station. Limestone Efficiencies - WA2UZA 201-329-6309.

"Overall, the ICOM IC-R70 outperforms any other model we have tested in the under-$1,000 category."

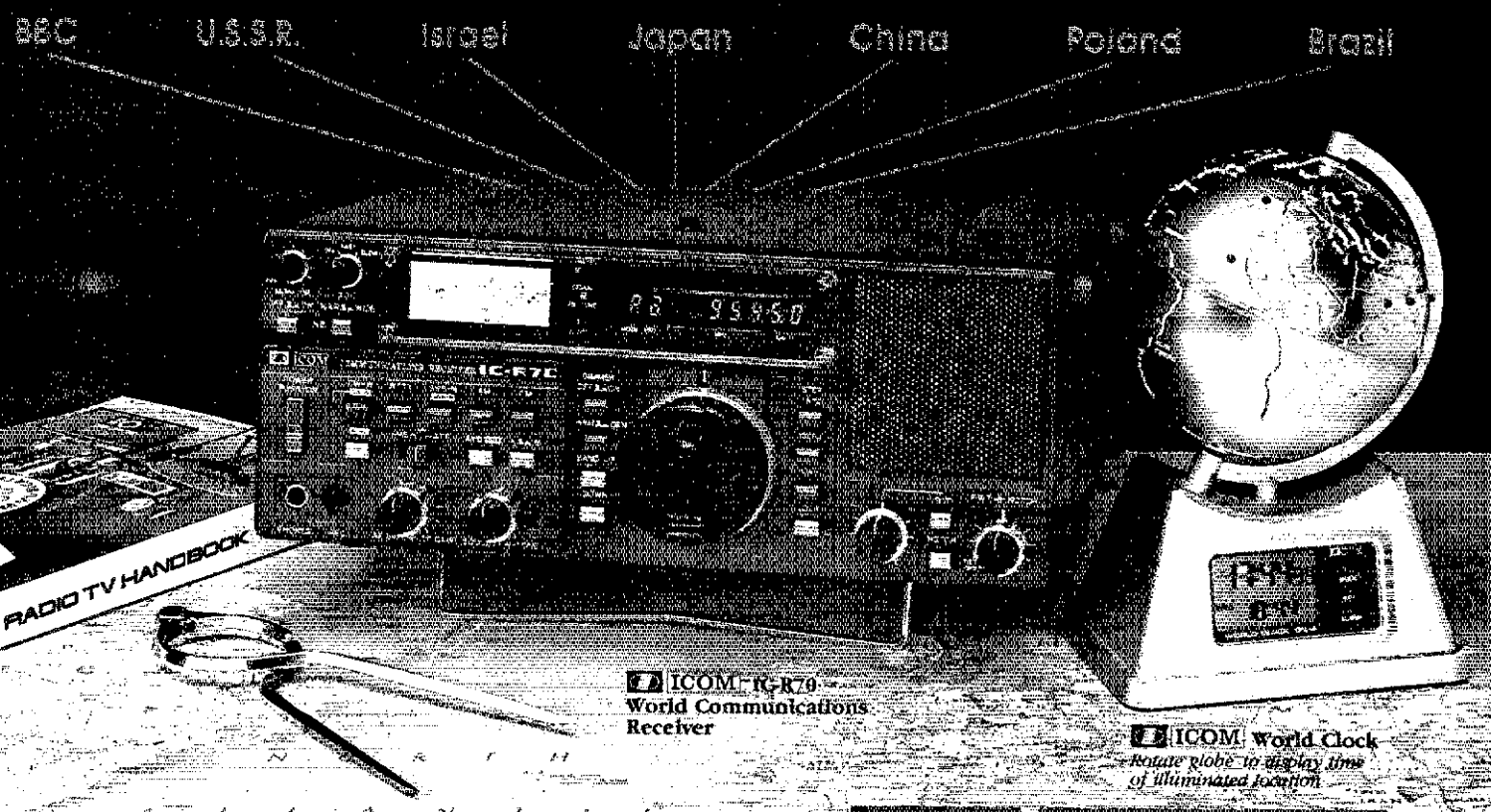
—World Radio TV Handbook 1983

With the IC-R70, ICOM continues its tradition of superior quality, high performance receiver design. Statements, such as the one above, are coming from shortwave listeners and equipment reviewers around the world.

What can a shortwave receiver do for you? The IC-R70 brings the news, music, and political opinions of other nations into your home or office. Enjoy music from the Near East, western Europe, South America; hear political opinion from Russia, Viet Nam, China; news from the BBC, Canada, Israel, Japan. Most countries broadcast in English as well as their national languages.

The IC-R70 is an easy-to-use comercial grade shortwave receiver, with features found only on the best receivers. The R70 out-performs receivers costing more than twice as much. And...

At a price well below $1,000, the ICOM R70 is the best performance value in a shortwave receiver today. See it at your authorized ICOM dealer, or contact ICOM for more information.



ICOM IC-R70 World Communications Receiver

ICOM World Clock
Rotate globe to display time of illuminated location

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

Multimode Mobile Magic

IC-290H & IC-490A

ICOM's latest state of the art 2 meter and 440MHz multimode transceivers.

IC-290H

25 Watts of Power. A full 25 watts in all modes gives extra communication range in the IC-290H.

Green LED Readout. For improved readability in bright sunlight.

Dual VFO's. Provide ease in marking frequencies. Tuning rates are 5KHz in FM, 100Hz in CW and SSB, and 1KHz with the tuning speed button pushed.

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

Adjustable Power Levels. Both the hi and lo power levels are independently adjustable for meeting simplex or amplifier input requirements.

Squelch in All Modes. Standard noise squelch in FM and AGC derived squelch for CW and SSB reduce fatigue factors and allow scanning silently while looking for band openings or satellite signals.

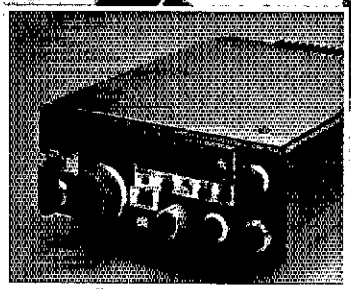
Multimode Capability. FM, SSB, and CW modes provide solid communication modes for repeater, simplex, satellite or the CW enthusiast. Sidetone is provided on CW.

Adjustable Duplex Splits. Offset may be changed from its initial value by pressing the priority button while in VFO mode, then rotating the main tuning knob. The offset is displayed on the frequency readout.

Scanning ($/S). Memory scanning and full or programmable band scan are standard features. Internal switches select busy/empty modes, adjustable delay or carrier operated resume, and full or program band scan.

Memory Backup. The optional, heatsink mounted, BU1 memory backup battery option provides retention of memory when moving the transceiver from one power source to another.

Touchtone® Microphone Supplied. Each unit comes with a touchtone® microphone as the standard unit microphone.



IC-490A

The operational characteristics of the IC-490A are the same as the IC-290H except for the features outlined in the following chart.

		IC-290H	IC-490A
Freq. Range (MHz)		143.8-148.199	430.0-439.999
Power	Hi	25	10
	Lo	1	1
Memories		5	4
Initial Offset		600KHz	5MHz
1MHz Up Button		Not Req'd	Yes
Normal Tuning Rates (KHz)	FM1	5	5
	FM2	Not used	25
	SSB	0.1	0.1
	CW	0.1	0.1

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The World System

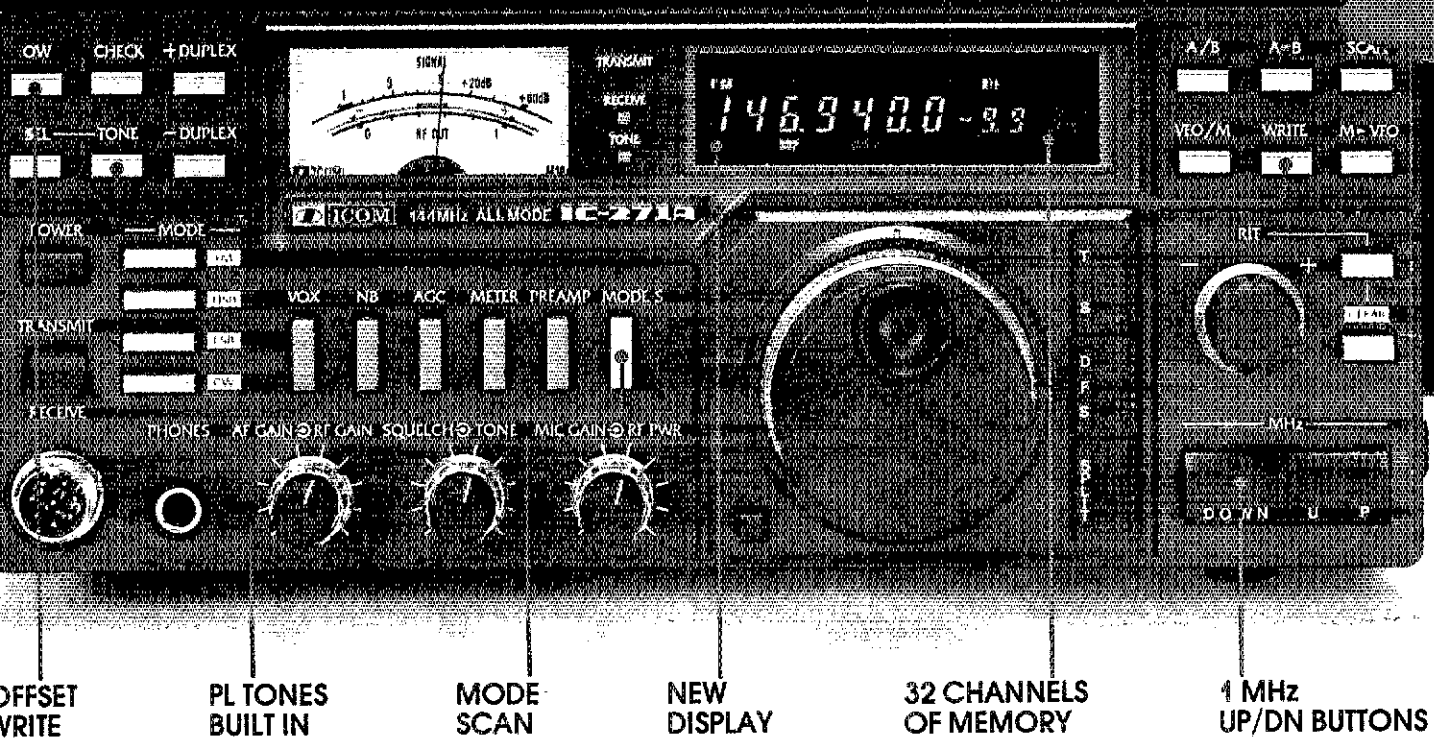
ICOM America, Inc., 2112-116th Ave NE, Bellevue, WA 98004 (206)454-8155/3331 Towerwood Drive, Suite 307, Dallas, TX 75234 (214)620-2780.

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

IC-271A

NEW!

25 Watts of FM, SSB, CW for 2 Meters



OFFSET WRITE

PL TONES BUILT IN

MODE SCAN

NEW DISPLAY

32 CHANNELS OF MEMORY

1 MHz UP/DN BUTTONS

ICOM presents the most advanced all mode, two meter base station available today . . . the IC-271A.

25 watts of power from 12 VDC or from 117 VAC with the optional internal power supply/32 full function memories/multimodes/subaudible tones/PLL locked to 10Hz/high visibility, multi-color fluorescent display/RIT readout/scanning/dual VFO's/new size.

25 watts. Now a 2 meter base station with 25 watts of power and an optional internal power supply. The IC-271A is a complete station.

32 full function memories. Each memory holds frequency, offset, offset direction, mode, and subaudible tone. Frequency, tones and offset are selected by rotating the main tuning knob.

Subaudible tones. Subaudible tones are selected by rotating the main tuning knob and may be stored into memory.

PLL locked to 10Hz. Extremely low noise and a good signal-to-noise ratio PLL allow synthesizer lock to 10Hz.

High visibility display. ICOM's new high visibility, multi-color display gives easy to read at-a-glance display of frequency, mode, offset, VFO in use, memory channel, and RIT offset direction and amount.

Scanning. The IC-271A can scan memories, programmable sections of the band, or modes. Mode-S scan is a mode scan and can be used to scan memories with a particular mode or to lock out frequencies continuously busy so that the receiver will not stop at that memory channel each time.

Dual VFOs. ICOM's dual VFO system is now even more versatile with the ability to transfer from memory to VFO. This allows frequencies from the tunable memories to transfer directly into another memory without moving a VFO to the new frequency first.

New size. Only 11¼"W x 4⅜"H x 10¾"D the IC-271A is styled to look good and engineered for ease of operation.

Other features. To make the IC-271A functional and easy to use, ICOM has incorporated many asked for features: UP/DN buttons, dial lock, switchable preamplifier, duplex check, all mode squelch, receive audio tone control, S meter, center meter, computer interface, and 7 year lithium battery memory backup.

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**

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American made RF Amplifiers and Watt/SWR Meters of exceptional value and performance.

•5 year warranty • prompt U.S. service and assistance

RF AMPLIFIERS

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.

MIRAGE
COMMUNICATIONS EQUIPMENT, INC.

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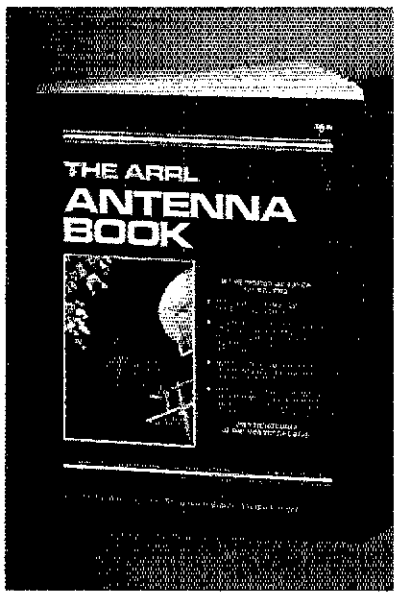
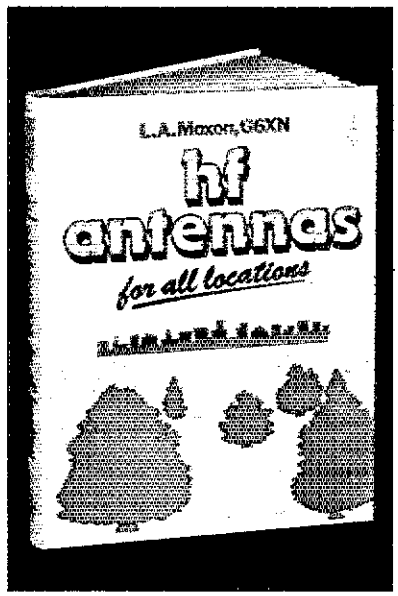
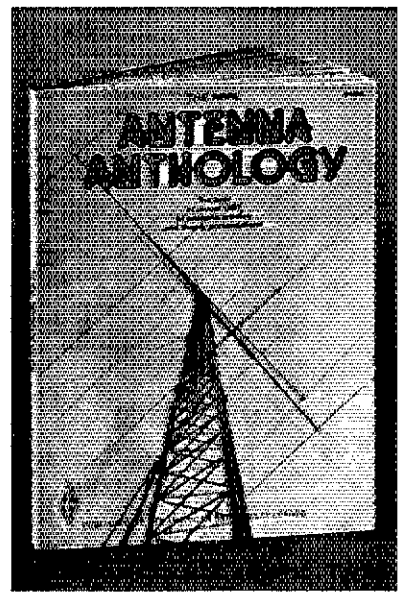
BOOKS

"A STATION IS ONLY AS EFFECTIVE AS ITS ANTENNA SYSTEM"







THE ARRL ANTENNA BOOK The best and most up-to-date antenna information around. The just revised 14th Edition contains in its 328 pages propagation, transmission line and antenna fundamentals. You can update your present antenna system with practical construction details of antennas for all amateur bands - 160 meters through microwaves. There are also antennas described for mobile and restricted space use. Tells how to use the Smith chart for making antenna calculations and covers test equipment for antenna and transmission line measurements. Over 600,000 copies of previous editions sold. Copyright 1982. Paper Ed. **$8.00** in the U.S., **$8.50** elsewhere, Cloth Ed. **$12.00** U.S., **$13.50** elsewhere.

HF ANTENNAS FOR ALL LOCATIONS by L.A. Moxon, G6XN. An RSGB publication. Contains 264 pages of practical antenna information. This book is concerned primarily with small wire arrays, although construction information is also given on a small number of aluminum antennas. Chapters include: Taking a New Look at hf Antennas; Waves and Fields; Gains and Losses; Feeding the Antenna; Close-spaced beams; Arrays, Long Wires, and Ground Reflections; Multiband Antennas, Bandwidth; Antenna Design for Reception; The Antenna and its Environment; Single-element Antennas; Horizontal Beams; Verticle Beams; Large Arrays; Invisible Antennas; Mobile and Portable Antennas; What Kind of Antenna; Making the Antenna Work; Antenna Construction and Erection. Copyright 1982, 1st Edition, Hardbound $12.00.

ANTENNA ANTHOLOGY The best QST hf antenna articles and theory presentations. Verticals: 2 and 4 band verticals for the novice, Cheapie GP, High Performance system for 20, 40 and 80, other loaded systems, Yagis: Short antennas, and The Log-Yag Array. Quads: Wire quads for 80 and 40, 2-Element Quad for the Novice, Miscellaneous Antennas: Loops, Delta-loops, Antennas for travel trailers and campers, plus matching devices and antenna test accessories. Copyright 1978, 148 pages. $4.00 U.S., $4.50 elsewhere.

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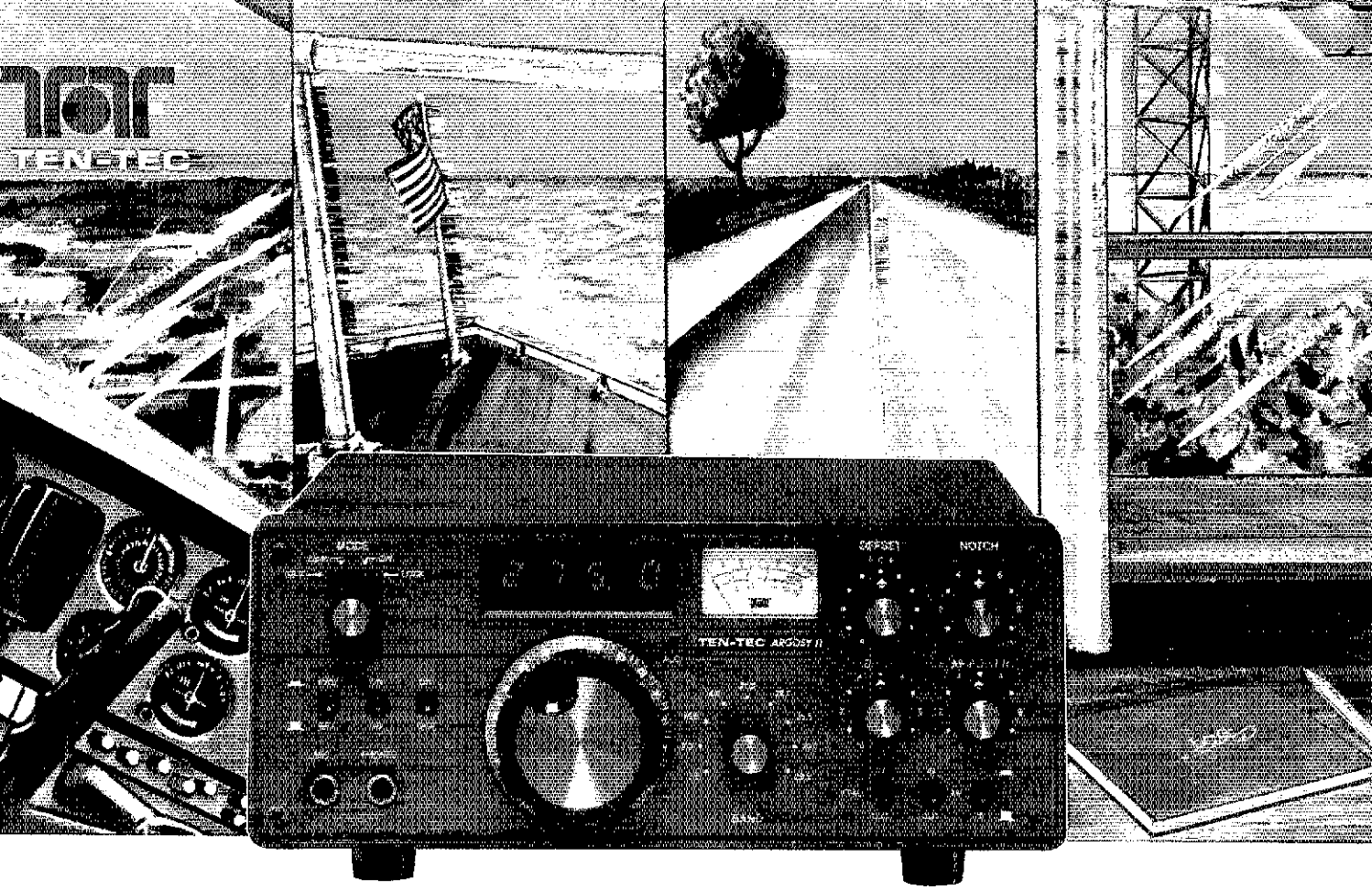


ARGOSY II
at home everywhere

Like its namesake, the ARGOSY II is a great traveler, land, sea, or air. And it has the right features to be an equally good companion at home.

Mobile/Portable/Fixed operation is easier with ARGOSY II. Broadband design eliminates receiver and final amplifier tune up. Small size permits convenient installation. Simple controls and switches make operation easy—even without looking. And its basic 13 Vdc design permits battery operation, drawing just 750 ma. on receive and 9 A max. on transmit to allow plugging into a car's cigarette lighter outlet for mobile use. Plus the easy disconnect from its mobile mount permits moving the ARGOSY II for fixed station use or safe keeping.

Two-Level Power. Switch from QRPp (5 watts output) to QRO (45 watts output). Low power for portable use from batteries, high power without a separate power amplifier. Low power for the challenge of QRP operation, high power for greater punch when conditions require it. Both power levels have ALC with optimum drive indicated by a front panel LED.

Solid-State, Six-Band Design. Covers 80-10 Meters, including the 30-meter band, in 9 segments (four for 10 Meters) with 40 kHz overrun on each band edge. Excellent sensitivity (0.3 μV), offset receiver tuning (±3 kHz), built-in notch filter tunes 200 Hz-3.5kHz, optional noise blanker, WWV reception, QSK, sidetone pitch and volume controls, and a new easy-to-read digital frequency display uses 4 large red 0.3" LEDs to indicate frequency (the bandswitch indicates band in use). Every feature you need for easy use and fine performance.

A great rig for traveling — and for staying home. Some of the features that make ARGOSY II perfect for mobile use also make it an ideal fixed station transceiver. One is its size—just 4" high, 9" wide, and 12" deep—so it fits conveniently on a desk with plenty of room left for accessories. And there's a full complement of accessories to choose from for mobile or fixed operation—microphones, filters, keyer, speech processor, mobile mount, and an ac supply. Best of all, ARGOSY II is low cost.

Check out the at-home-everywhere new digital ARGOSY II. See your dealer or write for information to TEN-TEC, Inc., Sevierville, TN 37862.

TS-830S

"Top-notch"...VBT, notch, IF shift, wide dynamic range

The TS-830S has every conceivable operating feature built-in for 160-10 meters (including the three new bands). It combines a high dynamic range with variable bandwidth tuning (VBT), IF shift, and an IF notch filter, as well as very sharp filters in the 455-kHz second IF.

TS-830S FEATURES:

- LSB, USB, and CW on 160-10 meters, including the new 10, 18, and 24-MHz bands. Receives WWV on 10 MHz.
- Wide receiver dynamic range, Junction FETs in the balanced mixer, MOSFET RF amplifier at low level, and dual resonator for each band.
- Variable bandwidth tuning (VBT). Varies IF filter passband width.
- Notch filter high-Q active circuit in 455-kHz second IF.
- IF shift (passband tuning).
- Noise-blanker threshold level control.
- Built-in digital display, (fluorescent tube), with analog dial.
- 6146B final with RF negative feedback. Runs 220 W PEP (SSB)/180 W DC (CW) input on all bands.
- Built-in RF speech processor.
- Narrow/wide filter selection on CW.
- SSB monitor circuit.
- RIT and XIT (transmitter incremental tuning).

Optional accessories:

- SP-230 external speaker.
- VFO-230 external digital VFO with five memories, digital display.
- VFO-240 external analog VFO.
- AT-230 antenna tuner.
- YG-455C (500 Hz) or YG-455C (250 Hz) CW filter for 455 kHz IF.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter for 8.83 MHz IF.
- KB-1 deluxe heavyweight knob

TS-530S

"Cents-ational"...IF shift, digital display, narrow-wide filter switch

The TS-530S SSB/CW transceiver covers 160-10 meters using the latest, most advanced circuit technology, yet at an affordable price.

TS-530S FEATURES:

- 160-10 meters, LSB, USB, CW, all amateur frequencies, including new 10, 18, and 24 MHz bands. Receives WWV on 10 MHz.
- IF shift tunes out interfering signals.
- Built-in digital display (six digits, fluorescent tubes), with analog dial.
- Narrow/wide filter selector switch for CW and/or SSB.
- Built-in speech processor, for increased talk power.
- Wide receiver dynamic range, with greater immunity to overload.
- Two 6146B's in final, allows 220W PEP/180 W DC input on all bands.
- Advanced single-conversion PLL, for better stability, improved spurious characteristics.
- Adjustable noise-blanker, with front panel threshold control.
- RIT/XIT front panel control allows independent fine-tuning of receive or transmit frequencies.

Optional accessories:

- SP-230 external speaker with selectable audio filters.
- VFO-240 remote analog VFO.
- VFO-230 remote digital VFO.
- AT-230 antenna tuner/SWR/power meter.
- MC-50 desk microphone
- KB-1 deluxe VFO knob.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filter.
- YK-88SN (1.8 kHz) narrow SSB filter.

TS-660

The TS-660 "QUAD BANDER" covers 6, 10, 12, 15 meters.

- FM, SSB (USB), CW, and AM
- Dual digital VFO's
- Digital display
- IF shift built-in
- 5 memories with memory scan
- UP/DOWN microphone
- All-mode squelch
- Noise blanker
- CW semi break-in/sidetone
- 10 W on SSB, CW, FM; 4 W on AM.

Optional accessories:

- PS-20 power supply
- VOX-4 speech processor/VOX
- SP-120 External speaker
- MB-100 Mobile mount
- YK-88C, YK-88CN CW filters
- YK-88A AM filter.

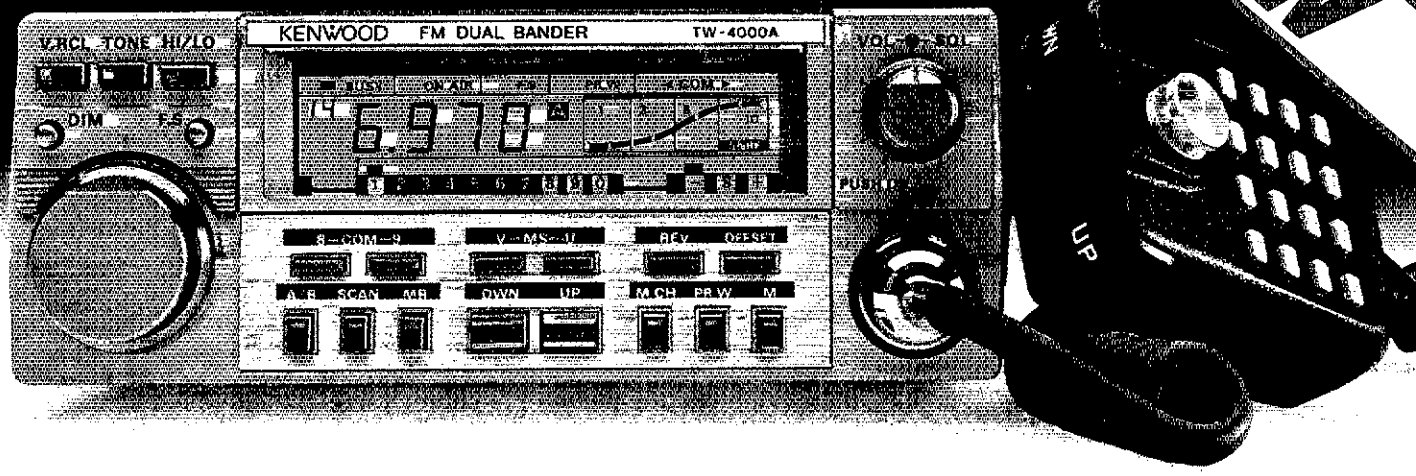
KENWOOD

TRIO-KENWOOD COMMUNICATIONS

1111 West Walnut, Compton, California 90220

FM "Dual-Bander."

NEW



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

TW-4000A

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

TW-4000A FEATURES:

- **2 m and 70 cm FM in a Compact Package** Covers the 2 m band (142.000-148.995 MHz), including certain MARS and CAP frequencies, plus the 70 cm FM band (440.000-449.995 MHz), all in a single compact package. Only 6-3/8 (161)W x 2-3/8 (60)H x 8-9/16 (217)D inches (mm), and 4.4 lbs. (2.0 kg.).
- **Large, Easy-to-Read LCD Display** A green, multi-function back-lighted LCD display for better visibility. Indicates frequency, memory channel, repeater offset, "S" or "RF" level, VFO A/B, scan, busy, and "ON AIR." Dimmer switch.
- **25 Watts RF Power on 2 m/70 cm.** Hi/Lo power switch.
- **Optional "Voice Synthesizer Unit"** Installs inside the TW-4000A. Voice announces frequency, band, VFO A or B, repeater offset, and memory channel number.
- **Front Panel Illumination**
- **10 Memories with Offset Recall and Lithium Battery Backup** Stores frequency, band, and repeater offset. Memory 0 stores receive and transmit frequencies independently for odd repeater offsets, or cross-band operation.
- **Programmable Memory Scan** Programmable to scan all memories, or only 2 m or 70 cm memories. Also may be programmed to skip channels.
- **Band Scan in Selected 1-MHz Segments** Scans within the chosen 1-MHz segment (ie., 144.000-144.995 or 440.000-440.995, etc.). The scanning direction may be reversed by pressing either the "UP" or "DOWN" buttons on the microphone.
- **Priority Watch Function** Unit switches to memory 1 for 1 second each 10 seconds, to monitor the activity on the priority channel.
- **Common Channel Scan** Memory 8 and 9 are alternately scanned every 5 seconds. Either channel may be recalled instantly.
- **Dual Digital VFO's** Selectable 5-kHz or 10-kHz for 2 m, and 5-kHz or 25-kHz for 70 cm. Depress "UP" or "DOWN" key on the front panel for band change in 1-MHz steps.
- **16-Key Autopatch UP/DOWN Microphone (Supplied)**
- **Repeater Reverse Switch**
- **High Performance Receiver/Transmitter** GaAs FET RF amplifiers on both 2 m and 70 cm, high performance MCF's in the 1st IF section, provide high receive sensitivity and excellent dynamic range. The high reliability RF power modules assure clean and dependable transmissions on either band.
- **Rugged Die-cast Chassis**
- **Optional Two-Frequency CTCSS Encoder** Easily mounted inside the radio, allows DIP switch programming of two different tone frequencies, for 2 m and 70 cm.
- **"BEEPER" sounds through speaker.**
- **Easy-to-Install mobile mount**

TW-4000A accessories:

- **VS-1 Voice Synthesizer**
- **TU-4C Two-Frequency Programmable CTCSS Encoder**
- **KPS-7A Fixed station power supply**
- **SP-40 Compact mobile speaker**

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

KENWOOD

... pacesetter in amateur radio

All mode "Dual-Bander"

TS-780

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

TS-780 FEATURES:

- USB, LSB, CW, FM all mode, covering the 2 m band (144.000-148.000 MHz) and the middle 70 cm band (430.000-440.000 MHz). UP/DOWN band switch.
- Dual digital VFO's with normal/tight drag switch. VFO steps in 20-Hz, 200-Hz, 5-kHz, or 12.5-kHz, plus "FM CH" channelized tuning. Split (cross) frequency operation possible. F. LOCK switch provided.
- 10 memories include band and frequency data, backed up by internal batteries (not supplied). Battery life exceeds one year. Memories 9 and 10 for priority instant recall.
- Band scan, with selectable 0.5, 1, 3, 5, and 10-MHz scan bandwidth.
- Memory scan selectable for all memories, or 2 m or 70 cm only.
- IF shift circuit rejects adjacent interference.
- High sensitivity and wide dynamic range • 7-digit fluorescent tube digital display • 10 watt RF output • 2 m ±600-kHz TX offset switch with reverse switch • Tone switch for optional TU-4C two frequency tone encoder unit • VOX and semi break-in CW built-in • FM center-tune meter • Noise blanker for SSB, CW.

Subject to FCC approval

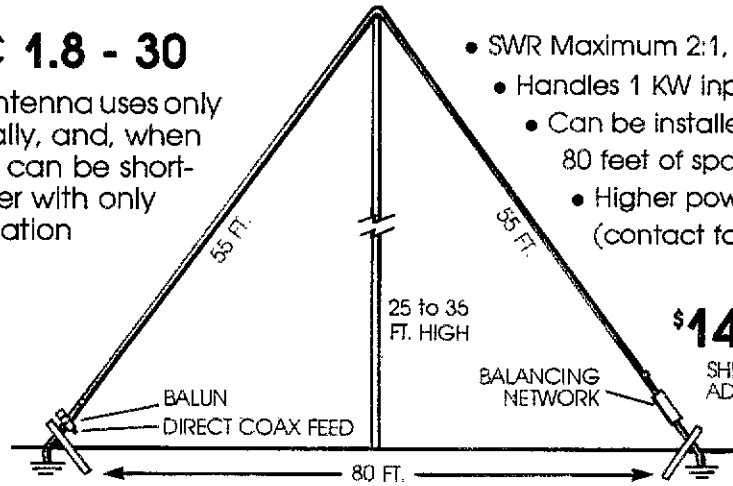
NEW from BARKER & WILLIAMSON!

1.8 - 30 MHz. Continuous Coverage Antenna for Commercial and Amateur Service

Model AC 1.8 - 30

The AC 1.8 - 30 Antenna uses only 80 feet horizontally, and, when space is limited, can be shortened even further with only slight loss of radiation efficiency.

Patent Pending



- SWR Maximum 2:1, 1.4:1 Average
- Handles 1 KW input ICAS
- Can be installed in approximately 80 feet of space
- Higher power models available (contact factory)

$149.50

SHIPPING AND HANDLING ADD $4.00

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SYNTHESIZED STABILITY

DRAKE RV75 Remote VFO

The RV75 Synthesized Remote VFO is designed to complement the DRAKE TR7, TR7A, R7, R7A, and the TR5. The RV75 provides a high degree of frequency control flexibility with crystal-controlled frequency stability. The RV75 output frequency is synthesized in 10 Hz increments for smooth frequency control and the weighted flywheel of the optical shaft encoder provides a smooth, solid feel.

• Synthesized Frequency Control • Crystal-Controlled Stability (±15 ppm 0° to +50°C) • • Patented Variable Tuning Rate • 10 Hz Resolution • 800 KHz Tuning Range • • User Selectable Direction of Frequency Change/Dial Rotation • Weighted Flywheel Shaft Encoder • 2 Programmable Fixed Frequencies • "RIT" Control • Dial Lock •

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Phone: (513) 866-2421 Telex: 288-017

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DRAKE TR7A TRANSCEIVER

No-Nonsense Continuous Duty Performance and Versatility

• **CONTINUOUS FREQUENCY COVERAGE**—1.5 to 30 MHz full-receive coverage. The optional AUX7 expands traditional Amateur band coverage to include 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). • **CONTINUOUS DUTY RATED**—Full power 250 watt input operation on SSB and CW (same on SSTV and RTTY with optional FA7 fan). • **FULL PASSBAND TUNING (PBT)** enhances use of high rejection 8-pole crystal filters. • **BUILT-IN FEATURES**—NB7 noise blanker, 2.3 kHz SSB and 500 Hz CW crystal filters plus provisions for two additional filters. • **MODULAR CONSTRUCTION**—Plug in G-10 glass epoxy printed circuit boards. • **STATE-OF-THE-ART DESIGN** combining solid-state PA, up-conversion, high-level double balanced 1st mixer and frequency synthesis provides a no tune-up, broadband, high dynamic range transceiver. • **ACCESSORIES**—A full line of compatible accessories, including the new RV75 digital synthesized VFO, is available from your Drake dealer. • Manufactured in U.S.A.

DRAKE. Let us take you there!

R. L. DRAKE COMPANY

DRAKE

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AMACOM '83

AMACOM '83 has the program for you Oct. 15-16, 1983, at Delgado Community College's City Park campus, New Orleans.

Hear Larry Levy, WB5MXS, speak on RTTY message storage and radio bulletin boards. Robert G. Heil, K9EID, will show you his CB-to-10-meter conversion and SSB audio processing tricks. Ted Saba, WA50ZH, will explain transistor amplifier design. Paul J. Azar Jr., N5AN, will demystify DX predictions for the sunspot cycle low. Craig Roberts, WB5HKO, will humor newcomers to amateur radio.

○

Also: *FCC exams, Quarter Century Wireless Assoc., Military Affiliate Radio Services, American Radio League, hamfest workshops, Red Cross, more exhibits, larger flea market, awards, and local tours.*

DETAILS:
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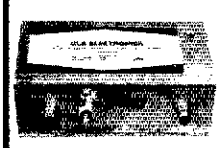
Reserve your AMACOM '84 room before January 1, 1984. Delta Division convention Oct. 20-21, 1984--that's during the Louisiana World Exposition!

HIGH PERFORMANCE PRESELECTOR-PREAMP

The solution to most interference, intermod, and desense problems in **AMATEUR** and **COMMERCIAL** systems.



- 40 to 1000 Mhz - tuned to your frequency
- 5 large helical resonators
- Low noise - High overload resistance
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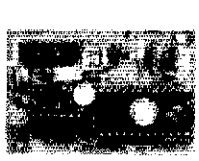
- 10 to 15 volts DC operation
- Size - 1.6 x 2.6 x 4.75" exc. connectors
- **FANTASTIC REJECTION!**

Typical rejection:
+600 Khz @ 144 Mhz:-28dB
±1.6 Mhz @ 220 Mhz:-40dB
±5 Mhz @ 450 Mhz:-50dB

Price - $79.95 bipolar w/RCA jacks
Connector options: BNC $5, UHF $6, N $10
SUPER HOT! GaAs Fet option $20

AUTOMATIC IDENTIFIERS



ID-1

ID-2

- For transceivers and repeaters - **AMATEUR** and **COMMERCIAL**
- Automatic operation - adjustable speed and amplitude
- Small size - easy installation - 7 to 15 volts DC
- 8 selectable, reprogrammable messages - each up to 2 min. long
- Wired, tested, and programmed with your message(s)
  Model ID-1 - $39.95 Model ID-2 w/2 to 10 minute timer - $59.95

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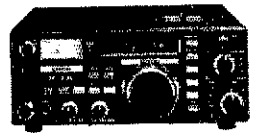
KENWOOD TR2500

ICOM



IC-730

YAESU, TENTEC, DRAKE ICOM, KENWOOD!

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MICROWAVE, satellite, video, audio components and equipment. Send $1 for 1983 Catalog. DSCo, Department E, 3110 Evelyn Street, Roseville, MN 55113.

WANTED: Tailtwister T2X, TH6DXX-to-TH7DX Conversion Kit, Yaesu YO101, 3-500Z. W2UGM, 66 Columbus Ave., Closter, NJ 07624 201-767-0123.

COLLINS S-line (WE) 75S-3, 32S-3 and 516F-2. Absolutely perfect condition. No marks or scratches. $750. 75S-3, same as above, $250. David L. Wilner, 415-383-4545.

WANT: DG-5 display for Kenwood TS-520S, P. Beautrow, 111 Sequoia Glen Lane, Novato, CA 94947.

COLLINS, MINT 75S3C & 32S3 round emblem plus 312 speaker ps. Package only $1800 Yaesu, mint FT301 plus FP-301, $500. Lyn, K4VBU, 1124 Plantation Road, Martinsville, VA 24112 703-632-3805.

QUAD KITS, $37.50 Quik-Quad, 1101 Plantation Dr., Cary, NC 27511.

2M Hand-Helds: Tempo S1, $140; Kenwood, TR-2400, $165. Original cartons. Mint. WB1EWP, Boston, 617-262-7711.

WANTED: Drake R-4C or SPR-4 receiver in new condition. Call: Bill, WA2TDR, 201-482-6629.

FOR SALE: QST's from 20's to date, H.R. 68 to date, 73's 60 to 82, CQ 45 to date, RADIO 39 to 42. All in very nice condition, by the year or individual. W6XI 619-469-9732.

DRAKE TR-7 (500 Hz, 6 kHz, 1.8 kHz filters) with RV-7, MS—7, and PS-7 (delux supply). Excellent condition. $1000. KJ6B.

R-390 receiver, excellent working order, aligned, .5-32 MHz continuous coverage, Collins manufacture. $170 shipping prepaid. Will deliver to KY, Cincinnati, Knoxville, or Nashville hamfests for less. K4RN, Box 312, Versailles, KY 40383 or 606-873-9959.

MOTOROLA: HT-100 batteries $25, U74MST $400, NLS MS-230 Miniscope $425, Collins 75A2 receiver $150; Wanted: Motorola MX300 or MT500; Charlie 212-268-2654 N2HA.

CLEANING OUT shack, S.A.S.E. only, Louis D'Antuono, WA2CBZ, new address, 8802 Ridge Blvd., Bklyn, NY 11209. Local pick-up only.

TENNATEST - Antenna noise bridge - outperforms others - accurate - costs less - $41 - Send stamp for details. W8URR, 1025 Wildwood Road, Quincy, MI 49082.

COLLINS still best! KWM-380's bought, sold, serviced. K1MAN 207-495-2215.

COAX: Low-Loss 50 Ω (1/2, 3/4, 7/8, 1 5/8, 3 1/8) inches. Specifications S.A.S.E. Link, 1081 Aron St., Cocoa, FL 32922.

WANT COLLINS: CT-2 Cable Trough for KWM-2A/S-Line. Owner's Manuals: 30S-1, 3rd. Edition; originals only, no reprints, and in good condx. 136A-1 Noise Blanker and 35U-1 Low Pass Filter for 75A-4. 312A-1 speaker w. Lumiline lamp. Xtal gripper for CP-1 Crystal Packet. 440F-1 Extension Cable for 516F-2. Any original sales literature for early 30K-1 transmitter, no reprints pse. Want to find Jones Micromatch wattmeter in good condition. AG1Y c/o ARRL Hq.

WANTED: Heath SBA-104-1 noise-blanker, K4RV, Rt. 7, Box 168, Lexington, S.C. 29072 803-359-3418.

YAESU FT-101B, fan, CW filter, with FV101B external VFO $375 you ship. W1AB, 203-767-8485.

ANTENNA, helically wound for 75 Meter band-built from ARRL antenna anthology, pg. 20 — except swing mount and top supported $70. 203-481-2058 Bob, KA1FZS.

MINT LINEAR. 160-10 meters (added by me). Ameritron AL-80. All factory improvements. 500 watts output CW and SSB. Pickup only. $475. Lee Aurick, W1SE, 203-667-2494 Tues. to Friday, 7:30 to 5:30. 203-666-8048 Mon. and evenings.

WANTED: Old bugs for my telegraph and radiotelegraph key collection. I am trying to find each make and model of bug manufactured before 1950. Vibroplex, Martin, Albright, Warner, D&K, Boulter, TMC, MacDonald, etc. Also looking for spark keys, Boston keys, military/spy keys and keys of historical significance. 73 de K5RW Neal McEwen 1128 Midway, Richardson, TX 75081.

DRAKE TR7 with two optional filters $895 you ship WA2LYZ 609-627-5683.

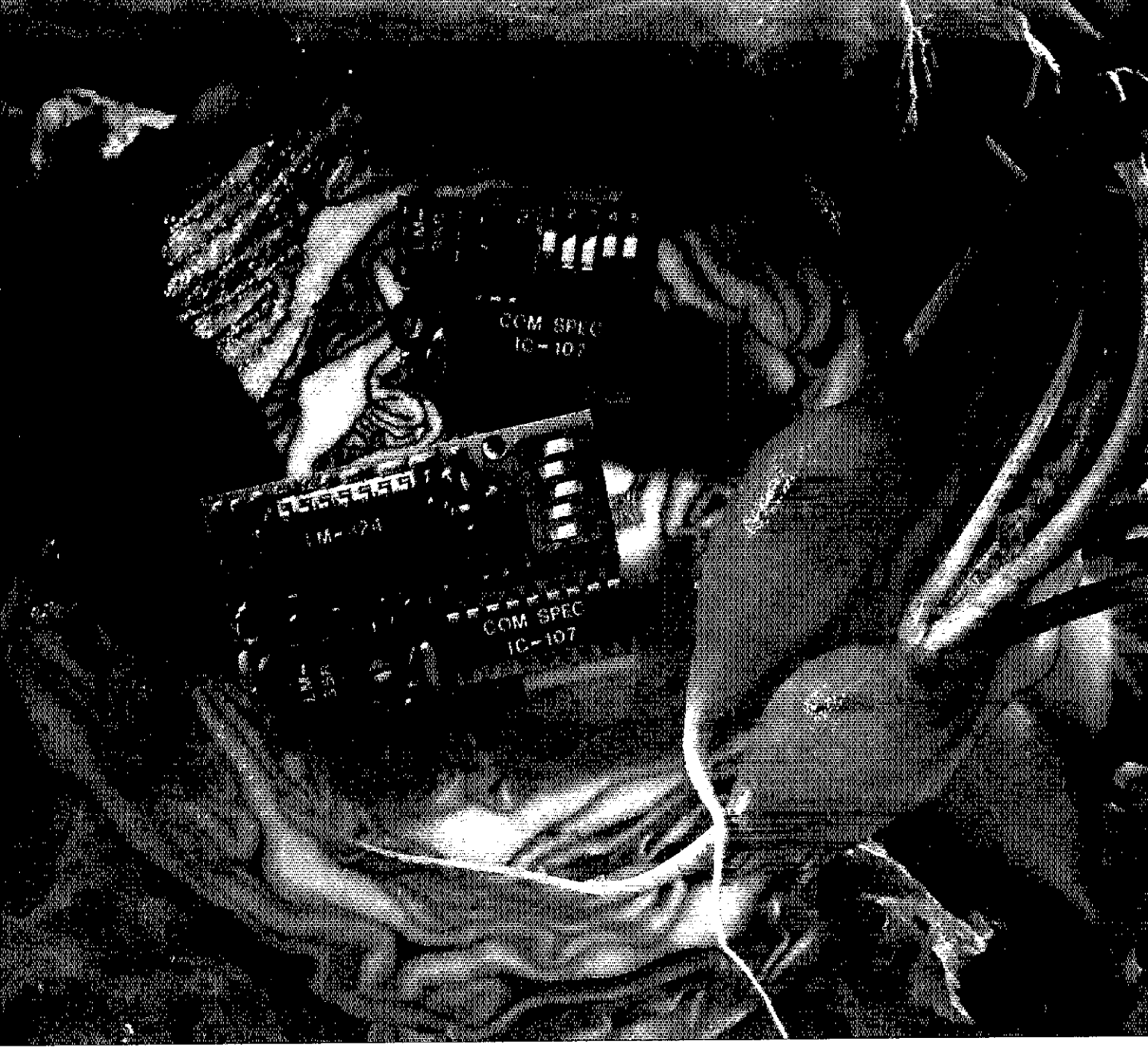
QSTs for sale. Solid from Jan '23 thru Nov '80 as a package. Kennedy, W3GPI, 4806 Harvard Road, College Park, MD 20740. 301-277-9259.

ICOM IC-701 transceiver, P.S., SM2 mike. Like new, $575. Heathkit HM-2140 HF wattmeter. Mint, $45. WB7VOO, 602-298-4820.

SALE, Sony 2001 SW rcvr new in box w/pwr suply. Best offer. L. M. Hamilton NJ6Y, 13750 Lemoli Ave. #38, Hawthorne 90250.

MODEL 28KSR Teletype with Reperf unit, Model 14 reader, Flesher DM-170 terminal unit. All for $100. You pay shipping. Dave, AD0D, 6728 South 52nd St., Omaha, NE 68117. 402-734-3672.

PANASONIC RF-4900: $299 & UPS. KA4ZIU; 13901 SW 75 St., Miami, FL 33183. 305-387-3373.



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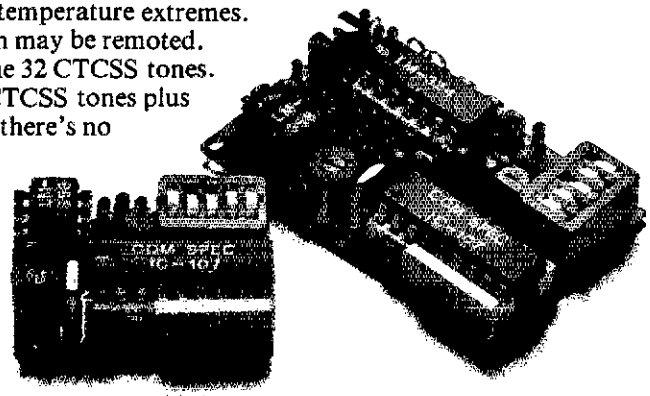

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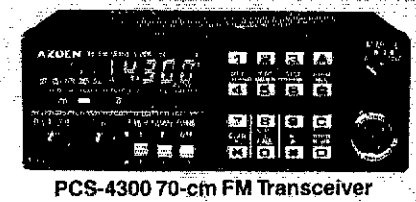

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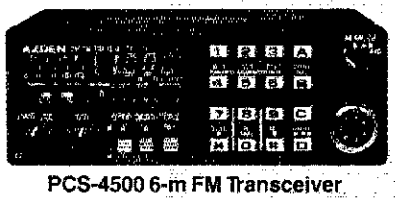

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- **CAP/MARS BUILT IN:** PCS-4000 includes coverage of CAP and MARS frequencies.
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- **DUAL MEMORY SCAN:** Scan memory banks either separately or together. COMPARE!
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- **FREE AND VACANT SCAN MODES:** Free scanning stops 5 seconds on a busy channel; autoresume can be overridden if desired. Vacant scanning stops on unoccupied frequencies.
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- **SUPERIOR RECEIVER:** Sensitivity is 0.2 uV or better for 20-dB quieting. Circuits are designed and manufactured to rigorous specifications for exceptional performance, second to none. COMPARE!
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- **OTHER FEATURES:** Dynamic microphone, rugged built-in speaker, mobile mounting bracket, remote speaker jack, and all cords, plugs, fuses, and hardware are included.
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FOR SALE: KLM 15 Mtr. 6 ele lightweight. New in box (local only) $195. Want Signal One CW filter also Avanti 2 mtr antenna, and 30S1 Collins amp. WB6BIK, John 415-930-7119.

WANTED: SB-500 2-meter transverter wired for use with SB-110 A, manual desired. Must be operational and in good condition. R.C. Lutz KA8OCE 3217 Madison Rd., Pinckney, MI 48169.

TELEX, Western Union 1976 Machine 60 or 100 wpm. WU values at $1500. Pedestal Type W/Tape. Swap for ham gear. L.H. Arnold 5100 Monument Ave., Richmond, VA 23230. 804-282-3691.

DRAKE DSR-2 professional communications receiver — WA2BAP Kitty, 212-925-7000.

TEN-TEC Century-21, Autek keyer, key, Dentron tuner, LP filter. Mint. $400. Robert Hajdak, 2679 Curry Circle NW, Uniontown, OH 44685.

TENTEC Omni-A p/s mic excellent $450. N6CX Box 475 Kenwood, CA 95452. 707-833-5282.

CARRIBEAN DXPEDITION! Well-equipped ham shack, contest-quality antenna farm, and secluded private villa in tropical gardens. Be a VP2M and give your family once-in-a-lifetime vacation. For details write VP2MF, Box 2, Plymouth, Montserrat, W.I., or N5DXD, Box 7681, Houston, TX 77270.

SELL QST 1971-82 bound; best offer, you ship. WA2PVN, 201-725-6788.

FOR SALE-Galaxy 300 Transceiver, 80-40-20 SSB, 40 CW $100 John H. Guthrie W3GJ, St. Marys, PA 15857.

VHF Starter Package: Janel Lab 144CA receive converter, 2dB nf. Hamtronics XV2 transmit converter, 1 mW input, 2 W output, collector current meter. Both 28 MHz if. Operating instructions. $100. Barry Wright, KA7V, 322 NW 18th Street, Ontario, OR 97914. 503-889-4546.

12-INCH Infoton video terminal. Factory refurbished. Upper case only. Standard keyboard. 24 x 80 screen. 75 to 9600 baud. RS232 plus I/O terminal strip. $250 plus shipping. Bill, W5UNB, 8820 James NE, Albuquerque, NM 87111. 505-262-2388.

COLLINS WANTED: CT-2 cable trough for KWM-2A/S-Line. This is a rare item; dig deep in the junk box and let me know. Needed to complete collection. AC1Y c/o ARRL Hq.

FOR SALE: Cushcraft ATB-34 beam; Wilson TT-45 crankup tower. W2HBV 201-325-2839 evenings and weekends.

WANTED-Unmodified Dentron 160-meter resonator with whip, female threads 3/8 x 24 S.A.E. Contact Gene, KA3AHL, 165 Benziger Ave., Staten Island, N.Y. 10301.

SELL Yaesu station-FT-901DM $625, FTV-901R with 6, 2, 3/4 meter modules $640, KLM amps PA 4-80AL $100, PA10-80BL $100, Tempo VHF One $200. All excellent with manuals and original cartons. George Jones W4XP 28 Wildwood, Stow, MA 01775. 617-562-3137.

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HENRY 3K Classic-X (factory mod. to "X"). Send S.A.S.E. for list W1AGA.

DRAKE L4B linear amplifier, like-new condition, used only 10 hours; includes 10 meter band. $725. Stu Cowan, W2LX, Box 596, Rye, NY 10580.

TELETYPE machine for sale. 33ASR. Rolls, tapes, ribbons — $1500 for all. Pick-up only. 516-623-9051. Lloyd Chosed, 40 Beverly Rd., Merrick, N.Y. 11566.

UNIMETRICS Sandpiper 2500 — 25 watt, 12 ch. marine VHF. Will cover police, fire, commercial w/proper crystals 9 marine freq. installed. Excellent condition. $225. Need a rig! KA8NNA Box 9615, Riviera Bch, FL 33404 or 305-848-7461.

SWAN 500CX ssb transcvr w/power supply and mic factory checked out and updated with 8950 tubes in finals. Excellent. $325. K6CEC, 213-367-5598.

COLLINS S-line, W/E, mint. Estate of W1NA, sole owner. 75A3, 32S1, 516-F2, console (speaker, patch). Package $800. plus UPS or pickup. Also many old Qst. J. Richards, 22 Trysting Road, North Scituate, MA 02060. 617-545-3252.

ICOM IC-290A fm/cw/ssb with TT mic. 10 watts nicad memory backup. $300. Bill N7EU. 209-292-7060.

COLLINS 75S-3B, winged emblem, 500 Hz filter, crystals for seven 10 meter segments including satellites; spare tubes, instruction book. Perfect condition. $410. Stu Cowan, W2LX, Box 596, Rye, NY 10580.

WANTED: Old Call Book 1922-1925 or partial photocopy listing 1CUK and/or 1ZV. Write to W1ZV.

FIELD-PROVEN Contest/Dupe Sheet and Antennas programs for Timex/Sinclair 1000 or Sinclair Z-81 with 16K. $10 for both on tape. WA2EKK — Phil Brown, 109 Hollybrook Road; Rochester, NY 14623.

APPLE //e, 64K, 80-column card, Apple Dumpling printer interface card/cable, Monitor ///, stand, two disk drives, all tech, software and system manuals, Apple Writer //e, 40 disks, game paddles, more. $2550 plus shipping. N1FB Paul K. Pagel, 4 Roberts Rd., Enfield, CT 06082.

WANTED: Prop-pitch rotor. Directional dial on control. State condition and best price. KD7CL — Danny Foster, 5622 S. Sandhill Rd., Las Vegas, NV 89120. 702-458-4147.

KENWOOD YG455C 500HZ TS830S CW filter $60. W7AM, Box 8173, Sisters, OR 97759.

FT107M 240 W. PEP digital solid state XCVR, 12 memories AC/PS, speaker/patch, desk mic, scanning band mic. $750 Ron-AB8K 513-898-4299.

KENWOOD TS-820, VFO-820. CW filter, digital display, mint. $675. Daytime. 414-565-3369. KR9R.

WRITE or phone for best cash price, trade, credit plan on Trio-Kenwood and other equipment. Phone 816-679-3127, Henry Radio, Butler, MO 64730.

WANTED: Borrow/buy inexpensive portable equipment for year in Singapore (9V1): 230 Vac ssb xcvr, vertical antenna, etc. WB2HTJ T. Agoston, 38 Wayside, Scarsdale, NY 10583.

WANTED-Kenwood TS-130V W9VTZ 414-962-5567.

TELETYPE 33ASR w/paper, tape, manuals, spares 20 mA loop good cond. $75. Gertsch FM3 20-1000 MHz sig gen/freq meter 0.001% $60. WA6FPO 213-792-8909.

COLLINS, Digitran pad kit, new, for KWM-380, unassembled. First $32. M.O., postpaid U.S., W2KKT.

SELLING: Brand-new Polar Research Lil' Slipper antenna rotator — $450. Icom 502A 6mSSB — $150. Bob Trapasso 919-895-2683.

SSTV-use Unexpanded VIC-20 as alphanumeric keyboard — f.s. output into Robot camera input ... cassette and schematic for optional preamp $9.95 postpaid. Bart Prater — N4ZV, 3141 Glenmont Dr., Roanoke, VA 24018.

NOSTALGIA buffs! Meissner Signal Shifter, National 101X receiver, both working, clean $100 each. Also Heath SB200 linear, near new $350. W5FR 713-488-0517.

SELL-Icom 701 xcvr with 701PS pwr sup, RM-2 micro processor control, SM-2 mic. All mint condition. All manuals $550. K2UQ 609-586-7443.

MAKING ROOM for new TS930S: Kenwood TS180S w/digital $500; TS820S $500; Drake MN-2000 Tuner $195; Kenwood VFO180 $100; Kenwood TS520S $400. All one owner, non-smoker, excellent operation and appearance, with manuals. W5FR 713-488-0517.

HAM-TENNA's Cushcraft Bonanza: A4 $221.50; A3 $170.50; 7 and 10 MHz kits $62.50; R3 $221.50; D40 $141.50; D3 $111.50; D4 $141.50; DW3 $121.50; 214 B or FB $66.50; ARX-2B $35.50 Consumers RG-8U foam 97% shield $30/ft. U.S.-made PL-259 10/$5.85 shipping additional. N.Y. residents add sales tax, No C.O.D. — P.O. Box 4414, Utica, N.Y. 13504.

TI994-4A Basic & Extended Basic Programs. CW RECEIVE/Transmit, CW Practice, DX Log/Call Locator, Amateur Call locator, SSTV Keyboard, 1010 Record, WAS, Programs for Hamkids. Write Sam Moore, AC5D, Box 368, Stigler, OK 74462.

NEW HUSTLER 10M beam $80 Linguaphone Spanish Course $80 shipping W6XM 528 Colima, La Jolla, CA 92037. 619-459-5527.

TRANSCEIVER Yaesu FT-101-Z with CW filter, mint, $450. E. Weber, K2EW 21 Castle Gate, Wassaic, NY 12592.

SELL: SB303 solidstate receiver — CW filter 175, SB101-HP23A $250, Carmichael 432 transmit converter $75. Ron K1VYU. 1-203-626-3021.

FOR SALE: Hallicrafters SX-117 receiver, HT-44 transmitter, HA-10 if/mf tuner and PS-150-120 power supply. All in perfect working condition. I use now. Some spare tubes and all original manuals included. Want to sell at best offer. Write or Call KD@BG, Don E. Boyvey 3122 Holcomb Des Moines, IA 50310. 515-279-6732.

MAGNUS A1000, 1-kW., HF linear amplifier for sale. 15 through 160 meters. Solid state. Mint condition. $850, firm, plus freight. LaRue Electronics, 1112 Grandview Street, Scranton, PA 18509, 717-343-2124.

FREE FOR Nothing — just pick it up. Teletype pageprinter complete with tape perforator, desk, in excellent shape. Call 201-483-5959 — WB2CIV.

DRAKE TR-4 w/34NB, AC-4, DC-3, MS-4; $475, R4B, $250. Gonset IV, VFO, best offer. W2SNJ, 33 Hughes Street, Maplewood, NJ 07040.

ROBOT 800H RTTY/CW/SSTV terminal, and USI International 12-inch green screen monitor. Both new. $500. N5SM Scott McDowell 3715 Lenwood Dr. Amarillo, TX 79109. 806-355-5019.

WANTED: Antenna Impedance Bridge. State, make price — W7MN.

SELL, Collins; KWM-2A (round); 312B-5 console; power supplies MP-1, PM-2, 516F-2; CC-2 case; Two spare plug-in relays (never used); Manuals; Spare tubes, $1,500. K4EC 8056 Claries Drive, Sarasota, FL 33580; 813-355-2493.

SEARS Communications Receiver — (Yaesu FRG-7) general coverage, 500 kHz to 29.9 MHz, excellent shape, $180 or best offer. N4ANJ, Mike, 703-483-1096.

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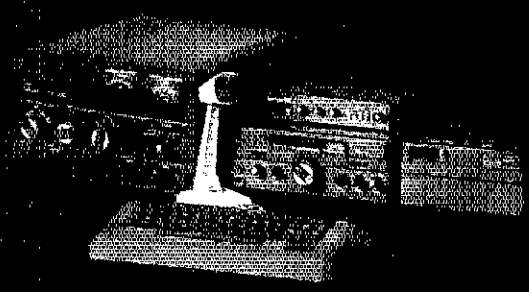

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Heath Company

IC2A. Perfect two-meter rig. Many valuable extras. Need cash. Any reasonable offer. Jerry, KE1S. 617-877-6119.

FOR SALE: Complete file of QST from 1935 to 1979. Three copies missing: September 1945, June 1954, and October 1978. Will ship, postpaid, to best offer. James B. Pretz, 1300 North 81st St., Kansas City, Kansas 66112.

WANTED: Ten Tec Century-21 with 276 Calibrator. L. Turner, POB 1240, Mendocino, CA 95460. 707-937-4430.

WANTED RA-62-B or RA-62-C 110Vac power supply for SCR-624 radio. Bob WB6VAE 280 St. Mary's Street, Martinez, CA 94553. 415-229-2785.

PARTS For Sale: Cleaning out accumulated amplifier parts: tubes; plate, filament, and modulation transformers; capacitors; chokes. S.A.S.E. Bill Abate, 1257 Wunderland Road, Roslyn, PA 19001.

WANTED — Heath MP-10 power inverter. Manual for Atlas 210X. K4FVI. 804-838-4423.

FOR SALE: Kenwood TS-180S w/DFC, YK-88S & YK-88C xtal filters, PS-30 AC PS, AT-180 Ant. Tuner, SP-180 Spkr., MC-50 desk mic. all for $850. Mint condition 28ASR w/typing re-perf, loop PS, and all manuals for $450. Azden PCS-2000 w/touch-tone mic. & tone encoder for $200. Icom 255-A w/Janel pre-amp QSA-5 & IC-HM8 touch-tone mic. for $200. Clegg FM-27B w/011 AC PS $175. Kenwood TR-7800 FM xcvr $200. Kenwood TR-2400 hand-held FM xcvr $200. All gear in exc. condition! Call Mark, W6JOB @ A.C. 213-821-9185, 4038 Moore Street, Los Angeles, CA 90066.

WANTED: National HRO-60 or HRO-500, or VLF receiver. Dick Santopietro, 23 Shatter Street, Providence, RI 02909. 401-944-4245.

DRAKE TR-7 PS-7 MS-7 fan. Purchased new January. Mint, $1100. Jerry, KG8R. 313-773-8704.

WANTED: Heathkit Mohawk rcvr in good condition. Write WA@MJA Dean Wyatt, 1113 3rd Ave. N. Wheaton, MN 56296. 612-563-8779.

REPLACE rusted antenna bolts with stainless steel. Small quantities, free catalog. Elwick, Dept. 492, 230 Woods Lane, Somerdale, N.J. 08083.

CUSTOM Dahl transformer 3500 Vac. — 2 amps, new $170. Signal/One CX-7 owned and modified by W2PV, 2 CW filters $595. K9LWT, 414-554-9170.

DRAKE UV-3 144-220-440 MHz transceiver — with TTP mic, trunk mount kit, PL, service manual, $570. Gerry, N2ASF, 5-6 PM ET, 516-283-3070, Box 585, Water Mill, NY 11976.

TEN TEC Omni D, Series B, 243 VFO. 252MO PS, 1.8, 500, 250 Hz filters, mint. $650 plus shipping. Yaesu SF-30C, 600 Hz filter, $25. K4VHH. 703-896-7534.

MISCELLANEOUS — Heathkit SA-5010 keyer and power supply $70, Heathkit HR-10B receiver and crystal calibration $45, Heathkit exhaust gas analyzer (used twice) $65, Kenwood HS-6 headphones $15, Miller transmitter low pass filter $15, Hustler 80M super resonator $20, Morgain 80-40HD/A dipole antenna $30. Will consider any offers. I pay shipping. KE6T, Box 1105, Glendora, CA 91740.

T-4XC/AC4 mint condition $300 — will ship UPS. W9VYW — 1-608-868-3503.

COMPLETE Yaesu 200W solid-state station. FT-301 transceiver, FP-301 ps/spkr, FV-301 remote VFO, FC-301 antenna tuner. Excellent condition. Includes mike, cables, manuals, UPS shipping in original cartons. Andy, AE6Y, 408-423-1485.

RTTY SYSTEM for sale — Microlog AVR-2 and AKB-1 deluxe units. Contain all features available on these units. KB9DO, 522 Bruce Ave., Milan, IL 61264. 309-787-0004.

DRAKE TR-3, power supply, mike, A1 condition $300. KA2CNG 607-797-7891.

WANTED — Collins 30 L-1. Barry Warren, N2BW, 21 Westover Rd., Troy, NY 12180. 518-272-4914.

WANTED: Schematics and manual for Tektronix 555 oscilloscope and power supply. Wayne Hester KD4QP, 205 Union Ave., Mobile, AL 36607.

WANTED, Military Surplus radios, we need Collins 618T, ARC-94, ARC-102, 718F-1/2, MRC-95, MRC-108, 671U, RT-980/GRC-171, RT-712/ARC-105, RT-804/APN-171, ARC-114, ARC-115, RT-823/ARC-131, or FM-622, RT-857/ARC-134 or Wilcox 807A, ARC-159, ARC-164, RT-859/APX-72, APN-153. Antenna couplers 490T, CU-1658A, CU-1669A, CU-1239/ARC-105, Sperry Rand 3226A1, 3226B1, 490B-1, 690D-1. Top dollar paid or trade for new Amateur gear, Write or phone Bill Slep 704-524-7519, Slep Electronics Co., Hwy. 441, Otto, N.C. 28763.

KENWOOD R-820 receiver for sale. Contains all filters. No reasonable offer refused. KB9DO — 522 Bruce Ave., Milan, IL 61264. 309-787-0004.

GOOD ANTENNA wire & powerstats — cheap!!! I have: 10,000 ft. no. 18 solid, hard-drawn, bare copper wire — Excellent for dipoles, radials, etc. Also, 30,000 ft. no. 16 Litz (9 strands of no. 26) and 5,000 ft. no. 8 Litz (400 strands no. 38!). Litz is ultra-flexible — good for quads, etc. All wire $3.50 per 100 ft., or offer on entire lot. Clubs — make a deal! Powerstats: 120-V pri., 0-140-V sec. at 1.75 or 2.25 A. Uses: Fil. regulation, soldering-iron or motorspeed control, etc. All cleaned and tested — $5 ea., or offer on 75 lot. Dennis Lusis, W1LJ, 203-666-1541 ext. 275 days, 589-7247 evenings.

SELL — Kenwood TS-520 w/CW filter, excellent condition throughout, $425 including shipping; wanted to buy — Drake L-7, prefer local pick-up. Karl, KB2XG. 518-489-7254.

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Over 200,000 persons have used TUNE IN THE WORLD WITH HAM RADIO as their steppingstone into Amateur Radio, the space-age hobby. The third edition of this popular package has been expanded with over 80 percent new material. The code cassette has also been redone and improved. Packed into the *Tune in the World* booklet are chapters on:

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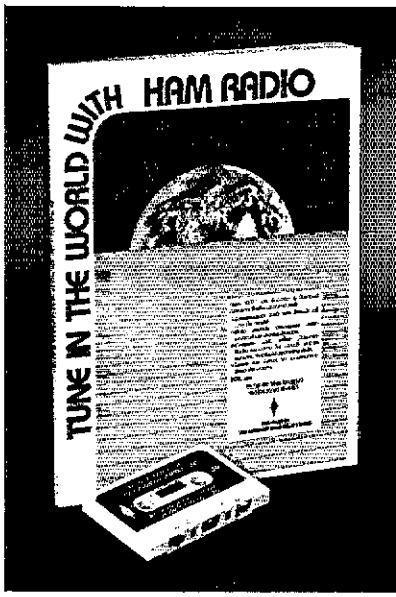

Consisting of 134 pages of easy-to-understand text and an additional 26 pages of equipment and publication advertising, the booklet provides a perfect introduction to an exciting hobby. The cassette prepares the prospective Novice for the 5-words-per-minute code exam by teaching the code character by character — a proven method. Code practice at 5 words per minute follows. The entire package is available for $8.50 (in U.S. funds) and is available at your favorite dealer or from **The American Radio Relay League, 225 Main Street, Newington, CT 06111.**

WANTED: HW-16 any condition. W8RJI, 765 Ranveen, Union Lake, MI 48085.

QTH for sale near Minneapolis. Exceptionally clean two-bedroom home with aluminum siding-house and garage. Fenced yard. 40-foot tower, assumable mortgage. Contact Dan Mack, 7828 Cambridge St., Louis Park, MN 55426. 612-938-8427.

SELL: Yaesu FT-101ZD with all new bands, digital dial, installed 350 Hz CW filter, FV-101Z external VFO, $750. Also Kenwood R/T 599D twins, $600. All in perfect condition with cables and manuals. W0GA, phone 319-752-8685, Burlington, Iowa 52601.

MICROPHONES: Best prices — New and used Amateur, Professional, Commercial mics. Microphone Specialists, Box 1372, Burnsville, MN 55337.

QUALITY STAINLESS hex-"U" bolts, screws-nuts-washers-more! Lists 25¢ or long S.A.S.E.! Walt, W8BLR, 29716 Briarbank, Southfield, Mich. 48034.

DRAKE 550 Communication Terminal (receive only) and 7030 Monitor used about 5 hours, $500 or best offer. QST 49 thru 79 $100 or best offer. You pay shipping on the above. W4PRJ 703-343-8710.

FOR SALE or trade: Tektronic 221 scope $595, New, Fluke 8000A digital multimeter $250. New, B+K 177 6-1/2" meter VTVM $95. New, B+K 280 digital VM $45. Used, Heathkit IM-13 VTVM 6" meter $40 used, Triplett WV-38A VM $35, used. Want solid state transceiver 80-10M, small diesel generator. 603-823-5667 or P.O. Box 91, Sugar Hill, N.H. 03585 R. J. Wetstone.

SIGNAL GENERATORS: HP616A 1.8-4.2 GHz, covers MDS/itfs bands. HP618B 3.8-7.6 GHz, covers satelite up/down links. $500 each manuals included. R. Hall KA4WSV, Falls Church, VA. 703-534-7107.

HEATHKIT HW-16 transceiver, good condition $50. Charles Ewing, 71 Bowdoin, Portland, ME 04102. 207-774-8009.

KENWOOD TS-830S with 500-Hz CW filter, VFO-240, all in immaculate condition-$850. Rohn/Spaulding 56-foot, self-supporting galvanized tower, excellent condition-$200. Accu-Keyer with 4 memories and power supply-$15. Dennis Lusis, W1LJ, 160 Curtiss St., Bristol, CT 06010. Tel: 203-666-1541, ext. 275 days, 203-589-7247 evenings.

DX-60, good condition $40. Some FT-243 xtals, 40-M CW, $1 each. List of other items, large S.A.S.E. Paul K. Pagel, N1FB, 4 Roberts Rd., Enfield, CT 06082.

VIC-20 and C-64 software PROKEY CW transmit program $20, VIDEOTITLIST to create video pictures for ATV/SSTV and VCR's $20, MINIMUF PLUS propagation program $6 S.A.S.E. for details. Prompt courteous service. Jim Grubbs, P.O. Box 3042, Springfield, IL 62708.

WANTED: E.F. Johnson CB/10 meter equipment. KA6NNR, Box 71703, Los Angeles, CA 90071. 213-795-3397.

WANTED: Collins filter 200 cps #526-7677-00 — item X455Q200 — W5LZP, RT1 Box 1603, Boerne, TX 78006. 512-698-2806.

TMC TRC3500/70U/600B. R.F. transformer, 70 to 600 ohm balanced open line; SO-239 input connectors, 3500W. Pep rating, 2-30MHz, all in weatherproof case. $250. KC2WE, Seth Taylor. 201-627-7566.

SELL: MFJ tuner #940B $55.50, MFJ #410 Random Code Generator $93.50, Realistic 160 solid state receiver $89.50. All like new, manuals, original cartons. KA4SDY, tel. 919-243-5388.

DRAKE TR-4, RV-4C, AC-4, MS-4, DC-4, W-4, spare tubes, $595, K5GTL, Box 387, Huntsville, TX 77340. 409-295-5548.

KENWOOD 'S20S, CW filter, Shure mic, exceptionally clean rig $595. Ron, KT2R, 201-825-2557.

MADISON-Hal; trade up your old VIC20, Kantronics, software or VIC20, AEA, software for new Hal CT2200, KB2100 system, $900 difference, FOB Houston. Madison Electronics, 1508 McKinney, Houston, TX 77010. 1-713-658-0268. 1-800-231-3057 (orders). Mastercard/Visa.

ANTENNAS, TOWERS — Hy-Gain and Cushcraft antennas for less. Hy-Gain towers and packages. Rotors, cable, and coax. Write for our low quote and filer. RF Enterprises, Route 7, St. Cloud, MN 56301.

SELL-TRADE: Heath HW100 transceiver, needs some minor work $100; HP-23-A p.s. $25; Heath IM-5218 VTVM. Like new w/probes $75; Isotron 80M and 40M antennas, like new w/instructions $75 the pair. KA7HRE, Box 3218, Polson, MT 59860. 406-883-5079.

S2T TEMPO 220 MHz handheld. Perfect condition. Tone pad, battery eliminator circuit installed, all manuals leather carrying case! $225 postpaid in 48. Peter O'Dell, KB1N, 7 Brian Rd., South Windsor, CT 06074. Please no calls after 9 PM Eastern 203-644-3543 or work 203-666-1541.

ROSS $$$ New Bargains: AEA CP-1 $172.90, MBA-RC $309.90, Isopole-144 $39.90, CK-2 $119.95, KT-2 $94.95, Robot RB-400 $389.90, RB-800 $429.90, Icom IC-730 $634.90, IC-451A $729.90, IC-551D $569.90, IC-740 $929.90. Every day is Icom day at Ross's. Kenwood TS-430S $779.90, TS-930S $1349.90, Complete Kenwood, Yaesu, Icom, Drake, ECT, lines in stock, Yaesu FT-707 $579.90, Used Yaesu FR101 FL101 $499.90, FT101E $479.90, Limited offer, mention this ad to receive these bargain prices. Send S.A.S.E. & call letters for list of used equipment and current specials. Prices cash, FOB Preston. Closed Monday at 2:00 Ross Distributing Company, 78 South State, Preston, ID 83263 208-852-0830.

NOVICE SPECIAL: Hallicrafters HT-44 200 watt SSB-CW 10 thru 80 meter transmitter w/P-500 supply in excellent condition. $100. K2AWA, P.O. Box 568, Boro Hall, Jamaica, N.Y. 11424.

ICOM R70 receiver. Mint. $490. Harvey AD2S 212-263-3494.

QUAD 3 or 4 element tri-bander. Tapered fibreglas spreaders. New wires; pre-measured and marked. Complete instructions. Cubex made. $250; freight collect. WD6HDF 408-335-3321.

VHF AMATEURS: Swan 250-C 6 meter SSB transceiver, 117 XC supply, $225, matching TV2-B 2 meter transverter $15. Clegg Venus 6 meter SSB transceiver w/PS, $125, Clegg Interceptor B VHF receiver $90. Contact WB2JXY, 58-15 218th St. Bayside, N.Y. 11364. Phone: 212-224-2448.

SELL: Mint Kenwood TS-820S, $540, W9TJH, 219-884-5519.

OMNI-A, p.s., Mike, Keyer, $575; 109 QSTs, 1922-34, $125; W1PHW, 401-767-3052; Box 437, Slatersville, R.I. 02876.

FOR SALE: Drake TR7, w/DR7, NB7, AUX7, FA7, 6.0/2.3/.5 filters, Op/service manuals, gen. coverage TX/RX, $875; Viking Adventurer, $30; Kenwood TR-7800, $200; Sony ICF-2001, $175 or trade for TenTec/Drake gear. WA7ZYQ. 208-245-2070.

WANTED: Yaesu FL-110 or 200 watt PA module from FT-301 for my 301S. Donna KA5OER, 1427 Rice, Vallejo, CA 94590.

2-METER transceiver: Heath HW-2036A Complete with Micoder II and antenna $145 or best offer. Nussbaum, 2764 Scenic Drive, West Columbia, SC 29169.

ANTENNAS: Cushcraft ATV-5, 5-band vertical $65; AEA Isopole $25, Both very good condition. Prefer pick up but will ship. N2CJO 201-852-2516.

HEATHKIT SB-102 transceiver with SB-650 digital display and SB-600 speaker/AC power supply. Retubed and aligned by professional tech. Like new $400. Call Joe WA2PJP 516-736-0261.

WANTED — Heathkit 6-meter rig SB110A. Please send condition, history and price to: KD4AJ, 1968 Huntington Hall Court, Atlanta, GA 30338.

NATIONAL NC-400 receiver, $225. Radio West loop antenna, $95. Wayne, WA6ERI. 714-687-5910.

Jobs for Hams

JOBS FOR ENGINEERS! R.S. James Associates, a small, highly specialized recruiting firm dedicated *only* to targeted placements, is seeking *experienced college graduate* RF/telecommunications engineers for design/development of circuitry/equipment functioning from HF through microwave. Our primary clients are in Eastern PA and Southern NJ, with a few sunbelt locations available. Generous relocation policies are possible in some cases. No fees, contracts, or other obligations are involved. For further information please contact Stu, K3UEI at 215-584-0775 9-4:30 M-F Eastern or submit resume including salary requirements and location preference to R.S. James Associates, 4240 Township Line Road, Harleysville, PA 19438.

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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!

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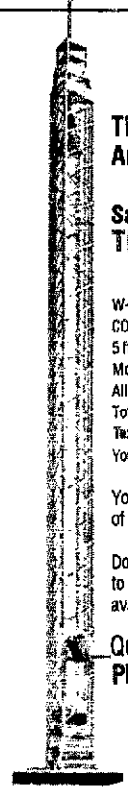
Tower Model	Tower Ht.	Load Rating	Ship Weight	Tower Base	Tower Price	Base Price	Total Price
HBX40	40 ft	10 sq ft	164	BXB6	289	24	313
HBX48	48 ft	10 sq ft	303	BXB7	369	26	395
HBX56	56 ft	10 sq ft	385	BXB8	449	30	479
HDBX40	40 ft	18 sq ft	281	BXB7	339	26	365
HDBX48	48 ft	18 sq ft	363	BXB8	429	30	459



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Quantities are limited.
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Up to 400 ft via UPS

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RG8X	52	.8	1.2	3.5	6.8
RG-58/U	52	1.4	1.9	8.0	12.5
½" Alum	50	.3	.5	1.2	2.2
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⅞" Heliax	50	.1	.2	.5	.9

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½" Alum. w/poly Jacket . . . . . $.79/ft
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½" Alum	$19	$19	$19	$25
½" Heliax™	$22	$22	$22	$22
⅞" Heliax™	$49	$49	$49	$49

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Silver PL259 . . . . $1.25 Nickle PL259 . . . . $.90
UG21B N Male . . $2.95 UG23D N Female . $2.95

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A50-5	$65	A50-6	$89	A147-4	$25	A147-11	$39
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228FB	$189	416TB	$59	424B	$63	617B	$179
147-20T	$63	144-10T	$45	144-20T	$69	432-20T	$49
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Model	Height Up	Down	Wind Load	List	Sale
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HG-54HD	54.0 ft	21.0 ft	16 sq ft	$1818	$1499
HG-70HD	70.0 ft	23.0 ft	16 sq ft	$2850	$2399
HG-33MT2	33.0 ft	11.5 ft	8.5 sq ft	$898	$779

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Transi-Trap™ Surge Protectors—In Stock Now!

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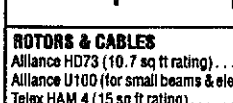
Model R-T 200W Deluxe . . . $29
Model HV 2KW Deluxe $32

KLM

KT34A 4-el Broad Band Triband Beam $309
KT34XA 6-el Broad Band Triband Beam $469
3.8-1 80-mtr Rotatable Dipole $429
7.2-1 40-mtr Rotatable Dipole $159
7.2-2 2-el 40-mtr Beam $289
7.2-3 3-el 40-mtr Beam $439
7.2-4A 4-el 40-mtr Beam $599
6el-20mtr Big Stick Monoband Beam $599
6el-15mtr Big Stick Monoband Beam $389
6el-10mtr Big Stick Monoband Beam $229
10-30-7LP Log Periodic Broad Band Beam $599
144-148-13LBA 13-el 2-mtr Beam $79
143-150-14C 14-el 2-mtr Satellite Antenna $79
420-470-18C 435 MHz Satellite Antenna $59
432-16LB 432 MHz Long Boom Antenna $59

MINI-PRODUCTS HQ-1 only $139!



Wing Span - 11 ft
Boom - 54 in. long
Wind Area - 1.5 sq ft
1200W P.E.P. Input
6-10-15-20 mtrs

ROTORS & CABLES

Alliance HD73 (10.7 sq ft rating) $99
Alliance U100 (for small beams & elevation) $49
Telex HAM 4 (15 sq ft rating) $199
Telex Tailtwister (20 sq ft rating) $249
Telex HDR300 Heavy Duty (25 sq ft rating) $439

Standard 8 cond cable $.19/ft (vinyl jacket 2-#18 & 6-#22 ga)
Heavy Duty 8 Cond cable $.36/ft (vinyl jacket 2-#16 & 6-#18 ga)

UNR-ROHN GUYED TOWERS

10 ft Sections 20G $32.50 25G $43.50 45G $95.50

Foldover Towers	Model	Height	Ant Load*	Price
	FK2548	48 ft	15.4 sq ft	$789
	FK2558	58 ft	13.3 sq ft	$879
	FK2568	68 ft	11.7 sq ft	$959
	FK4544	44 ft	34.8 sq ft	$1099
	FK4554	54 ft	29.1 sq ft	$1219
	FK4564	64 ft	28.4 sq ft	$1329
	25G Foldover Double Guy Kit			$199
	45G Foldover Double Guy Kit			$229

*Above antenna loads for 70 MPH winds and Guys at Hinge & Apex.

All Foldover Towers Shipped Freight Pre-Paid!
Foldover prices 10% higher west of Rockies.
All Rohn 25G & 45G Accessories in stock - Call!

TOWER/GUY HARDWARE

3/16" EHS Guywire (3990 lb rating) . . . . . $.12/ft
1/4" EHS Guywire (6000 lb rating) . . . . . $.15/ft
5/32" 7 × 7 Aircraft Cable (2700 lb rating) . . . . . $.12/ft
3/16" CCM Cable Clamp (3/16" or 5/32" Cable) . . . $.35
1/4" CCM Cable Clamp (1/4" Cable) . . . . . $.45
1/4" TH Thimble (fits all sizes) . . . . . $.30
3/8EE (3/8" Eye & Eye Turnbuckle) $5.95
3/8" EJ (3/8" Eye & Jaw Turnbuckle) $6.95
1/2" EE (1/2" Eye & Eye Turnbuckle) $8.95
1/2" EJ (1/2" Eye & Jaw Turnbuckle) $9.95
3/16" Preformed Guy Grip $1.79
1/4" Preformed Guy Grip $1.99
6" Diam - 4 ft Long Earth Screw Anchor $12.95
5000 Guy Insulator (5/32" or 3/16" Cable) . . . . . $.95
502 Guy Insulator (1/4" Cable) $1.95
5/8" Diam - 8 ft Copper Clad Ground Rod $11

PHILLYSTRAN GUY CABLE

HPTG2100 Guy Cable (2100 lb rating) . . . . . $.29/ft
HPTG4000 Guy Cable (4000 lb rating) . . . . . $.43/ft
HPTG6700 Guy Cable (6700 lb rating) . . . . . $.69/ft
9901LD Cable End (for 2100/4000 cable) $4.95
9902LD Cable End (for 6700 cable) $6.95
Socketlast Potting Compound (does 6-8 ends) $8.95

GALVANIZED STEEL MASTS

Heavy Duty Steel Masts 2 in OD - Galvanized Finish

Length	5 FT	10 FT	15 FT	20 FT
.12 in Wall	$25	$39	$59	$79
.18 in Wall	$39	$69	$99	$109
.25 in Wall	$69	$129	$189	$249

SOUTH RIVER ROOF TRIPODS

HDT-3 3 ft Tripod . . . . $19 HDT-5 5 ft Tripod $29
HDT-10 10 ft Tripod . . $49 HDT-15 15 ft Tripod . . $69
Heavy Duty Tripods include mtg hdw-UPS Shippable

TEXAS TOWERS

DIV. OF TEXAS RF DISTRIBUTORS INC.

MasterCard VISA

1108 Summit Ave., Suite 4 / Plano, Texas 75074

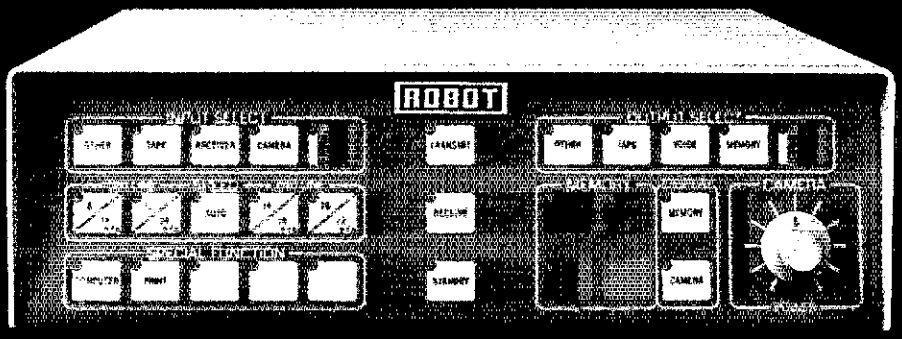
ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

Mon.-Fri. 8:30 a.m. - 5:30 p.m. Sat. 9 a.m. - 1 p.m.

TELEPHONE: (214) 422-7306

CIRCLE 10 ON READER SERVICE CARD

COLOR SSTV



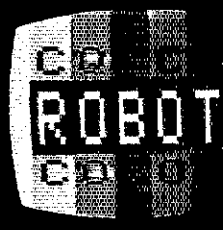
Introducing the Robot 450C and 1200C Single Frame Color SSTV Converters

Robot's new color slow scan TV converters provide you with a whole new dimension of Amateur Radio activity. Now you can exchange color pictures of your latest DX QSL card, the best stamp in your collection, or even that terrific sunset scene you shot last summer.

Robot's microprocessor controlled color SSTV equipment provides a significant breakthrough in the transmission of single frame color images known as "Time Multiplex Color Component System" (TMCCS). This method was chosen as being faster, easier to use and more reliable than the cumbersome frame or line sequential systems now in use, as well as being black and white compatible with the thousands of slow scan stations already on the air world wide.

In addition to having fast, single frame color capability as with the Robot Model 450C, the Model 1200C also offers sharp, high resolution color pictures that rival commercial broadcast television! With all their flexibility, interfaceability and dependability, the Models 450C and 1200C will be in the forefront of technology for years to come. Their new multi-dimensional SSTV standards will be the pace-setters in the industry.

There are even more features and capabilities too numerous to be listed here, such as computer interface, automatic fine tuning, multi speed operation and many more, so see your dealer today for literature and a demonstration, or write:



ATTENTION MODEL 400 OWNERS: Now you can have single frame color SSTV capability too by installing the Model 400C Update Kit to your unit. All necessary parts and hardware are included for an easy single evening installation.

ROBOT

Also introducing the new Robot Model 800C Super Terminal with color graphics capability when used with the new Robot color scan converters. Also has expanded memory with lithium battery back-up, and has both serial and parallel printer interface. A complete terminal for RTTY and Morse Code.

ROBOT RESEARCH, INC.
7591 Convoy Ct., San Diego, CA 92111 (619) 279-9430

World Leaders in Slow Scan TV, Phone Line TV and Image Processing 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.

0183R

YAESU ELECTRONICS CORPORATION 6851 Walthall Way, Paramount, CA 90723 • (213) 633-4007
YAESU CINCINNATI SERVICE CENTER 9070 Gold Park Drive, Hamilton, OH 45011 • (513) 874-3100

Digital DX-terity...

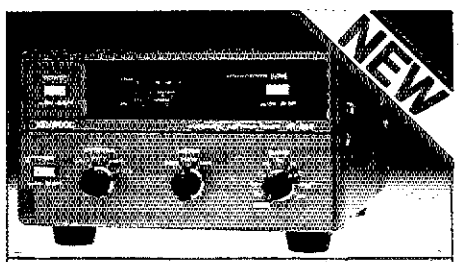
General coverage, Superior dynamic range, 2 VFO's, 8 memories, Scan, Notch...COMPACT!

TS-430S

The TS-430S combines the ultimate in compact styling with advanced circuit design and performance. An all solid-state SSB, CW, and AM transceiver, with FM optional, covering the 160-10 meter Amateur bands, it also incorporates a 150 kHz-30 MHz general coverage receiver having a superior dynamic range, dual digital VFO's, 8 memories, memory scan, programmable band scan, IF shift, notch filter, all-mode squelch, and built-in speech processor.

TS-430S FEATURES:

- **160-10 meter operation, with general coverage receiver**
  With 160-10 meter Amateur band coverage, including WARC 30, 17, and 12 meter bands, it also features a 150 kHz-30 MHz general coverage receiver. Innovative UP-conversion digital PLL circuit, for superior frequency stability and accuracy. UP/DOWN band switches for Amateur bands or 1-MHz steps across entire 150 kHz-30 MHz range. Two digital VFO's continuously tuneable from band to band. Band information output on rear panel.
- **USB, LSB, CW, AM, with optional FM**
  Operates on USB, LSB, CW, and AM, with optional FM, internally installed. AGC time constant automatically selected by mode.
- **Compact, lightweight design**
  Measures only 10-5/8 (270) W x 3-3/4 (96) H x 10-7/8 (275) D, inches (mm), weighs only 14.3 lbs. (6.5 kg.).
- **Superior receiver dynamic range**
  Use of 2SK125 junction-type FET's in the Dyna-Mix high sensitivity, balanced, direct mixer circuit provides superior dynamic range.
- **10-Hz step dual digital VFO's**
  10-Hz step dual digital VFO's operate independently, include band and mode information. Different band and mode cross operation possible. Dial torque adjustable. STEP switch for tuning in 10-Hz or 100-Hz steps. A=B switch quickly shifts "B" VFO to the same frequency and mode as "A" VFO, or vice-versa. VFO LOCK switch provided. RIT control tunes VFO or memory. UP/DOWN manual scan possible using optional microphone.
- **Eight memories store frequency, mode, and band data**
  Memories store frequency, mode, and band data. Eighth memory stores receive and transmit frequencies independently. M.CH switch for operation of memory as independent VFO, or fixed frequency.
- **Lithium battery memory back-up**
  Estimated five-year life.
- **Memory scan**
  Scans memories in which data is stored.
- **Programmable automatic band scan**
  Scans programmed band width. Scan speed adjustable. HOLD switch interrupts band or memory scan.
- **IF shift circuit for minimum QRM.**
  IF passband may be moved to place interferring signals outside the passband, for best interference rejection.
- **Tuneable notch filter built-in**
  Deep, sharp, tuneable, audio notch filter.
- **Narrow-wide filter selection**
  NAR-WIDE switch for IF filter selection on SSB, CW, or AM, when optional filters are installed. (2.4 kHz IF filter built-in.)
- **Speech processor built-in**
  Improves intelligibility, increases average "talk-power."
- **Fluorescent tube digital display**
  Indicates frequency to 100 Hz (10 Hz modifiable).
- **All solid-state technology**
  Input rated 250 W PEP on SSB, 200 W DC on CW, 120 W on FM (optional), 60 W on AM. Built-in cooling fan, multi-circuit final protection. Operates on 12 VDC, or 120/220/240 VAC with optional PS-430 AC power supply.
- **All-mode squelch circuit, built-in**
- **Noise blanker, built-in**
- **RF attenuator (20 dB)**
- **Vox circuit, plus semi break-in with side-tone**



Optional AT-250 Automatic Antenna Tuner
Designed to match the TS-430S in size, color, and appearance. Functionally compatible with any HF transceiver of 200 watts PEP or lower. (Requires manual bandswitching.)
• Covers 160-10 meter incl. WARC
• ABC Automatic Band Changing System (when used with TS-430S) • SWR/Power meter • 4 antenna terminals • Built-in AC Power Supply.

Other optional accessories:

- PS-430 compact AC power supply.
- PS-30 or KPS-21 AC power supplies.
- SP-430 external speaker.
- MB-430 mobile mounting bracket.
- AT-130 compact antenna tuner, 80-10 m incl. WARC.
- FM-430 FM unit.
- YK-88C (500 Hz) or YK-88CN (270 Hz) CW filters.
- YK-88SN (1.8 kHz) narrow SSB filter.
- YK-88A (6 kHz) AM filter.
- MC-42S UP/DOWN hand microphone.
- MC-60A deluxe desk microphone, UP/DOWN switch.
- MC-80 UP/DOWN desk microphone.

More information on the TS-430S is available from all authorized dealers of Trio-Kenwood Communications, 1111 West Walnut Street, Compton, California 90220.

KENWOOD

pacesetter in amateur radio

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